Town of Thompson's Station
Municipal Planning Commission
Meeting Agenda
January 24, 2017

Meeting Called To Order

Pledge Of Allegiance

Minutes-

Consideration Of The Minutes Of The November 18, 2016 Meeting.

Documents:

1152016 MINUTES.PDF

Public Comments-

Town Planner Report

Town Planner Report

Documents:

PLANNER REPORT 012417.PDF
DESIGN GUIDELINES.PDF

New Business:

1. Land Development Ordinance Amendments (Zone Amend 2017-001)

Documents:

ITEM 1 BOMA LDO AMENDMENT REQUEST.PDF
ITEM 1 LDO AMENDMENT STAFF REPORT.PDF
ITEM 1 TA MEMO.PDF

2. Final Plat For Phase 15 Of Tollgate Village (FP 2017-001)

Documents:

ITEM 2 STAFF REPORT TV FINAL PLAT 15.PDF
ITEM 2 TV PHASE 15 FINAL PLAT.PDF
ITEMS 2 3 AND 4 SITE DEVELOPMENT PLAN.PDF
ITEMS 2 3 AND 4 2003 TOLLGATE TRAFFIC STUDY.PDF
ITEMS 2 3 AND 4 2015 UPDATED TOLLGATE TRAFFIC STUDY.PDF
ITEMS 2 3 AND 4 2016 UPDATED TOLLGATE TRAFFIC STUDY.PDF
ITEMS 2 3 AND 4 RPM LETTER DATED JANUARY 6 2017.PDF
ITEMS 2 3 AND 4 DEVELOPER LETTER DATED JAN 11 2017.PDF
ITEMS 2 3 AND 4 DEVELOPER RESPONSE TO TRAFFIC STUDY COMMENTS.PDF

3. Preliminary Plat For Phase 16 Of Tollgate Village To Create 105 Single Family Lots, Six Open Space Lots And The Removal Of Eight Trees Exceeding 24 Inches In Diameter (PP 2017-001)

Documents:

ITEM 3 STAFF REPORT TV PRELIM PLAT 16.PDF
ITEM 3 TV PHASE 16 PRELIM PLAT.PDF

4. Preliminary Plat For Phase 17 Of Tollgate Village To Create 71 Single Family Lots, Five Open Space Lots And The Removal Of Seven Trees Exceeding 24 Inches In Diameter (PP 2017-002)

Documents:

ITEM 4 STAFF REPORT TV PRELIM PLAT 17.PDF
ITEM 4 TV PHASE 17 PRELIM PLAT.PDF

Adjourn

This meeting will be held at 7:00 p.m. at the Thompson's Station Community Center
1555 Thompson's Station Rd West

Minutes of the Meeting
of the Municipal Planning Commission
of the Town of Thompson 's Station, Tennessee
November 15, 2016

Call to Order:
The meeting of the Municipal Planning Commission of the Town of Thompson's Station was called to order at 7:00 p.m. on the 25rd day of October, 2016 at the Thompson's Station Community Center with the required quorum. Members and staff in attendance were: Chairman Jack Elder; Vice Chairman Mike Roberts; Commissioner Ben Dilks; Commissioner Sarah Benson; Commissioner Don Blair; Commissioner Debra Bender; Town Planner Wendy Deats; Town Administrator, Joe Cosentini; Town Attorney Todd Moore and Town Clerk, Jennifer Jones. Commissioner Darren Burress was unable to attend.

Pledge of Allegiance.

Minutes:
The minutes of the October 25, 2016 meeting were previously submitted.

> **Commissioner Roberts moved for approval of the October 25, 2016 meeting minutes. The motion was seconded and carried unanimously.**

Public Comment:

None

Town Planner Report:

Mrs. Deats updated the Commission on the following:

- Design Guidelines – Just received from Placemakers and Staff is currently reviewing. Would like to plan a work session in January.
- SIA Project - Currently moving forward and the utility work is starting. Please check Facebook and the Town website for updates.
- Greenway Trail – This is now complete and the final walk should be done on Thursday, November 15th, 2016.
- We are putting together the dates for the meetings now and they will remain on the 4th Tuesday of the month. The dates will be published in January, and will be emailed to you then.

New Business:

1. **Final Plat for the creation of 38 lots within Section 10B of the Fields of Canterbury (FP 2016-008)**

Mrs. Deats reviewed her staff report and recommended that the Planning Commission approve the final plat with the following contingencies:

1. Prior to the recordation of the final plat, a surety will be required in the amount of $163,000 for roads, drainage and erosion control.
2. Prior to the recordation of the final plat, a surety shall be required in the amount of $127,000 for sewer.

3. As builts shall be required for the drainage and sewer system with a letter from the Design Engineer that they are constructed per the approved drawings and functioning as intended.

After discussion, Commissioner Roberts made a motion to approve Item 1, a Final Plat for the creation of 38 lots within Section 10B of the Fields of Canterbury with the following contingencies:

1. **Prior to the recordation of the final plat, a surety will be required in the amount of $163,000 for roads, drainage and erosion control.**
2. **Prior to the recordation of the final plat, a surety shall be required in the amount of $127,000 for sewer.**
3. **As builts shall be required for the drainage and sewer system with a letter from the Design Engineer that they are constructed per the approved drawings and functioning as intended.**

The motion was seconded and carried unanimously.

2. Site Plan for the construction of a 10,541 square foot auditorium located at Heritage Middle School at 4803 Columbia Pike (SP 2016-004).

Mrs. Deats reviewed her report and recommended that the Planning Commission approve the site plan with the following contingencies:

1. Prior to the issuance of grading permits, construction plans shall be submitted and approved. Any upgrades to the utility infrastructure necessary for the project shall be completed by the applicant.
2. Prior to the issuance of a building permit, design review approval shall be obtained.
3. Any change of use or expansion of the project site shall conform to the requirements set forth within the Land Development Ordinance and shall be approved prior to the implementation of any changes on the project.

After discussion, Commissioner Blair made a motion to approve Item 2, a Site Plan for the construction of a 10,541 square foot auditorium located at Heritage Middle School at 4803 Columbia Pike with the following contingencies:

1. **Prior to the issuance of grading permits, construction plans shall be submitted and approved. Any upgrades to the utility infrastructure necessary for the project shall be completed by the applicant.**
2. **Prior to the issuance of a building permit, design review approval shall be obtained.**
3. **Any change of use or expansion of the project site shall conform to the requirements set forth within the Land Development Ordinance and shall be approved prior to the implementation of any changes on the project.**

The motion was seconded and carried unanimously.

3. Approval of the construction of Tollgate Intersection Improvements and the establishment of a surety for these traffic improvements.

Mrs. Deats reviewed her staff report and recommended that the Planning Commission approve the traffic improvement plans for the intersection of Columbia Pike /Tollgate Boulevard with the following contingencies:

1. Prior to the approval of installation of the traffic improvements, the Town Engineer shall approve the construction plans.
2. Prior to the approval of construction plans, the applicant shall post a surety in the amount of $221,000 for the intersection improvements.

After discussion, Commissioner Roberts made a motion to approve the Traffic Signal located at the intersection of Columbia Pike/Tollgate Boulevard with the following contingencies:

1. **Prior to approval of the installation of the traffic improvements, the Town Engineer shall approve the construction plans.**
2. **Prior to the approval of construction plans, the applicant shall post a surety in the amount of $126,000 for the traffic signal.**
3. **Prior to the approval of the construction plans, the applicant shall post a surety in the amount of $95,000 which could be waived if TDOT requires a surety that meets or exceeds this amount for the turn lane improvements.**
4. **The signalization shall include a controller compatible with signal synchronization within Thompson's Station.**

The motion was seconded and carried unanimously.

There being no further business, Commissioner Roberts made a motion to adjourn. The motion was seconded and the meeting was adjourned at 7:50 p.m.

_____
Jack Elder, Chairman

Attest: _____
Don Blair, Secretary

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1550 Thompson's Station Road W.
P.O. Box 100
Thompson's Station, TN 37179

DATE: January 18, 2017

TO: The Planning Commission

FROM: Wendy Deats, Town Planner

SUBJECT: Planner Report 1/24/2017

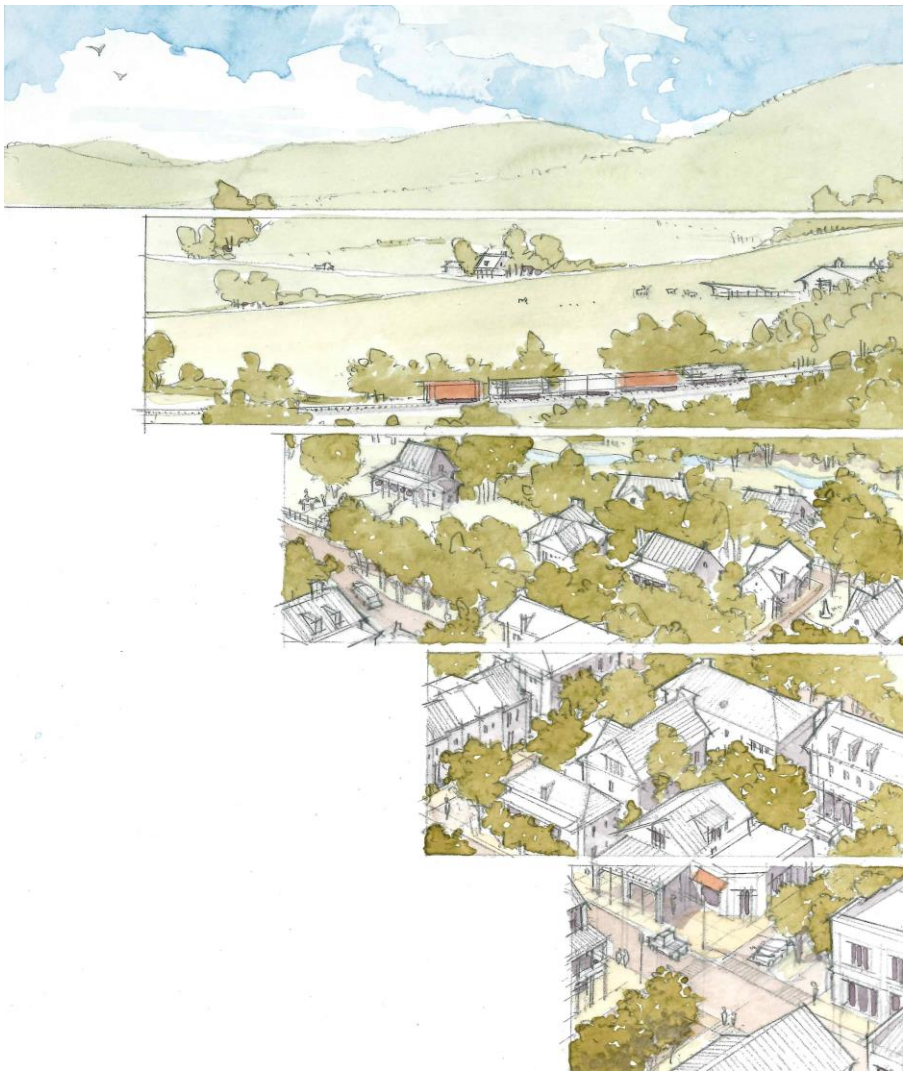
Design Guidelines:
PlaceMakers has prepared a Revised Draft Design Guidelines that will be reviewed and ultimately adopted by the Design Review Commission. The intent of the guidelines is to promote design excellence in character and compatibility of development to its surroundings. The guidelines are applicable to all commercial, mixed use and multi-family developments.

General Plan Update:
The Board of Mayor and Aldermen have requested a work session to begin the process of revising our General Plan. We will be scheduling a work session to begin studying the plan and identifying potential updates.

Two Farms at Thompson's Station:
Annexation: The referendum request was completed in December 2016 and has been certified and is annexed into the Thompson's Station municipal boundary.

Zoning/Concept Plan: The applicant will be required to go through the zoning and concept plan process for the project site. The site contains several streams tributaries, hillsides with slopes exceeding 15% and other constraints may be identified during the planning process. Therefore, additional studies are necessary to determine the potential impacts of the project, including an archeological survey, along with biological and geotechnical assessments. In addition, a traffic study is required and all off-site traffic improvements. All mitigation for the project will be the responsibility of the developer and will be included in a development agreement between the Town and the Developer. The traffic study will be reviewed by Town Staff, the Town's Consulting Engineer and Consulting Traffic Engineer along with Williamson County. The Developer is aware of these necessary technical studies.

DESIGN GUIDELINES



11/7/16

Town of Thompson's Station

Design Guidelines

TOWN OF THOMPSON'S STATION

Table of Contents

PURPOSE & APPLICABILITY

Purpose

Development regulations are found within the Land Development Ordinance (LDO) and these regulations promote design excellence in buildings, landscape, open space and urban design. The purpose of this manual is to provide developers and designers with clear answers to the question: What does Thompson's Station consider "good design?" The Town's intention for these "Design Guidelines" is to assure that new designs remain in continuity with the town's existing development "successes," and at the same time inspire exciting and creative additions to the community.

Town-Wide Design Principles

These principles state the Town's vision for the future of development and are applied to all types of development and use. The general criteria established for development in the Town of Thompson's Station include:

- **Character:** All developments should create buildings and landscapes that are particular to Thompson's Station and contribute to the public realm as well as the preservation of the rural landscape.
- **Compatibility:** New development should be visually appealing, and compatible with other development in the surrounding area.
- **Views:** Development should enhance the environment by enhancing existing views and providing vistas of important spaces and buildings.

Design Guidelines for Commercial, Mixed-Use and Multi-Family

These guidelines supplement the Town-Wide Design Principles. They set additional criteria for more intense and diverse development to aid in meeting the goal of excellence in design and asset to the landscape. These guidelines augment rather than replace the requirements of the LDO and proposals may be submitted that are in conflict with the criteria with a clear explanation of why the criteria could not be met. The goals of these criteria include the following:

- **Livability:** All new development, whether Transect-based or Use-based, should plan for buildings and outdoor spaces that are human-scale, consider active transportation needs, and provide for a interconnected network of circulation.

- **Context:** Ensure that new development fits into its existing context in a manner that benefits the Town's character and economy. This includes having a positive relationship between the building and the street and well as with the adjacent neighbors.
- **Harmony:** New developments should be designed to achieve a unified composition including building placement, volume, architectural elements, fenestration, proportion and landscape.
- **Durability:** Buildings should use durable materials that are assembled in a manner that achieves long-term value.

Applicability

These guidelines apply to all commercial, mixed-use and multi-family buildings in the Town of Thompson's Station. This applies to Transect zones and Use zones alike.

INTRODUCTION

Thompson's Station traces its origins to the 18th century and its role in Middle Tennessee's economy to the great railroad era of the 1800s. Current projected population and job growth is likely to make the region among the most dynamic in the nation over the next quarter-century. These Design Guidelines, in conjunction with the General Plan and Land Development Ordinance make sure the growth we capture is in character with who we are and what we value.

The opportunity that the Town wants to seize is an appropriate share of the dramatic growth in population and jobs predicted for the Nashville region. But that comes with avoiding the kinds of sprawling and disconnected development that damages the rural landscape, demands enormous low-return infrastructure investment and requires anybody who wants to get anywhere to endure commuting hassles among the worst in the US.

Thompson's Station will take advantage of lessons learned from communities in the broader region and elsewhere that allowed sprawling development to overwhelm them. The sort of regulations we want are ones that enable the kinds of places we admire. The rural landscape is of tremendous value and its preservation coupled with appropriate development is a priority established in the General Plan.

With this priority on the rural landscape, adding new buildings can be challenging. Introducing buildings that respect views, have the appropriate scale, and are an asset to the environment requires sensitivity and skill. To make the process and the assessment of the applications easier, criteria are provided at the scale of the Site, the Landscape, and the Building.

The Site

New development changes the character of the streets and roads they front as well as the neighborhoods they abut. Depending on the context, they should either preserve or enhance the character of the urban or rural context that is larger than their specific site. This includes a compatible connection to adjacent development.

The Landscape

New projects should contribute to the existing landscape. Buildings' form affects the environmental performance and quality of life possible in adjacent buildings and on adjacent sites. New development must not be considered as an island, but as an extension of adjacent neighborhoods and landscapes. This topic includes slope sensitivity, tree preservation and green infrastructure recommendations.

The Building

These guidelines have no criteria for architectural style, but buildings must possess sensitive massing, useable open space, pedestrian-friendly parking, durable materials, and human-scaled volume.

Summary

The LDO and the physical constraints of the site always take precedence in determining the ultimate site development. These guidelines are offered to help designers deal with such constraints efficiently and effectively.

Site development issues include landscape preservation, siting of buildings, parking and circulation, and stormwater management. Landscape character issues include entranceways, streetscapes, and tree and plant selection, including size and variety. Architectural character issues deal with proportion and scale, building materials, color and texture, and architectural detail.

I | THE SITE

1. | Public Realm

The most important criterion of context-sensitive development is how the site relates to the street or road it faces and abuts its neighbors. Character may be enhanced with sensitive siting, reduction in grading, and preservation of views.

The public realm is another term for the public right-of-way plus the front setback and in an urban context is the space between the buildings facing each other across a street. In a rural context, it is the space between the landscapes on either side of the road. The components are illustrated below and consist of the carriageway, planters including street trees, sidewalks or paths, and the setbacks in an urban environment.

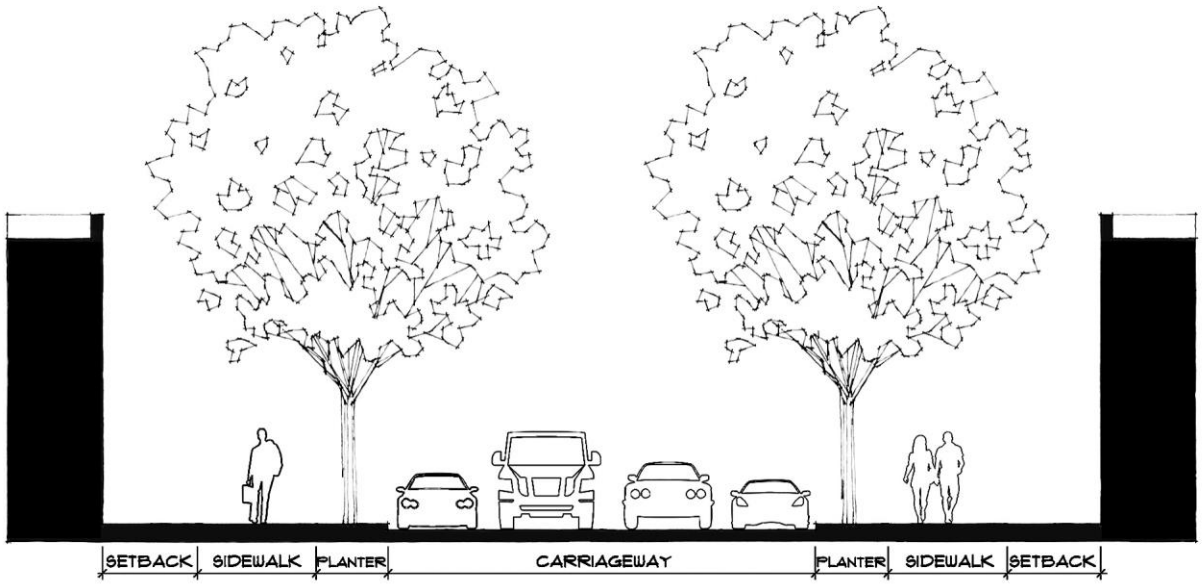


FIGURE 1. PUBLIC REALM COMPONENTS – URBAN CONTEXT

Recommendations

1.1. **Relationship to the Public Realm.** Orient buildings to positively define and frame public streets or civic spaces relative to the context. In a rural condition, development must be carefully sited to avoid compromising character and scenic vistas. Match or complement adjacent building heights and widths in use zones.

2. | Topography

High value is placed on the rural landscape. Because of this, buildings and streets should be designed to harmonize with existing topography and minimize land disturbance. Thompson's Station's topography requires special sensitivity in building placement.

Recommendations

2.1 **Grading**. Design the site to reduce the requirements for grading and complement the natural landform. Grading should blend gently with contours of adjacent properties, with smooth gradations around all proposed cut-and-fill slopes, both horizontally and vertically.

2.2 **Development Intensity**. Plans should be designed to reflect the capacity of existing topography, natural drainage-ways, soils, geology and other site conditions.

2.3 **Context**. Sites should be developed to reflect their natural characteristics. Flat, open areas are most desirable for larger buildings and parking while steeper areas may be able to accommodate smaller structures.

2.4 **Slope**. Portions of a site shall be identified as buildable relative to their slope and are defined as follows:

- **Prime Buildable**: Land with little or no building restrictions that occurs as a consequence of slope conditions. These areas are defined as slopes of less than 10 percent.
- **Secondary Buildable**: In areas with slopes of 10 to 15 percent, techniques should be utilized which minimize grading and site disturbance.
- **Conserved**: In areas with slopes of 15 to 25 percent, building and site preparation can occur, but restrictions are severe. These areas require customized architectural solutions and specialized site design techniques and approaches.
- **Preserved**: In areas with slopes greater than 25 percent, a detailed "site analysis" of soil conditions, hydrology, bedrock conditions, and other engineering and environmental considerations should be made to determine acceptable building and site engineering techniques. Generally, the high cost of development associated with acceptable techniques precludes development in these areas.

2.5 **Foundations**. Wherever possible, slab-on-grade construction is to be avoided in areas where the slope exceeds 5 percent.

3. | Drainage

The management of natural drainage is different in urban, suburban and rural conditions. However, all three scenarios should utilize green infrastructure solutions where possible. Drainage management solutions are closely related to topography, and where possible will include similar recommendations.

Recommendations

3.1 **Preservation**. Natural drainage patterns should be preserved where possible in the rural and suburban context. Urban development should be focused in flat areas, and in some situations may utilize piping to maximize the development without impact on slopes and views.

3.2 **Amenity**. Natural drainages should be used as an amenity where possible, and new ponding should also be developed as an amenity with gradual grades to avoid fencing.

3.3 **Recreation**. Where possible, combine natural drainages with recreational opportunities such as greenways and trails.

3.4 **Detention**. Detention ponds for run-off and sedimentation should be located where a natural holding pond already exists. Ponds should be designed and graded to fit naturally into the landscape and planted with wetland vegetation.

3.5 **Retention**. Ponds that always contain water should provide for aeration.

4. | Pedestrians

All new development should assure that pedestrian access is safe, pleasant, and convenient.

Recommendations

4.1 **Links**. Link internal pedestrian systems with adjacent properties and the public sidewalk if possible.

4.2 **Sidewalks**. Provide sidewalks along all public streets.

4.3 **Crosswalks**. Clearly mark internal crosswalks with a contrasting surface material.

4.4 **Entrances**. New buildings should be entered directly and prominently from the street through a lobby, or indirectly through a passage. Entrances should be clearly visible from the street. If entrances are accessed through courtyards, gates, porticos or trellises should be used to denote the entry.

5. | Parking

Parking location and standards are regulated by the LDO. In addition to those regulations, parking should not be the focal point or prominent feature of development, even in use zones.

Recommendations

5.1 **Location**. Parking should be located behind or beside buildings rather than adjacent to the street.

5.2 **Screening**. Plan trees and shrubs or construct walls and fences ro screen parking areas adjacent to streets or adjacent residential areas.

5.3 **Size**. Thompson's Station's rolling topography is an asset, but may enhance the view of parking lots. It is important to disperse parking masses in order to protect views.

5.4 **Orientation**. Parking lots and access aisles should follow existing grades where possible to minimize environmental disturbance.

5.5 **Sidewalks**. Pedestrian areas should be clearly designated by contrasting paving materials, special planting, and pedestrian-scaled lighting. If parking lots have more than 50 cars, an internal sidewalk system should be provided to safely separate pedestrians from vehicles.

5.6 **Landscaping**. Parking lots should be landscaped with native plants and shade trees to reduce stormwater runoff. Except in the T5 zone, a landscaped bay with a shade tree should occur after every ten (10) cars and dead end bays should not exceed 200' in length.

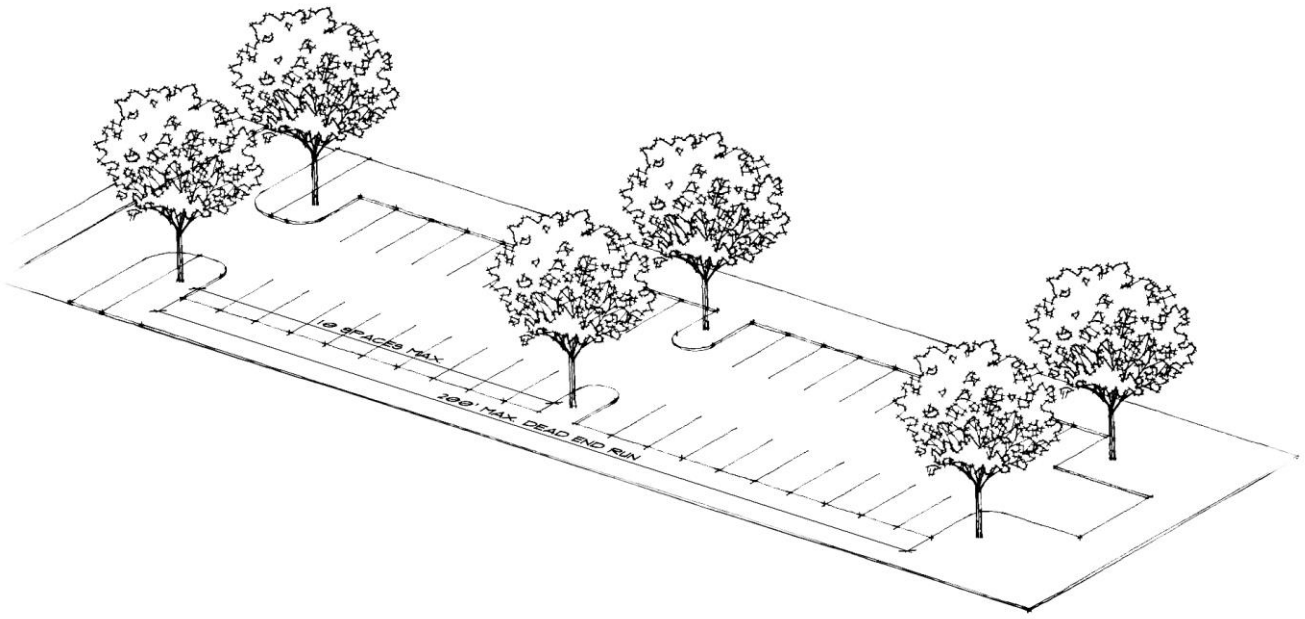


FIGURE 2. PARKIING ARRANGEMENT

6. | Service

Service location and standards are regulated by the LDO. In addition to those regulations, service area visibility should be minimized, even in use zones.

Recommendations

6.1 Locate all outside service and storage areas behind buildings or completely screened with the use of architecturally compatible walls or fencing material and the incorporation of landscape treatments.

6.2 Areas used for storage should be away from streets, residential areas, and other high visibility zones, and located preferably on the rear half of the site. This requirement also applies to outdoor storage of equipment, service vehicles and rental vehicles.

II | THE LANDSCAPE

As previously discussed, the rural character of the Thompson's Station landscape is highly valued by its residents. Where possible vistas, topography, greenways and significant tree stands should be protected. However, there are various contexts for development, and different criteria for preservation within each. Recommendations are grouped by context below.

1. | O1 and O2 Sectors

Development within these rural sectors should prioritize the natural environment.

Recommendations

1.1. **Preservation**. Minimize harm and disruption to existing plant and animal life and preserve vistas where possible.

1.2. **Greenways**. When a proposed development contains a planned greenway or is near a greenway, the developer should consult with the Town early in the design process to ensure appropriate character and connectivity.

1.3. **Farms and Hamlets**. Development within O2 may take the form or farms or hamlets. Design development around environmental features to preserve woodlands, streams and slopes.

2. | Suburban

Development within the suburban landscape should integrate with the natural landscape while supporting human activity. This character may occur in the G1 or G2 sectors within use zones.

Recommendations

2.1 **Greenways Connections.** A development located near or adjacent to a greenway should provide safe and efficient pedestrian connection to that greenway and to adjacent properties that might include pedestrian systems in the future.

2.2 **Recreation Areas**. Preservation of environmentally sensitive areas is considered a legitimate "recreational purpose." The development must provide for maintenance of both active and passive recreation areas in perpetuity.

2.3 **Park Design**. Design for parks and recreation areas should incorporate the following principles:

- Achieve a balance and compatibility between active and passive recreational uses;
- Ensure environmental diversity;
- Adapt land use to the features of the terrain instead of altering the terrain to suit the use;

- Consider sun orientation and climatic conditions when locating facilities; and
- Provide safety for users.

2.4 **Woodlands**. Wooded sites should be developed with careful consideration for the site's natural characteristics. When portions of the woods must be developed, wooded perimeters or the most desirable natural site features should be protected to retain the visual character of the site.

- Isolated pockets of existing trees should be protected, and used to enhance the site's visual impact.
- When a wooded site is subdivided, lot lines should be drawn through significantly wooded areas so that trees will be outside areas of construction activity.

2.5 **Buffers**. Maintain natural vegetation along property lines where possible to conceal parking and storage. Specific buffer requirements are regulated by the LDO.

2.6 **Parking**. **:** Parking lots design is encouraged to utilize crusher fines, bricks or cobble-stones, with materials spaced so that grass can grow.

3. | Urban

Development within the urban landscape should prioritize human activity while enhancing the natural landscape.

Recommendations

1.4. **Character**. In T5 areas of Thompson's Station, the landscape character should become more formal. While major tree stands and natural drainages should be preserved where possible that is not the highest priority like it is in the rural and suburban context.

III | THE BUILDING

1. | Private Realm

The challenging aspect of designing new buildings that complement the rural landscape is to limit the perception of a large volume. Buildings should not be designed in isolation, but responsive to their context. This may include enhancing a beautiful vista, or improving a limited condition. The scale of the building is critical, including how it meets both the street and adjacent neighbors.

Recommendations

1.1. **Context**. Design buildings to respond to their context and consider scale, mass, and views in the initial process. For parcels that provide a transition from less intense to more intense development, the issue of compatibility is particularly important. New higher-intensity projects need to respond to lower-intensity existing buildings through compatible massing and thoughtfully designed adjacent elevations.

2. | Style

The integrity of new buildings should be reflected in the consistency of their architectural elements, whether contemporary or traditional.

Recommendations

2.1 **Style Choice**. The style of new buildings should be clear and consistent, whether contemporary or traditional. Hybrid projects are discouraged.

2.2 **Contemporary**. Buildings designed in contemporary styles may have a framework established by the designer but must be described in a short design narrative including the following:

- How does the proposed building relate to its site and its neighbors in terms of setbacks, heights, massing, scale and materials?
- What measures have been taken to respond to the scale of adjacent development, if applicable?
- What is the design concept?
- What makes the proposed building appropriate to Thompson's Station?

2.3 **Traditional**. Buildings designed in traditional styles should adhere to the regional historic precedent for that style. This is particularly important for the following elements:

- Massing
- Eave details

- Door and window details
- Dormer details, if applicable
- Porch details, if applicable
- Materials

2.4 **Consistency**. All buildings within a parcel should be consistent in style.

3. | Massing

The volume of a building has much to do with how compatible it is in the landscape, in the neighborhood, and how well it contributes to the public realm. Massing changes from as context changes and is quite different between rural and town center.

Recommendations

3.1 **Simplicity**. The most attractive and beloved buildings in the region are those with simple massing. They have simple volumes, or an assembly of simple volumes. Excessive roof breaks and wall articulation should be avoided.

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	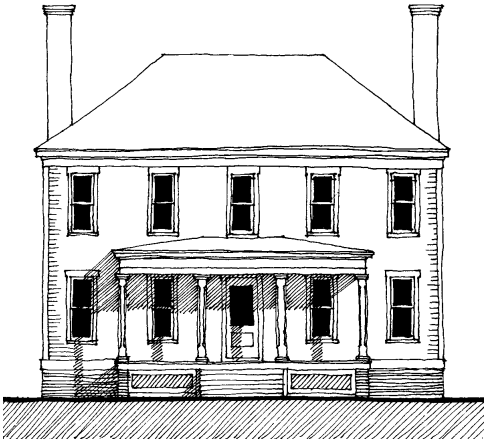

3.2 **Hierarchy**. Regardless of style, buildings should be composed with a clear hierarchy of massing when they have more than a single volume. This will identify how to use the building, locate the entry, and the common or most important spaces.

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	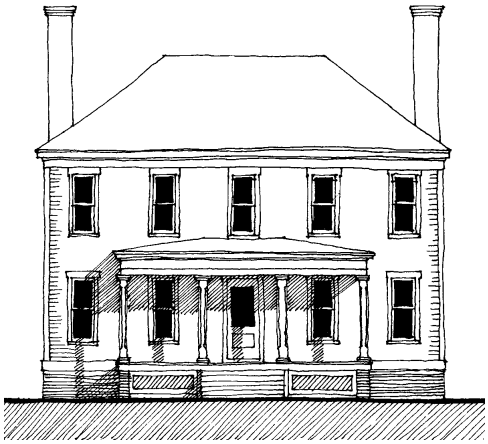

3.3 **Proportion**. Building masses and elevations should utilize simple, rational proportions. Most great architecture is built around a collection of simple proportions found in nature and music that include the rational (1:1, 2:1, 3:2, 4:3, etc.), and the irrational (the square root of 2 and the Golden Mean). All architectural elements (galleries, balconies, canopies, doors, windows, etc.) should relate stylistically and proportionally to one another and arbitrary proportions should be avoided.

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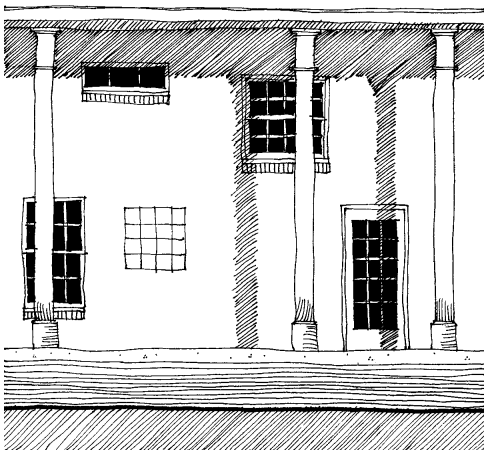
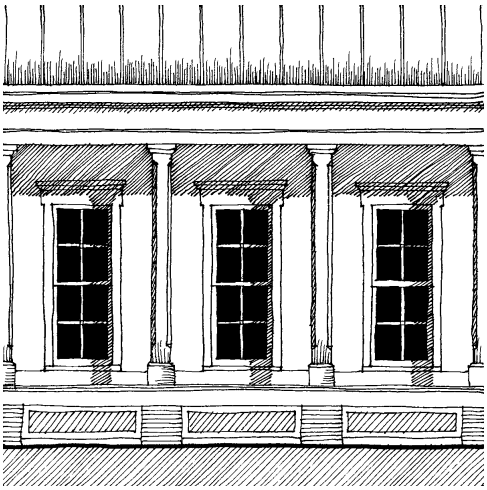
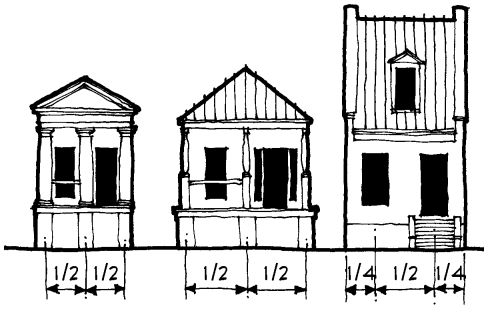
	

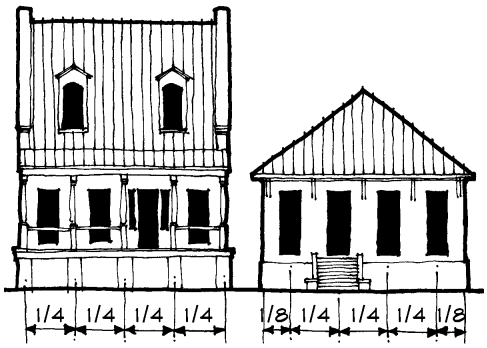
3.4 **Width**. A building should not exceed 160' in width facing a street, regardless of permissible lot width. Multi-family buildings should be broken into smaller volumes and arranged around courtyards unless they are aligned to a street frontage. This recommendation does not apply to industrial buildings.

3.5 **Bays**. Bay composition should respond to lot width as follows:

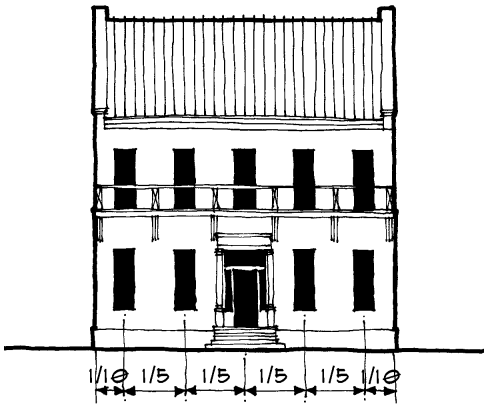
- **Thin lots**. Compose buildings on the thinnest lots as three-bay structures that may be gabled, hipped, or eave-fronted.



- **Medium width lots**. Compose buildings as L-shaped structures that may be hipped or eave-fronted. Buildings may be three, four or five bays.

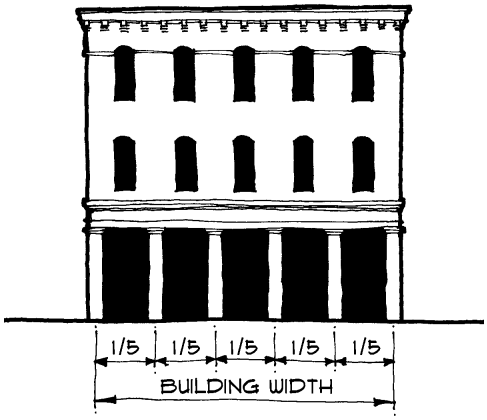


- **Wide lots**. Compose buildings on the widest lots as five-bay buildings, which should usually be eave-fronted for flat roof with parapet.

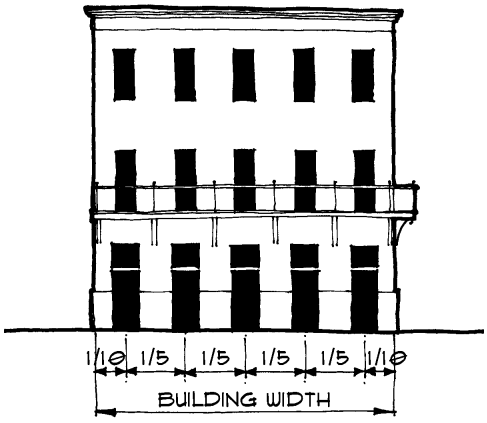


3.6 **Main Street Massing**. Compose main street buildings as large blocks that may either have a flat front, a balcony front or a gallery front. Galleries and balconies should project over the sidewalk.

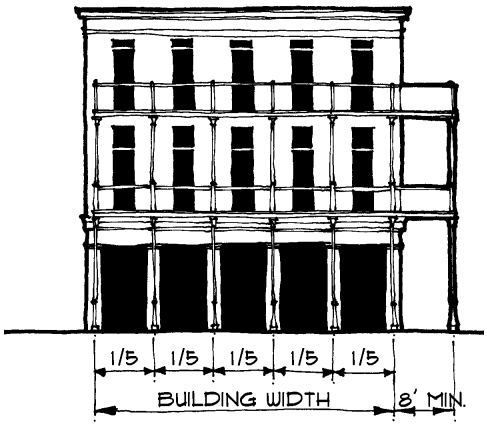
- **Flat Front**: This is a common building type in the region and should be composed as a masonry building that is primarily open at the first level and quite solid at upper levels.



- **Balcony Front**: Design building like the Flat Front building, except project a balcony from the second level over the sidewalk.



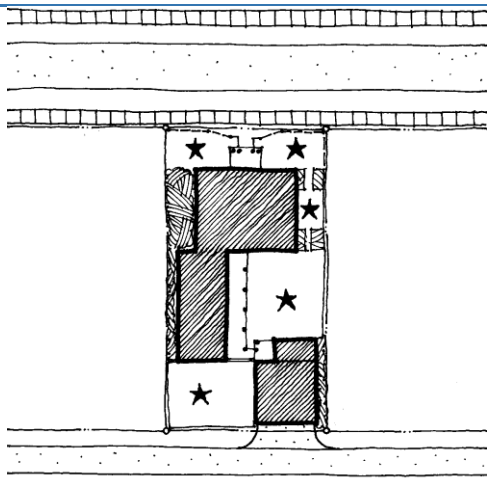
- **Gallery Front**: Design building like the Flat Front building except project an open gallery over the sidewalk. Gallery may contain more than one floor level.



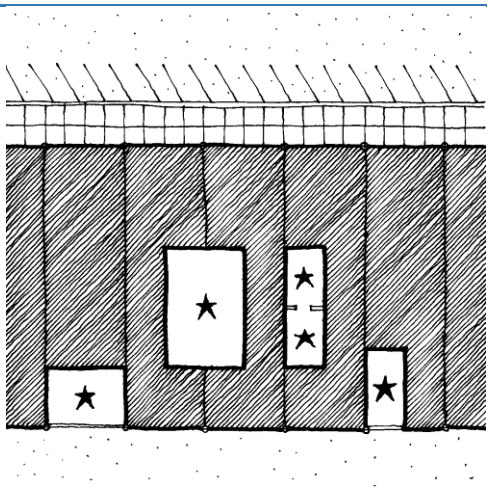
3.7 **Suburban Massing**. Buildings in suburban settings also require simplicity of massing. Overlapping gables and highly articulated facades should be avoided.

3.8 **Positive Outdoor Space**. Use buildings, their wings, fences, walls, and plant material to create positive outdoor spaces around buildings. People use exterior space when it is enclosed in a positive fashion like a room with regular shapes and proportions, but not when it is leftover corridor-like spaces around buildings. Shared outdoor space should provide shade, seating or other amenities that encourage active use.

T4 or Suburban



T5



4. | Walls

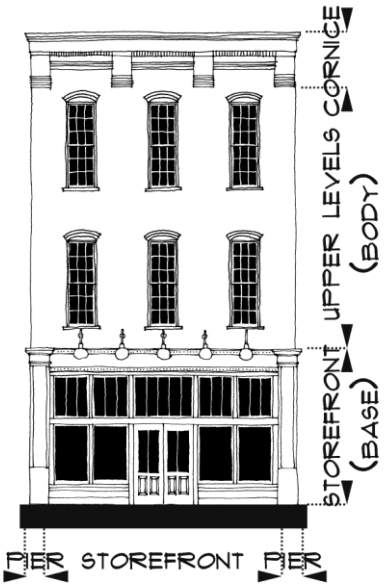
The front wall of buildings should be designed to reflect its use and encourage an active street environment.

Recommendations

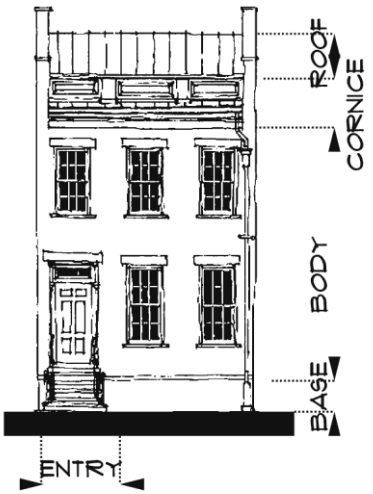
4.1 **Continuity**. All elevations of a building should have a coordinated style, materials, color, and detailing.

4.2 **Front Wall Composition**. Walls should generally be composed of a base, middle and cap but this varies with buildings that have shopfronts.

Retail First Floor



Residential or Office First Floor



4.3 **Storefront Composition**. Compose the storefront with a beam at the top that supports the wall above. The beam may be used for signage. The storefront should be divided vertically with transoms above doors and windows. The composition should include a base and piers. Depending upon the width, storefronts may be single, double or triple bays. Entries may be inset to allow for outward swinging doors.

4.4 **Storefront Windows**. The LDO regulates the required amount of clear glazing, and in addition to that the head height of storefront windows should be at least 7 feet above finished grade. The sill height should be between 6 and 24 inches above grade for retail use, and no more than 30 inches for other uses.

4.5 **Storefront Beam**. Provide a beam at the top of the storefront that structurally supports the wall above. The beam height should not be less than 1/12 of the opening span unless there are intermediate columns. The beam may serve as a sign band for the space.

4.6 **Storefront Doors**. Doors should be primarily clear glass, permitting views to the interior of the space. Storefront doors may be single or double and should be a least 7 feet tall.

4.7 **Wall Base**. Articulate the base of exterior walls using simple water table offsets and/or color in masonry walls and using skirt boards with drip caps in frame walls.

Frame Wall	Stucco Wall	Masonry Wall

4.8 **Upper Level Windows**. Windows on upper floors should be arranged in simple bays relative to the width of the buildings. For energy efficiency, glass walls are discouraged and windows should be operable.

5. | Materials

The materials and detailing of buildings should contribute to their durability and compatibility.

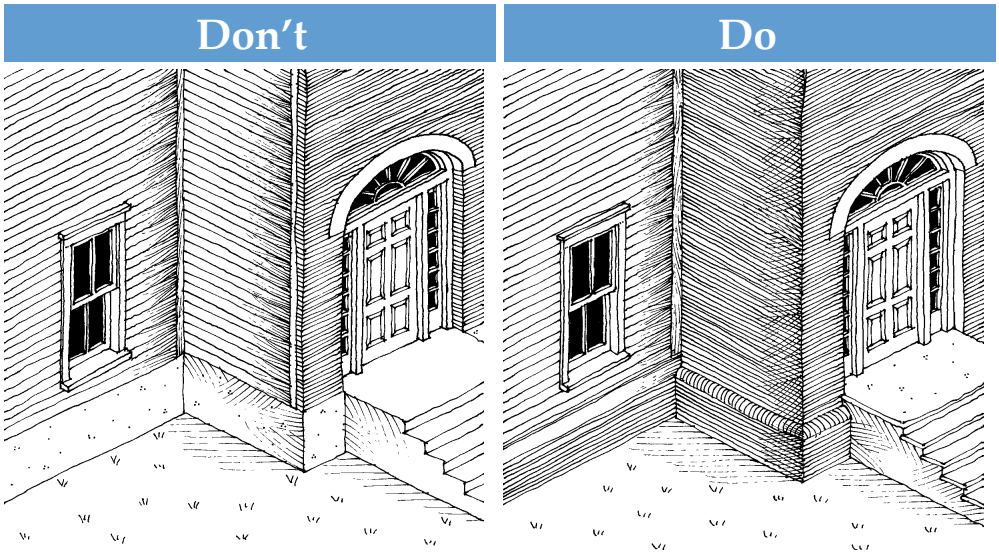
Recommendations

5.1 **Durability**. Materials should be used that have a long life and age well. These may include stone, unglazed and un-patterned brick, painted, stained or natural wood siding or shingles; textured concrete; and aluminum.

5.2 **Authenticity**. Faux or fake materials are discouraged. New materials should not imitate other materials, but should reflect their own identity.

5.3 **Multiple materials**. No more than two wall materials shall be visible on any exterior wall, not including the foundation wall or piers. Buildings may be enriched with ornament, but the basic construction system should be simple. Most walls should be built of one or two materials, not counting the foundation and trim work. If two materials are used, the lighter should be located above the heavier, for example wood above brick or stucco above stone.

5.4 **Material change**. Vertical joints between different materials should only occur at inside corners except in rare instances where it is appropriate to the style. Changing the material at the outside corner makes it look pasted on.



5.5 **Reflection**. Reflective materials may be allowed but must it must be shown not to be a nuisance.

5.6 **Color**. Building and trim colors should be appropriate to style. However, large areas of bright colors are discouraged unless they are an accent color.

6. | Roofs

Roof shape, slope and eave details should be appropriate to the style of the building.

Recommendations

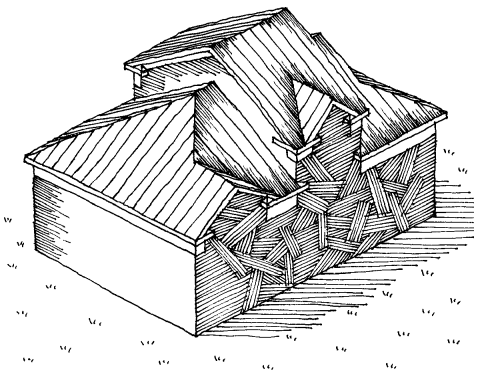
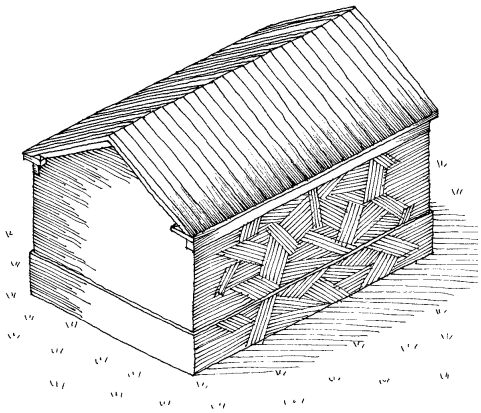
6.1 **Shape**. Roof shape should reflect the style of the building. If historic styles are used, one of the most important design elements is using the appropriate shape.

6.2 **Slope**. All primary roof slopes of a particular style should fall within a range of no greater than 20%. Secondary roof slopes should be appropriate to the style of the building, which is in most cases between 1/3 and 1/2 of the primary roof slope.

6.3 **Equipment**. All rooftop mechanical and electrical equipment should be screened from view from the street by a parapet.

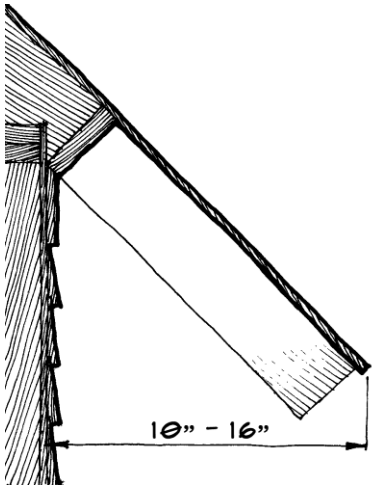
6.4 **Vents**. All utility infrastructure such as vents and ducts should be grouped together to minimize their negative impact.

6.5 **Eaves**. Eave lines should be simple and continuous unless there is a logical reason for a break.

Don't	Do
	

6.6 **Overhangs**. Eave overhangs should be appropriate to the style of the building.

- **Vernacular**. Design vernacular eaves with rafter tails that overhang 10″ to 16.″



- **Classical**. Classical eaves should overhang a distance equal to the cornice height as measured from the roof to the bottom of the bed moldings.

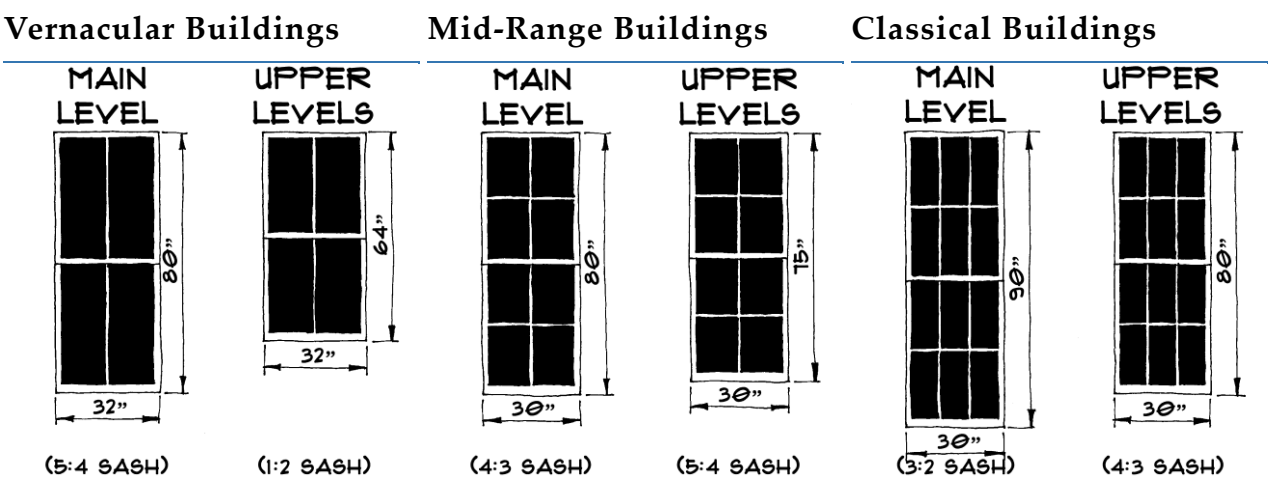
7. | Doors and Windows

The proportions and details of doors and windows should match the style of the building.

Recommendations

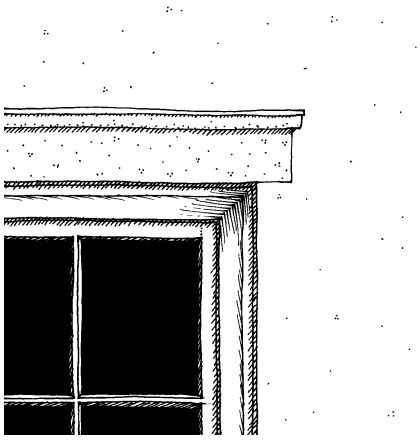
7.1 **Materials**. Recommended multi-family frame materials include wood, fiberglass, metal, vinyl, or aluminum. Recommended commercial frame materials include factory-painted, extruded aluminum, hollow steel frame, and wood.

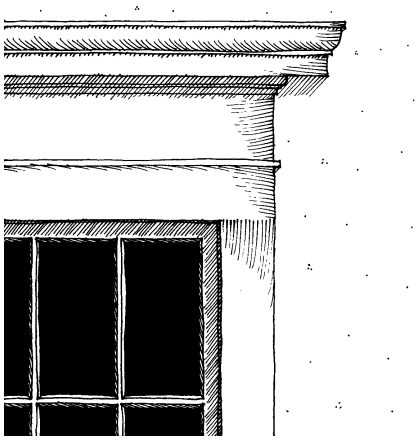
7.2 **Proportion**. Windows should be vertically or square in proportion with simple proportions including the rational (1:1, 2:1, 3:2, 4:3, etc.), and the irrational (the square root of 2 and the Golden Mean). Most windows on a given floor should be the same size. Windows on upper levels are typically not as tall as those on lower levels as illustrated below.



7.3 **Frame Opening Heads**. Span openings with a head casing similar in depth to the structural lintel behind it.

7.4 **Masonry Opening Heads**. Span masonry openings with visible structural lintels or with trim that follows the proportion of the structural lintel behind.





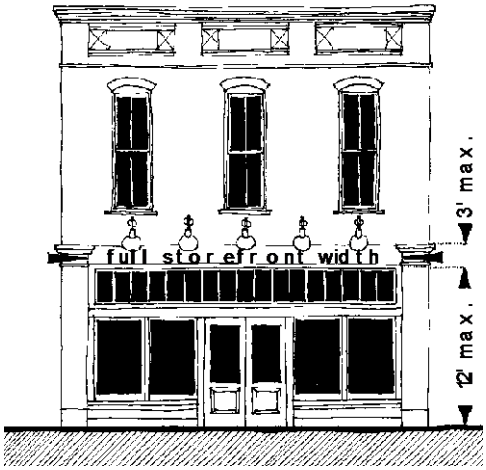
7.5 **Opening Arrangement**. Regularly space columns and openings when using a traditional style. Allow both window locations and column spacing of vernacular or contemporary buildings to be more relaxed.

8. | Signs

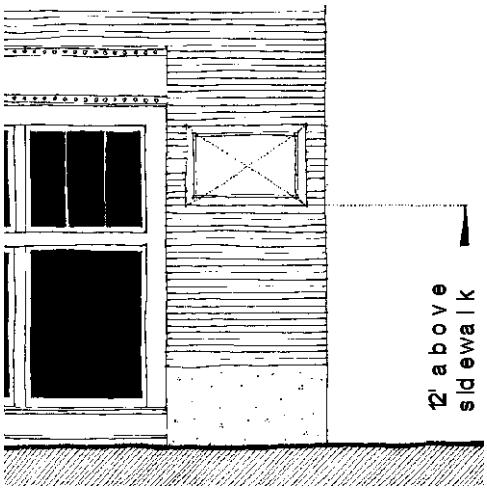
Signs should complement the style and composition of the structure. Signs are regulated by the LDO and the following recommendations augment the regulations.

Recommendations

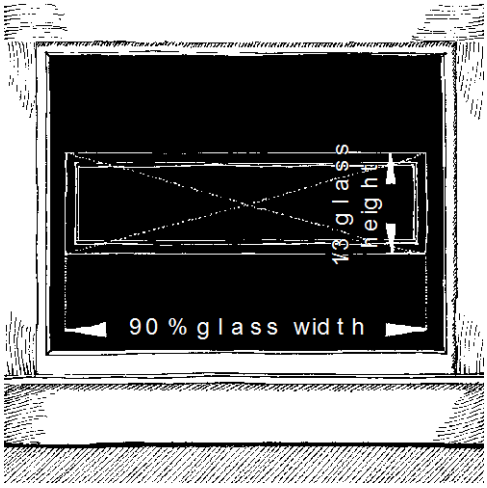
8.1 **Band Signs**. The band sign consists of a band of lettering across the entire width of the building. If lit, band signs must be front-lit with gooseneck lights. Band signs should be a maximum of 36" tall, and the bottom of the band sign should not be installed more than 12' or less than 10’ above the sidewalk.



8.2 **Board Signs**. Attached board signs consist of painted or vinyl graphics on a signboard. The cumulative square footage of all attached board signs for an establishment should be limited to the width of the storefront multiplied by 2. No single attached board sign should be larger than 6 square feet if the bottom of the sign is located 8 ' or less above the ground, 9 square feet if between 8 ' and 12' or 12 square feet if higher than 12' above the ground.



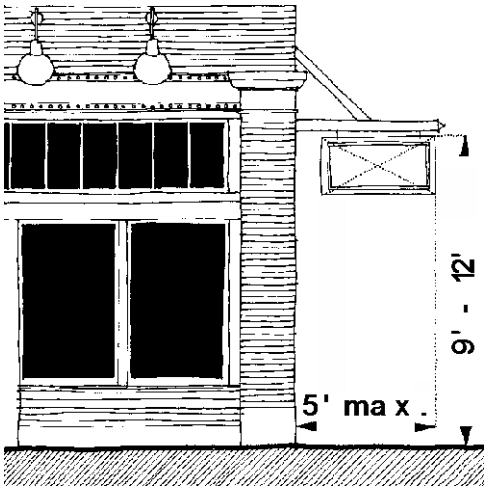
8.3 **Window Signs**. Window signs may be neon behind the glass or paint or vinyl applied directly to the glass. Neither should be mounted on opaque signboards. The height of any window sign should be limited to one-third the height of the glass in the sash where the sign is installed. The width of any window sign should be limited to 90% of the width of the glass in the sash where the sign is installed.



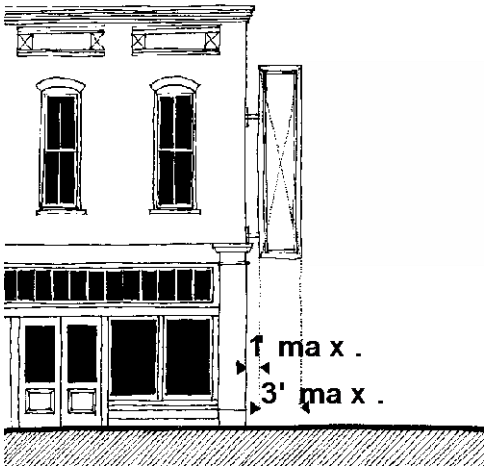
8.4 **Painted Wall Signs**. Painted wall signs should only occur only on brick wall surfaces that are set back at least 50' from the edge of pavement to allow for equal viewing by pedestrians and motorists. Because these signs usually occur at unbuilt "gaps" in the city

fabric that will later be filled, these signs should be considered temporary and should therefore not be the primary sign of the business they represent.

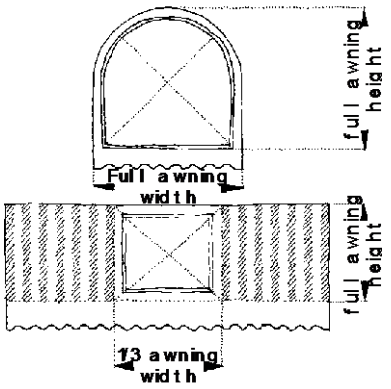
8.5 **Blade Signs**. Standard blade signs may project from a wall or hang from an architectural element. The top of the blade sign should be between 9' and 12' above the sidewalk. Blade signs should project no more than 5' from the wall.



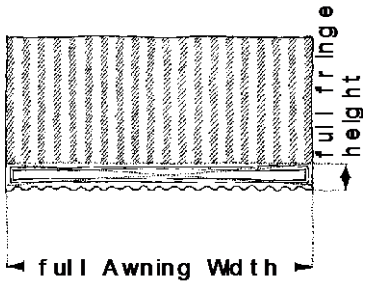
8.6 **Corner Signs**. Vertical corner signs may project perpendicular from one side of the building or at a 45° angle to the corner. They may be constructed of either signboards or metal, and they may be lit either with gooseneck lights or with surface neon. Vertical corner signs should be mounted a minimum of 12' above the sidewalk, measured to the bottom of the sign. The vertical corner sign should be mounted no more than 12" away from the exterior wall of the building and should be no more than 3' wide.



8.7 **Awning Signs**. Awning signs should be painted directly on canvas. Backlit awnings are discouraged. Signs that occupy the main body of the awning may fill the entire body of the awning if painted on the end of the awning; or they may occupy up to one-third of the awning if painted on the side of the awning.



Signs that occupy the fringe of the awning may fill the entire height and width of the fringe up to a maximum fringe height of 9".



AGENDA ITEM REQUESTS
JANUARY 2017 BOMA MEETING

ARTICLE 1 proposed LDO Amendments to the Planning Commission for review and recommendation during the January PC meeting and for discussion and First Public Reading for the February 2017 BOMA Meeting.

ARTICLE 1 LDO Amendment Proposals are:

ARTICLE 1 GENERAL PROVISIONS
1.2 Intent
1.2.2 The Town

Add these three bullets
g. Development should occur with a balanced mix of residential and commercial products to positively affect the Town's economy by increasing sales tax revenue.

h. Residential development should include both a balanced and diverse mix of housing products to positively affect the Town's economy by increasing local retail opportunities and growing the tax base.

i. It is the Town's desire that non-modular single-family detached units remain the primary dwelling type.

1.2.3. The community

Modify the following bullet
e. Within neighborhoods, a ***balanced*** range of housing types should be provided to accommodate diverse ages and incomes ***and positively affect the Town's economy by increasing local retail opportunities and growing the tax base.***

1.2.8. Subdivision Regulations

Modify the following bullet
a. That future growth and development in the Town should be performed in an orderly, *balanced,* incremental and predictable manner, in accordance with the General Plan, as adopted and amended.

1.3 Definitions

Modify the following definition
Mixed Use: multiple functions within the same building through superimposition or adjacency, or in multiple buildings by adjacency, or at a proximity determined by warrant. ***Residential functions within a mixed use building shall not exceed 66.67% of the total use.***

Modify the following definition
Mixed Use Building: Residential use combined with commercial use within the same building through superimposition or adjacency. This building type is urban in character and frequently is a multi-story

building with residential uses above commercial uses. ***Residential uses within a mixed use building shall not exceed 66.67% of the total use.***

ARTICLE 3 proposed LDO Amendments to the Planning Commission for review and recommendation during the January PC meeting and for discussion and First Public Reading for the February 2017 BOMA Meeting.

ARTICLE 3 LDO Amendment Proposals are:

ARTICLE 3 SUBDIVISION REGULATIONS

3.3 Resource Management

3.3.14 Tree Protection

Modify the following bullets

a. The resource inventory map must identify all non-invasive trees of ***18*** inches in caliper … from the Planning Commission for all trees ***18*** inches in caliper …

b. … which shall document all trees that are ***18*** inches or greater …

Article 4 LDO Amendments to the Planning Commission for review and recommendation during the January PC meeting and for discussion and First Public Reading for the February 2017 BOMA Meeting.

Article 4 LDO Amendment Proposals are:

ARTICLE 4 ZONING

4.1 General

Insert and add the following paragraphs [will require renumbering existing paragraphs]

4.1.1 Intent

The long term intention of the Land Development Ordinance is to guide new development to a higher quality standard while preserving the small town character of Thompson's Station. Achieving the right housing balance will positively affect the Town's economy by increasing local retail opportunities and growing the tax base, both beneficial to the whole Town.

The Land Development Ordinance will help the Town create the right balance of housing by:

- ***Ensuring new development preserves the distinctive, historical, and small town character of Thompson's Station for future generations.***
- ***Encouraging home ownership as a means to foster long term commitment to neighborhoods, promote pride and stability within a neighborhood, and create a higher rate of maintenance.***
- ***Raising the quality standard of new and replacement construction in the Town.***
- ***Capturing a larger population of Williamson County's executive, middle and upper income housing.***

- ***Encouraging a mix of housing options and lot sizes to meet the needs of a diverse population.***

Social and economic factors will change over time, as will the size and composition of the Town's population. These changes may alter housing preferences and influence the size, quality, and type of homes in demand at any point in time. This Land Development Ordinance is designed to help the Town ensure land use decisions are made in alignment with its long-term development goals.

Short-term market forces should not override the long-term development goals of the Town of Thompson's Station. It is the Town's desire that Single-Family Detached units remain the primary dwelling type in Thompson's Station while simultaneously providing a significant amount of diverse and affordable housing in the form of small detached single-family homes, townhouses, condominiums, and apartments.

4.1.2 ***Maximum Allowable Dwelling Types***

a. Maximum Allowable Combined Multi-Family Dwellings [Apartment, Garden Apartment, Condominium] plus Dwellings in Mixed Use Buildings [Apartments and Condominiums] plus Single-Family Attached Dwellings [Townhome, Live Work, Duplex, Triplex]:

The total combined number of the above dwelling unit types in all zoning districts throughout the Town of Thompson's Station, excluding the "Town Center" G3 Targeted Growth Sector, shall not exceed 25% of the total number of non-modular Single-Family Detached dwellings within the Town of Thompson's Station.

Article 5 LDO Amendments to the Planning Commission for review and recommendation during the January PC meeting and for discussion and First Public Reading for the February 2017 BOMA Meeting.

Article 5 LDO Amendment Proposals are:

ARTICLE 5 ADMINISTRATION AND PROCESS

5.3 Zoning Process

Change wording in paragraph
5.3.1 Amendments to the Ordinance

No change or departure from the text or maps of this ordinance shall be made, unless such amendment be first submitted to the Planning Commission ***for review and recommendation. The Town Administrator shall ensure no amendment proposal takes longer than forty (40) days between the time it is submitted to the Town and the time it is reviewed by the Planning Commission. After Planning Commission review and regardless of recommendation [approve, disapprove, or no recommendation], the Town Administrator shall ensure the first Public Hearing of the amendment proposal takes place during the next Town Board of Mayor and Aldermen meeting.***

Before finally adopting any such amendment …

Thompson's Station Planning Commission
Staff Report – Item 1 (File: Zone Amend 2017-001)
January 24, 2016
Land Development Ordinance Amendments

PROJECT DESCRIPTION

These are staff initiated amendments of the Land Development Ordinance.

PROPOSED REVISIONS

Section 3.7.4 Design Standards for Nonresidential Driveways (page 51). Driveways have a minimum driveway width of 24 feet for two-way access, however no standard is provided for a maximum. In order to ensure that driveways do not exceed a reasonable width while accommodating the turning radius for trucks, Staff recommends a maximum width of 30 feet be added.

Text as recommended:
3.7.4.a. For access to thoroughfares where the posted speed is 35 m.p.h or less, all two-way nonresidential driveways shall be constructed with a minimum horizontal width of twenty-four (24) feet and a maximum horizontal width of 36 feet.

Table 4.4 O2, G1, G2 Use Zones Land Use (page 79). Community gardens should be an allowable use in all districts including commercial and industrial zones therefore, Staff recommends the inclusion of community gardens within D1, CC, IM and IL.

Table 4.12 D3 Lot Standards (page 88). This zone permits density up to three units per acre on smaller lots with building setbacks closer to the roadway. These development standards are not conducive to a reduced access width for entry to the site given the proximity of the garage to the street. Therefore, Staff recommends that the access width be increased to a maximum of 20 feet to permit a driveway entrance to the garage within the D3 district.

Section 4.17.2e Permit Conditions (page 119). Yard signs are currently permitted for home occupations. No standards are set forth for these types of signs and residential land uses typically do not include signage on the site. Home occupations are permitted in keeping with the residential character of the site, therefore, Staff recommends the removal of the yard sign advertisement in the LDO.

Section 4.17.4eii. Exempt Signs (page 120). Campaign signs are permitted for 45 prior to an election however, Staff recommends removal of the timing for the campaign signs.

Table 4.25 General Sign Restrictions (page 120). This table is inconsistent with the requirements set forth within the text for signs in Section 4.17.6 for signage in use districts. Therefore, Staff recommends changing the title of the table to “transect zoning districts” instead of “general” sign restrictions and the use districts be removed from the table. In addition, a table will be inserted for “general use district” sign restrictions.

The tables as recommended:

TABLE 4.25 TRANSECT ZONE SIGN RESTRICTIONS

SIGN TYPE	T3	T4	T5	D1	D2	D3	NUMBER	MAX. SIGN AREA	MAX. COPY HEIGHT
Auxiliary									
Awning		P	P				1 sloping plane plus 1 valence per awning	75% of sloping plane; 75% of valence	16 in. on sloping plane; 8 in. on valence
Banner			P				1 per frontage	48 s.f.	n/a
Canopy			P				1 per canopy	2 s.f. per linear foot of shop-front	30 in. max.
Directional		P	P				n/a	12 s.f.	n/a
Display Case			P				1 per business	6 s.f.	n/a
Fuel Pricing							1 per business	32 s.f.	n/a
Marquee			P				1 per entry	n/a	n/a
Monument			P				1 per frontage	36 s.f.	n/a
Monument: Religious		P					1 per frontage	36 s.f.	n/a
Monument: Education		P					1 per frontage	36 s.f.	n/a
Projecting		P	P				1 per tenant	6 s.f.	8 in.
Sidewalk / Sandwich		P	P				1 per tenant	9 s.f.	n/a
Suspended		P	P				1 per entry	6 s.f.	8 in.
Wall			P				1 per frontage	3 s.f. per 1 linear ft. up to 90% of the building width	18 in. / 36 in. for more than one line of copy
Window		P	P				1 per window	25% of glazed area	12 in.
Window: Neon			P				1 per window	25% of glazed area in aggre-gate	12 in.
Yard	P	P			P	P	1 per lot	6 s.f.	8 in.

TABLE 4.26 USE DISTRICT SIGN RESTRICTIONS

SIGN TYPE	NC	CC	IL	IM	NUMBER	MAX. SIGN AREA	MAX. COPY HEIGHT
Auxiliary	P	P	P	P	2	10 s.f.	n/a
Canopy	P	P	P		1 per canopy	2 s.f. per linear foot of shop-front	30 in. max.
Directional	P	P	P	P	4	25 s.f.	n/a
Fuel Pricing		P	P	P	1 per business	32 s.f.	n/a
Monument	P	P	P	P	1 per frontage	80 s.f.	n/a
Projecting	P	P	P		1 per tenant	1.5 s.f. per 1 linear ft.	n/a
Wall	P	P	P	P	1 per frontage	1.5 s.f. per 1 linear ft.	24 in. / 36 in. for more than one line of copy
Window	P	P	P		1 per window	25% of glazed area	12 in.

Auxiliary signs are not permitted within the table, however, the use zones do permit auxiliary signs in compliance with the standards set forth, therefore Staff recommends the table be corrected to include a "P" for the NC, CC, IL and IM districts.

Section 4.17.6j Specific Use Zoning District Sign Regulations (page 125). On site temporary signs are permitted with a maximum of four (4) square feet. Four square feet may not provide enough sign area for visibility, therefore, Staff recommends on site temporary signs be granted a maximum of 12 square feet.

Section 5.2.18 Acceptance of Streets and Other Improvements (page 138). Builder's bonds are required after acceptance of streets and infrastructure. Builder cash bonds are specified in the table. One lot is $4,000, two lots is $3,000, three lots is $2,000 and four or more lots is $1,000. These bond amounts are not clearly specified in the LDO as per lot, therefore, Staff recommends the sentence preceding the table be corrected to include "per lot" and will read:

Text as recommended:
Section 5.2.18 The cash bond per lot will be determined as follows:

Section 5.4.9aiii Building and Sign Permits (page 149). The Town requires grading permits for overall project sites, however, not for individual lots at this time. However, grading activities do occur on individual lots for the construction of homes. Sometimes, significant grading occurs creating onsite issues. Therefore, Staff recommends that site specific grading plans be required prior to the issuance of building permits for all lots.

Appendix B. The types of sureties permitted within the LDO are letters of credit, cash escrow and certificates of deposit, therefore, Appendix B is no longer applicable as previously adopted. Therefore, Staff recommends a modification to the form for letters of credit (see attached draft).

RECOMMENDATION
Staff is requesting the Planning Commission recommend to the Board of Mayor and Aldermen these Staff initiated amendments to the Land Development Ordinance.

Phone: (615) 794-4333
Fax: (615) 794-3313
www.thompsons-station.com

1550 Thompson's Station Road W.
P.O. Box 100
Thompson's Station, TN 37179

DATE: January 24, 2017

TO: The Planning Commission

FROM: Joe Cosentini, Town Administrator

SUBJECT: Item 1 – Land Development Ordinance BOMA Requested Amendment

---

BOMA has requested that the Planning Commission review and make recommendations on several sections of the Town's Land Development Ordinance. Staff is providing comment on the areas where additional revision and discussion need to take place. The sections are as follows:

Black text = existing LDO language
RED = requested language to be added or amended
BOLD = staff comments

ARTICLE 1 GENERAL PROVISIONS
1.2 Intent
1.2.2 The Town

g. Development should occur with a balanced mix of residential and commercial products to positively affect the Town's economy by increasing sales tax revenue.

This statement is too narrow. Sales tax revenue is only one factor of the Town's overall economy and, though it is important, residential and commercial "products" should not be judged solely on their impact to sales tax revenue. Our economy is the result of many factors that should all be considered when evaluating projects including cultural impact, local history, natural resources, etc.

h. Residential development should include both a balanced and diverse mix of housing products to positively affect the Town's economy by increasing local retail opportunities and growing the tax base.

It is difficult to determine if this comment is intended for individual developments or if the focus is on a balanced development approach for the entire Town. Given the requested section placement, we assume the latter but should clarify. It should also be noted that residential development does not increase local retail opportunities but do provide population support for retail operation. Finally, all residential development grows the tax base as it increases the tax paying population.

i. It is the Town's desire that non-modular single-family detached units remain the primary dwelling type.

This statement is contradictory to "h" which asks for a diverse mix of housing products.

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1.2.3. The community

e. Within neighborhoods, a *balanced* range of housing types should be provided to accommodate diverse ages and incomes *and positively affect the Town's economy by increasing local retail opportunities and growing the tax base.*

Please see previous comments.

1.3 Definitions

Mixed Use: multiple functions within the same building through superimposition or adjacency, or in multiple buildings by adjacency, or at a proximity determined by warrant. *Residential functions within a mixed use building shall not exceed 66.67% of the total use.*

Mixed Use Building: Residential use combined with commercial use within the same building through superimposition or adjacency. This building type is urban in character and frequently is a multi-story building with residential uses above commercial uses. *Residential uses within a mixed use building shall not exceed 66.67% of the total use.*

The definition of "Mixed Use" does not need a percentage requirement as the meaning holds regardless of the percentages applied. The addition of an arbitrary percentage to the "Mixed Use Building" definition potentially limits the application of the use within all allowed zones including the transect districts that are designed to maximize residential density.

ARTICLE 4 ZONING

4.1 General

Insert and add the following paragraphs [will require renumbering existing paragraphs]

4.1.1 Intent

The long term intention of the Land Development Ordinance is to guide new development to a higher quality standard while preserving the small town character of Thompson's Station. Achieving the right housing balance will positively affect the Town's economy by increasing local retail opportunities and growing the tax base, both beneficial to the whole Town.

The Land Development Ordinance will help the Town create the right balance of housing by:

- *Ensuring new development preserves the distinctive, historical, and small town character of Thompson's Station for future generations.*
- *Encouraging home ownership as a means to foster long term commitment to neighborhoods, promote pride and stability within a neighborhood, and create a higher rate of maintenance.*
- *Raising the quality standard of new and replacement construction in the Town.*
- *Capturing a larger population of Williamson County's executive, middle and upper income housing.*
- *Encouraging a mix of housing options and lot sizes to meet the needs of a diverse population.*

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These policy statements are in direct conflict to one of the fundamental goals of responsible planning which is to create sustainable and diverse communities where housing options are available to all people. Creating these policies that effectively reduce or eliminate the necessary variety of housing stock is not conducive to creating a diverse community and can impact the ability of the Town to attract new and unique economic development projects.

Social and economic factors will change over time, as will the size and composition of the Town's population. These changes may alter housing preferences and influence the size, quality, and type of homes in demand at any point in time. This Land Development Ordinance is designed to help the Town ensure land use decisions are made in alignment with its long-term development goals.

Short-term market forces should not override the long-term development goals of the Town of Thompson's Station. It is the Town's desire that Single-Family Detached units remain the primary dwelling type in Thompson's Station while simultaneously providing a significant amount of diverse and affordable housing in the form of small detached single-family homes, townhouses, condominiums, and apartments.

4.1.2 *Maximum Allowable Dwelling Types*

a. *Maximum Allowable Combined Multi-Family Dwellings [Apartment, Garden Apartment, Condominium] plus Dwellings in Mixed Use Buildings [Apartments and Condominiums] plus Single-Family Attached Dwellings [Townhome, Live Work, Duplex, Triplex]:*

   The total combined number of the above dwelling unit types in all zoning districts throughout the Town of Thompson's Station, excluding the "Town Center" G3 Targeted Growth Sector, shall not exceed 25% of the total number of non-modular Single-Family Detached dwellings within the Town of Thompson's Station.

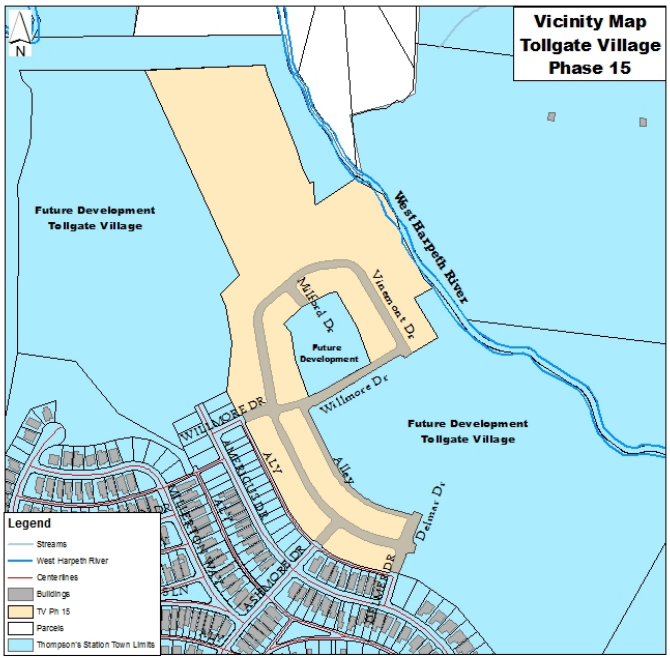
The purpose of the LDO is to implement the goals and policies of the General Plan which do not state to exclude or limit other forms of housing. The goals and policies set forth within the General Plan state to "provide opportunities for a range of housing units that meet a wide variety of income levels" that encourage mixed use and promote cluster developments with "creative housing options with flexible zoning and design standards" (General Plan Housing Element Goal 1, Polices 1.1 and 1.2). Furthermore, a zoning standard that limits the types of residential structures other than single family detached to a maximum of 25% does not seek to provide adequate housing for lower income individuals thus possibly creating a code conflict with the fair housing laws which seeks to promote suitable housing for everyone. Staff would recommend that standards be set for the development of these housing options rather than attempting to simply limit their ability to develop.

Attachments:
BOMA Requested LDO Amendments

Thompson's Station Planning Commission
Staff Report –Item 2 (FP 2017-001)
January 24, 2017
Request to approve the final plat for Phase 15 within Tollgate Village.

PROJECT DESCRIPTION

A request to approve the final plat for Phase 15 of Tollgate Village to create 83 single family lots and four open space lots.



BACKGROUND

On February 23, 2016, the Planning Commission approved the preliminary plat for phase 15 of Tollgate Village with the following contingencies:

1. Prior to the submittal of the final plat, the applicant shall enter into a development agreement for Tollgate Village Phase 15.
2. Prior to the approval of construction plans, all applicable codes and regulations shall be addressed to the satisfaction of the Town Engineer.
3. Prior to the approval of construction plans, a drainage study shall be submitted to verify that drainage is managed adequately on site.
4. Prior to the approval of construction plans, a geotechnical report shall be submitted identifying the location of any sinkholes.
5. Prior to the submittal of the final plat for Phase 15, an updated traffic study with a specific scope being a schedule of improvements for traffic mitigation including a secondary access shall be reviewed and approved by the Town.
6. A traffic signal shall be installed at the intersection of State Route 6 (Columbia Pike) and Tollgate Boulevard at the expense of the Developer.
7. Prior to approval of the final plat, the Developer shall report and update their schedule for the traffic signal installation and a bond will be required to ensure completion of the signal.
8. A construction route adjacent to Tollgate Boulevard, north of Phase 14 into Phase 15 shall be utilized by construction traffic.

9. Prior to the submittal of a final plat for Phase 15, a detailed slope analysis shall be prepared showing slopes 15% - 25% and slopes exceeding 25%. Any lots located within areas exceeding 25% slopes shall be located within an open space lot.

On June 14, 2016, the applicant obtained construction plan approval for this phase and has been working on installing the infrastructure within this phase.

On September 27, 2016, the Planning Commission suspended all plats within Tollgate Village due to issues related to infrastructure in several sections of the Tollgate Village which have not been completed by the developer and no sureties in place to ensure completion of the improvements. There are no completed public roads to access this phase of the development and no sureties in place to guarantee that such infrastructure will be completed.

On January 11, 2017, the developer sent a letter to the Tollgate residents committing to make the necessary repairs to these older phases of Tollgate upon approval of plats (See attached letter). However, again, the Town has not received any assurances from the developer for completion of these roads.

ANALYSIS

Final Plat

The purpose of the final plat is to provide a legal instrument where the transfer of ownership of lots is allowed and shall constitute a way where streets and other infrastructure can be accepted (LDO Section 5.2.7).

The layout of the lots is consistent with the approvals granted for phase 15 and all setbacks conform to the approved preliminary plat and Land Development Ordinance. Several lots are critical throughout this phase as noted on the plat. All critical lots will require engineered site plans to address all site specific issues.

Traffic Study

Background

The original traffic study prepared in 2003 evaluated the project based on two phases with an anticipated 10-year completion of the entire development (See attached study).

The 2003 traffic study recommended traffic mitigation for Phase I which consisted of 700 dwelling units as follows:

1. *"The eastbound approach of the south project driveway should be constructed to include separate lanes for left and right turning movements."*
2. *"As part of the State Route 840 construction project, TDOT plans to widen Highway 31 north of State Route 840 to a five lane cross section. The five lane section will extend for approximately 250 feet north of the high school access. Also, the planned widening will result in enough roadway width to provide a northbound left turn lane to serve the south project driveway to Tollgate Farms."*
3. *"The proposed site plan shows a driveway connection between Tollgate Farms and the high school. The connection will be beneficial since it will allow traffic to travel between the high school and the residential development without being required to travel on Highway 31."*

Improvements #1 and 2 are **complete**. Columbia Pike has a five lane cross section from State Route 840 to Tollgate Boulevard along with a northbound left turn lane onto Tollgate Boulevard and Tollgate Boulevard eastbound has a separate left and right turn lane onto Columbia Pike. Improvement #3 is **not complete**. Declaration Way is not a public road and no connection to Tollgate Village currently exists from this roadway. However, with the approval of the plat for Section 33, a 60-wide proposed right of way expansion for Branford Place to Declaration Way was recorded.

The 2003 traffic study recommended traffic mitigation for Phase II which consisted of office and retail development as follows:

1. *"It is recommended that the five lane cross-section be extended north to a point approximately 200 feet north of the north project driveway."*
2. *"A traffic signal should be installed at the intersection of Highway 31 and the south project driveway. This signal should be installed at the onset of Phase II development."*
3. *"The eastbound approach of the intersection of Highway 31 and the south project driveway should be improved to provide a dual left turn lane for traffic exiting the project site."*
4. *"The eastbound approach of the intersection of Highway 31 and the north project driveway should be constructed to include a right turn lane and a left turn lane."*
5. *"A northbound left turn lane on Highway 31 should be provided at the intersection with the north project driveway. This left turn lane should include approximately 200 feet of storage."*
6. *"The intersection of Highway 31 and Goose Creek Bypass should be realigned to form a T intersection. It is also recommended that a traffic signal be installed at this intersection.*
7. *"A southbound left turn lane should be provided on Highway 31 at the realigned intersection with Goose Creek Bypass. This left turn lane should include approximately 150 feet of storage."*
8. *"A westbound right turn lane on Goose Creek Bypass should be provided at the intersection of Highway 31 and Goose Creek Bypass. This right turn lane should include approximately 150 feet of storage.*

With the exception of a northbound turn lane at the proposed location of the secondary access, none of the other improvements related to Phase II have been completed.

<u>Updated Traffic Studies</u>

In 2015, a revised concept plan was submitted along with an updated traffic study (See attached study). The plan was not approved and the traffic study was not accepted or approved. In 2016, an updated traffic study, as required for approval of the phase 15 preliminary plat, was submitted in December. A "preferred" secondary access was noted in the report as a connection to Declaration Way. The schedule for the incorporating this secondary access is recommended after 248 additional units are constructed. The Town's Consulting Traffic Engineer reviewed the traffic study and submitted comments to Staff (See attached RPM letter dated January 6, 2017).

In addition, staff has the following concerns:

1. The traffic study doesn't include a project description to evaluate trip generation for differing land uses and the directional distribution of the trips.
2. The 2015 traffic study stated "it is important to note that the installation of the traffic signal at this intersection will require the widening of Columbia Pike north of the bridge over the West Harpeth River and will require bridge widening to accomplish." However, the study

did not address the need for any bridge improvements. In addition, the need for the signal is stated, however, the timing of the signal is not specified.

3. The report states that 248 additional SF dwellings can be added prior to a secondary access being necessary. However, the study does not specify existing unit count, therefore there is not a base number for adding the additional units. In addition, the study does not include non-residential land uses and how they may affect secondary access timing and location.
4. The report states that the "preferred" secondary access is at Declaration Way. Declaration Way is a private road (Williamson County Schools) providing access to the high school and analysis was not provided related to impacts from the connection. In addition, there is not analysis to explain why this secondary access is "preferred' to direct access onto Columbia Pike as shown on the approved site development plan and discussed in the original traffic study. The 2003 traffic study noted that the access was to provide reciprocal access between Tollgate Village and the school, not for improved access to Columbia Pike. Furthermore, the 2015 study indicates the conflict with the bridge and the need for bridge improvements, thereby recommending that the secondary access by shifted south on Columbia Pike by 240 feet. Additional analysis related to the need, timing and location of the secondary access is necessary. In addition, the 2015 study states that access at Declaration Way would provide "a marginally beneficial ingress/egress for the multi-family and commercial uses located on the southeastern portion of the Tollgate Village site." This study furthers states that access would be provided to an unsignalized intersection and that this access point would likely be a means of connecting to Tollgate Boulevard to access the signal. Therefore, Staff has concerns with the recommendation to utilize Declaration Way as the only secondary access without analysis demonstrating that this will result in improved connectivity and access for the development.

On January 17, 2017, the applicant submitted responses to these comments and they are under review by our Traffic Engineer. Staff is awaiting response, however at this time, Staff has concerns that the study does not satisfy the contingency for "a specific scope being a schedule of improvements for traffic mitigation including a secondary access shall be reviewed and approved by the Town."

Traffic Signal

The traffic signal at Tollgate Boulevard/Columbia Pike was approved by the Planning Commission in November 2015. The developer has submitted a request for approval to TDOT. TDOT has requested additional materials from the developer. Once those materials are submitted and a $150,000 surety posted, the grading permit will be issued by TDOT. In addition, the developer will be required to post the surety in the amount of $126,000 for the signal with the Town as approved by the Planning Commission.

Sewer

During the construction drawing approval phase, it was noted that an analysis of the wastewater system was needed for Tollgate Village. The development team has a pump test scheduled and are working with Staff to identify the necessary improvements. At this time, there are no indications that upgrades are necessary for phase 15, therefore, contingencies will be recommended with future plat approvals.

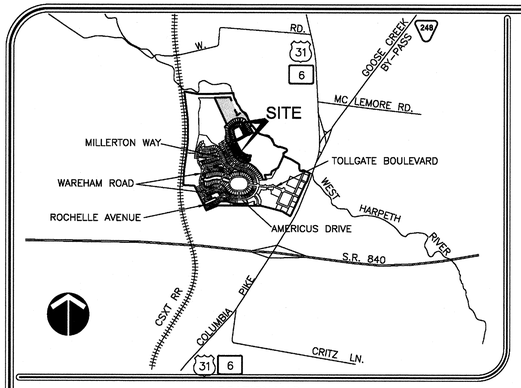
RECOMMENDATION

Staff recommends that the Planning Commission defer the application for final plat for phase 15 of Tollgate Village to allow the developer to:

- Revise the traffic study so that it provides "a specific scope being a schedule of improvements for traffic mitigation including a secondary access shall be reviewed and approved by the Town." In addition, the plat does not provide for the construction of a secondary access as shown on the approved site development plan and the developer does not have the ability to access Declaration Way at this time. Therefore, any consideration for access to Declaration Way must be coordinated with Williamson County Schools and an agreement for access reached.
- Obtain TDOT approval for the traffic improvements which include the traffic signal and the turn lane.
- Obtain approval from the Board of Mayor and Aldermen for the Development Agreement for Phase 15.

ATTACHMENTS

Final Plat
Site Development Plan (4/15/2014)
2003 Tollgate Village Traffic Study
2015 Tollgate Village Traffic Study
2016 Tollgate Village Traffic Study
RPM letter dated January 6, 2017
Developer Letter dated January 11, 2017
Developer Traffic Response dated January 17, 2017



LOCATION MAP
(NOT TO SCALE)

GENERAL NOTES:

1. THE PURPOSE OF THIS PLAT IS TO CREATE 83 RESIDENTIAL SINGLE-FAMILY LOTS AND 4 OPEN SPACE TRACTS.
2. BEARINGS SHOWN HEREON ARE BASED ON TENNESSEE COORDINATE SYSTEM OF 1983.
3. BY SCALED MAP LOCATION AND GRAPHIC PLOTTING ONLY, THIS PROPERTY LIES WITHIN FLOOD ZONES "AE", "X" (OTHER FLOOD AREAS) AND "X" (OTHER AREAS), AS DESIGNATED ON CURRENT FEDERAL EMERGENCY MANAGEMENT AGENCY MAP NO. 47187C0335F, WITH AN EFFECTIVE DATE OF SEPTEMBER 29, 2006, WHICH MAKES UP A PART OF THE NATIONAL FLOOD INSURANCE ADMINISTRATION REPORT; COMMUNITY NO. 470424, PANEL NO. 0335, SUFFIX F, WHICH IS THE CURRENT FLOOD INSURANCE RATE MAP FOR THE COMMUNITY IN WHICH SAID PREMISES IS SITUATED. SAID MAP DEFINES ZONE "AE" UNDER "SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD" AS BASE FLOOD ELEVATIONS DETERMINED. SAID MAP DEFINES ZONE "X" (OTHER FLOOD AREAS) UNDER "OTHER FLOOD AREAS" AS AREAS OF 0.2% ANNUAL CHANCE FLOOD AREAS OF 1% ANNUAL CHANCE FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 1% ANNUAL CHANCE FLOOD. SAID MAP DEFINES ZONE "X" (OTHER AREAS) UNDER "OTHER AREAS" AS AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.
4. THIS SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES. ABOVE GRADE AND UNDERGROUND UTILITIES SHOWN WERE TAKEN FROM VISIBLE APPURTENANCES, PUBLIC RECORDS, AND/OR MAPS PREPARED BY OTHERS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. THEREFORE, RELIANCE UPON THE TYPE, SIZE AND LOCATION OF UTILITIES SHOWN SHOULD BE DONE SO WITH THIS CIRCUMSTANCE CONSIDERED. DETAILED VERIFICATION OF EXISTENCE, LOCATION AND DEPTH SHOULD ALSO BE MADE PRIOR TO ANY DECISION RELATIVE THERETO IS MADE. AVAILABILITY AND COST OF SERVICE SHOULD BE CONFIRMED WITH THE APPROPRIATE UTILITY COMPANY. IN TENNESSEE, IT IS A REQUIREMENT, PER "THE UNDERGROUND UTILITY DAMAGE PREVENTION ACT", THAT ANYONE WHO ENGAGES IN EXCAVATION MUST NOTIFY ALL KNOWN UNDERGROUND UTILITY OWNERS NO LESS THAN THREE (3) NOR MORE THAN TEN (10) WORKING DAYS PRIOR TO THE DATE OF THEIR INTENT TO EXCAVATE AND ALSO TO AVOID ANY POSSIBLE HAZARD OR CONFLICT. TENNESSEE ONE CALL, DIAL 811.
5. THIS PROPERTY IS CURRENTLY ZONED D3 (HIGH DENSITY RESIDENTIAL).
   MINIMUM BUILDING SETBACKS:
   FRONT: 10'*
   SIDE: 7.5'
   REAR: 20'
   *20' MINIMUM DRIVEWAY LENGTH, EXCLUSIVE OF SIDEWALKS
6. ALL STREETS AND ALLEYS ARE DESIGNATED PUBLIC AND AS SUCH ARE PUBLIC UTILITY, ACCESS AND DRAINAGE EASEMENTS.
7. ALL PUBLIC STREETS AND DRAINAGE STRUCTURES WITHIN THE RIGHTS-OF-WAY WILL BE MAINTAINED BY THE TOWN OF THOMPSON'S STATION.
8. OPEN SPACE AREAS, ALLEYS AND ALL LANDSCAPING WITHIN ROADWAY MEDIANS SHALL BE MAINTAINED BY THE HOMEOWNER'S ASSOCIATION.
9. DOMESTIC WATER SUPPLY INFORMATION SHOWN HEREON TAKEN FROM PLANS PREPARED BY JAMES C. HAILEY & CO. DATED MARCH 15, 2016.
10. ANY/ALL FIVE FOOT (5') DRIVEWAYS REQUIRE THE INSTALLATION OF A MINIMUM OF A ONE-CAR PARKING PAD BY THE GARAGE.
11. LOTS SHOWN THUS (*) ARE DESIGNATED AS CRITICAL LOTS AND HAVE MANMADE SLOPES IN EXCESS OF 15% PER SECTION 3-102.104 OF THE SUBDIVISION REGULATIONS, PRIOR TO THE ISSUANCE OF A BUILDING PERMIT, A SITE GRADING PLAN FOR DEVELOPMENT OF THE LOT SHALL BE SUBMITTED ADDRESSING SITE SPECIFIC NATURAL RESOURCE ISSUES TO THE TOWN OF THOMPSON'S STATION FOR REVIEW AND APPROVAL. NO BUILDING PERMIT WILL BE ISSUED ON SAID LOTS UNTIL AND UNLESS THE TOWN ENGINEER HAS RECEIVED AND APPROVED THE SITE PLAN.
12. OPEN SPACE TRACTS 1596-1599 ARE ALSO A PUBLIC UTILITY, DRAINAGE AND ACCESS EASEMENTS.
13. I HEREBY STATE THAT THIS SURVEY WAS DONE IN COMPLIANCE WITH THE CURRENT TENNESSEE MINIMUM STANDARDS OF PRACTICE AND THIS IS A CATEGORY I SURVEY AND THE RATIO OF PRECISION OF THE UNADJUSTED SURVEY IS 1:43,595.

BY: _____ DATE: 01-16-17
JOHN T. DARNALL, TN RLS #1571

DEED REFERENCE:

BEING A PORTION OF THE SAME PROPERTY CONVEYED TO MBSC TN HOMEBUILDER, LLC, FROM TGF 2010, LLC OF RECORD IN BOOK 5264, PAGE 242, REGISTER'S OFFICE FOR WILLIAMSON COUNTY, TENNESSEE.

PROPERTY MAP REFERENCE:

BEING A PORTION OF PARCEL 1 AS SHOWN ON WILLIAMSON COUNTY PROPERTY MAP 132.

SURVEYOR:
RAGAN-SMITH ASSOCIATES, INC.
TOM DARNALL, RLS
315 WOODLAND STREET
NASHVILLE, TENNESSEE 37206
(615) 244-8591

OWNER / DEVELOPER
MBSC TN HOMEBUILDER, LLC
C/O BRIAN ROWE
312 S. GAY STREET, SUITE 200
KNOXVILLE, TENNESSEE 37902
(865) 408-8322

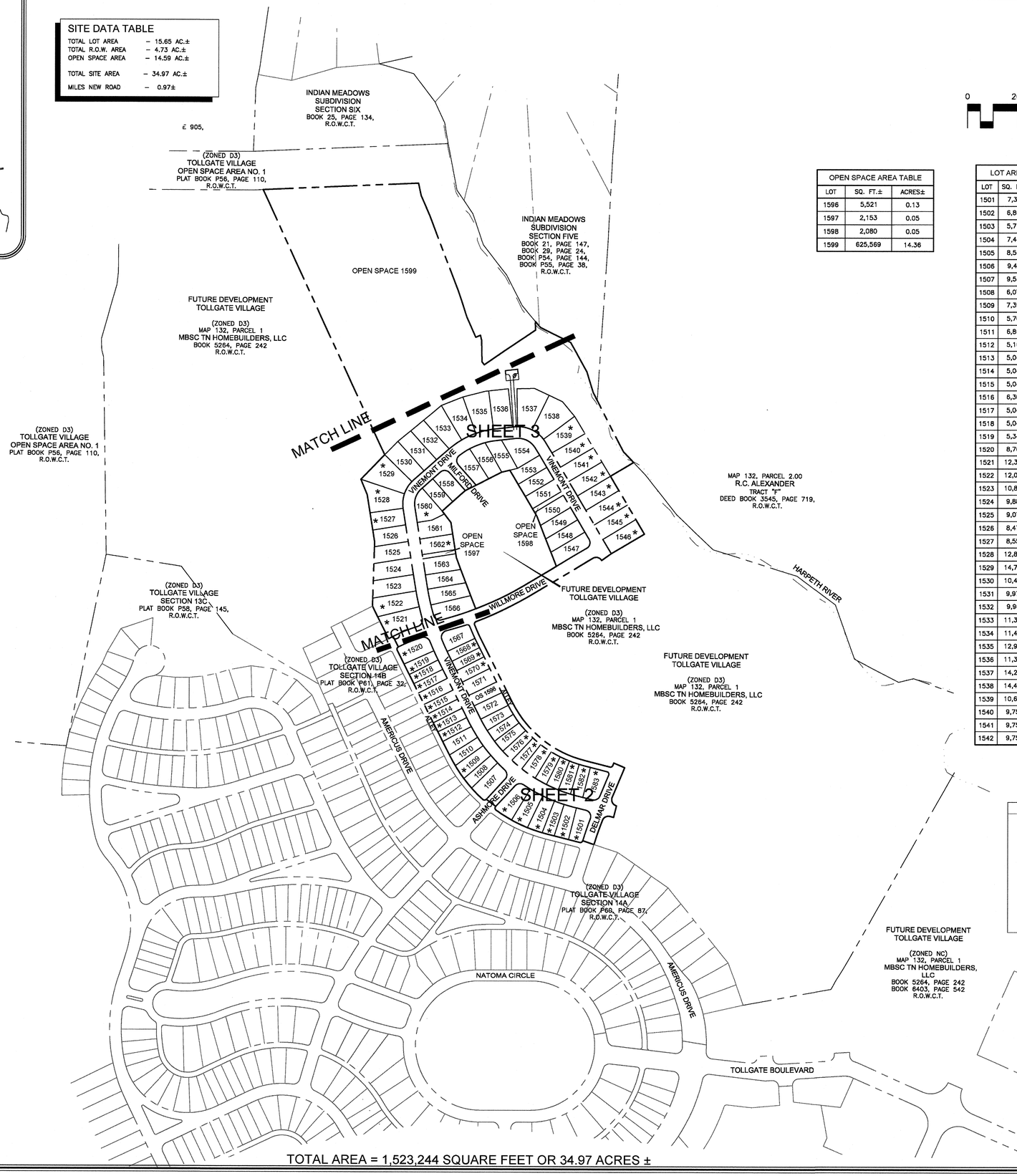
811
Know what's below.
Call before you dig.

LEGEND

OS	OPEN SPACE
R.O.W.	RIGHT-OF-WAY
R.O.W.C.T.	REGISTER'S OFFICE WILLIAMSON COUNTY, TENNESSEE

SITE DATA TABLE

TOTAL LOT AREA	– 15.65 AC.±
TOTAL R.O.W. AREA	– 4.73 AC.±
OPEN SPACE AREA	– 14.59 AC.±
TOTAL SITE AREA	– 34.97 AC.±
MILES NEW ROAD	– 0.97±



(SEE NOTE 2)

0 200 400 600

OPEN SPACE AREA TABLE		
LOT	SQ. FT.±	ACRES±
1596	5,521	0.13
1597	2,153	0.05
1598	2,080	0.05
1599	625,569	14.36

LOT AREA TABLE		
LOT	SQ. FT.±	ACRES±
1501	7,311	0.17
1502	6,807	0.16
1503	5,715	0.13
1504	7,449	0.17
1505	8,568	0.20
1506	9,461	0.22
1507	9,536	0.22
1508	6,074	0.14
1509	7,394	0.17
1510	5,703	0.13
1511	6,866	0.16
1512	5,165	0.12
1513	5,040	0.12
1514	5,040	0.12
1515	5,040	0.12
1516	6,300	0.14
1517	5,040	0.12
1518	5,040	0.12
1519	5,348	0.12
1520	8,765	0.20
1521	12,332	0.28
1522	12,003	0.28
1523	10,807	0.25
1524	9,888	0.23
1525	9,079	0.21
1526	8,475	0.19
1527	8,553	0.20
1528	12,884	0.30
1529	14,734	0.34
1530	10,437	0.24
1531	9,976	0.23
1532	9,901	0.23
1533	11,383	0.26
1534	11,469	0.26
1535	12,978	0.30
1536	11,386	0.26
1537	14,299	0.33
1538	14,426	0.33
1539	10,685	0.25
1540	9,750	0.22
1541	9,750	0.22
1542	9,750	0.22

LOT AREA TABLE		
LOT	SQ. FT.±	ACRES±
1543	9,750	0.22
1544	9,750	0.22
1545	9,750	0.22
1546	9,750	0.22
1547	9,079	0.21
1548	8,227	0.19
1549	7,731	0.18
1550	7,262	0.17
1551	7,150	0.16
1552	7,150	0.16
1553	7,285	0.17
1554	10,089	0.23
1555	8,062	0.19
1556	8,371	0.19
1557	8,648	0.20
1558	7,536	0.17
1559	6,490	0.15
1560	9,001	0.21
1561	8,820	0.20
1562	8,030	0.18
1563	8,338	0.19
1564	8,056	0.18
1565	9,064	0.21
1566	9,960	0.23
1567	8,131	0.19
1568	4,960	0.11
1569	4,800	0.11
1570	6,000	0.14
1571	6,986	0.16
1572	6,831	0.16
1573	5,491	0.13
1574	5,437	0.12
1575	5,437	0.12
1576	5,437	0.12
1577	5,437	0.12
1578	6,801	0.16
1579	5,437	0.12
1580	5,437	0.12
1581	5,437	0.12
1582	5,702	0.13
1583	8,205	0.19

RECORDER'S INFORMATION

TOTAL AREA = 1,523,244 SQUARE FEET OR 34.97 ACRES ±

CERTIFICATE OF OWNERSHIP & DEDICATION

I (WE) HEREBY CERTIFY THAT I AM (WE ARE) THE OWNER(S) OF THE PROPERTY SHOWN AND DESCRIBED HEREON AS EVIDENCED IN BOOK 5264, PAGE 242, R.O.W.C., AND THAT I (WE) HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY (OUR) FREE CONSENT, ESTABLISH THE MINIMUM BUILDING RESTRICTION LINE, AND THAT OFFERS OF IRREVOCABLE DEDICATION FOR ALL PUBLIC STREETS, UTILITIES AND OTHER FACILITIES HAVE BEEN FILED AS REQUIRED BY THESE REGULATIONS.

_____, 20__
DATE

MBSC TN HOMEBUILDERS, LLC

TITLE: _____

CERTIFICATE OF ACCURACY

I HEREBY CERTIFY THAT THE PLAN SHOWN AND DESCRIBED HEREON IS A TRUE AND CORRECT SURVEY TO THE ACCURACY REQUIRED BY THE THOMPSON'S STATION SUBDIVISION REGULATIONS AND THAT THE MONUMENTS HAVE BEEN PLACED AS SHOWN HEREON TO THE SPECIFICATIONS OPEN SPACE COVENANT RESTRICTIONS AS APPROVED BY THE TOWN ENGINEER. THOSE MONUMENTS NOT SET AND THE RATIO OF PRECISION OF THE SURVEY IS GREATER THAN 1:10000 AS SHOWN HEREON.

RAGAN SMITH ASSOCIATES, INC.

01-16-17
DATE

JOHN T. DARNALL, RLS NO. 1571

CERTIFICATE OF APPROVAL OF UTILITY SYSTEMS

I HEREBY CERTIFY THAT THE FOLLOWING UTILITY SYSTEMS OUTLINED OR INDICATED ON THE PLAN SHOWN HEREON HAVE BEEN INSTALLED IN ACCORDANCE WITH CURRENT LOCAL AND/OR STATE GOVERNMENT REQUIREMENTS OR THAT A SURETY BOND HAS BEEN POSTED WITH THE PLANNING COMMISSION TO ASSURE COMPLETION OF ALL REQUIRED IMPROVEMENTS IN CASE OF DEFAULT. ALSO, I CERTIFY THAT THE HYDRAULIC DESIGN CRITERIA SPECIFIED IN SECTION 3-106 OF THE THOMPSON'S STATION SUBDIVISION REGULATIONS HAVE BEEN MET.

WATER SYSTEM

_____
DATE

HB&TS UTILITY DISTRICT
GENERAL MANAGER

SEWER SYSTEM

_____
DATE

NAME, TITLE, AND AGENCY OF AUTHORIZED APPROVING AGENT

CERTIFICATION OF THE APPROVAL OF STREETS

I HEREBY CERTIFY: (1) THAT ALL STREETS DESIGNATED ON THIS FINAL SUBDIVISION PLAT HAVE BEEN INSTALLED IN AN ACCEPTABLE MANNER AND ACCORDING TO THOMPSON'S STATION'S SUBDIVISION REGULATIONS, OR (2) THAT A SURETY BOND HAS BEEN POSTED WITH THE PLANNING COMMISSION TO ASSURE COMPLETION OF ALL REQUIRED IMPROVEMENTS IN CASE OF DEFAULT.

_____
DATE

TOWN ENGINEER

CERTIFICATE OF APPROVAL OF MIDDLE TENNESSEE ELECTRIC MEMBERSHIP CORPORATION

I HEREBY CERTIFY THAT THE REQUIREMENTS SET FORTH IN RULES, REGULATIONS, BY-LAWS, POLICY AND OPERATIONAL BULLETINS, PLAT APPROVAL CHECKLIST AND TREE PLANTING GUIDELINES HAVE BEEN MET FOR MTEMC. ANY APPROVAL IS AT ALL TIMES CONTINGENT UPON CONTINUING COMPLIANCE WITH THE AFOREMENTIONED REQUIREMENTS.

_____
DATE

MIDDLE TENNESSEE ELECTRIC MEMBERSHIP CORPORATION

CERTIFICATE OF APPROVAL FOR RECORDING

I HEREBY CERTIFY THAT THE SUBDIVISION PLAT SHOWN HEREON HAS BEEN FOUND TO COMPLY WITH THOMPSON'S STATION SUBDIVISION REGULATIONS WITH THE EXCEPTION OF SUCH VARIANCES, IF ANY, AS ARE NOTED IN THE MINUTES OF THE PLANNING COMMISSION AND THAT IT HAS BEEN APPROVED FOR RECORDING IN THE OFFICE OF THE COUNTY REGISTER.

_____
DATE:

SECRETARY OF PLANNING COMMISSION

CERTIFICATE OF APPROVAL OF SUBDIVISION NAME AND STREET NAMES

I DO HEREBY CERTIFY THAT THE SUBDIVISION NAME AND STREET NAMES DENOTED ON THIS FINAL PLAT HAVE BEEN APPROVED BY THE WILLIAMSON COUNTY EMERGENCY COMMUNICATIONS AGENCY.

_____
DATE

WILLIAMSON COUNTY PUBLIC SAFETY

CERTIFICATE FOR ADDRESSES

I DO HEREBY CERTIFY THAT THE ADDRESSES DENOTED ON THIS FINAL PLAT ARE THOSE ASSIGNED BY DEPARTMENT OF INFORMATION TECHNOLOGY (IT).

_____
DATE

IT DEPT. E-911 ADDRESSING COORDINATOR

FINAL PLAT

TOLLGATE VILLAGE

SECTION 15

4TH CIVIL DISTRICT OF WILLIAMSON COUNTY, TOWN OF THOMPSON'S STATION, TENNESSEE

REVISED: JANUARY 16, 2017
DATE: DECEMBER 21, 2016
JOB NO. 10-081
SCALE: 1"=200'
W.O. 9260

OWNER/DEVELOPER
MBSC TN HOMEBUILDER, LLC
C/O BRIAN ROWE
312 S. GAY STREET, SUITE 200
CHATTANOOGA, TENNESSEE 37902
(865) 408-8322

RAGAN•SMITH
LAND PLANNERS • CIVIL ENGINEERS
LANDSCAPE ARCHITECTS • SURVEYORS
315 WOODLAND ST. P.O. BOX 60070 NASHVILLE, TN. 37206
(615) 244-8591 FAX (615)244-6739 tdarnall@ragansmith.com
CONTACT: TOM DARNALL, RLS

G:\10081.09\01-SURVEY\FINAL PLAT\SHEETS\SEC 15 FINAL PLAT.DWG
PLOTTED BY DAVID D. BRILEY ON: 1/16/2017 3:07 PM
LAST UPDATED BY DDB ON: 1/16/2017 3:07 PM

GENERAL NOTES

1. SEE SHEET 1 OF 4 FOR GENERAL NOTES AND LOT AND OPEN SPACE AREAS.

LINE TABLE		
LINE	BEARING	DISTANCE
L1	N63°19'57"E	4.97'
L2	S63°19'57"W	4.97'
L3	N74°31'17"E	23.74'
L4	S74°31'17"W	29.95'

CURVE TABLE						
CURVE	RADIUS	LENGTH	DELTA	TANGENT	CHORD	CHD BRG
C1	10.00'	14.96'	85°43'51"	9.28	13.61'	S61°13'21"W
C2	580.00'	216.99'	21°26'08"	109.78	215.73'	N65°11'39"W
C3	10.00'	17.02'	97°31'31"	11.41	15.04'	N05°42'50"W
C4	10.00'	15.56'	89°07'50"	9.85	14.03'	S87°36'50"W
C5	580.00'	214.13'	21°09'11"	108.30	212.92'	N37°14'39"W
C6	10.00'	15.71'	90°00'00"	10.00	14.14'	N18°19'57"E
C11	10.00'	16.02'	91°47'07"	10.32	14.36'	S23°58'55"W
C12	787.00'	65.34'	4°45'25"	32.69	65.32'	S24°17'21"E
C13	437.00'	375.59'	49°14'40"	200.28	364.14'	S51°17'23"E
C14	10.00'	14.16'	81°06'57"	8.56	13.00'	N63°31'49"E
C15	25.00'	43.15'	98°53'03"	29.21	37.99'	S26°28'11"E
C16	25.00'	35.81'	82°03'33"	21.75	32.82'	S63°03'30"W
C17	927.00'	59.41'	3°40'18"	29.71	59.40'	S20°11'35"W
C18	973.00'	49.31'	2°54'13"	24.66	49.31'	S19°48'32"W
C19	580.00'	16.70'	1°38'59"	8.35	16.70'	S75°05'14"E
C20	580.00'	61.06'	6°01'56"	30.56	61.03'	S71°14'46"E
C21	580.00'	68.00'	6°43'01"	34.04	67.96'	S64°52'18"E
C22	580.00'	71.23'	7°02'12"	35.66	71.19'	S57°59'41"E
C23	25.00'	35.25'	80°47'25"	21.27	32.40'	N83°26'38"E
C24	623.00'	214.76'	19°45'03"	108.46	213.70'	S66°02'12"E
C25	623.00'	31.27'	2°52'33"	15.64	31.27'	N57°35'56"W
C26	623.00'	55.51'	5°06'18"	27.77	55.49'	N61°35'21"W
C27	623.00'	50.05'	4°36'12"	25.04	50.04'	N66°26'36"W
C28	623.00'	40.03'	3°40'52"	20.02	40.02'	N70°35'09"W
C29	623.00'	37.90'	3°29'08"	18.96	37.90'	N74°10'09"W
C30	25.00'	42.40'	97°10'22"	28.34	37.50'	S27°19'32"E
C31	580.00'	62.07'	6°07'53"	31.06	62.04'	S44°45'18"E
C32	580.00'	47.89'	4°43'53"	23.96	47.88'	S39°19'26"E
C33	580.00'	59.69'	5°53'49"	29.87	59.67'	S34°00'35"E
C34	580.00'	44.48'	4°23'37"	22.25	44.47'	S28°51'52"E
C35	527.00'	94.95'	10°19'24"	47.61	94.82'	N68°29'39"E
C36	25.00'	36.98'	84°45'35"	22.81	33.70'	S63°57'52"E
C37	973.00'	86.32'	5°04'59"	43.19	86.29'	S24°07'34"E
C38	973.00'	40.20'	2°22'02"	20.10	40.20'	N22°46'05"W
C39	973.00'	39.29'	2°18'49"	19.65	39.29'	N25°06'31"W
C40	973.00'	6.83'	0°24'08"	3.41	6.83'	N26°28'00"W
C41	623.00'	227.97'	20°57'56"	115.27	226.70'	S37°09'02"E
C42	623.00'	12.82'	1°10'46"	6.41	12.82'	N27°15'26"W
C43	623.00'	48.84'	4°29'29"	24.43	48.82'	N30°05'34"W
C44	623.00'	39.07'	3°35'34"	19.54	39.06'	N34°08'05"W

CURVE TABLE						
CURVE	RADIUS	LENGTH	DELTA	TANGENT	CHORD	CHD BRG
C45	623.00'	48.84'	4°29'29"	24.43	48.82'	N38°10'37"W
C46	623.00'	39.07'	3°35'34"	19.54	39.06'	N42°13'09"W
C47	623.00'	39.34'	3°37'04"	19.68	39.33'	N45°49'28"W
C48	25.00'	39.57'	90°40'55"	25.30	35.57'	S02°17'32"E
C49	25.00'	35.39'	81°06'57"	21.40	32.51'	S63°31'49"W
C50	577.00'	495.92'	49°14'40"	264.44	480.79'	N51°17'23"W
C51	577.00'	23.91'	2°22'28"	11.96	23.91'	S74°43'29"E
C52	577.00'	50.57'	5°01'17"	25.30	50.55'	S71°01'36"E
C53	577.00'	50.57'	5°01'17"	25.30	50.55'	S66°00'19"E
C54	577.00'	50.57'	5°01'17"	25.30	50.55'	S60°59'03"E
C55	577.00'	63.26'	6°16'53"	31.66	63.22'	S55°19'58"E
C56	577.00'	50.57'	5°01'17"	25.30	50.55'	S49°40'53"E
C57	577.00'	50.57'	5°01'17"	25.30	50.55'	S44°39'36"E
C58	577.00'	50.57'	5°01'17"	25.30	50.55'	S39°38'19"E
C59	577.00'	50.57'	5°01'17"	25.30	50.55'	S34°37'02"E
C60	577.00'	51.46'	5°06'35"	25.75	51.44'	S29°33'06"E
C61	577.00'	3.32'	0°19'46"	1.66	3.32'	S26°49'56"E
C62	927.00'	71.74'	4°26'02"	35.89	71.72'	N24°27'02"W
C63	927.00'	20.45'	1°15'49"	10.22	20.45'	S26°02'09"E
C64	927.00'	51.29'	3°10'13"	25.65	51.29'	S23°49'08"E
C65	25.00'	42.22'	96°45'18"	28.14	37.38'	N26°08'38"E
C66	1223.00'	59.47'	2°47'09"	29.74	59.46'	N73°07'42"E
C67	10.00'	15.09'	86°29'13"	9.40	13.70'	S65°01'16"E
C68	807.00'	68.87'	4°53'24"	34.46	68.85'	S24°13'22"E
C69	807.00'	51.07'	3°37'34"	25.55	51.07'	N23°35'27"W
C70	807.00'	17.80'	1°15'49"	8.90	17.80'	N26°02'09"W
C71	457.00'	392.78'	49°14'40"	209.45	380.80'	S51°17'23"E
C72	457.00'	3.32'	0°24'57"	1.66	3.32'	N26°52'32"W
C73	457.00'	40.07'	5°01'23"	20.05	40.05'	N29°35'42"W
C74	457.00'	40.05'	5°01'17"	20.04	40.04'	N34°37'02"W
C75	457.00'	40.05'	5°01'17"	20.04	40.04'	N39°38'19"W
C76	457.00'	40.05'	5°01'17"	20.04	40.04'	N44°39'36"W
C77	457.00'	40.05'	5°01'17"	20.04	40.04'	N49°40'53"W
C78	457.00'	50.10'	6°16'53"	25.08	50.08'	N55°19'58"W
C79	457.00'	40.05'	5°01'17"	20.04	40.04'	N60°59'03"W
C80	457.00'	40.05'	5°01'17"	20.04	40.04'	N66°00'19"W
C81	457.00'	40.05'	5°01'17"	20.04	40.04'	N71°01'36"W
C82	457.00'	18.94'	2°22'28"	9.47	18.94'	N74°43'29"W
C83	10.00'	17.26'	98°53'03"	11.68	15.19'	S26°28'11"E

(SEE NOTE 2)

0 50 100 150

SHEET 3 MATCH LINE

FUTURE DEVELOPMENT TOLLGATE VILLAGE
(ZONED D3)
MAP 132, PARCEL 1
MBSC TN HOMEBUILDERS, LLC
BOOK 5264, PAGE 242
R.O.W.C.T.

(ZONED D3)
TOLLGATE VILLAGE SECTION 14B
PLAT BOOK P61, PAGE 32,
R.O.W.C.T.

(ZONED D3)
TOLLGATE VILLAGE SECTION 14A
PLAT BOOK P60, PAGE 87,
R.O.W.C.T.

OPEN SPACE 1596

WILLMORE DRIVE
AMERICUS DRIVE
VINEMONT DRIVE
ASHMORE DRIVE
DELMAR DRIVE
ALLEY

S63°19'57"W 20.00'
N26°40'03"W 46.00'
S26°40'03"E 270.04'
N22°58'20"E 10.32'
S75°54'43"E 99.43'
S67°01'40"E 46.00'
S22°58'20"W 124.23'
N52°57'44"W 46.25'
N75°54'43"W 14.88'
S14°05'17"W 146.00'
N75°54'43"W 134.57'
S18°21'25"W 39.67'
N71°38'35"W 46.00'
N16°21'25"E 132.0'

FUTURE DEVELOPMENT TOLLGATE VILLAGE
(ZONED D3)
MAP 132, PARCEL 1
MBSC TN HOMEBUILDERS, LLC
BOOK 5264, PAGE 242
R.O.W.C.T.

FUTURE DEVELOPMENT TOLLGATE VILLAGE
(ZONED D3)
MAP 132, PARCEL 1
MBSC TN HOMEBUILDERS, LLC
BOOK 5264, PAGE 242
R.O.W.C.T.

CRITICAL LOT SEE NOTE 11

811 Know what's below. Call before you dig.

LEGEND

■	MONUMENT (NEW) (4" DIAMETER ALUMINUM DISC W/ 5/8" IRON ROD MARKED "RAGAN-SMITH ASSOCIATES")	⊙	SANITARY SEWER MANHOLE
●	IRON ROD (NEW) (5/8" X 18" W/CAP STAMPED "RAGAN SMITH & ASSOCIATES")	▩	CATCH BASIN
○	IRON ROD (OLD)	—SA—	SANITARY SEWER LINE
123	STREET ADDRESS	—W—	WATER LINE
R.O.W.	RIGHT-OF-WAY		HEADWALL
—W—	WATER LINE	RCP	REINFORCED CONCRETE PIPE
	FIRE HYDRANT	P.U.D.E.	PUBLIC UTILITY & DRAINAGE EASEMENT
		R.O.W.C.T.	REGISTER'S OFFICE FOR WILLIAMSON COUNTY, TN
		M.T.E.M.C.E.	MIDDLE TENNESSEE ELECTRIC MEMBERSHIP CORPORATION EASEMENT

RECORDER'S INFORMATION

FINAL PLAT

TOLLGATE VILLAGE
SECTION 15

4TH CIVIL DISTRICT OF WILLIAMSON COUNTY,
TOWN OF THOMPSON'S STATION, TENNESSEE

REVISED: JANUARY 16, 2017
DATE: DECEMBER 21, 2016
JOB NO. 10-081
SCALE: 1"=50'
W.O. 9260

OWNER/DEVELOPER
MBSC TN HOMEBUILDER, LLC
C/O BRIAN ROWE
312 S. GAY STREET, SUITE 200
CHATTANOOGA, TENNESSEE 37902
(865) 408-8322

RAGAN•SMITH
LAND PLANNERS • CIVIL ENGINEERS
LANDSCAPE ARCHITECTS • SURVEYORS
315 WOODLAND ST. P.O. BOX 60070 NASHVILLE, TN. 37206
(615) 244-8591 FAX (615)244-6739 tdarnall@ragansmith.com
CONTACT: TOM DARNALL, RLS

SHEET 2 OF 4

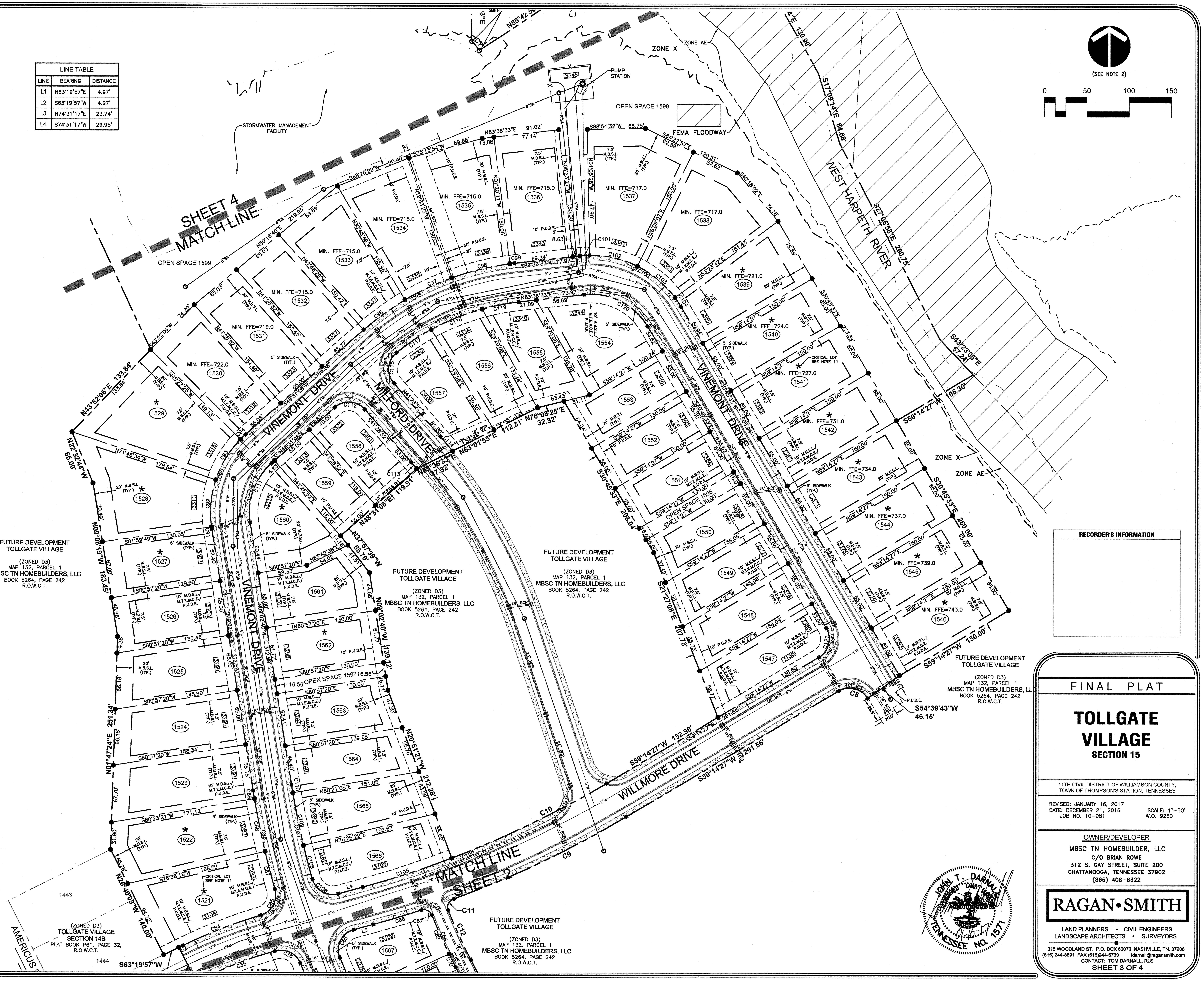
JOHN T. DARNALL LAND SURVEYOR TENNESSEE NO. 1571

GENERAL NOTES

1. SEE SHEET 1 OF 4 FOR GENERAL NOTES AND LOT AND OPEN SPACE AREAS.

CURVE TABLE						
CURVE	RADIUS	LENGTH	DELTA	TANGENT	CHORD	CHD BRG
C8	25.00'	39.27'	90°00'00"	25.00	35.36'	N75°45'33"W
C9	1223.00'	226.20'	10°35'50"	113.42	225.88'	S64°32'22"W
C10	1177.00'	203.44'	9°54'13"	101.98	203.19'	N64°11'33"E
C84	573.00'	99.26'	9°55'29"	49.75	99.13'	S68°17'41"W
C85	25.00'	38.97'	89°19'26"	24.71	35.15'	S28°35'43"W
C86	973.00'	119.25'	7°01'21"	59.70	119.18'	S12°33'20"E
C87	973.00'	45.93'	2°42'17"	22.97	45.93'	N14°42'52"W
C88	973.00'	63.70'	3°45'04"	31.86	63.69'	N11°29'11"W
C89	973.00'	9.62'	0°34'00"	4.81	9.62'	N09°19'39"W
C90	123.00'	123.57'	57°33'48"	67.57	118.44'	S19°44'14"W
C91	123.00'	2.24'	1°02'28"	1.12	2.24'	N08°31'25"W
C92	123.00'	56.30'	26°13'37"	28.65	55.81'	N05°06'37"E
C93	123.00'	56.50'	26°19'09"	28.76	56.01'	N31°23'01"E
C94	123.00'	8.54'	3°58'33"	4.27	8.53'	N46°31'52"E
C95	323.00'	197.82'	35°05'24"	102.12	194.74'	S66°03'50"W
C96	323.00'	60.42'	10°43'02"	30.30	60.33'	N53°52'39"E
C97	323.00'	61.30'	10°52'27"	30.74	61.21'	N64°40'24"E
C98	323.00'	70.77'	12°33'12"	35.53	70.63'	N76°23'13"E
C99	323.00'	5.33'	0°56'43"	2.66	5.33'	N83°08'11"E
C100	123.00'	140.90'	65°37'54"	79.32	133.32'	N63°34'30"W
C101	123.00'	11.38'	5°17'59"	5.69	11.37'	N86°15'32"E
C102	123.00'	58.48'	27°14'35"	29.81	57.93'	S77°28'11"E
C103	123.00'	58.48'	27°14'35"	29.81	57.93'	S50°13'36"E
C104	123.00'	12.55'	5°50'45"	6.28	12.54'	S33°40'56"E
C105	1177.00'	110.46'	5°22'38"	55.27	110.42'	S71°49'58"W
C106	25.00'	38.99'	89°21'31"	24.72	35.16'	N60°47'58"W
C107	927.00'	114.48'	7°04'33"	57.31	114.41'	N12°34'56"W
C108	927.00'	41.14'	2°32'35"	20.57	41.14'	S14°50'55"E
C109	927.00'	63.56'	3°55'42"	31.79	63.55'	S11°36'46"E
C110	927.00'	9.78'	0°36'16"	4.89	9.78'	S09°20'47"E
C111	77.00'	77.36'	57°33'48"	42.30	74.15'	N19°44'14"E
C112	25.00'	39.27'	90°00'00"	25.00	35.36'	S86°28'52"E
C113	577.00'	10.00'	0°59'35"	5.00	10.00'	S40°59'04"E
C114	623.00'	22.32'	2°03'11"	11.16	22.32'	N40°27'16"W
C115	25.00'	40.26'	92°16'08"	26.01	36.05'	N04°39'12"E
C116	277.00'	158.68'	32°49'17"	81.58	156.52'	N67°11'54"E
C117	277.00'	49.42'	10°13'23"	24.78	49.36'	S55°53'57"W
C118	277.00'	65.25'	13°29'46"	32.78	65.10'	S67°45'32"W
C119	277.00'	44.01'	9°06'08"	22.05	43.96'	S79°03'29"W
C120	77.00'	88.20'	65°37'54"	49.65	83.46'	S63°34'30"E
C121	25.00'	39.27'	90°00'00"	25.00	35.36'	S14°14'27"W
C122	1177.00'	313.90'	15°16'50"	157.89	312.97'	N66°52'52"E

LINE TABLE		
LINE	BEARING	DISTANCE
L1	N63°19'57"E	4.97'
L2	S63°19'57"W	4.97'
L3	N74°31'17"E	23.74'
L4	S74°31'17"W	29.95'



RECORDER'S INFORMATION

Know what's **below.**
Call before you dig.

LEGEND

■	MONUMENT (NEW) (4" DIAMETER ALUMINUM DISC W/ 5/8" IRON ROD MARKED "RAGAN-SMITH ASSOCIATES")	◎	SANITARY SEWER MANHOLE
		▤	CATCH BASIN
		—SA—	SANITARY SEWER LINE
●	IRON ROD (NEW) (5/8" X 18" W/CAP STAMPED "RAGAN SMITH & ASSOCIATES")	—W—	WATER LINE
			HEADWALL
○	IRON ROD (OLD)	RCP	REINFORCED CONCRETE PIPE
123	STREET ADDRESS	P.U.D.E.	PUBLIC UTILITY & DRAINAGE EASEMENT
R.O.W.	RIGHT-OF-WAY		
—W—	WATER LINE	R.O.W.C.T.	REGISTER'S OFFICE FOR WILLIAMSON COUNTY, TN
	FIRE HYDRANT	M.T.E.M.C.E.	MIDDLE TENNESSEE ELECTRIC MEMBERSHIP CORPORATION EASEMENT

G:\10081-92601-SURVEY\PLATS\SECTION 15\FINAL PLAT\9260 SEC 15 FINAL PLAT.DWG
PLOTTED BY DAVID D. BRILEY ON: 1/16/2017 3:01 PM LAST UPDATED BY DDB ON: 1/16/2017 3:00 PM

JOHN T. DARNALL TENNESSEE NO. 1571

FINAL PLAT

TOLLGATE VILLAGE

SECTION 15

11TH CIVIL DISTRICT OF WILLIAMSON COUNTY,
TOWN OF THOMPSON'S STATION, TENNESSEE

REVISED: JANUARY 16, 2017
DATE: DECEMBER 21, 2016
JOB NO. 10-081
SCALE: 1"=50'
W.O. 9260

OWNER/DEVELOPER

MBSC TN HOMEBUILDER, LLC
C/O BRIAN ROWE
312 S. GAY STREET, SUITE 200
CHATTANOOGA, TENNESSEE 37902
(865) 408-8322

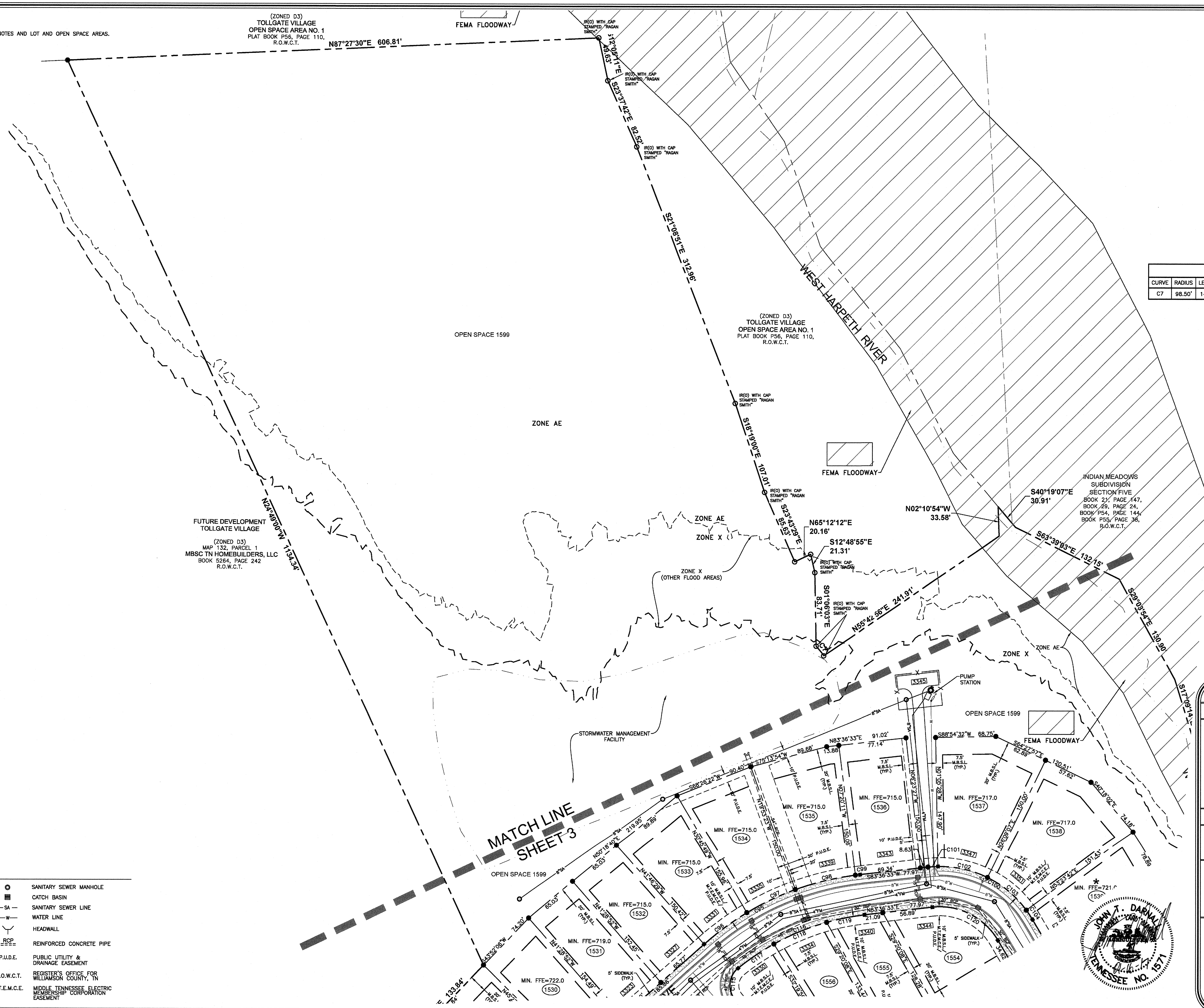
RAGAN•SMITH

LAND PLANNERS • CIVIL ENGINEERS
LANDSCAPE ARCHITECTS • SURVEYORS

315 WOODLAND ST. P.O. BOX 60070 NASHVILLE, TN. 37206
(615) 244-8591 FAX (615)244-6739 tdarnall@ragansmith.com
CONTACT: TOM DARNALL, RLS

GENERAL NOTES

1. SEE SHEET 1 OF 4 FOR GENERAL NOTES AND LOT AND OPEN SPACE AREAS.



CURVE TABLE						
CURVE	RADIUS	LENGTH	DELTA	TANGENT	CHORD	CHD BRG
C7	98.50'	14.17'	8°14'23"	7.09	14.15'	N38°24'16"W

(SEE NOTE 2)

0 50 100 150

RECORDER'S INFORMATION

Know what's below. Call before you dig.

LEGEND

■	MONUMENT (NEW) (4" DIAMETER ALUMINUM DISC W/ 5/8" IRON ROD MARKED "RAGAN-SMITH ASSOCIATES")	◎	SANITARY SEWER MANHOLE
		▤	CATCH BASIN
		—SA—	SANITARY SEWER LINE
●	IRON ROD (NEW) (5/8" X 18" W/CAP STAMPED "RAGAN SMITH & ASSOCIATES")	—W—	WATER LINE
			HEADWALL
○	IRON ROD (OLD)	RCP	REINFORCED CONCRETE PIPE
123	STREET ADDRESS	P.U.D.E.	PUBLIC UTILITY & DRAINAGE EASEMENT
R.O.W.	RIGHT-OF-WAY		
—W—	WATER LINE	R.O.W.C.T.	REGISTER'S OFFICE FOR WILLIAMSON COUNTY, TN
	FIRE HYDRANT	M.T.E.M.C.E.	MIDDLE TENNESSEE ELECTRIC MEMBERSHIP CORPORATION EASEMENT

G:\10081-92601-SURVEY\PLATS\SECTION 15\FINAL PLAT\9260 SEC 15 FINAL PLAT.DWG
PLOTTED BY DAVID D. BRILEY ON: 1/16/2017 3:01 PM LAST UPDATED BY DDB ON: 1/16/2017 3:00 PM

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PROPOSED PUBLIC GREENWAY

FLOOD PLAIN (TYP)

PROPOSED PUBLIC GREENWAY

AMENITY CENTER

PLATTED LOTS (TYP)

TOWNHOMES-LIVE/WORK UNITS

OFFICE

JACKSON LAKE

HOTEL SITE

SHELTER INSURANCE

COMMERCIAL OUTPARCELS

EXISTING SANITARY LIFT STATION

HIGHWAY 31

PLATTED LOTS (TYP)

MULTI FAMILY

MEDICAL OFFICE BUILDING

COMMERCIAL OUTPARCELS

COLUMBIA PIKE

PROPOSED PUBLIC GREENWAY (ACCESS EASEMENT FROM COUNTY SCHOOL REQUIRED)

INDEPENDENCE HIGH SCHOOL

STATE RT. 840

VICINITY MAP
NOT TO SCALE

SITE DATA

TOTAL SITE AREA ..... 345.9 ACRES

OPEN SPACE ..... 120 ACRES (35%)

LAND USES:

SINGLE FAMILY ..... 669 Total
Platted 378
Proposed 474

TOWNHOME ..... 88 Total
Platted 61
Proposed 27

MULTI-FAMILY/CONDO ..... 256 Total
Existing 30
Proposed 220

OFFICE
Prof. Office. ..... 30,000 s.f.

COMMERCIAL
Commercial Village Site Plan ..... 193,000 s.f.
(948 SP. INC. ON-STREET)
Medical Office (existing) .... 4.3 acres
Outparcels ..... 11.2 acres

SCALE:1"=200'
April 15, 2014

Concept Plan

TOLLGATE Village

Town of Thompson's Station,
Williamson County, Tennessee

RAGAN•SMITH
LAND PLANNERS • CIVIL ENGINEERS
LANDSCAPE ARCHITECTS • SURVEYORS
JOB NO: 10-081/9260

TRAFFIC IMPACT STUDY

TOLLGATE FARMS

THOMPSON STATION, TENNESSEE

PREPARED FOR: TOLLGATE FARMS, LLC

PREPARED BY:

RPM TRANSPORTATION CONSULTANTS, LLC

7000 Executive Center Drive, Suite 230

Brentwood, TN 37027

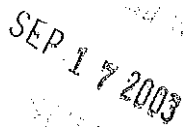


TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

The purpose of this study is to analyze the traffic impacts of the Tollgate Farms development proposed to be constructed on Highway 31 in Thompson Station, Tennessee. Specifically, the project is proposed to be located on Highway 31 between State Route 840 and Goose Creek Bypass. This study was prepared in order to evaluate the traffic impacts of the project and to address access needs for the proposed development.

In this study, the operating characteristics of the intersections in the vicinity of the project site are evaluated. The expected trips generated by the proposed development are estimated and distributed to the roadway network. The intersections are then re-evaluated to determine the anticipated traffic impacts of the project. Finally, recommendations are presented, including roadway improvements and/or traffic control improvements that are needed to accommodate the expected traffic.

2. PROJECT DESCRIPTION

The location of the proposed project is shown in Figure 1. As shown by Figure 1, the project site is located on the west side of Highway 31, north of the future location of State Route 840. The project site is in the City of Thompson Station in Williamson County, Tennessee.

Currently, this property contains a couple of single family homes, while the majority of the land is undeveloped. Other development in the vicinity of the project site includes Independence High School, which is currently under construction. The high school will be located just south of the project site, on the northwest corner of the interchange of State Route 840 and Highway 31.

Appendix A contains the current site plan for this area. The proposed project consists of a mix of residential, office, and retail development. Residential development is located in the northern and western portions of the project site, while retail and office development is located in the eastern· portion of the site. For the purpose of this study, it was assumed that the project will be developed in two phases. Phase I will include the residential development and Phase 11 will include office and retail development.

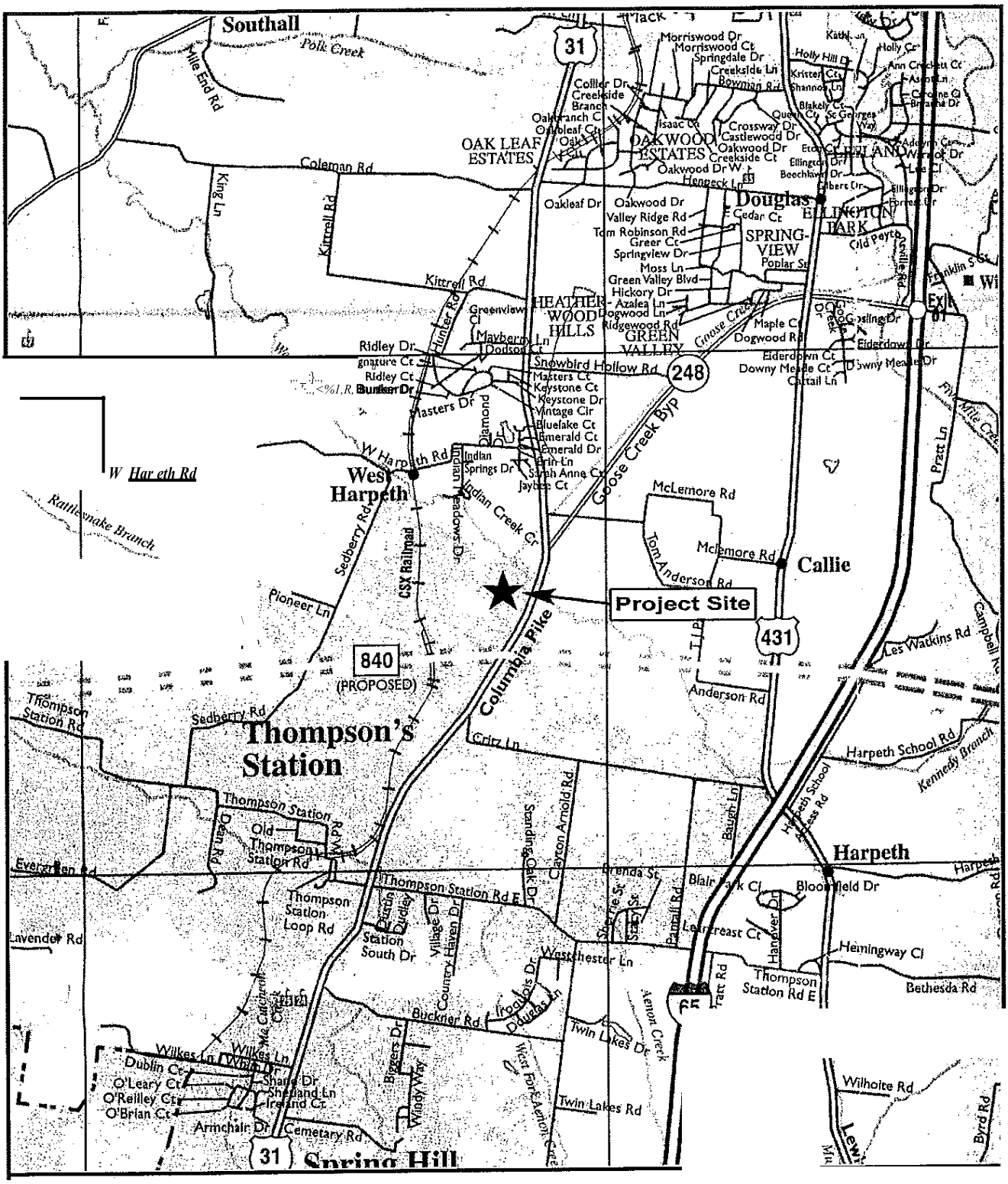
Phase I consists of approximately 700 dwelling units. Approximately 105 units will be developed as apartments, 120 units as townhouses and the remaining 475 units will be developed as single family homes.

Phase II will consist of office and retail development. The office development will include approximately 520,000 square feet of space and the retail will include approximately 185,000 square feet of space.·

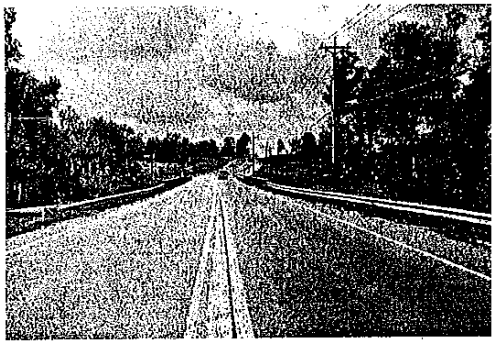
According to the site plan, two driveways will provide access to the project site. The southernmost driveway will intersect Highway 31 approximately 1,850 feet south of the intersection with Goose Creek Bypass and 1,720 feet north of the proposed northern ramps to State Route 840. The northernmost driveway will intersect Highway 31 approximately 525 feet north of the southernmost driveway. It is expected that the south project driveway will serve the residential, retail and office developments. The north project driveway will primarily serve the retail and office developments. Therefore, the south driveway is expected to be completed as part of Phase I and the north driveway is expected to be completed as part of Phase 11 of the project.

A roadway is currently under construction that will serve Independence High School. According to a representative of Williamson County Schools, this roadway will become a public road once construction is completed. Access to the Tollgate Farms site will be provided by this roadway as well as the two project driveways. This roadway is located on Highway 31 approximately 2,520 feet south of the intersection with Goose Creek Bypass and approximately 1,020 feet north of the proposed northern ramps for State Route 840. Also, it will intersect Highway 31 approximately 680 feet south of the south driveway to Tollgate Farms. It is expected that some of the traffic from the residential development within Tollgate Farms will also use this roadway for access to Highway 31.

To identify and evaluate the impacts of the development, the traffic projections and analyses for this study are separated into two sections. Phase I is included in the first analysis section of this report. Total buildout of Phases I and II are analyzed as the second analysis section of this report. For the purposes of this study, it was assumed that Phase I will be completed in approximately five years and the entire project will be completed in approximately ten years.


Southall
Polk Creek
Mill End Rd
King Ln
Coleman Rd
Kittrell Rd
OAK LEAF ESTATES
OAKWOOD ESTATES
Douglas
SPRING-VIEW
HEATHER-WOOD HILLS
GREEN VALLEY
Snowbird Hollow Rd
248
Goose Creek Byp
Bunker Dr
Masters Dr
Diamond
W Harpeth Rd
West Harpeth
Indian Springs Dr
Indian Creek Cir
Rattlesnake Branch
Sedberry Rd
CSX Railroad
Pioneer Ln
McLemore Rd
Tom Anderson Rd
Callie
Project Site
431
840
(PROPOSED)
Columbia Pike
Thompson's Station
Thompson Station Rd
Old Thompson Station Rd
Thompson Station Rd E
Evergreen Rd
Lavender Rd
Thompson Station Loop Rd
Station South Dr
Dudley Dr
Village Dr
Country Haven Dr
Buckner Rd
Wilkes Ln
Dublin Ct
O'Leary Ct
O'Reilley Ct
O'Brian Ct
Sharp Dr
Shepherd Ln
Ireland Ct
Armchair Dr
Cemetery Rd
Spring Hill
Criz Ln
Clayton Arnold Rd
Sanding Oak Dr
Anderson Rd
Les Watkins Rd
Harpeth School Rd
Kennedy Branch
Harpeth
Bloomfield Dr
Hemingway Ct
Bethesda Rd
Twin Lakes Dr
Twin Lakes Rd
Aenon Creek
Wilhoite Rd
Byrd Rd
Pratt Ln
Five Mile Creek

RPM Transportation Consultants, LLC	No Scale	Figure 1. Location of the Project Site



3. BACKGROUND SETTING

3.1 Regional and Local Access

Regional and local access to the project site will be provided by Highway 31 and Goose Creek Bypass. Descriptions of these roadways are as follows:

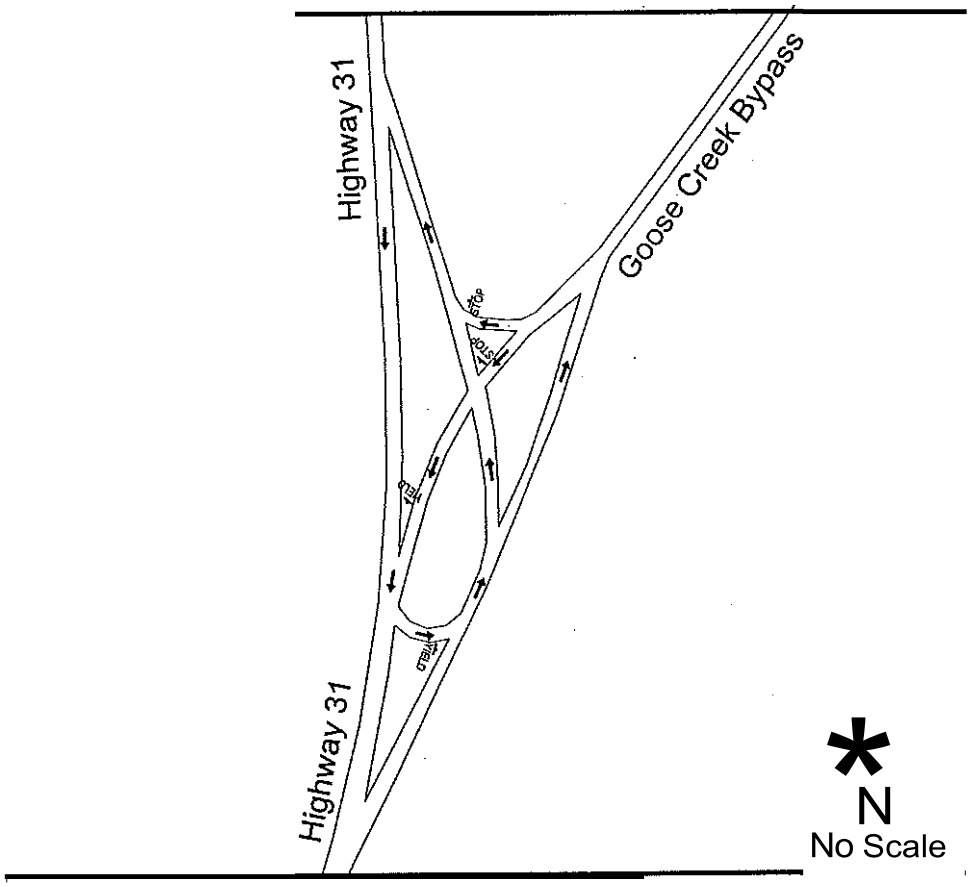
- Highway 31 is a major north-south route that forms a connection between the City of Franklin and the City of Columbia. In the vicinity of the project site, Highway 31 has one 12-foot travel lane in each direction. Shoulders are provided on both sides of Highway 31. The posted speed limit is 45 mph. Highway 31 is classified as an arterial in the 1996 Major Thoroughfare Plan Update for Williamson County. There is no existing sidewalk on either side of Highway 31.

Southbound Highway 31 north of project site

- Goose Creek Bypass, in the vicinity of the site, generally travels in an east- west direction and provides a connection between Interstate 65 and Highway 31. Goose Creek Bypass has one 12-foot travel lane in each direction. Shoulders are provided on both sides of Goose Creek Bypass. The posted speed limit on this roadway is 55 mph and it is classified as an arterial in the 1996 Major Thoroughfare Plan Update for Williamson County. There is no existing sidewalk on either side of Spring Hill Circle.

- The intersection of Highway 31 and Goose Creek Bypass is a Y-shaped intersection, designed as shown in the diagram below. Each intersection approach is one lane. As shown, southbound and northbound through traffic on Highway 31 flows freely through the intersection. Also, northbound Highway 31 to eastbound Goose Creek Bypass flows freely. The other intersection approaches are controlled as shown.

Westbound Goose Creek Bypass at Hwy 31


Highway 31
Goose Creek Bypass
Highway 31
N
No Scale

3.2 Planned Roadway Improvement Projects

The Tennessee Department of Transportation (TOOT) is currently constructing a segment of State Route 840 in the vicinity of the project site. A sketch showing the improvements planned by TOOT is included in Appendix A. A grade-separated interchange will be constructed at the intersection of State Route 840 and Highway 31. The interchange will consist of four entrance/exit ramps that will intersect Highway 31.

The entrance and exit ramps serving State Route 840 westbound will intersect Highway 31 at a signalized intersection on the north side of the interchange. The westbound approach of the State Route 840 exit ramp will consist of a dual left turn lane and a separate right turn lane. The southbound approach on Highway 31 will consist of two through lanes and a separate right turn lane. The northbound approach on Highway 31 will consist of two through lanes and a separate left turn lane. The east leg of the intersection is a one-way entrance ramp to westbound State Route 840.

The entrance and exit ramps serving State Route 840 eastbound will intersect Highway 31 on the south side of the interchange at a signalized intersection. The eastbound approach on the State Route 840 exit ramp will also consist of a dual left turn lane and a separate right turn lane. The southbound approach on Highway 31 will consist of two through lanes and a separate left turn lane. The northbound approach on Highway 31 will consist of two through lanes and a separate right turn lane. The west leg of the intersection serves as a one-way entrance ramp to eastbound State Route 840.

Highway 31 will be widened at the interchange to include two travel lanes in each direction and turn lanes onto the ramps; however, it will transition to a single lane in each direction along the frontage of the Tollgate Farms site.· According to a representative of TOOT, the roadway improvement project is expected to be completed in 2005.

Also, as previously mentioned, Independence High School is currently under construction just south of the Tollgate Farms. A roadway to access the high school is being constructed and will intersect Highway 31 approximately 2,520 feet south of Goose Creek Bypass and approximately 1,080 north of the northern State Route 840 ramps.

According to plans by Johnson & Bailey Architects P.C. and Littlejohn Engineering Associates, Inc., the high school access road will intersect Highway 31 at an unsignalized T-intersection. The southbound approach to this intersection along Highway 31 will consist of two through lanes and a separate right turn lane. The northbound approach on Highway 31 will consist of two through lanes and a separate left turn lane. The eastbound high school access road approach will consist of separate right and left turn lanes.

3.3 Existing Traffic Operations

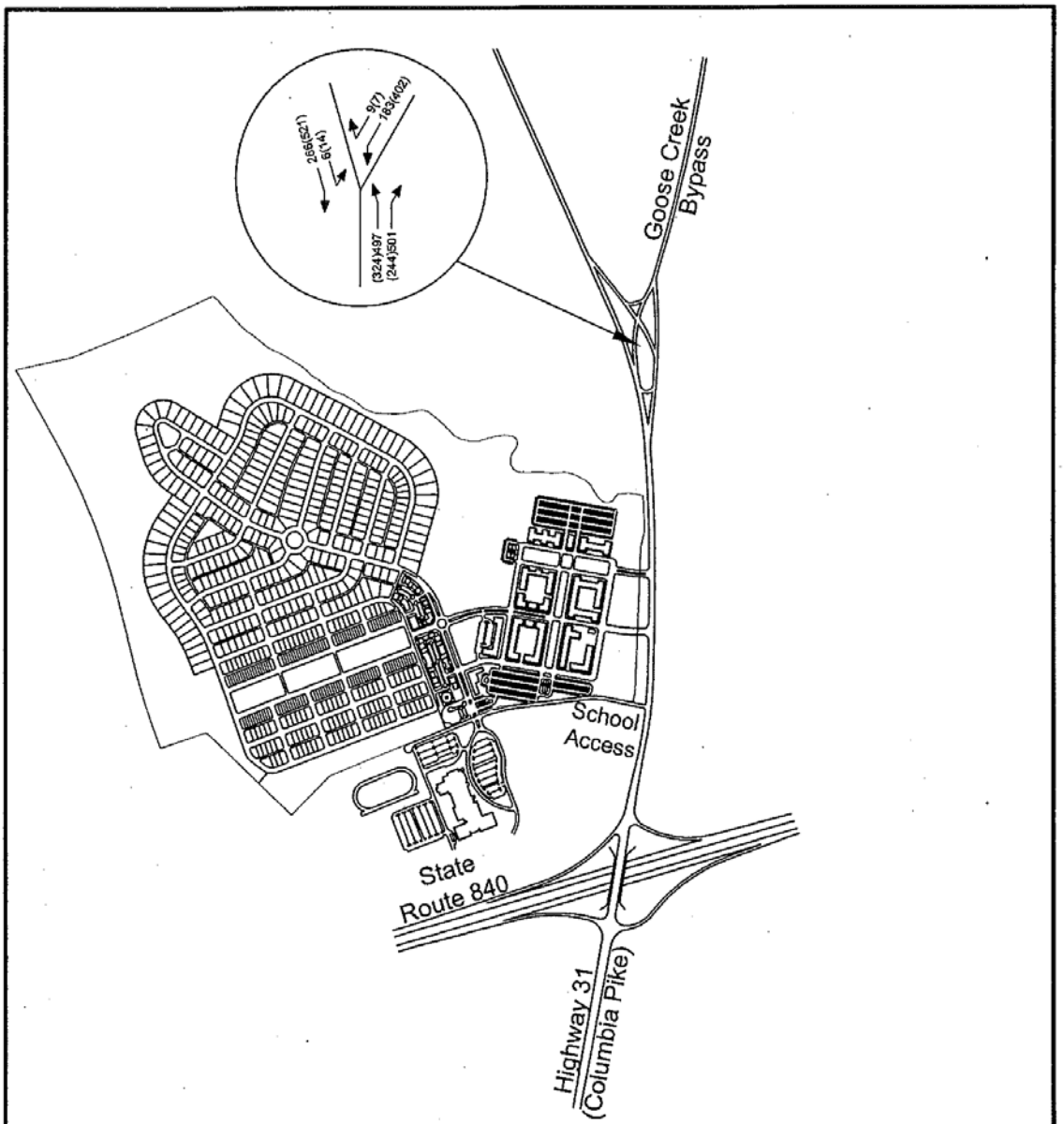
To provide data for the traffic impact analysis, manual traffic counts were conducted at the intersection of Highway 31 and Goose Creek Bypass.

Specifically, the traffic counts were conducted from 7:00 - 9:00 AM and 2:00 - 6:00 PM. From the counts obtained, it was determined that the peak hours of traffic flow at the intersection occurs from 7:00 - 8:00 AM and 4:45 - 5:45 PM. The existing peak hour turning movement volumes for the intersection studied are presented in Figure 2. The AM peak hour for traffic for the high school that is currently under construction is also expected to occur from 7:00 - 8:00 AM. The PM peak hour for the high school traffic is expected to occur from 2:15 - 3:15 PM. The existing school PM peak hour turning movement volumes for the intersections studied are presented in Figure 3.

To determine the current operation of the intersections studied, capacity analyses were performed for the AM, PM and school peak hours. The capacity calculations were performed according to the methods outlined in the Highway Capacity Manual, Transportation Research Board (TRB) 2000.

The capacity analyses result in the determination of a Level of Service (LOS) for an intersection. The LOS is a concept used to describe how well an intersection or roadway operates. LOS A is the best, while LOS F is the worst. LOS D is typically considered as the minimum acceptable LOS for a signalized intersection in an urbanized area. Table 1 presents descriptions of LOS for signalized intersections. The descriptions of LOS for unsignalized intersections are presented in Table 2.

The results of the capacity analyses for the existing conditions at the intersection of Highway 31 and Goose Creek Bypass are presented in Table 3. As shown in Table 3, all critical turning movement at the study operate at LOS C or better. These results show that the intersection currently operates with minor delays; Appendix B contains the capacity analysis worksheets.



Transportation Consultants, LLC	N No Scale	Figure 2. Existing Peak Hour Traffic Volumes

TABLE 1

DESCRIPTIONS OF LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS

Level of Service	Description	Control Delay per Vehicle (sec)
A	Operations with very low delay. This occurs when progression is extremely favorable. Most vehicles do not stop at all.	≤ 10
B	Operations with stable flows. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.	>10 and ≤ 20
C	Operations with stable flow. Occurs with fair progression and/or longer cycle lengths. The number of vehicles stopping is significant, although many still pass through the intersection without stopping.	>20 and ≤ 35
D	Approaching unstable flow. The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop.	>35 and ≤ 55
E	Unstable flow. This is considered to be the limit for acceptable delay. These high delays generally indicate poor progression, long cycle lengths, and high V/C ratios.	>55 and ≤ 80
F	Unacceptable delay. This condition often occurs with oversaturation or with high V/C ratios. Poor progression and long cycle lengths may also cause such delay levels.	>80.0

Source: Highway Capacity Manual, TRB 2000

TABLE 2

DESCRIPTIONS OF LEVEL OF SERVICE FOR UNSIGNALIZED INTERSECTIONS

Level of Service	Control Delay (sec)	Description
A	≤ 10.0	Little or no delay
B	>10 and ≤ 15	Short traffic delay
C	>15 and ≤ 25	Average traffic delay
D	>25 and ≤ 35	Long traffic delay
E	>35 and ≤ 50	Very long traffic delay
F	> 50.0	Extreme traffic delay

Source: Highway Capacity Manual, TRB 2000

TABLE 3

EXISTING PEAK HOUR LEVELS OF SERVICE

INTERSECTION	TURNING MOVEMENT	LEVEL OF SERVICE		
		AM PEAK HOUR	PM PEAK HOUR	SCHOOL PM PEAK HOUR
Highway 31 and Goose Creek Bypass	Westbound Left Turns	C	C	B
	Westbound Right Turns	B	B	B
Note: For unsignalized intersections, a LOS is presented for each critical turning movement.				

4. BACKGROUND TRAFFIC VOLUMES - PHASE I

In order to account for the traffic growth prior to the completion of Phase I of the proposed project, background traffic volumes were established. As mentioned previously, it was assumed that Phase I of the project will be completed within five years. Average daily traffic volumes obtained from the Tennessee Department of Transportation (TOOT) indicate that the traffic volumes in the vicinity of the project site have been increasing at a rate of approximately 9% per year. However, this is an extremely high growth rate and it is not anticipated that traffic in this area will consistently grow at such a high rate. The proposed development will contribute to the traffic growth in this area. Therefore, it is assumed that the background traffic in the vicinity of the site will grow at approximately 2% per year. Based on these results, the existing traffic volumes were adjusted to account for the growth in traffic expected to occur prior to the completion of Phase I.

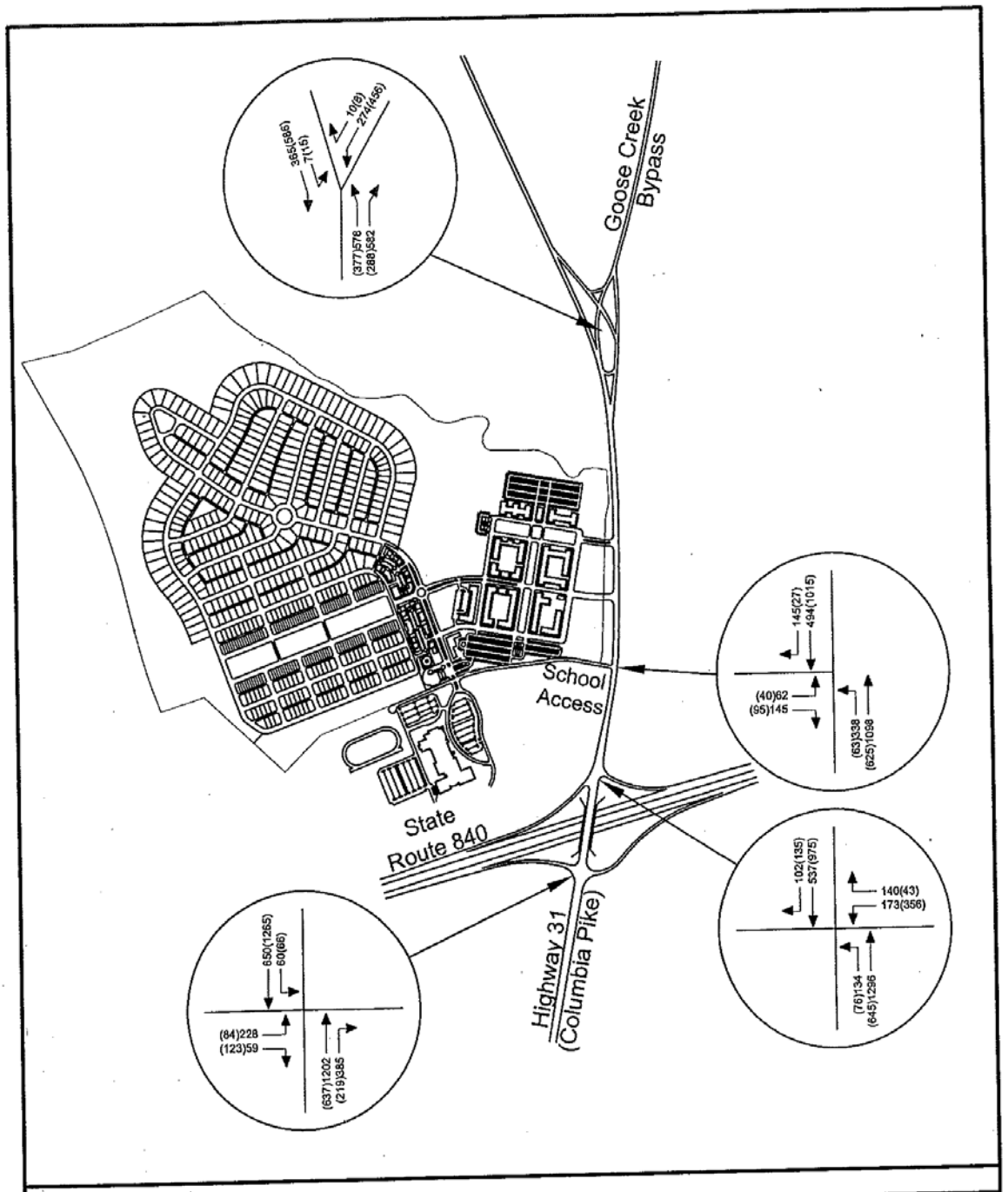
Additionally, the traffic expected to be generated by Independence High School was added to the background traffic growth. Based on the enrollment at other Williamson County high schools, it was assumed that approximately 1,500 students will attend Independence High School.

A traffic generation process was used to estimate the amount of traffic expected to be generated by the high school. Daily trip rates and AM, PM, and school PM peak hour trip rates were taken from Trip Generation, Sixth Edition, a publication of the Institute of Transportation Engineers (ITE). The trip generations are included in Appendix C. The directional distributions, and assignments for the high school traffic are included in Appendix D.

The background traffic volumes for the year 2008 are shown in Figures 4 and 5. These volumes account for traffic growth expected to occur prior to the completion of Phase I. These are the traffic volumes expected in the study area by the year 2008 even if Tollgate Farms is not developed.

Based on traffic assignment information provided by TOOT, the background traffic volumes were distributed to the State Route 840 interchange that is expected to be in use by 2008. These volumes are also presented in Figures 4 and 5. The TOOT traffic assignment information is included in Appendix D.

To determine the operation of the intersections studied for the background conditions, capacity analyses were performed for the AM, PM and school peak hours. The results of the capacity analyses for the background conditions at the intersections studied are presented in Table 4. As shown in Table 4, the westbound left turns at the unsignalized intersection of Highway 31 and Goose Creek Bypass will operate at LOS D or better during all peak hours with one exception. This movement will operate at LOS E during the PM peak hour.



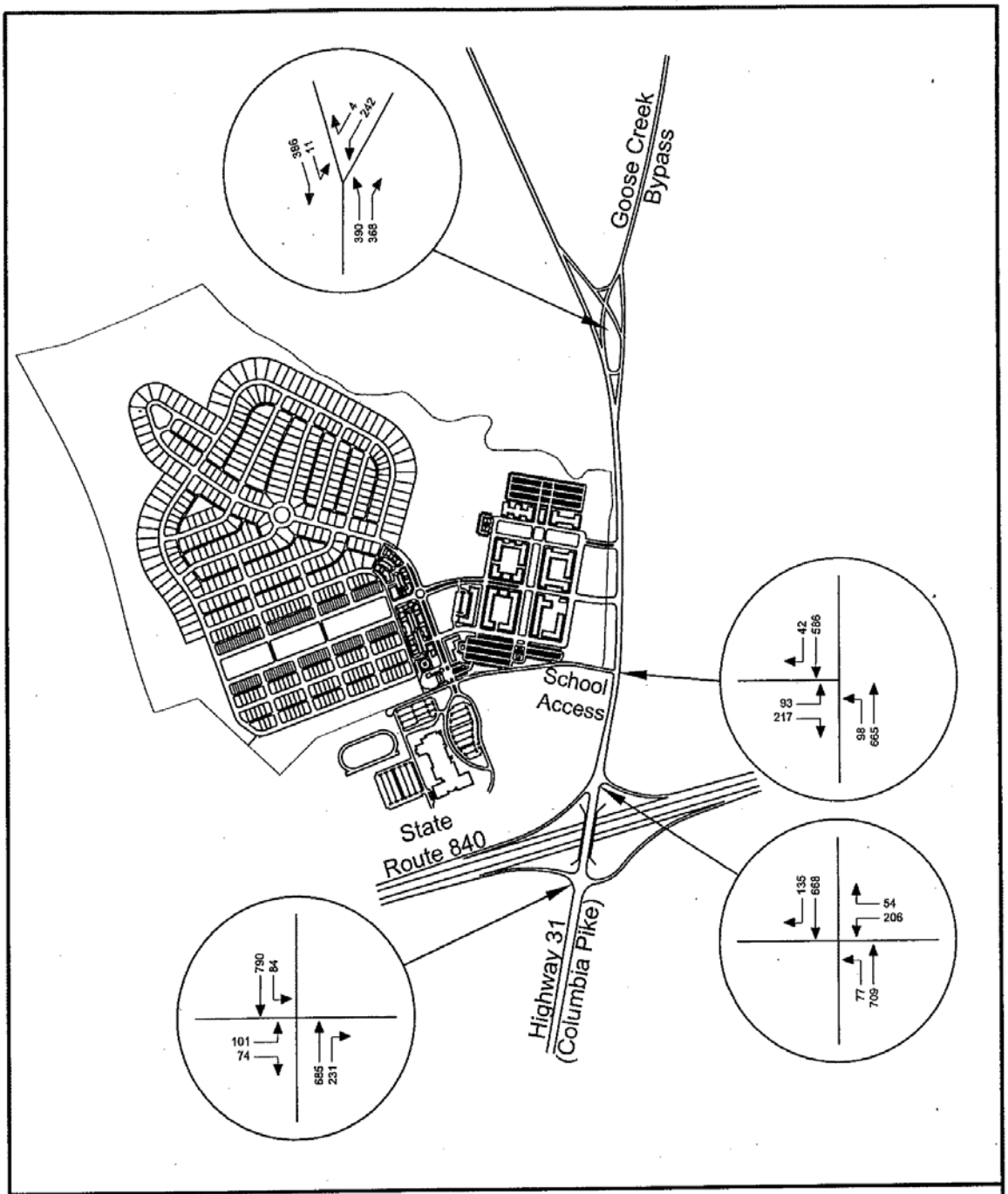
Transportation Consultants, LLC

N

No Scale

Figure 4.

Background Peak Hour Traffic Volumes for Year 2008



Transportation Consultants, LLC

N

No Scale

Figure 5.

Background Traffic Volumes During the School PM Peak Hour for Year 2008

TABLE 4

BACKGROUND PEAK HOUR LEVELS OF SERVICE
FOR YEAR 2008

INTERSECTION	TURNING MOVEMENT	LEVEL OF SERVICE		
		AM PEAK HOUR	PM PEAK HOUR	SCHOOL PM PEAK HOUR
Highway 31 and Goose Creek Bypass	Westbound Left Turns	D	E	C
	Westbound Right Turns	B	B	B
Highway 31 and Independence High School Access Road (Unsignalized)	Northbound Left Turns	Analyzed as Signalized	B	Analyzed as Signalized
	Eastbound Left Turns		F	
	Eastbound Right Turns		C	
Highway 31 and Independence High School Access Road (Signalized)	Overall Intersection	B	Analyzed as Unsignalized	B
Highway 31 and State Route 840 (North Ramps)	Overall Intersection	B	B	A
Highway 31 and State Route 840 (South Ramps)	Overall Intersection	B	B	A
Note: For signalized intersections, an overall LOS is presented. For two-way stop intersections, a LOS is presented for each critical turning movement.				

The signalized intersections of Highway 31 and the westbound and eastbound ramps to State Route 840 will operate at LOS B or better during all peak hours. Appendix B contains the capacity analysis worksheets.

For the purposes of this study, it was assumed that the intersection of Highway 31 and the high school access road will be operated by a police officer during the AM and school peak hours. Therefore, this intersection was analyzed as a signalized intersection during these peak hours to simulate how it will operate when controlled by a police officer. This is an appropriate method of analysis since the officer directs traffic similarly to the way a well-timed signal operates. This intersection is expected to operate at LOS B during the AM and school PM peak hours.

During the PM peak hour, this intersection will operate as an unsignalized intersection. The analyses show that the northbound left turns from Highway 31 will operate at LOS B. The eastbound left turns from the high school access road will operate at LOS F. However, it should be noted that the left turn volumes from the high school access road are low and overall delay at this intersection will be low.

5. IMPACTS PHASE I

5.1 Trip Generation

A traffic generation process was used to estimate the amount of traffic expected to be generated by the proposed Tollgate Farms project. Factors for the trip generation were taken from Trip Generation, Sixth Edition, a publication of the Institute of Transportation Engineers (ITE).

The trip generations for the proposed project are shown in Table 5. As shown by Table 5, Phase I of the proposed project is expected to generate a total of approximately 6,069 trips per day. The AM, PM and school PM peak hour trip generations for the total development of the site will · equal approximately 470, 627 and 382 trips, respectively. The trip generation calculations are included in Appendix C.

TABLE 5

TRIP GENERATION
FOR PHASE I OF THE PROPOSED PROJECT

LAND USE	SIZE	GENERATED TRAFFIC						
		DAILY TRAFFIC	AM PEAK HOUR		PM PEAK HOUR		SCHOOL PM PEAK HOUR	
			ENTER	EXIT	ENTER	EXIT	ENTER	EXIT
Residential Condominium/Townhouse	120 Units	760	10	49	48	23	26	22
Single-Family Homes	475 Units	4,546	89	267	307	173	157	129
Apartments	105 Units	763	9	46	51	25	26	22
TOTAL		**6,069**	**108**	**362**	**406**	**221**	**209**	**173**

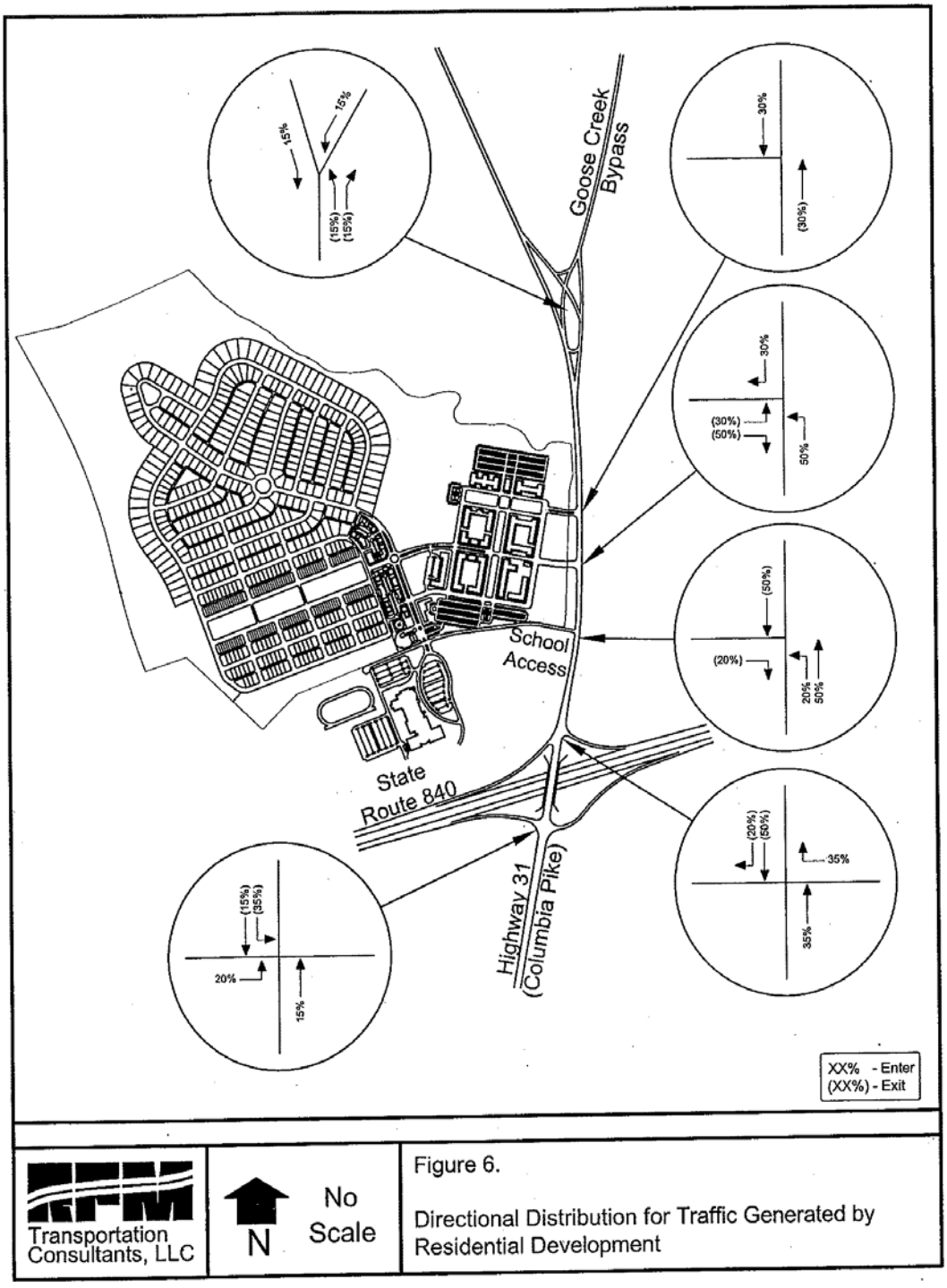
Source: ITE Trip Generation, 6th Edition

5.2 Trip Distribution and Traffic Assignment - Phase I

The trips generated by the proposed project were assigned to the roadway system according to the directional distribution shown in Figure 6. This distribution was based on the directions of approach of the existing traffic, the access proposed for the projec.t, and the locations of population centers in the area.

As shown by Figure 6, approximately 15% of the new traffic generated by the residential development is expected to be oriented north of the project site on Highway 31 and approximately 15% is expected to be oriented north of the project site on Goose Creek Bypass. Approximately 15% is expected to be oriented south of the project site on Highway 31. Approximately 20% is expected to be oriented west of the site on State Route 840. The remaining 35% is expected to be oriented east of the site on State Route 840.

The assignments of the trips that will be generated by the residential development are included in Appendix D.



5.3 Capacity/ Level of Service Analyses - Phase I

The site generated traffic volumes were added to the background peak hour traffic volumes in order to obtain the total projected traffic volumes for the intersections within the study area. Figure 7 presents the total projected AM and PM peak hour traffic volumes expected at the completion of Phase

I of the proposed project. Figure 8 presents the total projected school PM peak hour traffic volumes expected at the completion of Phase I.

Capacity analyses were performed in order to determine the impact of the project on the study intersections. Also, these capacity analyses were used to evaluate the need for roadway and traffic control improvements at the intersections studied.

For the initial analyses conducted, it was assumed that the intersection of Highway 31 and Goose Creek Bypass will remain unsignalized with the existing roadway geometry. Also, it was assumed that the intersection of Highway 31 and the south project driveway will be unsignalized. For the initial analyses, it was assumed that this intersection will consist of a shared through/left turn lane on the northbound approach of Highway 31, a shared through/right turn lane on the southbound approach of Highway 31, and separate right and left turn lanes on the eastbound approach of the south project driveway. It was assumed that the intersections of Highway 31 and the entrance/exit ramps for State Route 840 will operate according to the geometry that was used for the background traffic analysis. The lane configurations for these intersections were described in Section 3.2. The intersection of Highway 31 and the high school access road was analyzed as a signalized intersection to simulate control by a police officer during the AM and school peak hours, as previously described. This intersection was analyzed as an unsignalized intersection for the PM peak hour. The lane configurations for these intersections were also described in Section 3.2.

The results of the capacity analyses for the Phase I projected conditions are presented in Table 6. As shown in Table 6, the westbound left turns at the unsignalized intersection of Highway 31 and Goose Creek Bypass will operate at LOS E during the AM peak hour and LOS F during the PM peak hour. It should be noted that this delay is typical of an approach to unsignalized intersections on an arterial type roadway. At the intersection of Highway 31 and the south project driveway, the eastbound left turning movements will operate at LOS F during all three peak hours. The eastbound right turns will operate at LOS E during the PM peak hour. The eastbound left turns at the intersection of Highway 31 and the high school access road will also operate at LOS F during the PM peak hour, however, this intersection will operate at LOS B during the AM and school peak hours. All other critical turning movements at the intersections studied will operate at LOS C or better.

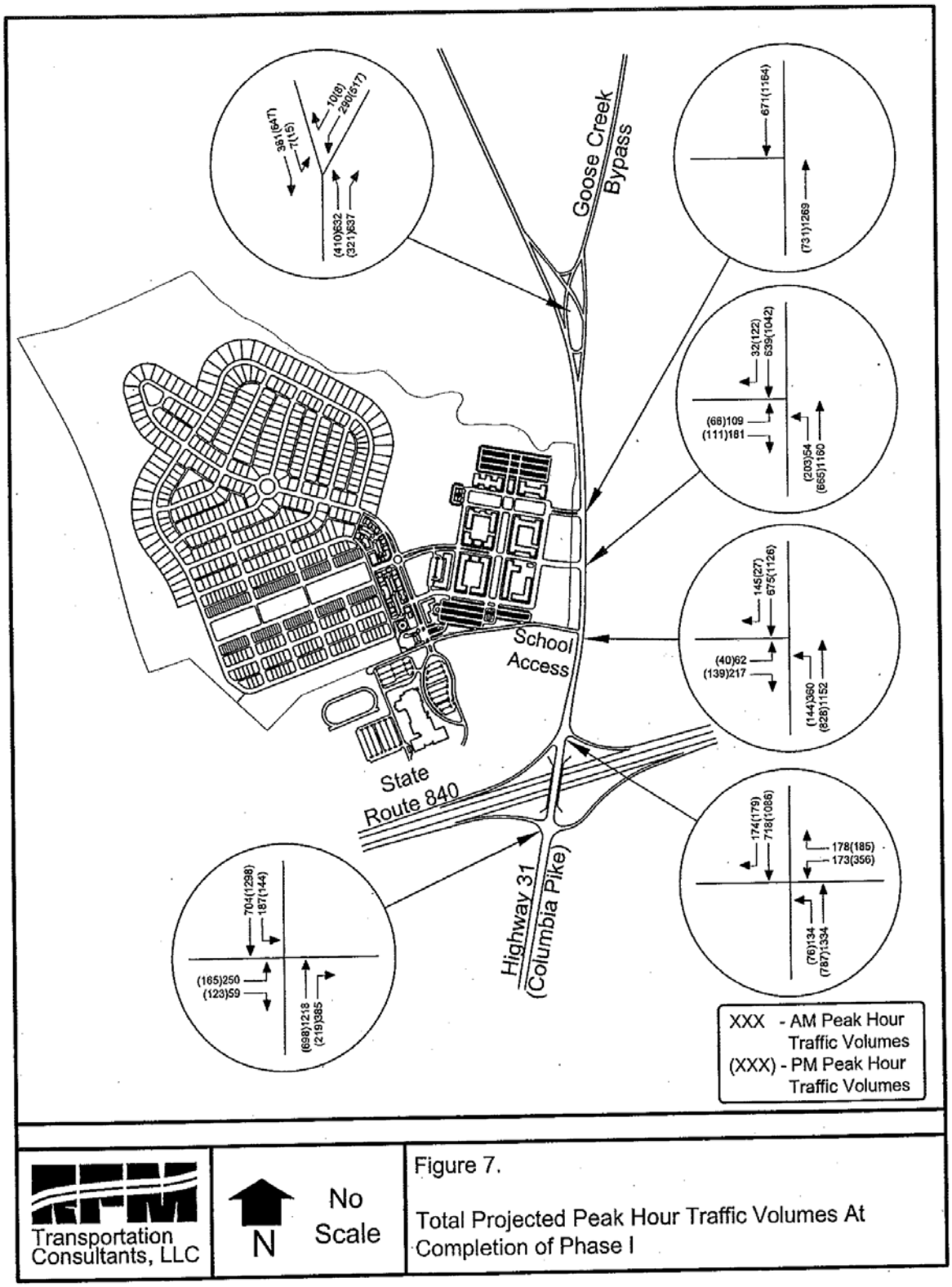


Figure 7.

Total Projected Peak Hour Traffic Volumes At Completion of Phase I

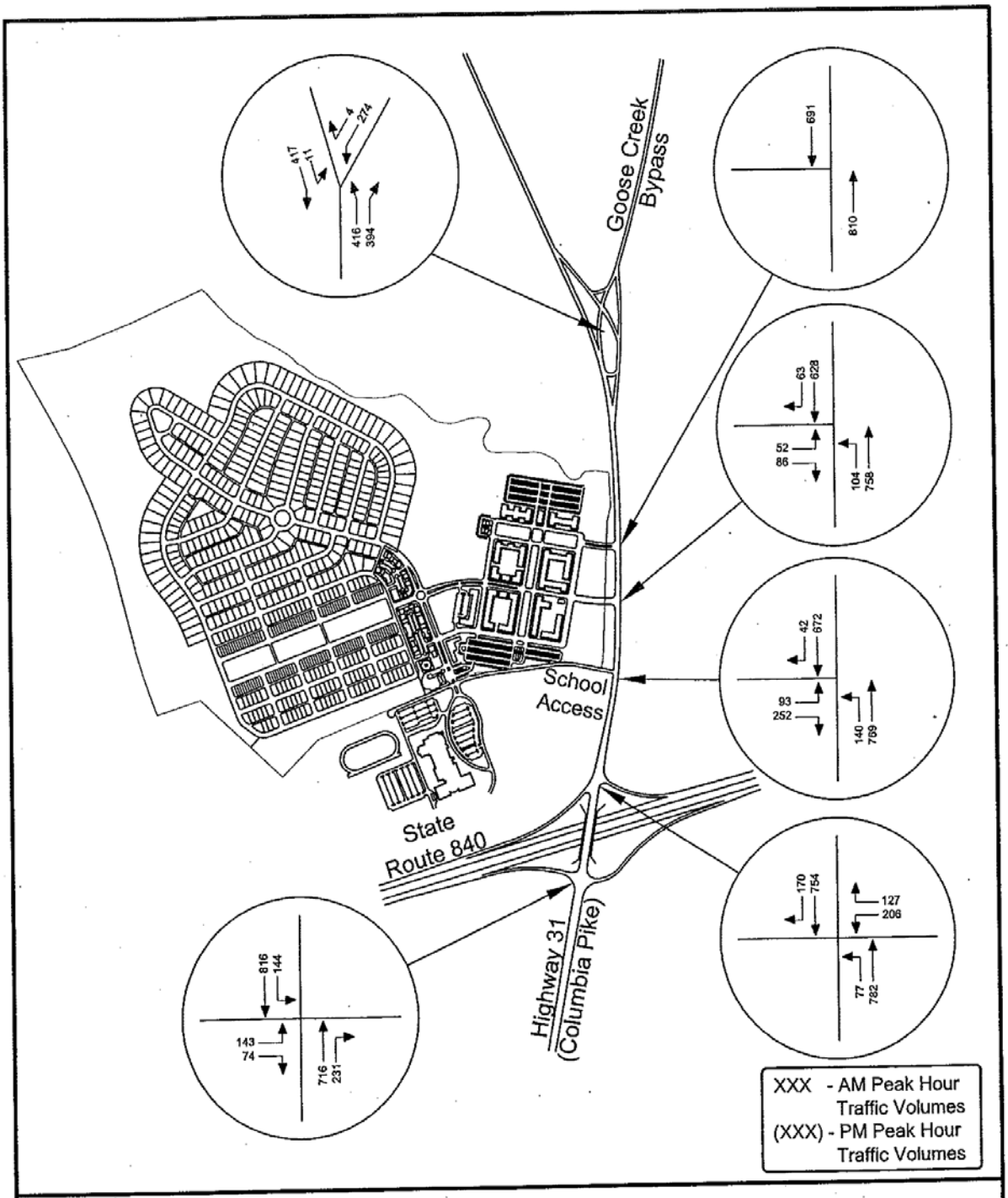


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Figure 8.

Total Projected Traffic Volumes During the School PM Peak Hour At Completion of Phase I

TABLE 6

PROJECTED PEAK HOUR LEVELS OF SERVICE AT COMPLETION OF PHASE I

INTERSECTION	TURNING MOVEMENT	LEVEL OF SERVICE		
		AM PEAK HOUR	PM PEAK HOUR	SCHOOL PM PEAK HOUR
Highway 31 and Goose Creek Bypass (unsignalized)	Westbound Left Turns	E	F	C
	Westbound Right Turns	B	B	B
Highway 31 and South Project Driveway (unsignalized)	Northbound Left Turns	A	C	A
	Eastbound Left Turns	F	F	F
	Eastbound Right Turns	C	E	C
Highway 31 and Independence High School Access Road (unsignalized)	Northbound Left Turns	Analyzed as Signalized	C	Analyzed as Signalized
	Eastbound Left Turns		F	
	Eastbound Right Turns		C	
Highway 31 and Independence High School Access Road (signalized)	Overall Intersection	B	Analyzed as Unsignalized	B
Highway 31 and State Route 840 (North Ramps)	Overall Intersection	B	B	B
Highway 31 and State Route 840 (South Ramps)	Overall Intersection	A	B	A

Note: For signalized intersections, an overall LOS is presented. For two-way stop intersections, a LOS is presented for each critical turning movement.

Additional analyses were performed to determine a left turn lane would improve traffic operations for the intersection of Highway 31 and the south project driveway. The analyses indicate that the eastbound left turns will continue to operate at LOS F during all peak hours and the eastbound right turns will operate at LOS E during the PM peak hour. However, the delays at this intersection will improve with the addition of the northbound left turn lane. Also, as previously mentioned, this delay is typical of the minor approaches to unsignalized intersections on an arterial type roadway. This northbound left turn lane should include approximately 200 feet of storage.

According to the roadway plans for Independence High School, a southbound right turn lane and a northbound left turn lane will be provided on Highway 31 at the high school access road intersection. The northbound left turn Jane includes approximately 200 feet of storage and the southbound right turn lane includes approximately 150 feet of storage. Analyses were conducted to determine if these turn lane storage lengths are adequate. The results of these analyses indicate that the storage length of this southbound right turn lane and the northbound left turn lane on Highway 31 are sufficient.

Field investigations were also made to determine if adequate sight distance will be available for motorists exiting the south project access on Highway 31. For a 45 mph speed limit, MSHTO requires a

minimum stopping sight distance of 360 feet. However, the intersection sight distance required for 45 mph is 500 feet. Therefore, at least 500 feet of sight distance should be provided when looking to the north and south on Highway 31 from the proposed project accesses. The results of the field investigations indicate that the sight distance available in both directions at this access will significantly exceed 500 feet.

Based on the traffic analyses presented in this section, it is anticipated that the impacts of Phase I of the proposed project will be manageable with the recommended improvements.

5.4 Traffic Signal Warrant Analysis - Phase 1

The capacity analyses conducted in Section 5.3 of this report indicated the possible need for installation of a traffic signal at the intersection of Highway 31 and the south project driveway. However, a traffic signal should not normally be installed at an intersection unless the traffic volumes meet established signal warrant values. Therefore, a traffic signal warrant analysis was performed for the intersection of Highway 31 and the south project driveway based on Phase I projected traffic volumes.

The Manual on Uniform Traffic Control Devices (MUTCD) sets forth ten different warrants that have been developed by the traffic engineering profession to facilitate the determination of whether a signal is warranted. These warrants include minimum conditions that normally indicate when a traffic signal is justified at a particular location. The MUTCD states that "traffic control signals should not be installed unless one or more of the signal warrants in the manual are met." A complete description of the relevant traffic signal warrants, as presented in the MUTCD, is included in Appendix E.

As previously mentioned, the speed limit on Highway 31 is posted at 45 mph. Therefore, the signal warrant analysis at the intersection of Highway 31 and the south project driveway was based on reduced signal warrants. The results of this signal warrant analysis are presented in Table 7.

The results shown in Table 7 indicate that the projected traffic volumes at the intersection of Highway 31 and the south project driveway will only satisfy one of the five volume-related traffic signal warrants. In particular, Warrant #3 (Peak Hour Volume Warrant) will be satisfied for the required number of hours. Therefore, the installation of a traffic signal· will is not recommended for the intersection of Highway 31 the south project driveway based on Phase I of the proposed development.

TABLE 7

TRAFFIC SIGNAL WARRANT ANALYSIS
BASED ON PHASE I PROJECTED TRAFFIC VOLUMES
HIGHWAY 31 AND SOUTH PROJECT DRIVEWAY

HOUR	TRAFFIC VOLUMES		REDUCED WARRANTS MET? *				
	MAIN ST. BOTH DIRECTIONS	MINOR ST. HIGHEST APPROACH	#1A	#1B	#1C	#2	#3
7:00 - 8:00	1,885	108	Yes	Yes	Yes	Yes	Yes
8:00 - 9:00	1,429	84	--	Yes	--	Yes	--
9:00 - 10:00	986	61	--	Yes	--	--	--
10:00 - 11:00	983	51	--	--	--	--	--
11:00 - 12:00	1,025	50	--	--	--	--	--
12:00 - 1:00	1,015	52	--	--	--	--	--
1:00 - 2:00	1,047	53	--	Yes	--	--	--
2:00 - 3:00	1,498	52	--	--	--	--	--
3:00 - 4:00	1,742	61	--	Yes	--	--	--
4:00 - 5:00	2,024	65	--	Yes	--	--	--
5:00 - 6:00	1,991	66	--	Yes	--	--	--
Note: Warrants 1A, 1B and 1C must be satisfied for at least 8 hours of a typical day. Warrant 2 must be met for at least 4 hours, and Warrant 3 must be met for at least one hour of a typical day.							

* Based on one-lane major approaches and a one-lane minor approach.

6. CONCLUSIONS AND RECOMMENDATIONS- PHASE I

The analyses presented in this study indicate that with certain roadway and traffic control improvements the impacts of Phase I of the proposed project will be manageable. The specific recommendations, which are shown conceptually in Figure 9, are described as follows:

- The eastbound approach of the south project driveway should be constructed to include separate lanes for left and right turning movements.

- As part of the State Route 840 construction project, TOOT plans to widen Highway 31 north of State Route 840 to a five-lane cross section. The five- lane section will extend for approximately 250 feet north of the high school access. · Also, the planned widening will result in enough roadway width to provide a northbound left turn lane to serve the south project driveway to Tollgate Farms. These improvements are illustrated in Figure 9.

- The proposed site plan shows a driveway connection between Tollgate Farms and the high school. This connection will be beneficial since it will allow traffic to travel between the high school and the residential development without being required to travel on Highway 31. This will help reduce traffic congestion on Highway 31.

Implementation of the above recommendations will provide acceptable traffic operations for the public roadways and intersections within the study area.

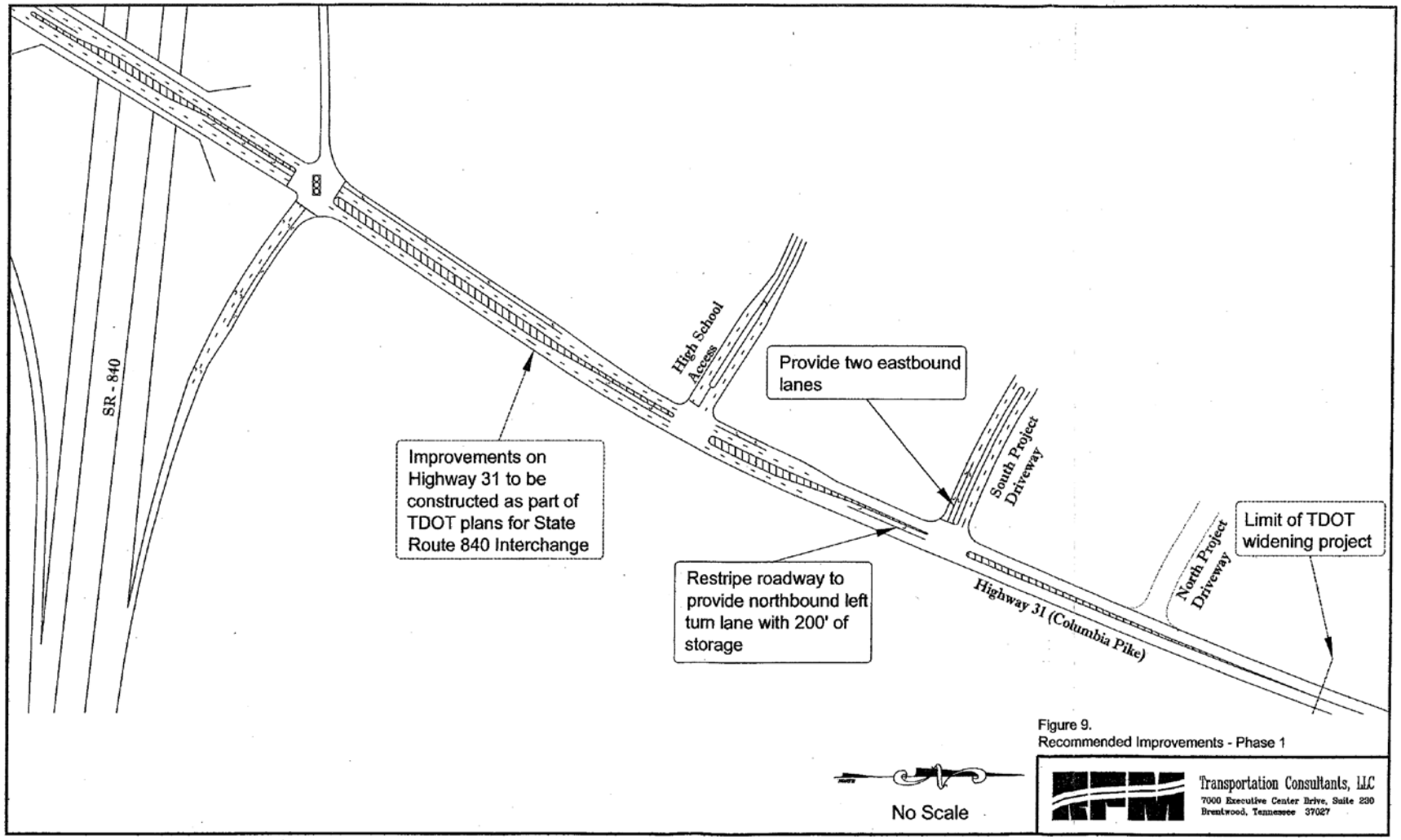

Figure 9.
Recommended Improvements - Phase 1

7. BACKGROUND TRAFFIC VOLUMES-TOTAL BUILDOUT

In order to account for the traffic growth prior to the completion of total buildout of the proposed project, background traffic volumes were established. As mentioned previously, it was assumed that total buildout of the project will be completed within ten years. Also, as previously mentioned, average daily traffic volumes obtained from TOOT indicate that the traffic volumes in the vicinity of the project site have been increasing at a rate of approximately 9% per year. However, this is an extremely high growth rate and it is not anticipated that traffic in this area will consistently grow at such a high rate. The proposed development will contribute to the traffic growth in this area. Therefore, it is assumed that the background traffic in the vicinity of the site will grow at approximately 2% per year. Based on these results, .the existing traffic volumes were adjusted to account for the growth in traffic expected to occur prior to total buildout of this project.

As previously stated, the traffic expected to be generated by Independence High School was added to the background traffic growth. The trip generations are included in Appendix C. The directional distributions, and assignments for the high school traffic are included in Appendix D.

The background traffic volumes for the year 2013 are shown in Figures 1O and 11. These volumes account for traffic growth expected to occur prior to the completion of the total project. These are the traffic volumes expected in the study area by the year 2013 even if the proposed project is not developed.

As previously stated in Section 4., the background traffic volumes were distributed to the State Route 840 interchange based on information provided by TOOT. These volumes are also included in Figures 10 and 11.

In order to determine the operation of the intersections studied for the background conditions, capacity analyses were performed for the AM, PM and school peak hours. The results of the capacity analyses for the background conditions at the intersections studied are presented in Table 8. As shown in Table 8, the westbound turning movements at the unsignalized intersection of Highway 31 and Goose Creek Bypass will operate at LOS E during the AM peak hour, LOS F during the PM peak hour and LOS C during the school peak hour. The signalized intersections of Highway 31 and the westbound and eastbound ramps to State Route 840 will operate at LOS B or better during all peak hours. Appendix B contains the capacity analysis worksheets.

As previously mentioned, it was assumed that the intersection of Highway 31 and the high school access road will be operated by a police officer during the AM and school peak hours. Therefore, this intersection was analyzed as a signalized intersection during these peak hours to simulate how it will operate when controlled by a police officer. This intersection is expected to operate at· LOS B during the AM and school peak hours. During the PM peak hour, the eastbound left turns on the high school access road approach will operate at LOS F if it operates as an unsignalized intersection. The northbound left turns on Highway 31 will operate at LOS Bas an unsignalized intersection.

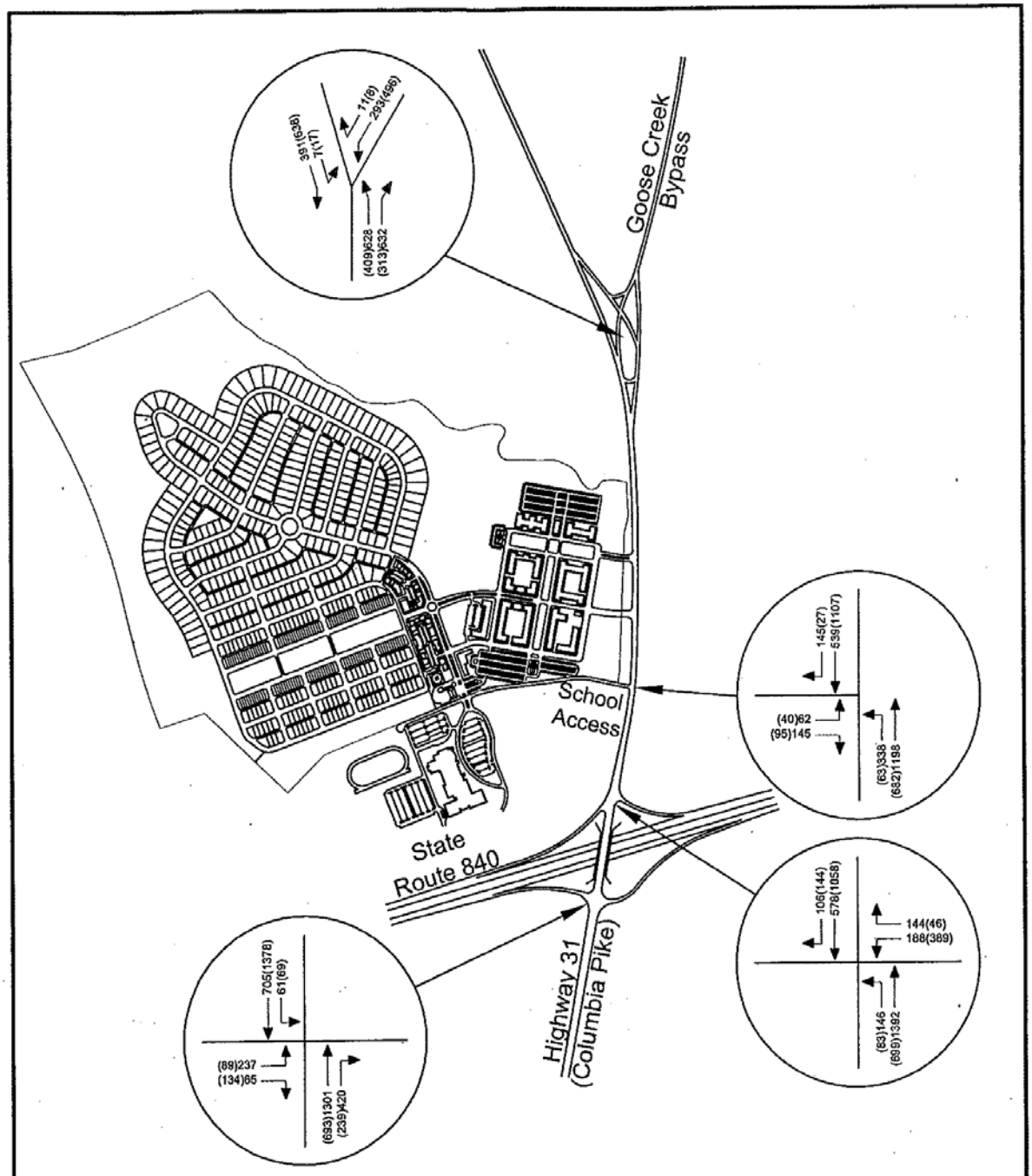

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Figure 10.

Background Peak Hour Traffic Volumes for Year 2013

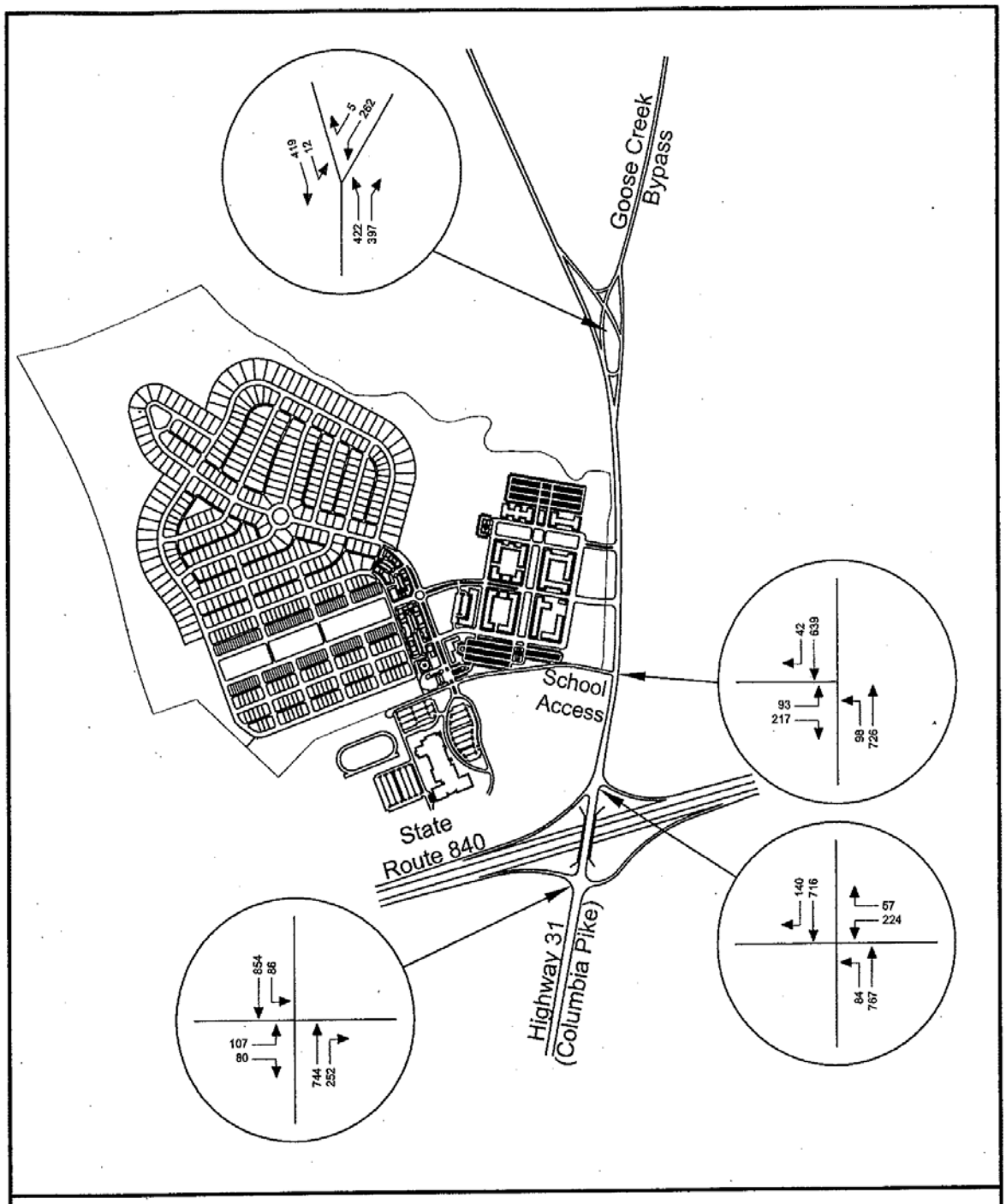

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Figure 11.

Background Traffic Volumes During the School PM Peak Hour for Year 2013

TABLE 8

BACKGROUND PEAK HOUR LEVELS OF SERVICE FOR YEAR 2013

INTERSECTION	TURNING MOVEMENT	LEVEL OF SERVICE		
		AM PEAK HOUR	PM PEAK HOUR	SCHOOL PM PEAK HOUR
Highway 31 and Goose Creek Bypass	Westbound Left Turns	E	F	C
	Westbound Right Turns	E	F	C
Highway 31 and Independence High School Access Road (unsignalized)	Northbound Left Turns	Analyzed as Signalized	B	Analyzed as Signalized
	Eastbound Left Turns		F	
	Eastbound Right Turns		C	
Highway 31 and South Project Driveway (unsignalized)	Overall Intersection	B	Analyzed as Unsignalized	B
Highway 31 and State Route 840 (North Ramps)	Overall Intersection	B	B	B
Highway 31 and State Route 840 (South Ramps)	Overall Intersection	B	B	A
Note: For signalized intersections, an overall LOS is presented. For two-way stop intersections, a LOS is presented for each critical turning movement.				

8. IMPACTS - PHASE II

8.1 Trip Generation

A traffic generation process was used to estimate the amount of traffic expected to be generated by Phase II of Tollgate Farms. Factors for the trip generation were taken from Trip Generation, Sixth Edition, which is a publication of the Institute of Transportation Engineers (ITE) and from data collected by RPM Transportation ponsultants, LLC.

Phase II of the proposed development consists of retail and office developments. This portion of the development will include a total of approximately 185,000 square feet of retail, and approximately 520,000 square feet of office space.

Data presented in the Trip Generation Handbook by ITE show that developments which contain multiple uses will commonly have internal trips between the developments. To provide a conservative estimate, a 10% internal trip rate was used between the retail uses and the office and residential uses within Phase II.

Studies have shown that most new retail developments generate relatively little "new" traffic. The traffic volumes entering and exiting new retail sites are usually either captured ("pass-by") trips from the adjacent street or diverted trips from streets serving other destinations. This traffic will be on the roadway system and will be passing by the site even if the proposed development is not constructed.

Based on the traffic that travels on Highway 31 during a typical day, Trip Generation indicates that a pass-by percentage of approximately 35% is typical during the weekdays. However, for the purposes of this study, it was conservatively estimated that 25% of the traffic generated by the retail development will be pass-by traffic on Highway 31.

The trip generations for the proposed project is shown in Table 9. As shown by Table 9, Phase II of the proposed project is expected to generate a total of approximately 14,832 trips per day. The AM, PM and school PM peak hour trip generations for the total development of the site will equal approximately 925, 1,604 and 1,116 trips, respectively. The trip generation calculations are included in Appendix C.

TABLE 9

TRIP GENERATION
FOR PHASE II OF THE PROPOSED PROJECT

LAND USE	SIZE	GENERATED TRAFFIC						
		DAILY TRAFFIC	AM PEAK HOUR		PM PEAK HOUR		SCHOOL PM PEAK HOUR	
			ENTER	EXIT	ENTER	EXIT	ENTER	EXIT
Shopping Center	185,000 s.f.	10,124	141	90	452	490	453	418
General Office	520,000 s.f.	4,708	611	83	113	549	98	147
TOTAL		14,832	**752**	**173**	**565**	**1,039**	**551**	**565**

Note: The trip generations shown above represent total generated traffic, including pass-by and internal trips.

Source: ITE Trip Generation, 6th Edition

8.2 Trip Distribution and Traffic Assignment- Phase II

The primary trips that will be generated by the retail development were added to the roadway system using the directional distribution shown in Figure 12. As shown by Figure 12, approximately 15% of the new traffic generated by the retail development is expected to be oriented north of the project site on Highway 31 and approximately 20% is expected to be oriented north of the project site on Goose Creek Bypass. Approximately 20% is expected to be oriented south of the project site on Highway 31.

Approximately 20% is expected to be oriented west of the site on State Route 840. The remaining 25% is expected to be oriented east of the site on State Route 840.

In addition to the new trips generated by the shopping center, a portion of the generated traffic will come from the existing traffic that normally travels by this site. As previously stated, the percentage of the pass-by trips was estimated as 25% of the trips generated by the retail development.

The directional distribution of trips produced by the office development is shown in Figure 13. As shown by Figure 13, approximately 15% of the new traffic generated by the office development is expected to be oriented north of the project site on Highway 31 and approximately 20% is expected to be oriented north of the project site on Goose Creek Bypass. Approximately 15% is expected to be oriented south of the project site on Highway 31. Approximately 20% is expected to be oriented west of the site on State Route 840. The remaining 30% is expected to be oriented east of the site on State Route 840.

The directional distribution of trips generated by Phase I are described in Section 5.2 of this study. The assignments of the primary and pass-by trips that will be generated by the Phase I development and by the retail and office development are included in Appendix D.

Using the peak hour trip generations, as well as the directional distributions, the trips generated by Phase I and Phase II of the proposed project were added to the roadway system.

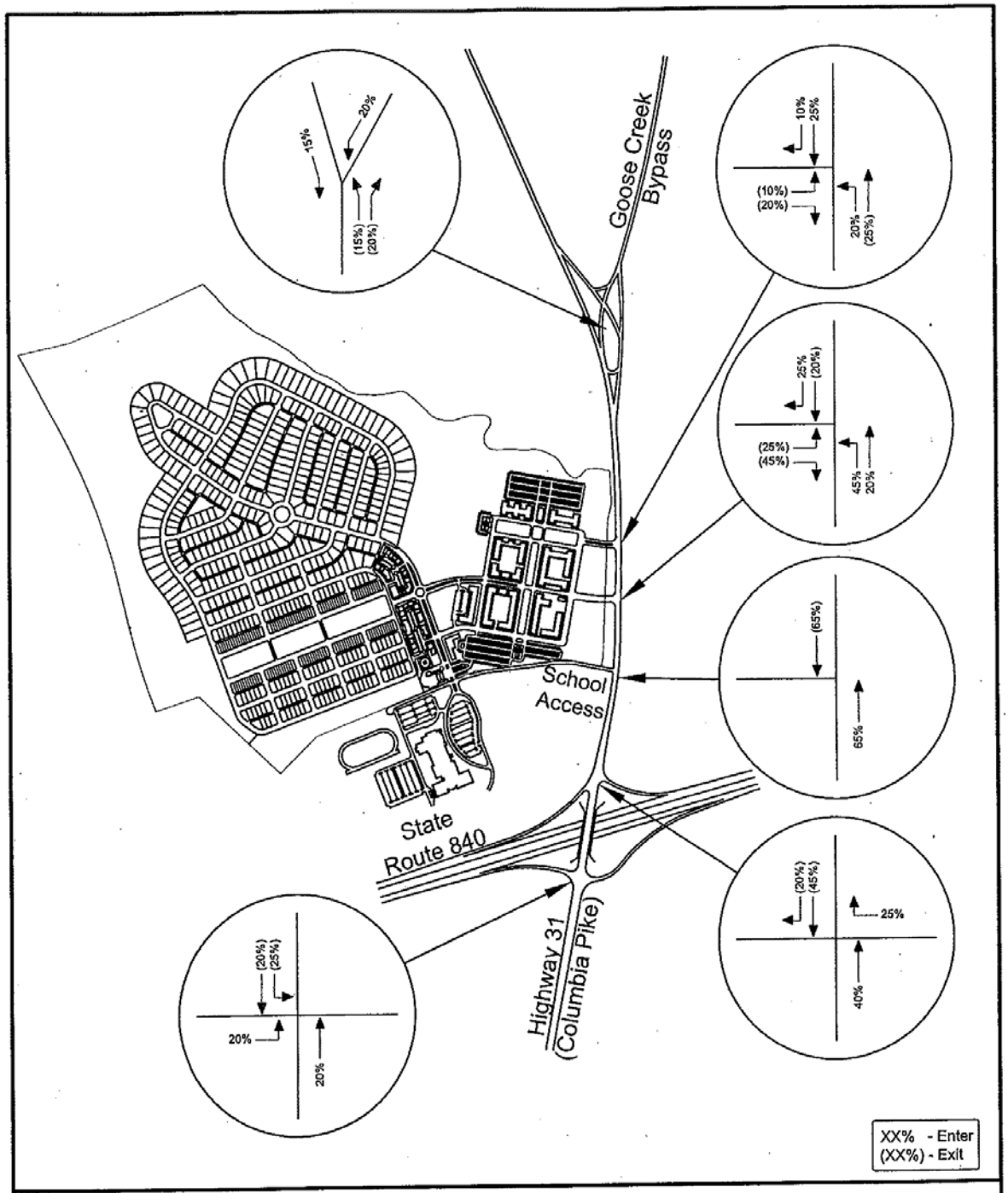

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Figure 12.

Directional Distribution of Traffic Generated by the Retail Development (Primary Trips)

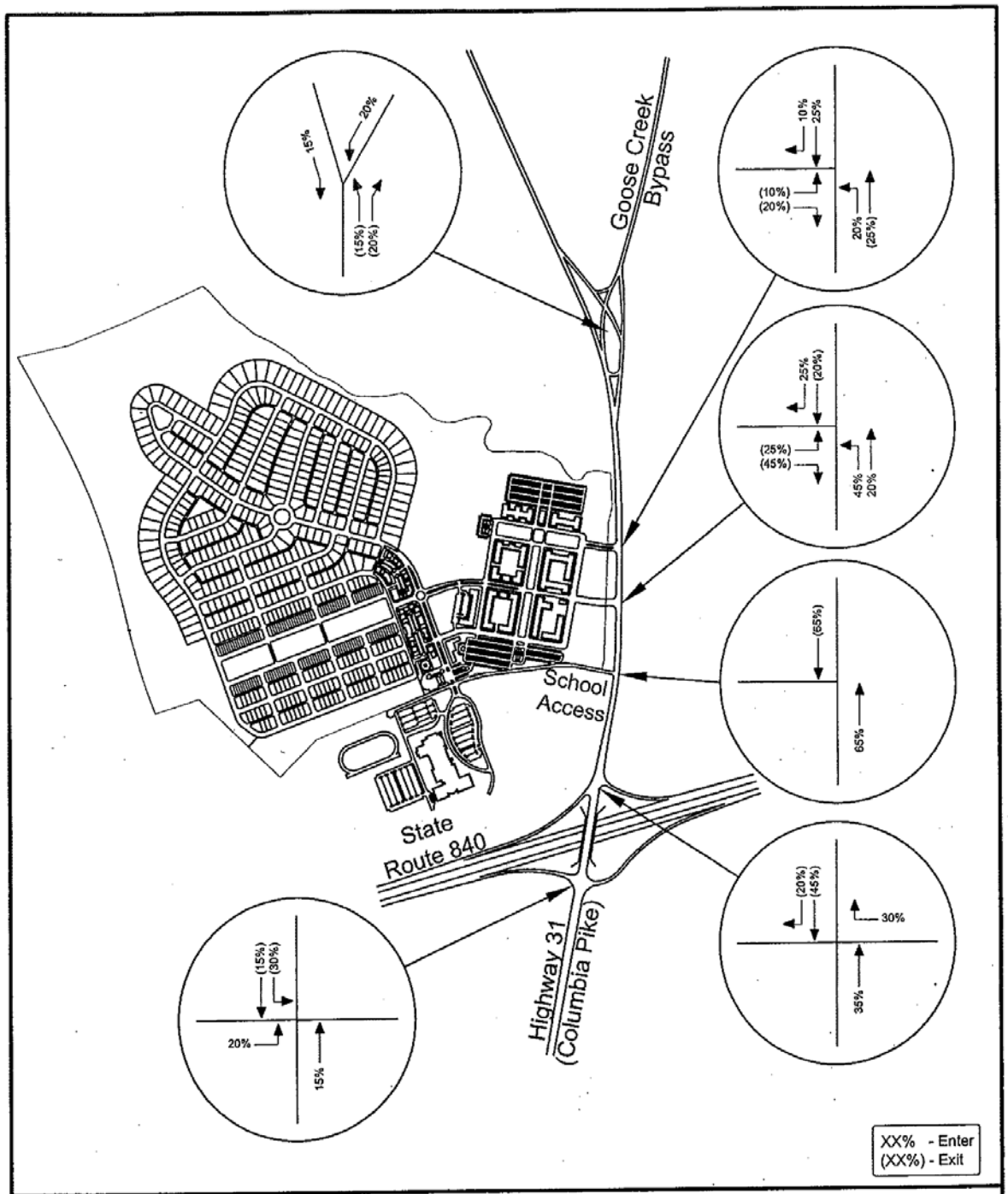

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Figure 13.

Directional Distribution of Traffic Generated by the Office Development

8.3 Capacity/ Level of Service Analyses - Total Buildout

The site generated traffic volumes for Phases I and II were added to the background peak hour traffic volumes in order to obtain the total projected traffic volumes for the intersections within the study area. Figure 14 presents the total projected AM and PM peak hour traffic volumes expected at total buildout of the proposed project. Figure 15 presents the total projected school peak hour traffic volumes expected at total buildout of the proposed project.

Capacity analyses were performed in order to determine the impact of the project on the study intersections. Also, these capacity analyses were used fo evaluate the need for roadway and traffic control improvements at the intersections studied.

For the initial analyses conducted for total buildout, it was assumed that the improvements identified in Section 6 and Figure 9 will be completed. These improvements include installation of a northbound left turn lane on Highway 31 at this intersection.

The results of the capacity analyses based on the total buildout of the project are presented in Table 10. As shown in Table 10, the westbound left turns at the intersection of Highway 31 and Goose Creek Bypass will operate .at LOS F during the AM and PM peak hours and at LOS E during the school PM peak hour. The eastbound left turns at the intersection of Highway 31 and the north project driveway will operate at LOS F during all peak hours, and the eastbound right turns will operate at LOS F during the PM peak hour. The eastbound left and right turns at the intersection of Highway 31 and the south project driveway will operate at LOS F during all peak hours. The northbound left turns will operate at LOS F during the PM peak hour. As previously mentioned, the intersection of Highway 31 and the high school access road was analyzed as a signalized intersection during the AM and school peak hours to simulate control by a police officer, and as an unsignalized intersection during the PM peak hour. At this intersection, the northbound left turns, eastbound left turns and the eastbound right turns will all operate at LOS F during the PM peak hour. All other critical turning movements will operate at LOS D or better at the intersections studied.

Analyses were conducted to determine if installation of a traffic signal would improve traffic operations at the intersection of Highway 31 and the south project driveway. These results indicate that the intersection would operate at LOS F during all peak hours. However, additional analyses were conducted to determine if widening Highway 31 from two lanes to five lanes would improve traffic operations at the intersections of Highway 31 and the north and south project driveways. As previously stated, plans obtained from TOOT indicate that a five-lane cross section will be constructed from State Route 840 to approximately 250 feet north of the high school access. The results of these analyses indicate that widening Highway 31 to five lanes from approximately 250 feet north of the high school access to approximately 200 feet north of the north project driveway would significantly improve the traffic operations within the area.

However, the signalized intersection of Highway 31 and the south project driveway will continue to operate at LOS E during the PM peak hour even after Highway 31 has been widened. Further analyses indicated that a dual left turn lane on the westbound approach to this intersection would improve the

operation to LOS B during the AM and school PM peak hours, and to LOS D during the PM peak hour. Also, at the unsignalized intersection of Highway 31 and the north project driveway, further analyses indicate that the addition of a northbound left turn lane will improve the traffic operations at this intersection. All critical turning movements will operate at LOS D, with the exception of the eastbound left turns during the AM and PM peak hour, which will operate at LOS E and F, respectively. This northbound left turn lane should include approximately 200 feet of storage.

Additional analyses were also performed to determine if realignment and traffic signal control would provide acceptable traffic operations for the intersection of Highway 31 and Goose Creek Bypass. Realignment of this intersection should include a through lane and a separate left turn lane on the southbound approach of Highway 31. The southbound left turn lane should include approximately 150 feet of storage. The northbound approach should consist of a through lane and a channelized right turn lane. The westbound approach on Goose Creek Bypass should be realigned to intersect Highway 31 at an approximate ninety degree angle and should consist of separate left and right turn lanes. The westbound right turn lane on Goose Creek Bypass should include approximately 150 feet of storage. As shown in Table 10, the results of the capacity analysis indicate that this intersection will operate at LOS B during the AM and school peak hour and LOS D during the PM peak hour with the installation of a traffic signal and realignment of the intersection. Improvements should be made to this intersection at the onset of Phase II development.

According to the roadway plans for Independence High School, a southbound right turn lane and a northbound left turn lane will be provided on Highway 31 at the high school access road intersection. The northbound left turn lane includes approximately 200 feet of storage and the southbound right turn lane inciudes approximately 150 feet of storage. Analyses were conducted to determine if these turn lane storage lengths are adequate. The results of these analyses indicate that the storage lengths of this southbound right turn lane and the northbound left turn lane on Highway 31 are sufficient.

Field investigations were a_lso made to determine if adequate sight distance will be available for motorists exiting the north project access on Highway 31. For a 45 mph speed limit, AASHTO requires a minimum stopping sight distance of 360 feet. However, the intersection sight distance required for 45 mph is 500 feet. Therefore, at least 500 feet of sight distance should be provided when looking to the north and south on Highway 31 from the proposed project accesses. The results of the field investigations indicate that the sight distance available at this access will significantly exceed 500 feet.

It is important to note that the improvements to this intersection are not completely due to Tollgate Farms. In fact, based on buildout conditions, the Tollgate Farms traffic represents only about 25% of the total traffic at the intersection. Also, Highway 31 is a state route. Therefore, it would be reasonable for this improvement to be constructed by the state·.

Based on the traffic analyses presented in this section, it is anticipated that the impacts of Phase II of the proposed project will be manageable with the recommended improvements.

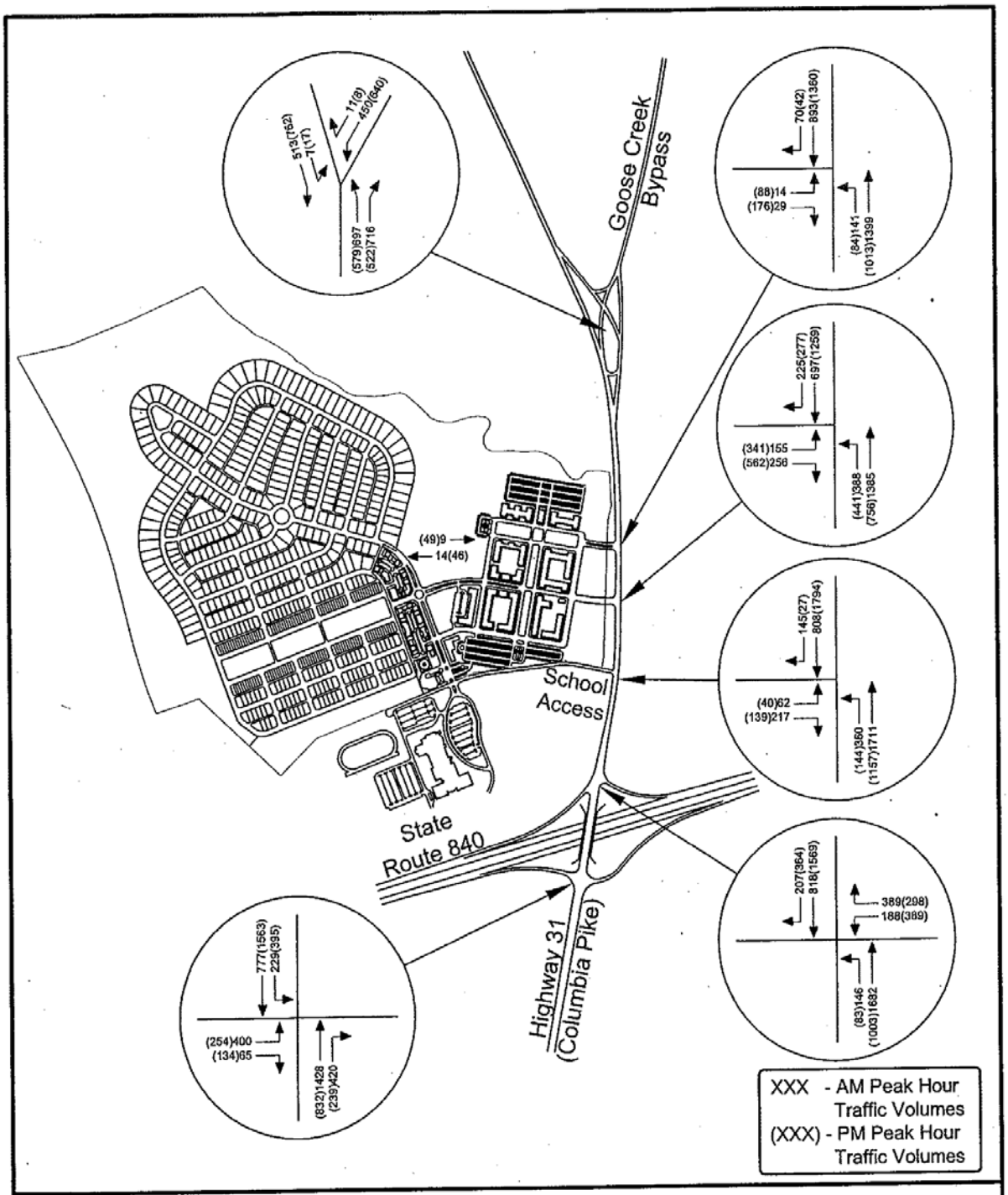

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Figure 14.

Total Projected Peak Hour Traffic Volumes At Total Buildout of Development

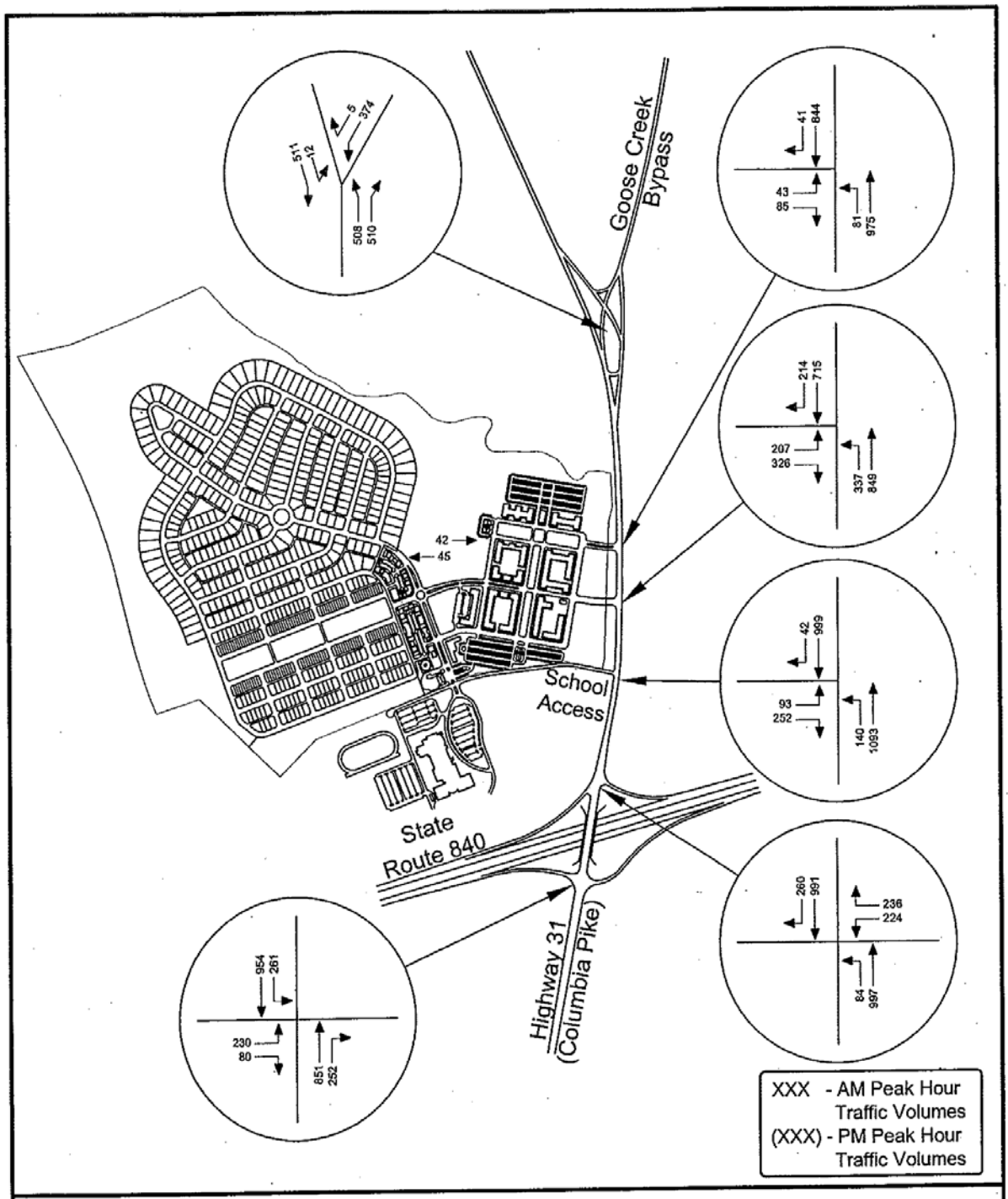

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Figure 15.

Total Projected Traffic Volumes During the School PM Peak Hour At Total Buildout of Development

TABLE 10

PROJECTED PEAK HOUR LEVELS OF SERVICE AT TOTAL BUILDOUT

INTERSECTION	TURNING MOVEMENT	LEVEL OF SERVICE		
		AM PEAK HOUR	PM PEAK HOUR	SCHOOL PM PEAK HOUR
Highway 31 and Goose Creek Bypass (unsignalized)	Westbound Left Turns	F	F	E
	Westbound Right Turns	B	B	B
Highway 31 and Goose Creek Bypass (signalized and improved)	Overall Intersection	C	C	B
Highway 31 and North Project Driveway	Northbound Left Turns	B	C	B
	Eastbound Left Turns	F	F	F
	Eastbound Right Turns	C	F	C
Highway 31 and North Project Driveway (improved)	Northbound Left Turns	B	C	B
	Eastbound Left Turns	E	F	D
	Eastbound Right Turns	B	D	C
Highway 31 and South Project Driveway (with northbound left turn lane)	Northbound Left Turns	C	F	C
	Eastbound Left Turns	F	F	F
	Eastbound Right Turns	F	F	F
Highway 31 and South Project Driveway (signalized)	Overall Intersection	F	F	F
Highway 31 and South Project Driveway (signalized and improved)	Overall Intersection	B	D	B
Highway 31 and Independence High School Access Road (unsignalized)	Northbound Left Turns	Analyzed as Signalized	F	Analyzed as Signalized
	Eastbound Left Turns		F	
	Eastbound Right Turns		F	
Highway 31 and Independence High School Access Road (signalized)	Overall Intersection	B	Analyzed as Unsignalized	B
Highway 31 and State Route 840 (North Ramps)	Overall Intersection	C	B	B
Highway 31 and State Route 840 (South Ramps)	Overall Intersection	C	B	A

Note: For signalized intersections, an overall LOS is presented. For two-way stop intersections, a LOS is presented for each critical turning movement.

8.4 Traffic Signal Warrant Analysis - Total Buildout

The capacity analyses conducted in Section 8.3 of this report indicated the possible need for installation of a traffic signal at the intersection of Highway 31 and Goose Creek Bypass. However, a traffic signal should not normally be installed at an intersection unless the traffic volumes meet established signal warrant values. Therefore, a traffic signal warrant analysis was performed for the intersection of Highway 31 and Goose Creek Bypass based on traffic volumes for the total buildout of the proposed project.

The Manual on Uniform Traffic Control Devices (MUTCD) sets forth ten different warrants that have been developed by the traffic engineering profession to facilitate the determination of whether a signal is warranted. These warrants include minimum conditions that normally indicate when a traffic signal is justified at a particular location. The MUTCD states that "traffic control signals should not be installed unless one or more of the signal warrants in the manual are met." A complete description of the relevant traffic signal warrants, as presented in the MUTCD, is included in Appendix E.

As previously mentioned, the speed limit on Highway 31 is posted at 45 mph. Therefore, the signal warrant analysis at the intersection of Highway 31 and Goose Creek Bypass was based on reduced signal warrants. The results of this signal warrant analysis are presented in Table 11.

The results shown in Table 11 indicate that the projected traffic volumes at the intersection of Highway 31 and Goose Creek Bypass satisfy all five of the· volume-related traffic signal warrants. In particular, Warrant 1A (Minimum Vehicular Volume), Warrant 1B (Interruption of Continuous Traffic), Warrant 1C (Combination of 1A and 18), Warrant #2 (Four Hour Volume Warrant) and Warrant #3 (Peak Hour Volume Warrant) will be satisfied for the required number of hours. Therefore, the installation of a traffic signal will be justified at the intersection of Highway 31 and Goose Creek Bypass based on the total buildout of the proposed development.

The capacity analyses conducted in Section 8.3 of this report also indicated the possible need for installation of a traffic signal at the intersection of Highway 31 and the south project driveway. However, a traffic signal should not normally ·be installed at an intersection unless the traffic volumes meet established signal warrant values. Therefore, a traffic signal warrant analysis was performed for the intersection of Highway 31 and the south project driveway based on Phase I projected traffic volumes.

As previously mentioned, the speed limit on Highway 31 is posted at 45 mph. Therefore, the signal warrant analysis at the intersection of Highway 31 and the south project driveway was based on reduced signal warrants. The results of this signal warrant analysis are presented in Table 12.

The results shown in Table 12 indicate that the projected traffic volumes at the intersection of Highway 31 and the south project driveway satisfy all five of the volume-related traffic signal warrants. In particular, Warrant 1A (Minimum Vehicular Volume), Warrant 18 (Interruption of Continuous Traffic), Warrant 1C (Combination of 1A and 1B), Warrant #2 (Four Hour Volume Warrant) and Warrant #3 (Peak Hour Volume Warrant) will be satisfied for the required number of hours. Therefore, the installation of a traffic signal will be justified at the intersection of Highway 31 and the south project driveway based on the completion of Phase I of the proposed development.

TABLE 11

TRAFFIC SIGNAL WARRANT ANALYSIS
BASED ON TOTAL BUILDOUT TRAFFIC VOLUMES
HIGHWAY 31 AND GOOSE CREEK BYPASS

	TRAFFIC VOLUMES		REDUCED WARRANTS MET? *				
HOUR	MAIN ST. BOTH DIRECTIONS	MINOR ST. HIGHEST APPROACH	#1A	#1B	#1C	#2	#3
7:00 - 8:00	1,933	450	Yes	Yes	Yes	Yes	Yes
8:00 - 9:00	1,517	303	Yes	Yes	Yes	Yes	Yes
9:00 - 10:00	1,025	292	Yes	Yes	Yes	Yes	Yes
10:00 - 11:00	997	284	Yes	Yes	Yes	Yes	Yes
11:00 - 12:00	1,034	294	Yes	Yes	Yes	Yes	Yes
12:00 - 1:00	1,030	296	Yes	Yes	Yes	Yes	Yes
1:00 - 2:00	1,058	302	Yes	Yes	Yes	Yes	Yes
2:00 - 3:00	1,478	337	Yes	Yes	Yes	Yes	Yes
3:00 - 4:00	1,643	456	Yes	Yes	Yes	Yes	Yes
4:00 - 5:00	1,861	602	Yes	Yes	Yes	Yes	Yes
5:00 - 6:00	1,800	579	Yes	Yes	Yes	Yes	Yes
Note: Warrants 1A, 1B and 1C must be satisfied for at least 8 hours of a typical day. Warrant 2 must be met for at least 4 hours, and Warrant 3 must be met for at least one hour of a typical day.							

* Based on two-lane major approaches and a one-lane minor approach.

TABLE 12

TRAFFIC SIGNAL WARRANT ANALYSIS
BASED ON TOTAL BUILDOUT TRAFFIC VOLUMES
HIGHWAY 31 AND SOUTH PROJECT DRIVEWAY

	TRAFFIC VOLUMES		REDUCED WARRANTS MET? *				
HOUR	MAIN ST. BOTH DIRECTIONS	MINOR ST. HIGHEST APPROACH	#1A	#1B	#1C	#2	#3
7:00 - 8:00	2,695	155	Yes	Yes	Yes	Yes	Yes
8:00 - 9:00	2,048	143	Yes	Yes	Yes	Yes	Yes
9:00 - 10:00	1,475	153	Yes	Yes	Yes	Yes	Yes
10:00 - 11:00	1,449	155	Yes	Yes	Yes	Yes	Yes
11:00 - 12:00	1,504	172	Yes	Yes	Yes	Yes	Yes
12:00 - 1:00	1,520	183	Yes	Yes	Yes	Yes	Yes
1:00 - 2:00	1,549	189	Yes	Yes	Yes	Yes	Yes
2:00 - 3:00	2,056	206	Yes	Yes	Yes	Yes	Yes
3:00 - 4:00	2,295	223	Yes	Yes	Yes	Yes	Yes
4:00 - 5:00	2,690	312	Yes	Yes	Yes	Yes	Yes
5:00 - 6:00	2,688	342	Yes	Yes	Yes	Yes	Yes
Note: Warrants 1A, 1B and 1C must be satisfied for at least 8 hours of a typical day. Warrant 2 must be met for at least 4 hours, and Warrant 3 must be met for at least one hour of a typical day.							

*** Based on two-lane major approaches and a one-lane minor approach.**

9. CONCLUSIONS AND RECOMMENDATIONS- TOTAL BUILDOUT

The analyses presented in this study indicate that with certain roadway and traffic control improvements the impacts of total buildout of the Tollgate Farms project will be manageable. The specific recommendations are shown in Figures 16a and 16b and described as follows:

Highway 31 and Site Access Improvements

- To accommodate the total buildout of Tollgate Farms, it is recommended that the five lane cross-section be extended north to a point approximately 200 feet north of the north project driveway. Plans obtained from TOOT indicate as part of the State Route 840 construction project a five-lane cross-section will be constructed from State Route 840 to approximately 250 feet north of the high school access.

- A traffic signal should be installed at the intersection of Highway 31 and the south project driveway. This signal should be installed at the onset of Phase II development.

- The eastbound approach of the intersection of Highway 31 and the south project driveway should be improved to provide a dual left turn lane for traffic exiting the project site.

- The eastbound approach of the intersection of Highway 31 and the north project driveway should be constructed to include a right turn lane and a left turn lane.

- A northbound left turn lane on Highway 31 should be provided at the intersection with the north project driveway. This left turn lane should include approximately 200 feet of storage.

Intersection of Highway 31 and Goose Creek Bypass Improvements

- The intersection of Highway 31 and Goose Creek Bypass should be realigned to form a T-intersection, as shown in Figure 16b. It is also recommended that a traffic signal be installed at this intersection.

- A southbound left turn lane should be provided on Highway 31 at the realigned intersection with Goose Creek Bypass. This left turn lane should include approximately 150 feet of storage.

- A westbound right turn lane on Goose Creek Bypass should be provided at the intersection of Highway 31 and.Goose Creek Bypass. This right turn lane should include approximately 150 feet of storage.

As previously mentioned, it is important to note that the improvements to this intersection are not completely due to Tollgate Farms. The Tollgate Farms traffic represents only about 25% of the total traffic at the intersection based on total buildout. Also, since Highway 31 is a state route, it would be reasonable for this improvement to be constructed by the state.

Site Access

- The site plan shows two proposed driveways that will provide access to the Tollgate Farms project. These two driveways will be needed to provide adequate access to the site. These driveways are spaced approximately 525 feet apart. Also, the southern driveway and the high school access are spaced approximately 650 feet apart. The capacity analyses show that these intersection spacings are adequate to accommodate the left turn storage distances that will be required for the intersections.

- The proposed site plan shows a driveway connection between Tollgate Farms and the high school. This connection will be beneficial since it will allow traffic to travel between the high school and the residential development without being required to travel on Highway 31. This will help reduce traffic congestion on Highway 31.

In conclusion, implementation of the above recommendations will provide acceptable traffic operations for the public roadways and intersections within the study area.

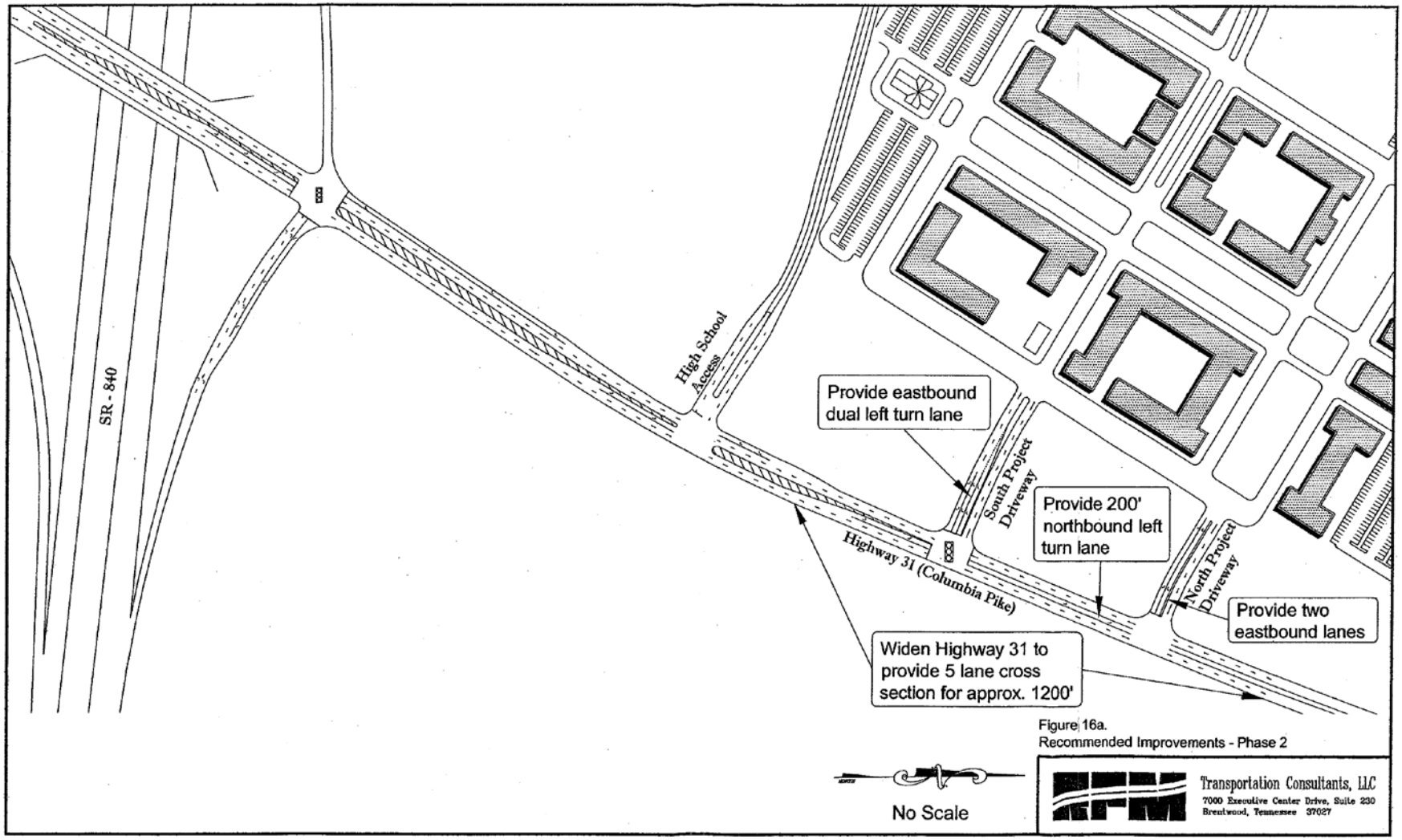

Figure 16a.
Recommended Improvements - Phase 2

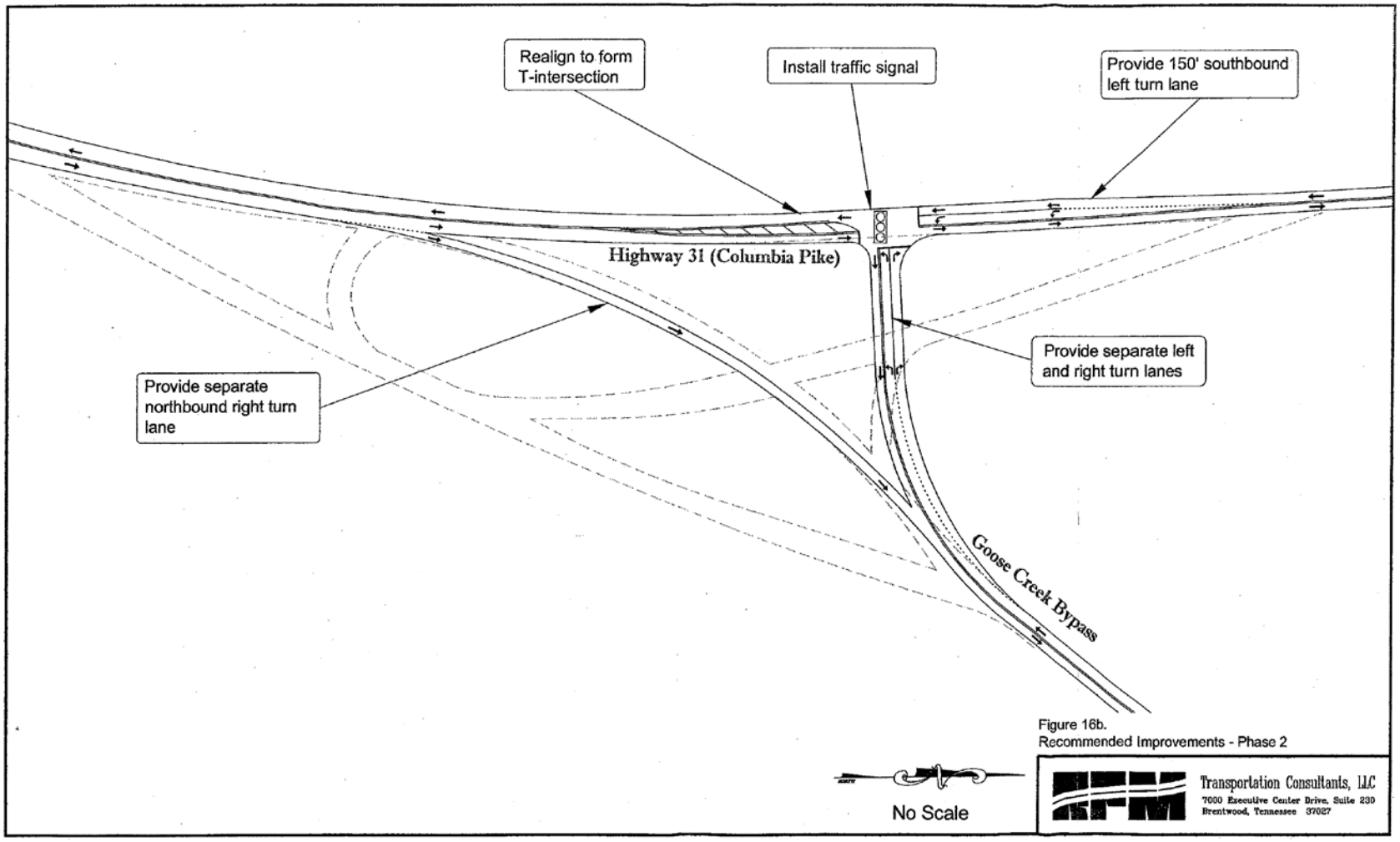

Figure 16b.
Recommended Improvements - Phase 2

TRAFFIC IMPACT STUDY

for

TOLLGATE VILLAGE

Thompson's Station, Tennessee

February 25, 2015

Prepared for:

MBSC TN HOMEBUILDERS, LLC
402 S. Gay Street, Suite 202
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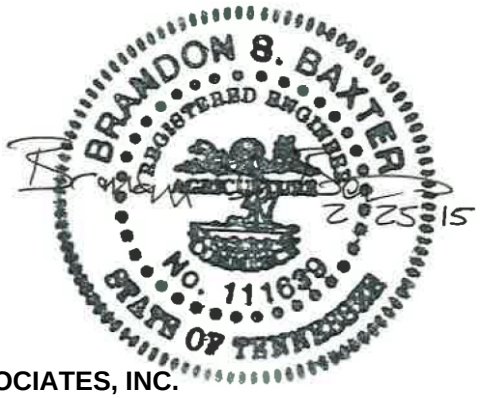

Prepared by:

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TOLLGATE VILLAGE

TABLE OF CONTENTS

PAGE

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

INTRODUCTION

Tollgate Village is located on the west side of Columbia Pike (US Highway 31 / State Route 6) between Independence High School and the West Harpeth River in the Town of Thompson's Station, Tennessee. An update to the Tollgate Village Concept Plan is proposed that includes changes to the proposed land uses and number of units.

BACKGROUND TRAFFIC

Based upon anticipated development activity, the horizon year 2020 will be used to consider the full build-out of the proposed concept plan at Tollgate Village. To account for background traffic growth within the area, TDOT historical traffic count data and Nashville MPO transportation model data was obtained for the project area. Based upon the Nashville MPO data and a linear regression analysis of the historical traffic count data, a ***2.6 percent annual growth rate*** will be applied to the existing traffic volumes for the period from 2014 to 2020.

SITE TRAFFIC

The traffic impact of the development at Tollgate Village is based upon a calculation of the number of vehicle trips that will enter and/or exit the site. The analysis periods of this study are the midday and p.m. peak hours of a typical weekday on Columbia Pike. Therefore, trips were generated according to the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 9th Edition*. The trip generation for Tollgate Village is shown in the table below.

TOLLGATE VILLAGE TRIP GENERATION

Land Use	Total Units	Daily	A.M. Peak Hour			P.M. Peak Hour		
			Enter	Exit	Total	Enter	Exit	Total
Single Family Detached Homes	681 lots	5,818	122	364	486	360	213	573
Townhomes	231 units	1,279	32	155	187	79	39	118
Multifamily	275 units	1,698	28	110	138	106	57	163
Live/Work	49 units	346	7	32	39	22	11	33
General Office	30,000 sf	483	64	9	73	17	84	101
Medical Office	46,800 sf	1,561	88	24	112	39	103	142
Commercial/Retail (Outparcels) (Primary Trips Only)	54,000 sf	3,936	66	41	107	96	86	182
Hotel	50 rooms	74	16	11	27	15	15	30
TOTAL		**15,195**	**423**	**746**	**1,169**	**734**	**608**	**1,342**

TRAFFIC ANALYSIS

The following public roadway intersections were analyzed for capacity deficiencies and improvement needs:

- Columbia Pike at Tollgate Boulevard

For these intersections, the following traffic scenarios were analyzed, where applicable:

- 2014 Existing Traffic Conditions
- 2020 Total Traffic that contains all traffic projected in the study area, including Tollgate Village

CONCLUSIONS AND RECOMMENDATIONS

Columbia Pike at Tollgate Boulevard

The capacity analysis results for the intersection of Columbia Pike and Tollgate Boulevard indicate that traffic operations are currently characterized by acceptable levels of service during the a.m. and p.m. peak hours. The eastbound left turn from Tollgate Boulevard onto Columbia Pike northbound is the movement that experiences the highest delay during peak hours. At unsignalized intersections on arterial roads, it is expected that the side street left turn movement will generally have a higher delay than other turning movements at the intersection. For existing conditions, the analysis results indicate acceptable levels of service and the volume-to-capacity ratio for Tollgate Boulevard indicates that there is capacity available for additional traffic growth.

In the horizon year 2020, the analysis was conducted for unsignalized control and for signalized control. For the unsignalized control, the levels of service and volume-to-capacity ratios for Tollgate Boulevard indicate that the capacity of the intersection is exceeded at full build-out without a traffic signal. Based on the TDOT review of Columbia Pike in the vicinity and the preliminary indications that a new traffic signal will be installed as part of TDOT improvements, the analysis of the intersection under traffic signal control indicates that acceptable intersection operations can be provided if the following improvements are implemented.

- A southbound right turn lane should be constructed on Columbia Pike at Tollgate Boulevard. The storage length of this turn lane should be 250 feet with 100 feet of taper.

It is important to note that the installation of a traffic signal at this intersection will require widening of Columbia Pike north of Tollgate Boulevard to provide additional merge and lane drop transition length. This widening will extend to the north of the bridge over the West Harpeth River and will require bridge widening to accomplish. The schedule for design and construction of a traffic signal at this intersection by TDOT will be impacted by the need to widen the existing bridge structure.

Secondary Access (North)

The Tollgate Village Concept Plan includes a proposed secondary access to Columbia Pike approximately 640 feet north of Tollgate Boulevard. This location will provide access to portions of the multifamily and commercial uses (hotel, office, and outparcels) from Columbia Pike.

Construction of this access would provide a beneficial ingress/egress for the multifamily and commercial uses located on the northeastern portion of the Tollgate Village site. This access would be unsignalized and would serve a portion of the multifamily and commercial site traffic oriented to the north on Columbia Pike or the Goose Creek Bypass.

The proximity of this secondary access to the existing bridge of Columbia Pike over the West Harpeth River does impact the feasibility items noted below.

- The existing northbound left turn lane on Columbia Pike ends approximately 240 feet south of the proposed location for this access. In order to provide a left turn lane at this access, the widening of Columbia Pike would be necessary. If widened, the length of lane transition tapers north of the secondary access on Columbia Pike would result in the need to widen the bridge of Columbia Pike over the West Harpeth River.

- If this secondary access is moved approximately 240 feet to the south on Columbia Pike, the widening of Columbia Pike to accommodate a left turn lane extension is not necessary.

- The existing bridge on Columbia Pike over the West Harpeth River and existing utility poles on the west side of Columbia Pike impact the ability to construct a southbound right turn lane on Columbia Pike at this secondary access.

Secondary Access (South)

The Tollgate Village Concept Plan includes a proposed connection to Declaration Way, the existing access drive to Independence High School. This location would provide a secondary route of access to a portion of the multifamily and commercial uses (medical office and outparcels) from Columbia Pike via Declaration Way. Access at this location will require an agreement with Williamson County Schools because Declaration Way is a private drive.

Construction of this access would provide a marginally beneficial ingress/egress for the multifamily and commercial uses located on the southeastern portion of the Tollgate Village site. This access would provide connectivity to the unsignalized intersection of Columbia Pike and Declaration Way. While a small portion of the multifamily and commercial site traffic oriented to the south on Columbia Pike may use this secondary access, it is reasonable to expect that traffic from Independence High School would be more likely to use this connection as a means to access the future traffic signal at the intersection of Columbia Pike and Tollgate Boulevard.

I. INTRODUCTION

The purpose of this study is to update the analysis of transportation related impacts at the Tollgate Village development located in Thompson's Station, Tennessee. A traffic impact study for Tollgate Village was previously conducted and approved in 2003. Development is occurring at Tollgate Village based upon the traffic study and previously approved plans. At this time, an updated Concept Plan for Tollgate Village is being prepared that includes land use and/or unit quantity adjustments to support the ongoing development activities. This study has been requested by the Town of Thompson's Station planning staff in order to address transportation impacts and mitigating measures as part of the updated concept plan review process.

In order to evaluate and quantify the impacts of this development, an inventory of the existing transportation system was carried out, along with an assessment of its adequacy. Based on the project schedule, a design year was established and system-wide growth rates were applied to existing traffic volumes. Site traffic was generated, distributed, and assigned to the roadway network to quantify the site impact. Transportation analyses were performed in order to assess any site or non-site related impacts on the system. Finally, recommendations for roadway improvements and/or transportation system improvements were offered.

II. PROPOSED DEVELOPMENT

A. Project Description

As shown in Figure 1, Tollgate Village is located on the west side of Columbia Pike (US Highway 31 / State Route 6) between Independence High School and the West Harpeth River in the Tow of Thompson's Station, Tennessee. The Tollgate Village Concept Plan includes a total area of 345.9 acres. Table 1 below shows the currently approved and proposed site data as represented on the concept plan for Tollgate Village.

TABLE 1

TOLLGATE VILLAGE SITE DATA

Land Use	Currently Approved Plan	Proposed Concept Plan	Change in Units
Single Family	669 lots (approx. 217 built)	681 lots	+ 12 lots
Townhome	88 units	234 units	+ 146 units
Multifamily	256 units	275 units	+ 19 units
Live/Work	-	49 units (26,000 sf)	+ 49 units
Office	30,000 sf (100% built)	30,000 sf	none
Medical Office	46,800 sf (100% built)	46,800 sf	none
Retail	193,000 sf	-	- 193,000 sf
Hotel	-	1.52 acres	+ 1.52 acres
Outparcels	11.2 acres	10.82 acres	- 0.38 acres

The proposed Tollgate Village Concept Plan is shown in Figure 2.

B. Site Access

Access to Tollgate Village includes an existing primary access and future, proposed secondary accesses as described below.

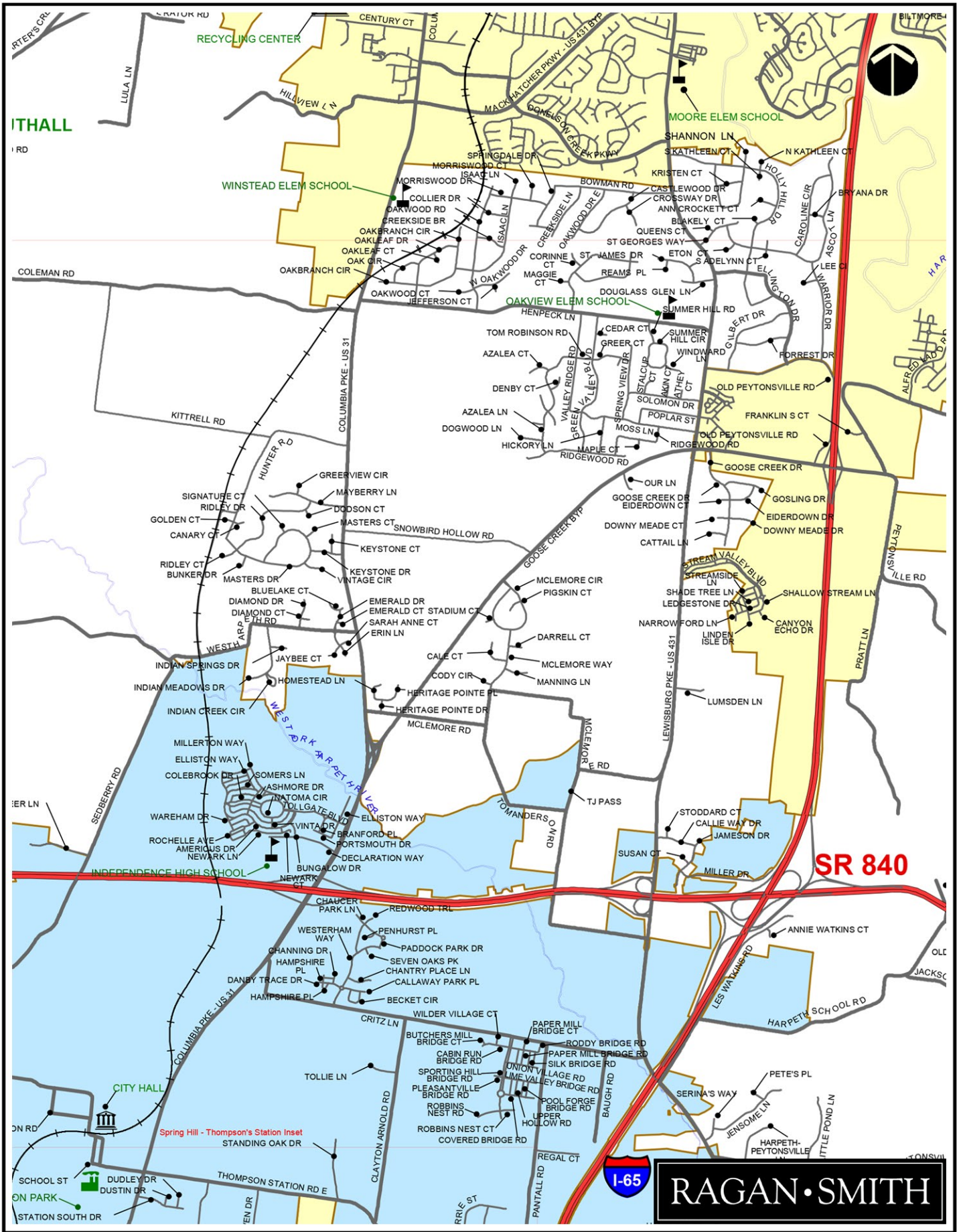
- Primary Access - Primary access to Tollgate Village is provided by Tollgate Boulevard. Tollgate Boulevard intersects Columbia Pike approximately 1,875 feet north of the State Route 840 interchange and approximately 1,900 feet south of the Goose Creek Bypass (State Route 248). Tollgate Boulevard consists of one (1) lane for traffic entering Tollgate Village and two (2) lanes for traffic exiting Tollgate Village. The exiting lane assignment on Tollgate Boulevard includes one (1) right turn lane and one (1) left turn lane with storage lengths of approximately 250 feet. This access is unsignalized and two-way stop control is in place at Columbia Pike.

- Secondary Access (North) - The Tollgate Village Concept Plan includes a proposed secondary access to Columbia Pike approximately 640 feet north of Tollgate Boulevard. This location will provide access to portions of the multifamily and commercial uses (hotel, office, and outparcels) from Columbia Pike.

- Secondary Access (South) - The Tollgate Village Concept Plan includes a proposed connection to Declaration Way, the existing access drive to Independence High School. This location would provide a secondary route of access to a portion of the multifamily and commercial uses (medical office and outparcels) from Columbia Pike via Declaration Way. Access at this location will require an agreement with Williamson County Schools because Declaration Way is a private drive.

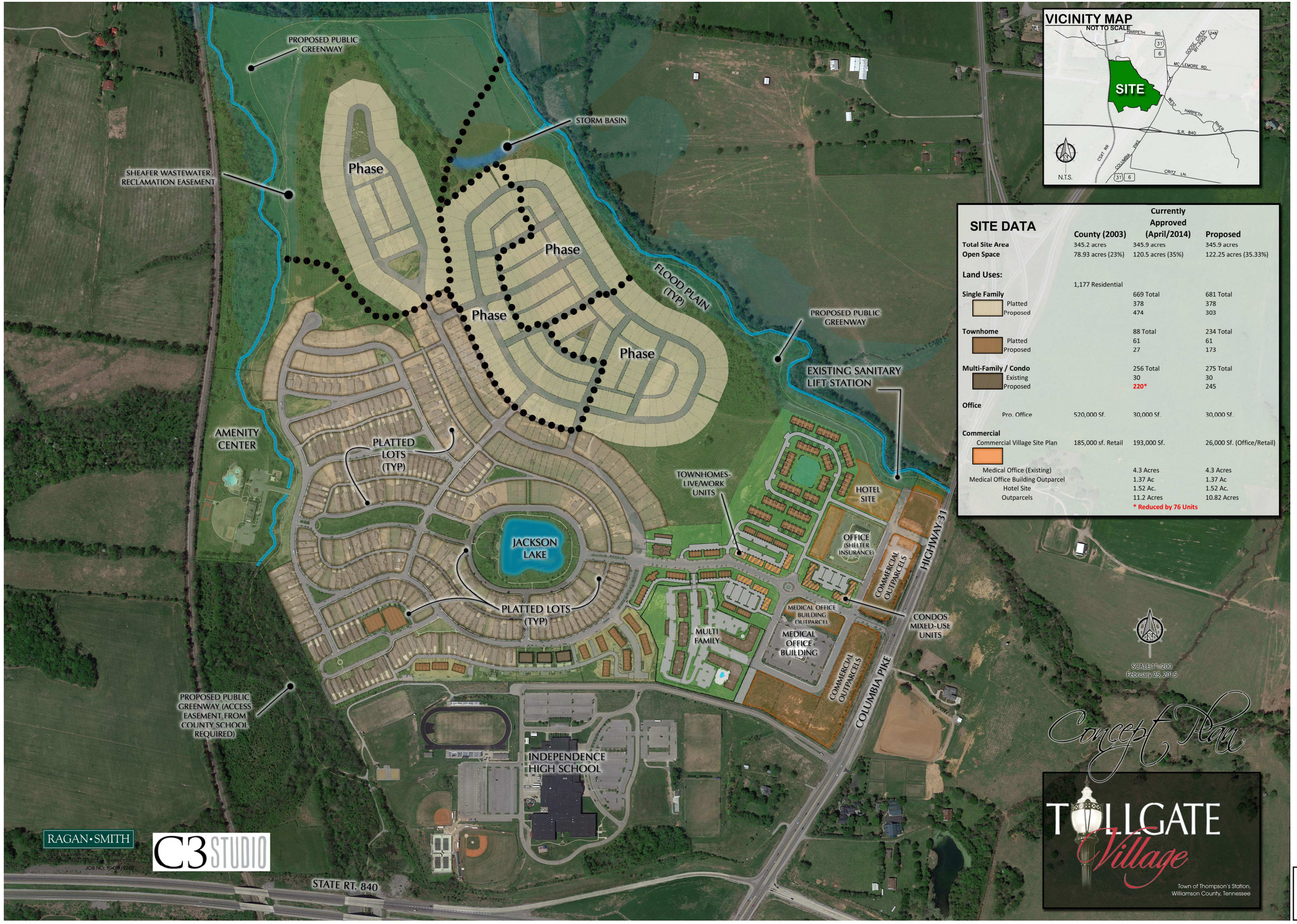
C. Phasing and Timing

The build-out of Tollgate Village is occurring in multiple phases with the development schedule largely influenced by market conditions . For the future traffic analysis in this report, it will be assumed that the full build-out of Tollgate Village occurs in the year 2020.



Tollgate Village Location Map

Figure 1



SITE DATA

	County (2003)	Currently Approved (April/2014)	Proposed
Total Site Area	345.2 acres	345.9 acres	345.9 acres
Open Space	78.93 acres (23%)	120.5 acres (35%)	122.25 acres (35.33%)
Land Uses:	1,177 Residential		
Single Family		669 Total	681 Total
Platted		378	378
Proposed		474	303
Townhome		88 Total	234 Total
Platted		61	61
Proposed		27	173
Multi-Family / Condo		256 Total	275 Total
Existing		30	30
Proposed		220*	245
Office			
Pro. Office	520,000 Sf.	30,000 Sf.	30,000 Sf.
Commercial			
Commercial Village Site Plan	185,000 sf. Retail	193,000 Sf.	26,000 Sf. (Office/Retail)
Medical Office (Existing)		4.3 Acres	4.3 Acres
Medical Office Building Outparcel		1.37 Ac	1.37 Ac
Hotel Site		1.52 Ac.	1.52 Ac.
Outparcels		11.2 Acres	10.82 Acres

* Reduced by 76 Units

Figure 2

III. EXISTING CONDITIONS

A. Transportation System

The existing transportation system in the area that provides access to Tollgate Village consists of arterial and collector roadways. The following roadways are located within the project area and will comprise the study area for consideration of the updated concept plan at Tollgate Village.

- **Columbia Pike (US Highway 31 / State Route 6)** in the study area is classified as an arterial roadway in the Town of Thompson's Station Comprehensive Plan. Columbia Pike transitions from a two-lane to a five-lane roadway between the West Harpeth River and Tollgate Boulevard. The five-lane section of Columbia Pike continues to south of State Route 840. The posted speed limit on Columbia Pike is 45 mph.

- **Tollgate Boulevard** in the study area is classified as a collector roadway in the Town of Thompson's Station Comprehensive Plan. Tollgate Boulevard is two-lane roadway and provides primary access to Tollgate Village. Tollgate Boulevard ends within the Tollgate Village development and does not provide access to any area adjacent to or beyond the area included on the Tollgate Village concept plan. The posted speed limit on Tollgate Boulevard is 30 mph.

B. Traffic Volumes

In order to assess the adequacy of the local transportation system, an evaluation of the current operational quality of intersections within the study area was required. The peak hour of the adjacent street traffic was used to determine the impact of the development plan at Tollgate Village on the existing transportation system.

Peak hour traffic volumes for the existing base conditions in 2014 were taken from a turning movement traffic conducted by the Tennessee Department of Transportation at the following location.

- Columbia Pike at Tollgate Boulevard

Base traffic volumes for 2014 existing traffic conditions are shown on page 11 in Figure 3.

C. Proposed Transportation System

The Tennessee Department of Transportation (TDOT) is conducting a review of Columbia Pike between the Goose Creek Bypass and State Route 840. Based upon preliminary information from Town of Thompson's Station and TDOT staff, a component of the review being conducted by TDOT included an 8-hour turning movement traffic and signal warrant analysis for the intersection of Columbia Pike and Tollgate Boulevard. At the time of this study, the final report of TDOT's review was not available. However, based upon discussions with Town of Thompson's Station and TDOT staff, the TDOT review did indicate that signal warrants could be satisfied at the intersection of Columbia Pike and Tollgate Boulevard and that the installation of a new traffic signal at this intersection would be initiated by TDOT. The schedule for design and construction of this traffic signal is unknown.

IV. FORECASTED BACKGROUND TRAFFIC

A. Introduction

Based upon anticipated development activity, the horizon year 2020 will be used to consider the full build-out of the proposed concept plan at Tollgate Village. Before any impacts to the study area can be addressed, some estimate of background traffic volumes must be established. Background traffic volumes were established by using an annual growth rate based upon historical traffic data and future traffic forecasts.

B. Annual Growth

To establish background traffic volumes, TDOT historical traffic was obtained for the general study area. Table 2 below shows the available traffic data for the years 2010 to present.

TABLE 2

HISTORICAL TRAFFIC COUNT DATA

Year	Williamson County Station 94 [(1)]	Williamson County Station 95 [(2)]
2010	11,976	4,411
2011	11,513	5,191
2012	13,049	5,953
2013	12,682	5,441
2014	13,281	5,604

[(1)] Location - On Columbia Pike north of the Goose Creek Bypass
[(2)] Location - On the Goose Creek Bypass north of Columbia Pike

In addition to the historical traffic count data for Columbia Pike and the Goose Creek Bypass, the forecasted growth rate of the Nashville Metropolitan Organization (MPO) transportation model was available as part of the traffic counts and traffic forecasts completed by TDOT. For the vicinity of Tollgate Village, the Nashville MPO transportation model indicates that a growth rate of 2.6 percent annually is expected.

Based upon the Nashville MPO data and a linear regression analysis of the historical traffic count data, a ***2.6 percent annual growth rate*** will be applied to the existing traffic volumes.

Background traffic volumes for the future horizon year 2020 are shown on page 11 in Figure 3.

V. PROPOSED SITE TRAFFIC

A. Proposed Site Trip Generation

In order to quantify site related impacts within the study area, some estimates of site traffic generation and trip assignment had to be established. Trip generation rates for the development were established using information for the weekday p.m. peak hour of the adjacent street as shown in the ITE *Trip Generation Manual, 9th Edition*. Table 3 below shows the unadjusted trip generation for the proposed Tollgate Village concept plan.

TABLE 3

TOLLGATE VILLAGE UNADJUSTED TRIP GENERATION

Land Use	Total Units	Daily	A.M. Peak Hour			P.M. Peak Hour		
			Enter	Exit	Total	Enter	Exit	Total
Single Family Detached Homes	681 lots	6,134	122	364	486	372	219	591
Townhomes	234 units	1,348	32	155	187	81	40	121
Multifamily	275 units	1,790	28	110	138	110	59	169
Live/Work	49 units	346	7	32	39	22	11	33
General Office	30,000 sf	526	64	9	73	18	87	105
Medical Office	46,800 sf	1,699	88	24	112	41	106	147
Commercial/Retail (Outparcels)	54,000 sf	4,550	66	41	107	190	206	396
Hotel	50 rooms	74	16	11	27	15	15	30
TOTAL UNADJUSTED		**16,467**	**423**	**746**	**1,169**	**849**	**743**	**1,592**

Retail-oriented developments often attract trips from motorists already passing by the development on an adjacent street. This is known as the "pass-by trip" phenomenon. Pass-by trips are made as intermediate stops on the way from an origin to a destination. This traffic will be on the roadway system passing by the site even if the proposed development is not constructed. Based upon the size of retail uses at Tollgate Village, the *ITE Trip Generation Handbook* reveals that a pass-by trip rate of approximately 47 percent is appropriate for the p.m. peak hour. The derivation of pass-by traffic volumes is shown in the appendix of this report.

Since Tollgate Village will contain a mix of office, retail, and residential uses, some trip interaction between these uses is expected. These types of trips between different uses within a mixed use development are defined as "internal" trips. The impact and net effect of internal trips can be established using the methodology shown in the *ITE Trip Generation Handbook*. For the retail, office, and residential land uses at Tollgate Village, the *ITE Trip Generation Handbook* indicates that approximately 8 percent of the daily trips and 5 percent of the p.m. peak trips will be internal. The derivation of internal traffic is shown in the appendix of this report.

The Tollgate Village trip generation, adjusted to account for the impact of internal trips, is shown below in Table 4.

TABLE 4

TOLLGATE VILLAGE ADJUSTED TRIP GENERATION

Land Use	Total Units	Daily	A.M. Peak Hour			P.M. Peak Hour		
			Enter	Exit	Total	Enter	Exit	Total
Single Family Detached Homes	681 lots	5,818	122	364	486	360	213	573
Townhomes	234 units	1,279	32	155	187	79	39	118
Multifamily	275 units	1,698	28	110	138	106	57	163
Live/Work	49 units	346	7	32	39	22	11	33
General Office	30,000 sf	483	64	9	73	17	84	101
Medical Office	46,800 sf	1,561	88	24	112	39	103	142
Commercial/Retail (Outparcels) (Primary Trips Only)	54,000 sf	3,936	66	41	107	96	86	182
Hotel	50 rooms	74	16	11	27	15	15	30
TOTAL ADJUSTED		**15,195**	**423**	**746**	**1,169**	**734**	**608**	**1,342**

B. Trip Generation Comparison

As previously discussed, a traffic impact study for Tollgate Village was completed in 2003 and development has been occurring based on a previously approved plan for Tollgate Village. With the proposal of an updated concept plan, a comparison of the trip generation shown in the previously completed traffic impact study and the trip generation of the proposed updated concept plan is appropriate to identify the net impact of new traffic generated by Tollgate Farms. Table 5 below summarizes the trip generation for Tollgate Village as shown in the 2003 traffic impact study and as calculated for the updated concept plan.

TABLE 5

TOLLGATE VILLAGE TRIP GENERATION COMPARISON

Trip Generation Source	Daily	A.M. Peak Hour			P.M. Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
2003 Traffic Impact Study	20,901	860	535	1,395	971	1,260	2,231
2014 Updated Concept Plan	15,195	423	746	1,169	734	608	1,342
NET CHANGE	**- 5,706**	**- 437**	**211**	**- 226**	**- 237**	**- 652**	**- 889**

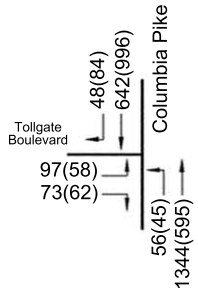
As shown in Table 5 above, the updated concept plan for Tollgate Village results in the net reduction of trips generated by the development on a daily basis and during the a.m. and p.m. peak hours.

C. Site Trip Distribution and Assignment

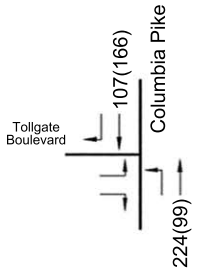
Site trips were distributed based upon the prevalent traffic patterns in the area including the turning movement data available from TDOT at the intersection of Columbia Pike and Tollgate Boulevard. The distribution of site trips for Tollgate Village is shown on page 11 in Figure 3.

Site traffic volumes generated by Tollgate Village in the horizon year 2020 are shown in Figure 7. The accumulation of existing, background growth, and site generated traffic for the horizon year 2020 are also shown in Figure 3.

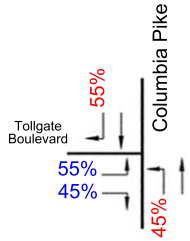
2014 Existing Traffic Volumes



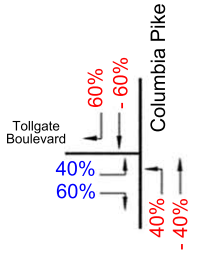
2020 Background Growth



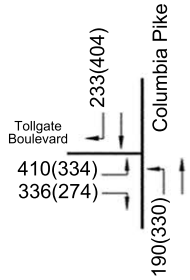
Primary Site Trip Distribution



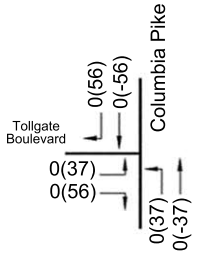
Pass-by Site Trip Distribution



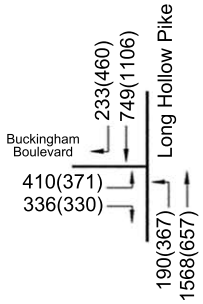
2020 Primary Site Traffic Volumes



2020 Pass-By Site Traffic Volumes



2020 Total Traffic Volumes



Peak Hours
A.M.(P.M.)

RAGAN•SMITH

Tollgate Village
Columbia Pike at Tollgate Boulevard
Intersection Traffic Volumes

Figure 3

VI. TRANSPORTATION ANALYSIS

A. Intersection Capacity Analysis

In order to gauge the site impact and identify capacity deficient locations, capacity analyses were conducted at critical roadway intersections within the study area. Capacity analyses were conducted according to the methodology and procedures outlined in the *Highway Capacity Manual*, 2010, published by the Transportation Research Board.

In the study area, critical intersections were analyzed for capacity deficiencies and geometric improvements for the a.m. and p.m. peak hours for future conditions. Analysis considered the transportation system with and without the site. The following intersections were analyzed:

- Columbia Pike at Tollgate Boulevard

Capacity analysis results for the existing roadway network are shown below in Table 6.

TABLE 6

INTERSECTION CAPACITY ANALYSIS RESULTS

Location	Year	Development Condition	Intersection Control [1]	Turning Movement	Level-of-Service	
					A.M.	P.M.
Columbia Pike at Tollgate Boulevard	2014	Existing	TWSC	NB Left Turn	A	B
				EB Left Turn	D	D
				EB Right Turn	B	B
	2020	Total	TWSC	NB Left Turn	B	F
				EB Left Turn	F	F
				EB Right Turn	C	F
	2020	Total	Signal	Overall Intersection[2]	B	C

[1] Signal = Traffic Signal Control, TWSC = Two-way Stop Control
[2] With Recommended Improvement

The intersection capacity analysis results presented above conservatively include all Tollgate Village site traffic using Tollgate Boulevard for access. While the addition of a secondary access will allow traffic to disperse at two ingress/egress locations, the analysis of the full build-out of Tollgate Village with one access results in a more conservative evaluation of future traffic operations.

Level of service (LOS) criteria for unsignalized intersections is shown in Table 7.

TABLE 7		
DESCRIPTIONS OF LEVEL OF SERVICE FOR UNSIGNALIZED INTERSECTIONS		
Level of Service	**Description**	**Control Delay (sec./veh.)**
A	Usually no conflicting traffic	0 - 10
B	Occasionally some delay due to conflicting traffic	> 10 - 15
C	Delay is noticeable but not inconveniencing	> 15 - 25
D	Delay is noticeable and irritating, increased risk taking	> 25 - 35
E	Delay approaches tolerance level, risk taking likely	> 35 - 50
F	Delay exceeds tolerance level, high likelihood of risk taking	> 50
Source: Highway Capacity Manual, HCM 2010		

Level of service (LOS) criteria for signalized intersections is shown in Table 8.

TABLE 8		
DESCRIPTIONS OF LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS		
Level of Service	**Description**	**Control Delay (sec./veh.)**
A	Volume-to-capacity ratio is low, progression is extremely favorable, most vehicles travel through intersection without stopping	≤10
B	Volume-to-capacity ratio is low, progression is good and/or short cycle lengths is present, more vehicles stop than for LOS A	> 10 - 20
C	Progression is favorable and/or cycle length is moderate, number of vehicles stopping is significant although many still pass thru intersection without stopping.	> 20 - 35
D	Volume-to-capacity ratio is high, progression is ineffective, cycle length is long, many vehicles stop	> 35 - 55
E	Volume-to-capacity ratio is high, progression is unfavorable, cycle length is long, many vehicles stop	> 55 - 80
F	Volume-to-capacity ratio is very high, progression is very poor, cycle length is long, most cycles fail to clear the queue	> 80
Source: Highway Capacity Manual, HCM 2010		

VII. CONCLUSIONS AND RECOMMENDATIONS

A. Introduction

At full build out, Tollgate Village will contribute approximately 15,195 trips per day to the local roadway network. For this development, a specific review of access and traffic operations during peak periods of site traffic is warranted to provide efficiency and acceptable levels of service.

Based upon a review of the existing and future proposed conditions within the study area, we offer the recommendations shown below. These recommendations have been developed to provide efficient movement of traffic to Tollgate Village while minimizing the impact to non-site trips on the roadway network.

B. Columbia Pike at Tollgate Boulevard

The capacity analysis results for the intersection of Columbia Pike and Tollgate Boulevard indicate that traffic operations are currently characterized by acceptable levels of service during the a.m. and p.m. peak hours. The eastbound left turn from Tollgate Boulevard onto Columbia Pike northbound is the movement that experiences the highest delay during peak hours. At unsignalized intersections on arterial roads, it is expected that the side street left turn movement will generally have a higher delay than other turning movements at the intersection. For existing conditions, the analysis results indicate acceptable levels of service and the volume-to-capacity ratio for Tollgate Boulevard indicates that there is capacity available for additional traffic growth.

In the horizon year 2020, the analysis was conducted for unsignalized control and for signalized control. For the unsignalized control, the levels of service and volume-to-capacity ratios for Tollgate Boulevard indicate that the capacity of the intersection is exceeded at full build-out without a traffic signal. Based on the TDOT review of Columbia Pike in the vicinity and the preliminary indications that a new traffic signal will be installed as part of TDOT improvements, the analysis of the intersection under traffic signal control indicates that acceptable intersection operations can be provided if the following improvements are implemented.

- A southbound right turn lane should be constructed on Columbia Pike at Tollgate Boulevard. The storage length of this turn lane should be 250 feet with 100 feet of taper.

It is important to note that the installation of a traffic signal at this intersection will require widening of Columbia Pike north of Tollgate Boulevard to provide additional merge and lane drop transition length. This widening will extend to the north of the bridge over the West Harpeth River and will require bridge widening to accomplish. The schedule for design and construction of a traffic signal at this intersection by TDOT will be impacted by the need to widen the existing bridge structure.

C. Secondary Access (North)

The Tollgate Village Concept Plan includes a proposed secondary access to Columbia Pike approximately 640 feet north of Tollgate Boulevard. This location will provide access to portions of the multifamily and commercial uses (hotel, office, and outparcels) from Columbia Pike.

Construction of this access would provide a beneficial ingress/egress for the multifamily and commercial uses located on the northeastern portion of the Tollgate Village site. This access would be unsignalized and would serve a portion of the multifamily and commercial site traffic oriented to the north on Columbia Pike or the Goose Creek Bypass.

The proximity of this secondary access to the existing bridge of Columbia Pike over the West Harpeth River does impact the feasibility items noted below.

- The existing northbound left turn lane on Columbia Pike ends approximately 240 feet south of the proposed location for this access. In order to provide a left turn lane at this access, the widening of Columbia Pike would be necessary. If widened, the length of lane transition tapers north of the secondary access on Columbia Pike would result in the need to widen the bridge of Columbia Pike over the West Harpeth River.

- If this secondary access is moved approximately 240 feet to the south on Columbia Pike, the widening of Columbia Pike to accommodate a left turn lane extension is not necessary.

- The existing bridge on Columbia Pike over the West Harpeth River and existing utility poles on the west side of Columbia Pike impact the ability to construct a southbound right turn lane on Columbia Pike at this secondary access.

D. Secondary Access (South)

The Tollgate Village Concept Plan includes a proposed connection to Declaration Way, the existing access drive to Independence High School. This location would provide a secondary route of access to a portion of the multifamily and commercial uses (medical office and outparcels) from Columbia Pike via Declaration Way. Access at this location will require an agreement with Williamson County Schools because Declaration Way is a private drive.

Construction of this access would provide a marginally beneficial ingress/egress for the multifamily and commercial uses located on the southeastern portion of the Tollgate Village site. This access would provide connectivity to the unsignalized intersection of Columbia Pike and Declaration Way. While a small portion of the multifamily and commercial site traffic oriented to the south on Columbia Pike may use this secondary access, it is reasonable to expect that traffic from Independence High School would be more likely to use this connection as a means to access the future traffic signal at the intersection of Columbia Pike and Tollgate Boulevard.

APPENDIX

A. BASE TRAFFIC DATA & TRAFFIC COUNTS

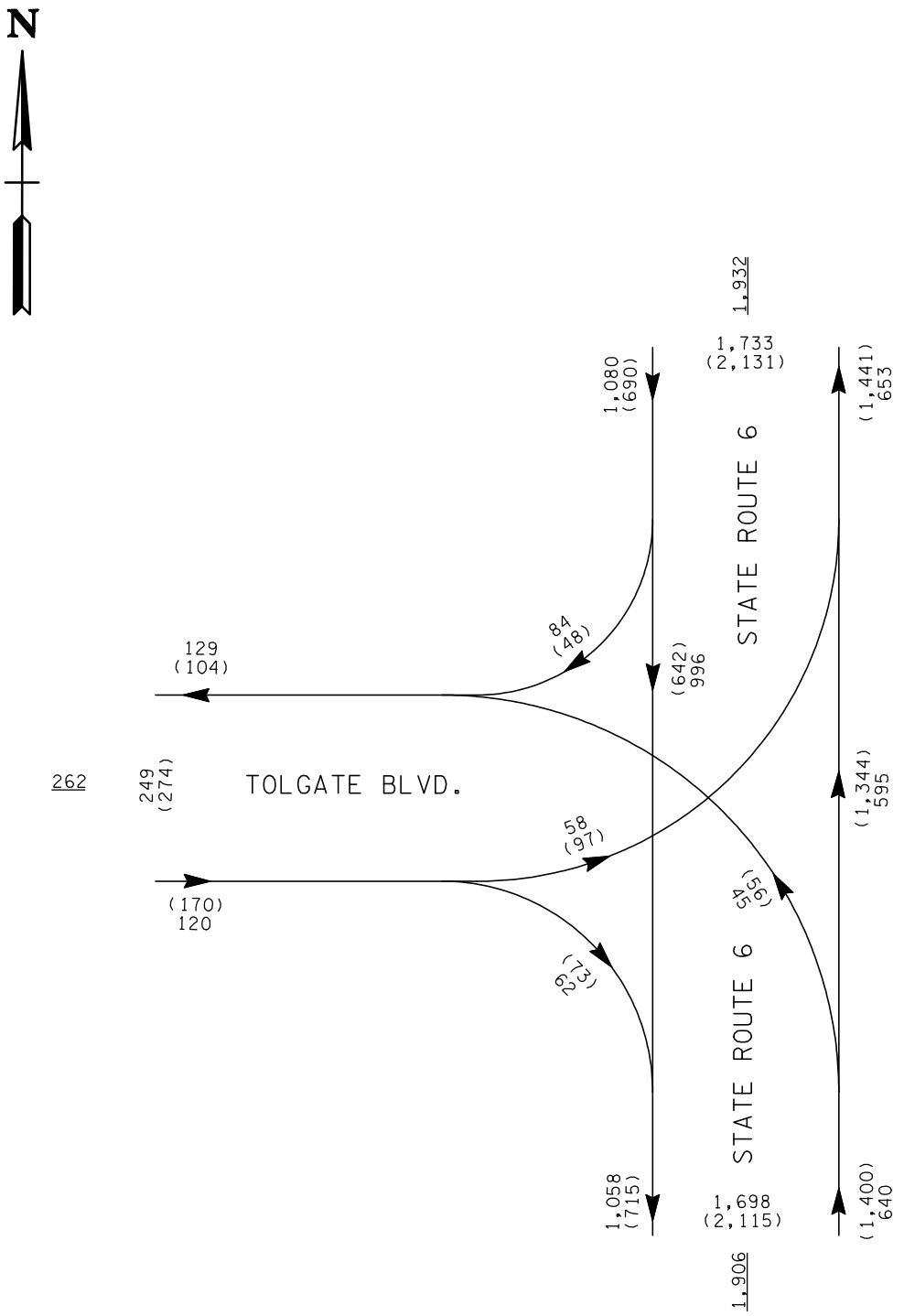
B. TRIP GENERATION

C. TRAFFIC ASSIGNMENT

D. CAPACITY ANALYSIS WORKSHEETS

APPENDIX A

BASE TRAFFIC DATA & TRAFFIC COUNTS



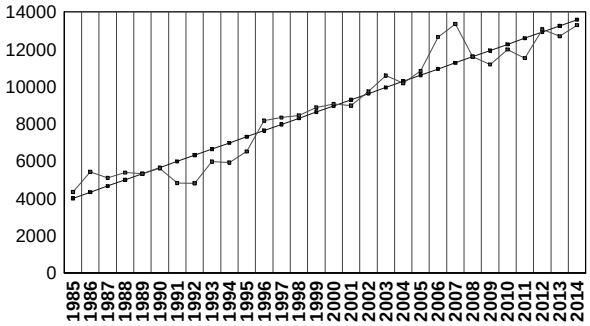
2014 DHV
STATE ROUTE 6 AT TOLGATE BLVD. PM (AM) N.T.S.

County: Williamson **Station Number:** 000094

Route: SR006 **Station Type:** Other Rural **Station Out:** NO

Location: S OF FRANKLIN

Month	Year	Average Weekday Traffic	Average Daily Traffic	Annual Average Daily	Axle Adjustment Factor	Remarks
03	1985	4,172	4,422	4,334	0.98	
02	1986	4,642	5,524	5,414	0.98	
02	1987	4,367	5,197	5,093	0.98	
03	1988	5,080		5,376	0.98	
03	1989	5,157	0	5,310	0.98	ACTUAL = 5459
01	1990	5,487	0	5,600	0.98	ACTUAL = 6721
03	1991	4,509	4,915	4,817	0.98	
03	1992	4,684	4,918	4,800	0.98	
04	1993	6,214	6,090	5,968	0.98	
05	1994	6,225	6,038	5,917	0.98	
04	1995	6,916	6,639	6,506	0.98	
03	1996	8,165	8,328	8,162	0.98	
04	1997	8,850	8,496	8,326	0.98	
04	1998	8,969	8,610	8,438	0.98	
03	1999	8,781	9,044	8,863	0.98	
05	2000	9,826	9,236	9,051	0.98	DIFF MONTH
05	2001	12,271	11,657	8,968	0.98	ACTUAL = 11424
01	2002	9,633	9,922	9,724	0.98	
03	2003	14,458	14,602	10,583	0.98	ACTUAL = 14310
03	2004	9,972	10,370	10,163	0.98	
03	2005	10,927	11,036	10,816	0.98	
05	2006	14,026	12,904	12,646	0.98	UP & DOWN
03	2007	14,185	13,618	13,345	0.98	
03	2008	12,071	11,830	11,593	0.98	
06	2009	0	0	11,170	0.98	TAKEN FROM CLASS
11	2010	12,864	12,221	11,976	0.98	
04	2011	13,200	11,748	11,513	0.98	
05	2012	13,450	13,316	13,049	0.98	
01	2013	12,325	12,941	12,682	0.98	
01	2014	0	0	13,281	0.98	EST



Trend Line based on years 1985 - 2014

COVERAGE COUNT DATA WITH 24 HOUR TOTALS

Station Number:	000094	**County:**	94 Williamson
Start Date:	01 / 16 / 2013	**End Date:**	01 / 17 / 2013
Start Time:	12 : 00	**End Time:**	12 : 00
Direction:	0 (Coverage)		

Time	
12:00 - 13:00	571
13:00 - 14:00	583
14:00 - 15:00	868
15:00 - 16:00	921
16:00 - 17:00	963
17:00 - 18:00	1,000
18:00 - 19:00	755
19:00 - 20:00	452
20:00 - 21:00	426
21:00 - 22:00	261
22:00 - 23:00	176
23:00 - 24:00	92
24:00 - 01:00	43
01:00 - 02:00	20
02:00 - 03:00	19
03:00 - 04:00	32
04:00 - 05:00	66
05:00 - 06:00	339
06:00 - 07:00	856
07:00 - 08:00	1,205
08:00 - 09:00	845
09:00 - 10:00	597
10:00 - 11:00	618
11:00 - 12:00	617

Total: 12,325 x Variation Factor: 1.05 = 12,941 x Truck Factor: 0.98 = AADT: 12,682.4

Peak AM	**Peak Total**	**Peak Hour Factor**	**Peak PM**	**Peak Total**	**Peak Hour Factor**
06:45 - 07:45	1223	0.96	16:30 - 17:30	1018	0.93

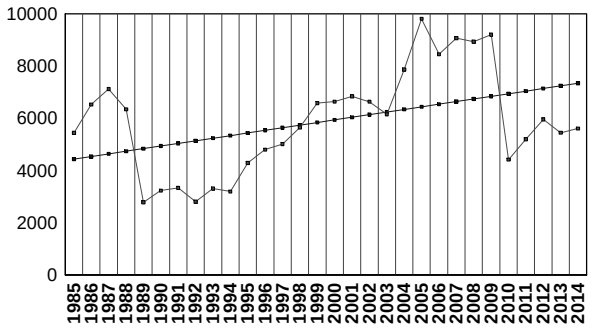
Peak AM %	**Dir Dist AM %**	**Peak PM %**	**Dir Dist PM %**	**Daily Peak %**	**Daily Dir Dist %**
10	65	8	65	10	65

County: Williamson **Station Number:** 000095

Route: SR248 **Station Type:** Other Rural **Station Out:** NO

Location: GOOSE CR BP - S OF FRANKLIN

Month	Year	Average Weekday Traffic	Average Daily Traffic	Annual Average Daily	Axle Adjustment Factor	Remarks
03	1985	5,514	5,845	5,436	0.93	
02	1986	5,894	7,014	6,523	0.93	
02	1987	6,433	7,655	7,119	0.93	
03	1988	6,311		6,339	0.93	
03	1989	7,072	0	2,780	0.93	ACTUAL = 7103
01	1990	2,777		3,228	0.93	SATURN PKWY OPEN
03	1991	3,287	3,583	3,332	0.93	
03	1992	2,895	3,011	2,800	0.93	
04	1993	3,625	3,553	3,304	0.93	
04	1994	3,392	3,290	3,191	0.97	
04	1995	4,600	4,416	4,283	0.97	
03	1996	4,947	4,944	4,796	0.97	
04	1997	5,380	5,165	5,010	0.97	
04	1998	6,061	5,819	5,644	0.97	
03	1999	6,584	6,782	6,579	0.97	
05	2000	7,273	6,837	6,632	0.97	DIFF MONTH
05	2001	11,536	10,959	6,831	0.97	ACTUAL = 10630
02	2002	6,637	6,836	6,631	0.97	
03	2003	8,424	8,508	6,149	0.97	ACTUAL = 8253
03	2004	7,874	8,110	7,866	0.97	HIGH 2 YRS - KEEP
03	2005	10,007	10,107	9,804	0.97	GOING UP
05	2006	9,466	8,709	8,447	0.97	SEE 2004
11	2007	0	0	9,065	0.97	EST
03	2008	5,373	5,266	8,932	0.97	ACTUAL = 5108
06	2009	0	0	9,199	0.97	EST
11	2010	4,787	4,548	4,411	0.99	LOW LAST 2 YRS COUNTED
04	2011	5,892	5,244	5,191	0.99	SEE 2008 ACTUAL
05	2012	6,074	6,013	5,953	0.99	
01	2013	5,234	5,496	5,441	0.99	
01	2014	0	0	5,604	0.99	EST



Trend Line based on years 1985 - 2014

COVERAGE COUNT DATA WITH 24 HOUR TOTALS

Station Number:	000095	**County:**	94 Williamson
Start Date:	01 / 16 / 2013	**End Date:**	01 / 17 / 2013
Start Time:	12 : 00	**End Time:**	12 : 00
Direction:	0 (Coverage)		

Time	
12:00 - 13:00	237
13:00 - 14:00	232
14:00 - 15:00	316
15:00 - 16:00	333
16:00 - 17:00	327
17:00 - 18:00	325
18:00 - 19:00	323
19:00 - 20:00	181
20:00 - 21:00	189
21:00 - 22:00	115
22:00 - 23:00	55
23:00 - 24:00	26
24:00 - 01:00	13
01:00 - 02:00	11
02:00 - 03:00	8
03:00 - 04:00	11
04:00 - 05:00	16
05:00 - 06:00	101
06:00 - 07:00	423
07:00 - 08:00	628
08:00 - 09:00	543
09:00 - 10:00	354
10:00 - 11:00	231
11:00 - 12:00	236

Total: 5,234 x Variation Factor: 1.05 = 5,496 x Truck Factor: 0.99 = AADT: 5,440.74

Peak AM	**Peak Total**	**Peak Hour Factor**	**Peak PM**	**Peak Total**	**Peak Hour Factor**
06:45 - 07:45	634	0.97	15:30 - 16:30	356	0.88

Peak AM %	**Dir Dist AM %**	**Peak PM %**	**Dir Dist PM %**	**Daily Peak %**	**Daily Dir Dist %**
12	65	7	65	12	65

APPENDIX B

TRIP GENERATION

TOLLGATE VILLAGE TRIP GENERATION

Single-Family Detached Housing - 681 Dwelling Units

Use ITE Land Use Code 210 (Single-Family Detached Housing) and associated trip generation rates for 24-hour total trips and peak hour trips.

Average Daily Traffic

Ln(T) = 0.92 Ln(X) + 2.72
Ln(T) = 0.92 Ln(681) + 2.72
T = 6134

A.M. Peak Hour of Adjacent Street Traffic

T = 0.70(X) + 9.74
T = 0.70(681) + 9.74
T = 486

Enter = 0.25(486) = 122
Exit = 0.75(486) = 364

P.M. Peak Hour of Adjacent Street Traffic

Ln(T) = 0.90 Ln(X) + 0.51
Ln(T) = 0.90 Ln(681) + 0.51
T = 591

Enter = 0.63(591) = 372
Exit = 0.37(591) = 219

TOLLGATE VILLAGE TRIP GENERATION

Residential Condominium/Townhouse - 234 Dwelling Units

Use ITE Land Use Code 230 (Residential Condominium/Townhouse) and associated trip generation rates for 24-hour total trips and peak hour trips.

Average Daily Traffic

Ln(T) = 0.87 Ln(X) + 2.46
Ln(T) = 0.87 Ln(234) + 2.46
T = 1348

A.M. Peak Hour of Adjacent Street Traffic

T = 0.80(X) + 0.26
T = 0.80(234) + 0.26
T = 187

Enter = 0.17(187) = 32
Exit = 0.83(187) = 155

P.M. Peak Hour of Adjacent Street Traffic

Ln(T) = 0.82 Ln(X) + 0.32
Ln(T) = 0.82 Ln(234) + 0.32
T = 121

Enter = 0.67(121) = 81
Exit = 0.33(121) = 40

TOLLGATE VILLAGE TRIP GENERATION

Multifamily - 275 Dwelling Units

Use ITE Land Use Code 220 (Apartment) and associated trip generation rates for 24-hour total trips and peak hour trips.

Average Daily Traffic

T = 6.06(X) + 123.56
T = 6.06(275) + 123.56
T = 1790

A.M. Peak Hour of Adjacent Street Traffic

T = 0.49(X) + 3.73
T = 0.49(275) + 3.73
T = 138

Enter = 0.20(138) = 28
Exit = 0.80(138) = 110

P.M. Peak Hour of Adjacent Street Traffic

T = 0.55(X) + 17.65
T = 0.55(275) + 17.65
T = 169

Enter = 0.65(169) = 110
Exit = 0.35(169) = 59

TOLLGATE VILLAGE TRIP GENERATION

Live/Work Units - 49 Dwelling Units

Use ITE Land Use Code 230 (Residential Condominium/Townhouse) and associated trip generation rates for 24-hour total trips and peak hour trips.

Average Daily Traffic

Ln(T) = 0.87 Ln(X) + 2.46
Ln(T) = 0.87 Ln(49) + 2.46
T = 346

A.M. Peak Hour of Adjacent Street Traffic

T = 0.80(X) + 0.26
T = 0.80(49) + 0.26
T = 39

Enter = 0.17(39) = 7
Exit = 0.83(39) = 32

P.M. Peak Hour of Adjacent Street Traffic

Ln(T) = 0.82 Ln(X) + 0.32
Ln(T) = 0.82 Ln(49) + 0.32
T = 33

Enter = 0.67(33) = 22
Exit = 0.33(33) = 11

TOLLGATE VILLAGE TRIP GENERATION

General Office Building - 30,000 Sq. Feet Gross Floor Area (X = GSF/1000)

Use ITE Land Use Code 710 (General Office Building) and associated trip generation rates for 24-hour total trips and peak hour trips.

Average Daily Traffic

Ln(T) = 0.76 Ln(X) + 3.68
Ln(T) = 0.76 Ln(30) + 3.68
T = 526

A.M. Peak Hour

Ln(T) = 0.80 Ln(X) + 1.57
Ln(T) = 0.80 Ln(30) + 1.57
T = 73

Enter = 0.88(73) = 64
Exit = 0.12(73) = 9

P.M. Peak Hour

T = 1.12 (X) + 78.45
T = 1.12 (30) + 78.45
T = 105

Enter = 0.17(105) = 18
Exit = 0.83(105) = 87

TOLLGATE VILLAGE TRIP GENERATION

Medical Office Building - 46,800 Sq. Feet Gross Floor Area (X = GSF/1000)

Use ITE Land Use Code 720 (Medical Office Building) and associated trip generation rates for 24-hour total trips and peak hour trips.

Average Daily Traffic

T = 40.89(X) - 214.97
T = 40.89(46.8) - 214.97
T = 1699

A.M. Peak Hour of Adjacent Street Traffic

T = 2.39(X)
T = 2.39(46.8)
T = 112

Enter = 0.79(112) = 88
Exit = 0.21(112) = 24

P.M. Peak Hour of Adjacent Street Traffic

Ln(T) = 0.90 Ln(X) + 1.53
Ln(T) = 0.90 Ln(46.8) + 1.53
T = 147

Enter = 0.28(147) = 41
Exit = 0.72(147) = 106

TOLLGATE VILLAGE TRIP GENERATION

Shopping Center - 54,000 Sq. Feet Gross Floor Area (X = GSF/1000)

Use ITE Land Use Code 820 (Shopping Center) and associated trip generation rates for 24-hour total trips and peak hour trips.

Average Daily Traffic

Ln(T) = 0.65 Ln(X) + 5.83
Ln(T) = 0.65 Ln(54) + 5.83
T = 4550

A.M. Peak Hour of Adjacent Street Traffic

Ln(T) = 0.61 Ln(X) + 2.24
Ln(T) = 0.61 Ln(54) + 2.24
T = 107

Enter = 0.62(107) = 66
Exit = 0.38(107) = 41

P.M. Peak Hour of Adjacent Street Traffic

Ln(T) = 0.67 Ln(X) + 3.31
Ln(T) = 0.67 Ln(54) + 3.31
T = 396

Enter = 0.48(396) = 190
Exit = 0.52(396) = 206

TOLLGATE VILLAGE TRIP GENERATION

Hotel - 50 Rooms

Use ITE Land Use Code 310 (Hotel) and associated trip generation rates for 24-hour total trips and peak hour trips.

Average Daily Traffic

T = 8.95(X) - 373.16
T = 8.95(50) - 373.16
T = 74

A.M. Peak Hour of Adjacent Street Traffic

T = 0.53(X)
T = 0.53(50)
T = 27

Enter = 0.59(27) = 16
Exit = 0.41(27) = 11

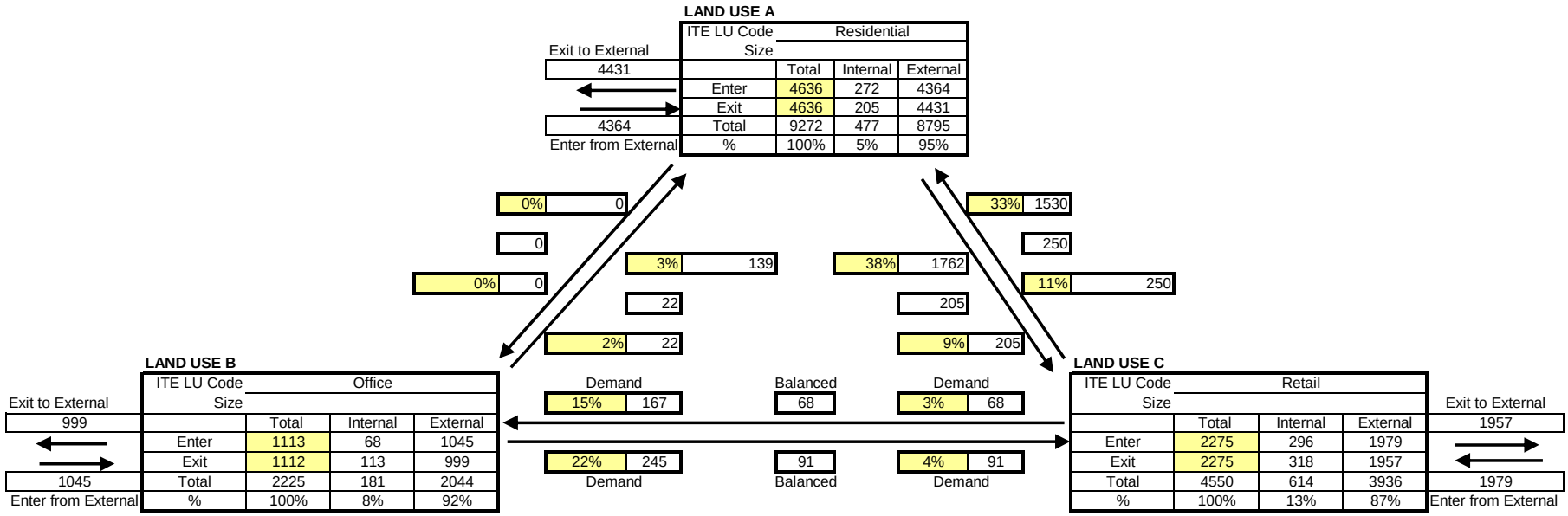
P.M. Peak Hour of Adjacent Street Traffic

T = 0.60(X)
T = 0.60(50)
T = 30

Enter = 0.51(30) = 15
Exit = 0.49(30) = 15

MULTI-USE DEVELOPMENT
TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY

Analyst: bsb
Date: 2/25/2015
Name of Dvlpt: Tollgate Village
Time Period: Daily

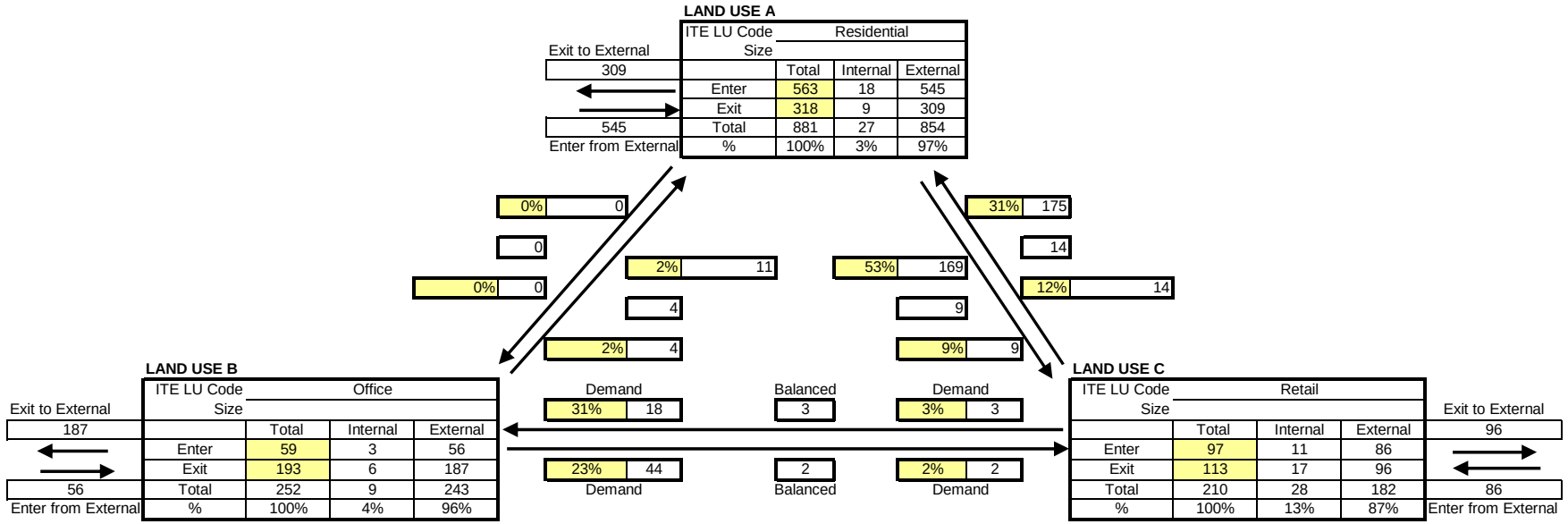


Net External Trips for Multi-Use Development

	LAND USE A	LAND USE B	Land Use C	Total	
Enter	4364	1045	1979	7388	
Exit	4431	999	1957	7387	
Total	8795	2044	3936	14775	INTERNAL CAPTURE
Use Trip. Gen. Est.	9272	2225	4550	16047	8%

Analyst	bsb	Name of Dvlpt	Tollgate Village
Date	2/25/2015	Time Period	PM Peak Hour

MULTI-USE DEVELOPMENT
TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY



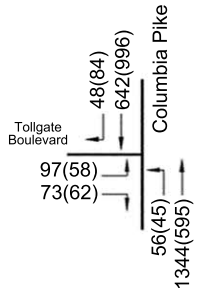
Net External Trips for Multi-Use Development

	LAND USE A	LAND USE B	Land Use C	Total	
Enter	545	56	86	687	
Exit	309	187	96	592	
Total	854	243	182	1279	INTERNAL CAPTURE
Use Trip. Gen. Est.	881	252	210	1343	5%

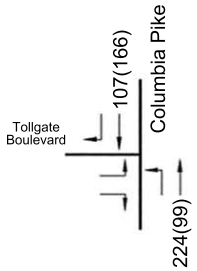
APPENDIX C

TRAFFIC ASSIGNMENT

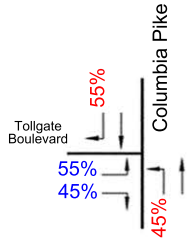
2014 Existing Traffic Volumes



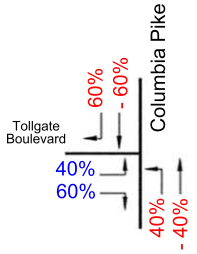
2020 Background Growth



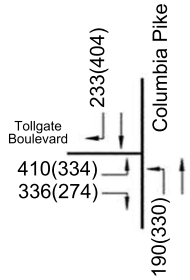
Primary Site Trip Distribution



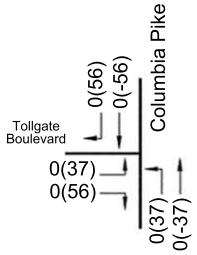
Pass-by Site Trip Distribution



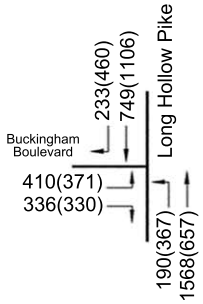
2020 Primary Site Traffic Volumes



2020 Pass-By Site Traffic Volumes



2020 Total Traffic Volumes



Peak Hours
A.M.(P.M.)

RAGAN•SMITH

Tollgate Village
Columbia Pike at Tollgate Boulevard
Intersection Traffic Volumes

Figure
C1

APPENDIX D

CAPACITY ANALYSIS WORKSHEETS

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*bsb*
Agency/Co.	*Ragan-Smith*
Date Performed	*2/25/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Intersection	*Columbia Pk @ Tollgate Blvd*
Jurisdiction	*Thompson's Station*
Analysis Year	*2014 Base Traffic*

Project Description *Tollgate Village*

East/West Street: *Tollgate Blvd* | North/South Street: *Columbia Pike*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*56*	*1344*			*642*	*48*
Peak-Hour Factor, PHF	*0.96*	*0.96*	*1.00*	*1.00*	*0.96*	*0.96*
Hourly Flow Rate, HFR (veh/h)	*58*	*1400*	*0*	*0*	*668*	*50*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Two Way Left Turn Lane*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*0*	*0*	*2*	*0*
Configuration	*L*	*T*			*T*	*TR*
Upstream Signal		*1*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*97*		*73*			
Peak-Hour Factor, PHF	*0.96*	*1.00*	*0.96*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*101*	*0*	*76*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (veh/h)	*58*					*101*		*76*
C (m) (veh/h)	*892*					*262*		*690*
v/c	*0.07*					*0.39*		*0.11*
95% queue length	*0.21*					*1.73*		*0.37*
Control Delay (s/veh)	*9.3*					*27.1*		*10.9*
LOS	*A*					*D*		*B*
Approach Delay (s/veh)	--	--				*20.1*		
Approach LOS	--	--				*C*		

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*bsb*
Agency/Co.	*Ragan-Smith*
Date Performed	*2/25/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Intersection	*Columbia Pk @ Tollgate Blvd*
Jurisdiction	*Thompson's Station*
Analysis Year	*2014 Base Traffic*

Project Description *Tollgate Village*

East/West Street: *Tollgate Blvd* | North/South Street: *Columbia Pike*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*45*	*595*			*996*	*84*
Peak-Hour Factor, PHF	*0.93*	*0.93*	*1.00*	*1.00*	*0.93*	*0.93*
Hourly Flow Rate, HFR (veh/h)	*48*	*639*	*0*	*0*	*1070*	*90*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Two Way Left Turn Lane*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*0*	*0*	*2*	*0*
Configuration	*L*	*T*			*T*	*TR*
Upstream Signal		*1*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*58*		*62*			
Peak-Hour Factor, PHF	*0.93*	*1.00*	*0.93*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*62*	*0*	*66*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (veh/h)	*48*					*62*		*66*
C (m) (veh/h)	*610*					*212*		*518*
v/c	*0.08*					*0.29*		*0.13*
95% queue length	*0.26*					*1.17*		*0.43*
Control Delay (s/veh)	*11.4*					*28.9*		*13.0*
LOS	*B*					*D*		*B*
Approach Delay (s/veh)	--	--				*20.7*		
Approach LOS	--	--				*C*		

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*bsb*
Agency/Co.	*Ragan-Smith*
Date Performed	*2/25/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Intersection	*Columbia Pk @ Tollgate Blvd*
Jurisdiction	*Thompson's Station*
Analysis Year	*2020 Total Traffic*

Project Description *Tollgate Village*

East/West Street: *Tollgate Blvd* | North/South Street: *Columbia Pk*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*190*	*1568*			*749*	*233*
Peak-Hour Factor, PHF	*0.96*	*0.96*	*1.00*	*1.00*	*0.96*	*0.96*
Hourly Flow Rate, HFR (veh/h)	*197*	*1633*	*0*	*0*	*780*	*242*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Two Way Left Turn Lane*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*0*	*0*	*2*	*0*
Configuration	*L*	*T*			*T*	*TR*
Upstream Signal		*1*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*410*		*336*			
Peak-Hour Factor, PHF	*0.96*	*1.00*	*0.96*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*427*	*0*	*350*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (veh/h)	*197*					*427*		*350*
C (m) (veh/h)	*687*					*142*		*567*
v/c	*0.29*					*3.01*		*0.62*
95% queue length	*1.18*					*39.66*		*4.19*
Control Delay (s/veh)	*12.3*					*970.0*		*21.0*
LOS	*B*					*F*		*C*
Approach Delay (s/veh)	--	--				*542.6*		
Approach LOS	--	--				*F*		

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*bsb*
Agency/Co.	*Ragan-Smith*
Date Performed	*2/25/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Intersection	*Columbia Pk @ Tollgate Blvd*
Jurisdiction	*Thompson's Station*
Analysis Year	*2020 Total Traffic*

Project Description *Tollgate Village*

East/West Street: *Tollgate Blvd* | North/South Street: *Columbia Pk*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*367*	*657*			*1106*	*460*
Peak-Hour Factor, PHF	*0.93*	*0.93*	*1.00*	*1.00*	*0.93*	*0.93*
Hourly Flow Rate, HFR (veh/h)	*394*	*706*	*0*	*0*	*1189*	*494*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Two Way Left Turn Lane*					
RT Channelized			*0*			*0*
Lanes	*1*	*2*	*0*	*0*	*2*	*0*
Configuration	*L*	*T*			*T*	*TR*
Upstream Signal		*1*			*0*	

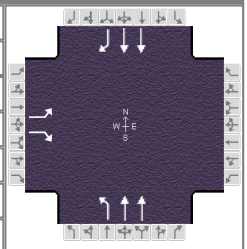
Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*371*		*330*			
Peak-Hour Factor, PHF	*0.93*	*1.00*	*0.93*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*398*	*0*	*354*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (veh/h)	*394*					*398*		*354*
C (m) (veh/h)	*385*							*367*
v/c	*1.02*							*0.96*
95% queue length	*12.73*							*10.74*
Control Delay (s/veh)	*85.4*							*72.6*
LOS	*F*							*F*
Approach Delay (s/veh)	--	--						
Approach LOS	--	--						

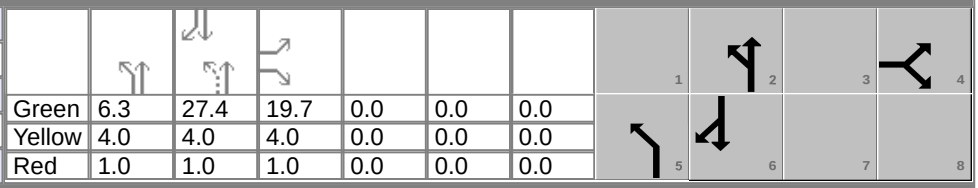
HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Ragan-Smith			Duration, h	0.25
Analyst	bsb	Analysis Date	Feb 25, 2015	Area Type	Other
Jurisdiction	Thompson's Station	Time Period	AM Peak Hour	PHF	0.92
Intersection	Columbia Pk @ Tollgate Bl	Analysis Year	2020	Analysis Period	1> 7:00
File Name	2020_Total_SR 6 @ Tollgate_AM Peak.xus				
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	410		336				190	1568			749	233

Signal Information			
Cycle, s	68.5	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	6.3	27.4	19.7	0.0	0.0	0.0			
Yellow	4.0	4.0	4.0	0.0	0.0	0.0			
Red	1.0	1.0	1.0	0.0	0.0	0.0			

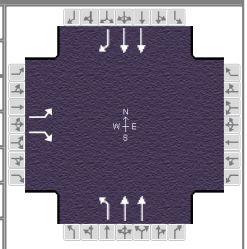
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		7.3
Phase Duration, s		24.7			11.3	43.8		32.4
Change Period, ($Y+R_c$), s		5.0			5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.3			3.0	3.0		3.0
Queue Clearance Time (g_s), s		18.0			6.2	28.5		14.0
Green Extension Time (g_e), s		1.6			0.2	10.1		10.0
Phase Call Probability		1.00			0.98	1.00		1.00
Max Out Probability		0.04			0.00	0.02		0.03

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	446		365				207	1704			814	253
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810		1610				1810	1809			1809	1610
Queue Service Time (g_s), s	16.0		14.4				4.2	26.5			12.0	7.7
Cycle Queue Clearance Time (g_c), s	16.0		14.4				4.2	26.5			12.0	7.7
Green Ratio (*g/C*)	0.29		0.29				0.52	0.57			0.40	0.40
Capacity (*c*), veh/h	521		464				428	2049			1451	646
Volume-to-Capacity Ratio (*X*)	0.855		0.787				0.482	0.832			0.561	0.392
Available Capacity (c_a), veh/h	790		703				656	3949			2896	1289
Back of Queue (*Q*), veh/ln (95th percentile)	11.2		9.0				2.4	12.2			7.5	4.3
Queue Storage Ratio (*RQ*) (95th percentile)	1.12		0.90				0.24	0.00			0.00	0.43
Uniform Delay (d_1), s/veh	23.1		22.5				10.8	12.2			15.9	14.6
Incremental Delay (d_2), s/veh	3.8		1.6				0.3	0.3			0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	26.9		24.2				11.1	12.6			16.0	14.8
Level of Service (LOS)	C		C				B	B			B	B
Approach Delay, s/veh / LOS	25.7	C		0.0			12.4	B		15.7	B	
Intersection Delay, s/veh / LOS	16.2						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.9	C	0.7	A	2.3	B
Bicycle LOS Score / LOS		F			2.1	B	1.4	A

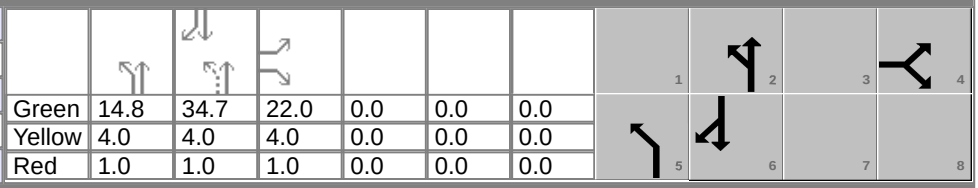
HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Ragan-Smith			Duration, h	0.25
Analyst	bsb	Analysis Date	Feb 25, 2015	Area Type	Other
Jurisdiction	Thompson's Station	Time Period	PM Peak Hour	PHF	0.92
Intersection	Columbia Pk @ Tollgate Bl	Analysis Year	2020	Analysis Period	1> 7:00
File Name	2020_Total_SR 6 @ Tollgate_PM Peak.xus				
Project Description	Tollgate Village				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	372		330				369	657			1106	461

Signal Information			
Cycle, s	86.6	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	14.8	34.7	22.0	0.0	0.0	0.0		
Yellow	4.0	4.0	4.0	0.0	0.0	0.0		
Red	1.0	1.0	1.0	0.0	0.0	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		7.3
Phase Duration, s		27.0			19.8	59.5		39.7
Change Period, ($Y+R_c$), s		5.0			5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.3			3.0	3.0		3.0
Queue Clearance Time (g_s), s		20.6			14.4	9.9		27.8
Green Extension Time (g_e), s		1.4			0.4	7.5		6.8
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		0.09			0.15	0.00		0.10

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	404		359				401	714			1202	501
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810		1610				1810	1809			1809	1610
Queue Service Time (g_s), s	18.6		18.5				12.4	7.9			25.8	23.5
Cycle Queue Clearance Time (g_c), s	18.6		18.5				12.4	7.9			25.8	23.5
Green Ratio (*g/C*)	0.25		0.25				0.60	0.63			0.40	0.40
Capacity (*c*), veh/h	461		410				442	2279			1451	646
Volume-to-Capacity Ratio (*X*)	0.877		0.875				0.908	0.313			0.829	0.776
Available Capacity (c_a), veh/h	626		557				549	3130			2087	929
Back of Queue (*Q*), veh/ln (95th percentile)	13.8		12.6				10.3	4.3			15.3	12.9
Queue Storage Ratio (*RQ*) (95th percentile)	1.38		1.26				1.03	0.00			0.00	1.29
Uniform Delay (d_1), s/veh	31.0		31.0				20.8	7.4			23.3	22.6
Incremental Delay (d_2), s/veh	8.4		9.1				15.0	0.0			1.3	1.5
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	39.4		40.1				35.8	7.4			24.6	24.0
Level of Service (LOS)	D		D				D	A			C	C
Approach Delay, s/veh / LOS	39.7		D	0.0			17.6		B	24.4		C
Intersection Delay, s/veh / LOS	25.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.9	C	0.7	A	2.3	B
Bicycle LOS Score / LOS		F			1.4	A	1.9	A

TRAFFIC STUDY

for

TOLLGATE VILLAGE

Thompson's Station, Tennessee

December 20, 2016

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10-081 / 9260

TOLLGATE VILLAGE
TRAFFIC STUDY

TABLE OF CONTENTS

TOLLGATE VILLAGE
TRAFFIC STUDY

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

INTRODUCTION

Tollgate Village is located on the west side of Columbia Pike (US Highway 31 / State Route 6) between Independence High School and the West Harpeth River in the Town of Thompson's Station, Tennessee. The purpose of this traffic study is to review the need for a traffic signal at the intersection of Columbia Pike at Tollgate Boulevard and to establish a schedule of improvements for traffic mitigation including a secondary access at Tollgate Village.

EXISTING CONDITIONS

Turning movement traffic count data for the intersection of Columbia Pike and Tollgate Boulevard was collected on November 17, 2016 during the following times:

- 6:00 a.m. – 7:00 p.m.

Based on the traffic count data, the a.m., midday, and p.m. peak hours for intersection analysis are ***6:45 a.m. – 7:45 a.m.***, ***1:00 p.m. – 2:00 p.m.***, and ***4:45 p.m. – 5:45 p.m.***, respectively.

STUDY METHODOLOGY

The Manual on Uniform Traffic Control Devices (MUTCD) published by the Federal Highway Administration (FHWA) provides signal warrants that are the basis for the consideration of traffic signal need and new traffic signal installation. The nine (9) MUTCD traffic signal warrants are listed below.

- Warrant 1, Eight-Hour Vehicular Volume
- Warrant 2, Four-Hour Vehicular Volume
- Warrant 3, Peak Hour
- Warrant 4, Pedestrian Volume
- Warrant 5, School Crossing
- Warrant 6, Coordinated Signal System
- Warrant 7, Crash Experience
- Warrant 8, Roadway Network
- Warrant 9, Intersection Near a Grade Crossing

Warrant 1 (Eight-Hour Vehicular Volume) and Warrant 2 (Four-Hour Vehicular Volume) were specifically considered in this study as they are applicable to the study area and Tollgate Village development.

In addition to the evaluation of the need for a traffic signal, the need for other traffic mitigation measures was assessed based upon intersection capacity analysis and warrants for turn lanes. The schedule for a secondary access at Tollgate Village was established based upon the available capacity at the intersection of Columbia Pike and Tollgate Boulevard and the development growth that could be served by the available capacity.

TRAFFIC ANALYSIS

The intersection of Columbia Pike and Tollgate Boulevard was analyzed for improvement needs and capacity deficiencies.

For this intersection, the following traffic analyses were conducted:

- Traffic Signal Warrant Evaluation – 2016 Existing Traffic Volumes
- Intersection Capacity Analysis – 2016 Existing Traffic Volumes
- Intersection Capacity Analysis – Available Future Capacity (to determine schedule for secondary access need)

CONCLUSIONS AND RECOMMENDATIONS

- A traffic signal should be installed at the intersection of Columbia Pike and Tollgate Boulevard. The existing northbound lanes that merge from two to one at Tollgate Boulevard should be extended approximately 300 feet north of Tollgate Boulevard to provide merging area downstream of the new traffic signal. The Tollgate Village developer has already completed design plans for a traffic signal including the extended northbound merge area at this intersection and has submitted the plans to the Town of Thompson's Station for approval and to TDOT as part of a grading permit application.

- A southbound right turn lane should be constructed on Columbia Pike at Tollgate Boulevard. The right turn lane should have a full width storage length of 275 feet and a taper length of 100 feet. The Tollgate Village developer has already completed design plans for a southbound right turn lane at this intersection and has submitted the plans to the Town of Thompson's Station for approval and to TDOT as part of a grading permit application.

- Based upon traffic operations and the intersection capacity, a secondary access to Tollgate Village should be provided after 248 additional single family homes have been completed.

- If land uses other than single family homes are proposed for Tollgate Village before 248 additional single family homes have been completed, the current edition of the ITE *Trip Generation Manual* should be used to establish a trip generation equivalent for the proposed land use.

- The preferred option for secondary access is to Declaration Way south of Tollgate Village. This secondary access location is in close proximity to portions of Tollgate Village that are already developed and occupied and it will provide a reciprocal secondary access to Independence High School.

- New traffic counts should be conducted at the intersection of Columbia Pike and Tollgate Boulevard after 248 additional single family homes are complete in order to assess the traffic signal timing plan and implement any signal timing modifications that may improve the operation and efficiency of the traffic signal.

- Based upon recent development progress and the anticipated development schedule, the completion of 248 additional single family homes will take approximately 3 years. Therefore, the first half of 2020 can be established as a reasonable schedule for providing a secondary access to Tollgate Village.

I. INTRODUCTION

The specific scope and purpose of this study is to review the need for a traffic signal at the intersection of Columbia Pike at Tollgate Boulevard and to establish a schedule of improvements for traffic mitigation including a secondary access at the Tollgate Village community located in the Town of Thompson's Station, Tennessee. This traffic study and the specific scope of the study have been requested by the Town of Thompson's Station staff and planning commission as part of the Final Plat submittal for Tollgate Village Section 15.

In order to evaluate the justification of a traffic signal installation and other traffic mitigation needs, current data must be collected regarding intersection geometrics, daily and peak period vehicle turning movement counts, traffic flow characteristics in the study area, and accident histories at the intersection. Once this information is collected, specific warrants must be reviewed for satisfaction. The warrants for traffic signals have been developed and are outlined in the Manual on Uniform Traffic Control Devices (MUTCD) published by the Federal Highway Administration (FHWA). These warrants relate to the need for a traffic signal based upon several variables, including:

- Traffic volumes entering the intersection
- Proximity to a school zone
- Specific accident experience
- Relationship to a system of adjacent signalized intersections
- Railroad at-grade crossing near the intersection

Intersection capacity analysis and turn lane warrant tools were checked to identify traffic mitigation measures other than a traffic signal installation that are appropriate for the Tollgate Village community.

Finally, recommendations were offered for roadway improvements or intersection control modifications based on the collected data and completed analyses.

II. EXISTING CONDITIONS

A. Transportation System

The existing transportation system in the area that provides access to Tollgate Village consists of arterial and collector roadways. The following roadways will comprise the study area for consideration of traffic mitigation measures at Tollgate Village.

- **Columbia Pike (US Highway 31 / State Route 6)** in the study area is classified as a minor arterial on the Tennessee Department of Transportation (TDOT) functional classification system and is listed as an arterial in the General Plan for Thompson's Station. The current Thompson's Station Road Map does not indicate a classification for Columbia Pike. The Columbia Pike corridor connects the cities of Franklin and Columbia and passes through the Town of Thompson's Station and the City of Spring Hill. Within the vicinity of Tollgate Village, Columbia Pike transitions from a two-lane to a five-lane roadway between the West Harpeth River and Tollgate Boulevard. The five-lane section of Columbia Pike continues to the south beyond State Route 840. The posted speed limit on Columbia Pike is 45 mph.

- **Tollgate Boulevard** is listed as a collector roadway in the General Plan for Thompson's Station. The current Thompson's Station Road Map does not indicate a classification for Tollgate Boulevard. Tollgate Boulevard is two-lane roadway and provides primary access to Tollgate Village. Tollgate Boulevard ends within the Tollgate Village development and does not provide access to any area adjacent to or beyond the area included on the Tollgate Village concept plan. The posted speed limit on Tollgate Boulevard is 30 mph.

Figure 1 shows the location of Tollgate Village and the intersection of Columbia Pike at Tollgate Boulevard. Figure 2 shows an aerial layout of the Tollgate Village community.

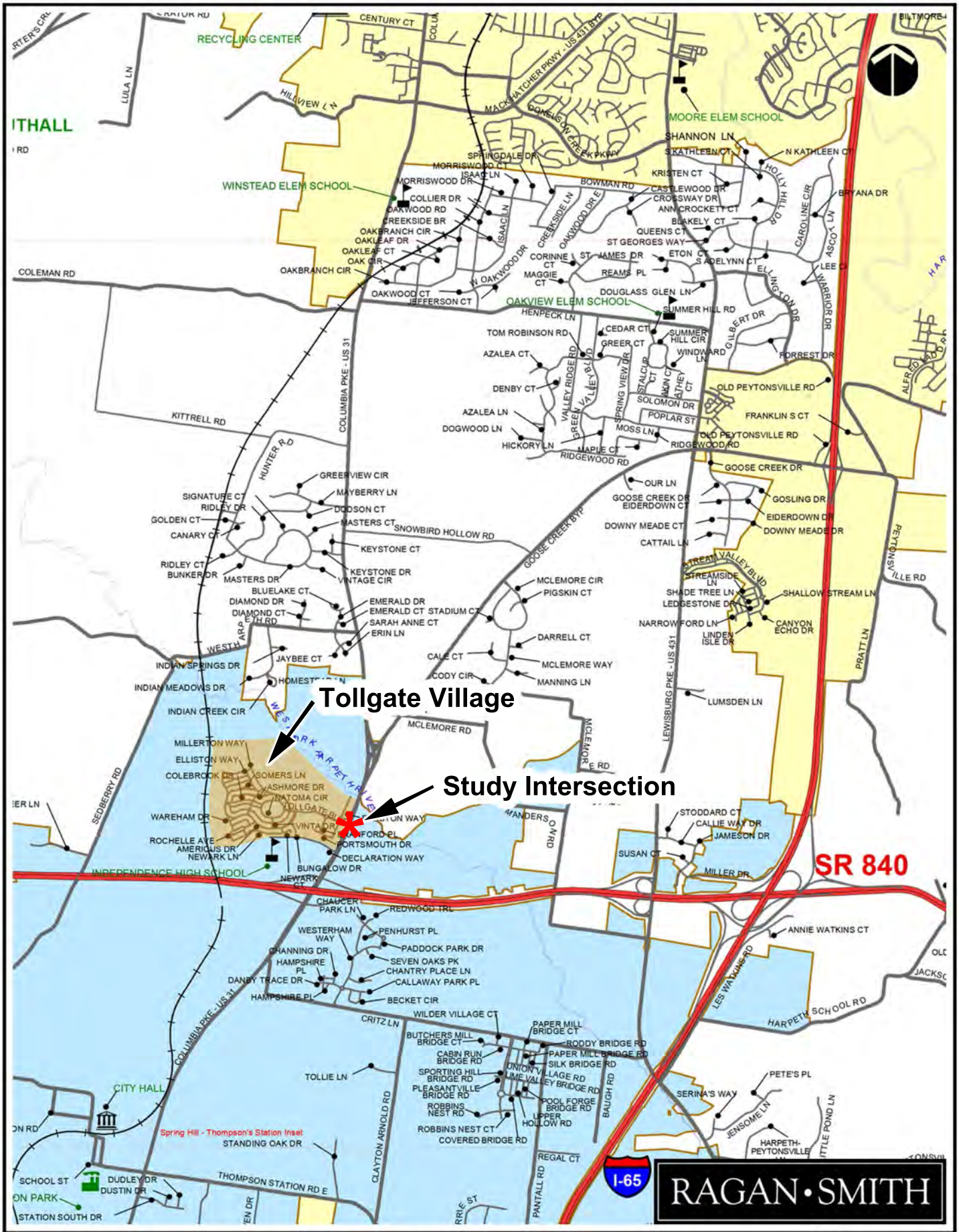
B. Project Access

Access to Tollgate Village includes an existing primary access and future, proposed secondary access as described below.

- Primary Access – Primary access to Tollgate Village is provided by Tollgate Boulevard. Tollgate Boulevard intersects Columbia Pike approximately 1,875 feet north of the State Route 840 interchange and approximately 1,900 feet south of the Goose Creek Bypass (State Route 248). Tollgate Boulevard consists of one (1) lane for traffic entering Tollgate Village and two (2) lanes for traffic exiting Tollgate Village. The exiting lane assignment on Tollgate Boulevard includes one (1) right turn lane and one (1) left turn lane with storage lengths of approximately 200 feet. This access is currently unsignalized and two-way stop control is in place at Columbia Pike.

- Secondary Access (North) – The Tollgate Village Concept Plan indicates that a secondary access to Columbia Pike will be located approximately 640 feet north of Tollgate Boulevard. Other than the existing Shelter Insurance building, this location will provide access to portions of Tollgate Village that are currently undeveloped.

- Secondary Access (South) – The Tollgate Village Concept Plan includes a proposed connection to Declaration Way, the existing access drive to Independence High School. This location will provide access to the Vintage Tollgate site and Williamson Medical Group office building from Columbia Pike via Declaration Way. Access at this location will require an agreement with Williamson County Schools.



Tollgate Village Location Map

Figure 1

Tollgate Village
Aerial Layout

Figure
2

C. Traffic Volumes

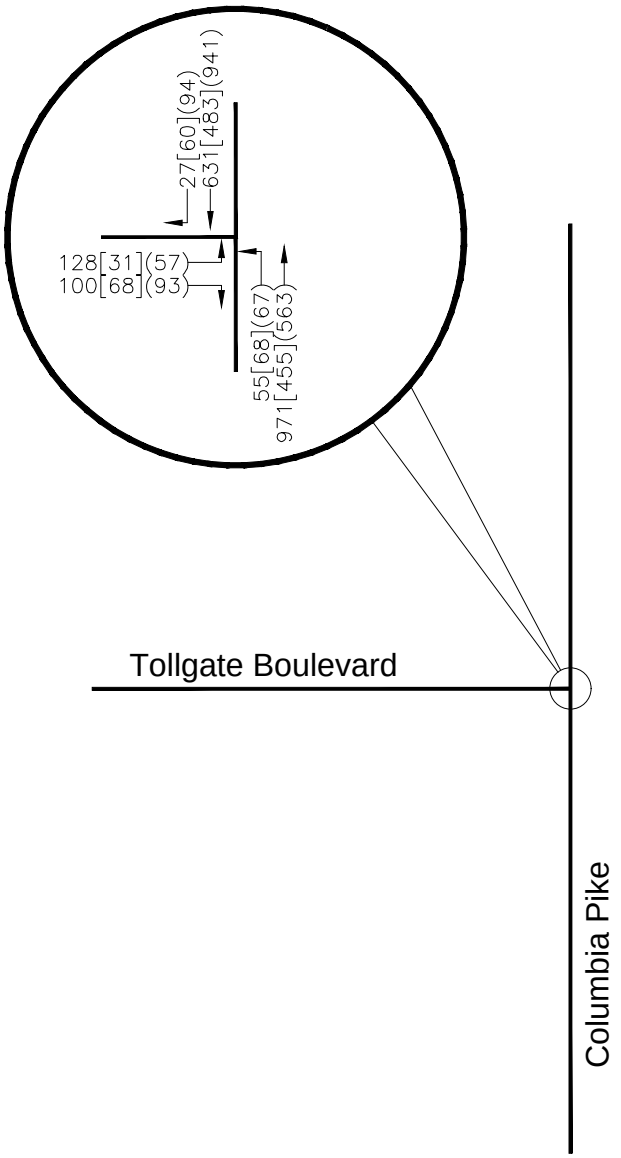
The evaluation of the need for a traffic signal and other traffic mitigation measures at the intersection of Columbia Pike and Tollgate Boulevard was based on turning movement traffic counts collected by Ragan-Smith representatives and historical traffic count data available from the Tennessee Department of Transportation (TDOT).

TDOT collects 24 hour traffic count data on a yearly basis at over 12,000 locations across the State of Tennessee. Within the study area, data from three TDOT annual traffic count locations within 2 miles of the subject intersection was used to determine the peak periods for traffic on an average weekday. Based on the TDOT traffic data, turning movement counts were conducted at the intersection of Columbia Pike and Tollgate Boulevard on November 17, 2016 beginning at 6:00 a.m. and ending at 7:00 p.m.

In total, 13 hours of traffic data was gathered at the intersection of Columbia Pike and Tollgate Boulevard to analyze the need for a traffic signal. Counts taken manually include the recording of 15-minute interval totals to assess peaking characteristics during the day. Raw count data is included in the Appendix of this report. All manual counts were specific to turning movement volumes.

The peak hour of traffic during the a.m. and/or p.m. periods is typically used to assess the operational characteristics of an intersection. For this study, the midday peak hour has also been reviewed. According to the traffic counts conducted on Columbia Pike at Tollgate Boulevard, the a.m., midday, and p.m. peak hours for intersection analysis are ***6:45 a.m. – 7:45 a.m.***, ***1:00 p.m. – 2:00 p.m.***, and ***4:45 p.m. – 5:45 p.m.***, respectively.

Figure 3 shows the 2016 a.m., midday, and p.m. peak hour traffic volumes for the intersection of Columbia Pike at Tollgate Boulevard.



Legend:

XX[XX](XX) = AM[MID](PM) Peak Hour Traffic Volumes

Tollgate Village
2016 Existing Traffic Volumes

Figure
3

III. METHODOLOGY

A. Introduction

In order to assess the need for traffic signals at the intersection of Long Hollow Pike at Upper Station Camp Creek Road / Brixton Boulevard, existing intersection conditions were checked against specific warrants found in the Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD). The purpose of the signal warrants is to consider factors related to the operation and safety of the intersection and the potential to improve these conditions. The MUTCD provides guidance that a traffic signal should not be installed unless one or more of the signal warrants are satisfied. The nine (9) MUTCD traffic signal warrants are listed below.

- Warrant 1, Eight-Hour Vehicular Volume
- Warrant 2, Four-Hour Vehicular Volume
- Warrant 3, Peak Hour
- Warrant 4, Pedestrian Volume
- Warrant 5, School Crossing
- Warrant 6, Coordinated Signal System
- Warrant 7, Crash Experience
- Warrant 8, Roadway Network
- Warrant 9, Intersection Near a Grade Crossing

Warrant 1 (Eight-Hour Vehicular Volume) and Warrant 2 (Four-Hour Vehicular Volume) were specifically considered in this study as they are applicable to the study area and Tollgate Village development.

In addition to the evaluation of the need for a traffic signal, the need for other traffic mitigation measures was assessed based upon intersection capacity analysis and warrants for turn lanes. The schedule for a secondary access at Tollgate Village was established based upon the available capacity at the intersection of Columbia Pike and Tollgate Boulevard and the development growth that could be served by the available capacity.

B. Signal Warrant Description

This study is being completed at the request of the Town of Thompson's Station staff and planning commission as part of the Final Plat submittal for Tollgate Village Section 15. The requirement for Tollgate Village to check signal warrants at the intersection of Columbia Pike and Tollgate Boulevard is based primarily upon the development traffic using this intersection. Therefore, the traffic signal warrants that consider intersection traffic volumes will be the primary focus of this study.

A description of each of the MUTCD traffic signal warrants and statement of its applicability to this study is shown below.

- **Warrant 1, Eight-Hour Vehicular Volume**

  The intended application of this warrant is at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal or where the traffic volume on a major street is so heavy that traffic on a minor intersecting street experiences significant delay or conflict when entering or crossing the major street.

This warrant is applicable to the evaluation of the subject intersection and will be reviewed further in this study.

- **Warrant 2, Four-Hour Vehicular Volume**

  This warrant is intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

  This warrant is applicable to the evaluation of the subject intersection and will be reviewed further in this study.

- **Warrant 3, Peak Hour**

  This warrant is intended for use at a location where traffic conditions cause minor-street traffic to suffer undue delay when entering or crossing the major street for a minimum of 1 hour of an average day. This signal warrant is generally applied only in specific locations that attract or discharge large numbers of vehicles over a short time.

  This warrant may not be applicable due to the trip generation characteristics of the residential land uses. However, since traffic volumes are available at the subject intersection this warrant will be reviewed further in this study.

- **Warrant 4, Pedestrian Volume**

  This warrant is intended to be used where a high traffic volume on the major street causes pedestrians excessive delay when crossing the major street.

  This warrant is not applicable at the subject intersection because there are no pedestrian facilities located on Columbia Pike and no pedestrians were observed crossing Columbia Pike during the traffic count collection. This warrant will not be reviewed further in this study.

- **Warrant 5, School Crossing**

  The School Crossing signal warrant should be evaluated where the fact that school children cross the major street is the principal reason to consider installing a traffic control signal.

  The nearest school to the study area is located 0.2 miles away but there is no crossing for school children on Columbia Pike at the subject intersection or at the school access. Therefore, this warrant is not applicable at the subject intersection and will not be reviewed further in this study.

- **Warrant 6, Coordinated Signal System**

  This warrant is intended to be used where a coordinated signal system is in place and sometimes necessitates installing traffic control signals at intersections where

they would not otherwise be needed in order to maintain proper platooning of vehicles.

The Town of Thompson's Station and the City of Spring Hill have a coordinated signal system that begins approximately 2.5 miles south of the subject intersection. Two existing traffic signals and one planned traffic signal are located between the coordinated signal system and the subject intersection. This warrant is not applicable at the subject intersection and will not be reviewed further in this study.

- **Warrant 7, Crash Experience**

  The Crash Experience signal warrant is intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal.

  Based upon a Road Safety Audit Report prepared by TDOT in 2015, the crash experience data for the subject intersection does not meet the minimum criteria for application of this warrant. Therefore, this warrant will not be reviewed further in this study.

- **Warrant 8, Roadway Network**

  This warrant is intended for use when installing a traffic control signal at some intersections might be justified to encourage concentration and organization of traffic flow on a roadway network.

  This warrant is not applicable at the project intersection and will not be reviewed further in this study.

- **Warrant 9, Intersection Near a Grade Crossing**

  The Intersection Near a Grade Crossing signal warrant is intended for use at a location where none of the conditions described in the other eight traffic signal warrants are met, but the proximity to the intersection of a grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic control signal.

  This warrant is not applicable at the project intersection and will not be reviewed further in this study.

C. Project Access Improvements

As part of the assessment of appropriate traffic mitigation measures for Tollgate Village, a review of turn lane warrants and intersection capacity analysis has been completed for the intersection of Columbia Pike at Tollgate Boulevard.

The purpose of the turn lane warrant review is to determine if there is a need for turn lanes on Columbia Pike at Tollgate Boulevard. Since there is an existing left turn lane on Columbia Pike at Tollgate Boulevard, only the right turn lane warrants will be reviewed in this study.

The purpose of the intersection capacity analysis is to determine the quality of the existing traffic operations and to confirm that appropriate intersection control or laneage improvements indicated by the traffic signal warrant and turn lane warrant reviews will improve the quality of traffic operations. Additionally, the schedule for a secondary access at Tollgate Village was established based upon the available capacity at the intersection of Columbia Pike and Tollgate Boulevard and the development growth that could be served by the available capacity.

IV. TRANSPORTATION ANALYSIS

A. Traffic Signal Warrants

As discussed in the methodology portion of this study, Warrant 1 (Eight-Hour Vehicular Volume) and Warrant 2 (Four-Hour Vehicular Volume) are applicable to the study area and will be evaluated for the intersection of Columbia Pike at Tollgate Boulevard. Additionally, the availability of the traffic volume data allows an evaluation of Warrant 3 (Peak Hour) to be completed. The traffic data checked against the signal warrants includes 2016 existing counted traffic volumes.

The existing laneage and traffic volumes at the intersection of Columbia Pike and Tollgate Boulevard were compared to the traffic signal criteria shown in the MUTCD. As provided for in the MUTCD, the right-turn traffic on the minor street (Tollgate Boulevard) at this intersection was reduced since right-turn movements can experience less delay than left-turn or through movements when a separate right turn lane is provided. The right turn volume reduction was determined based upon the method presented in the National Cooperative Highway Research Program (NCHRP) Report 457, *Evaluating Intersection Improvements: An Engineering Study Guide*, that considers the major street traffic that conflicts with the right-turn movement, the number of lanes serving the conflicting volume, and the geometry of the minor street approach. The NCHRP Report 457 analysis indicated that all right turn movements on Tollgate Boulevard should be subtracted for each hour evaluated.

The existing traffic data and a summary of the signal warrant evaluation results for the intersection of Columbia Pike at Tollgate Boulevard are shown below in Table 1.

TABLE 1

TRAFFIC SIGNAL WARRANT SUMMARY

COLUMBIA PIKE AT TOLLGATE BOULEVARD

Time Period	Major Street Volume	Minor Street Volume	Traffic Signal Warrant				
			#1			#2	#3B
			Cond. A (70%)	Cond. B (70%)	Combination (56%)	70%	70%
6 a.m. – 7 a.m.	1,282	101		X	X	X	X
7 a.m. - 8 a.m.	1,597	125	X	X	X	X	X
8 a.m. - 9 a.m.	1,285	106	X	X	X	X	X
9 a.m. - 10 a.m.	994	77		X		X	
10 a.m. - 11 a.m.	961	57		X			
11 a.m. - 12 p.m.	931	75		X		X	
12 p.m. - 1 p.m.	968	48					
1 p.m. - 2 p.m.	1,067	32					
2 p.m. - 3 p.m.	1,312	54		X			
3 p.m. - 4 p.m.	1,435	46					
4 p.m. - 5 p.m.	1,624	48					
5 p.m. - 6 p.m.	1,580	53		X			
No. of Hours that Warrant is Satisfied			2	8	3	5	3
Minimum Hours to Satisfy Warrant			8	8	8	4	1
Is Warrant Met?			**YES**			**YES**	**YES**

As shown by the data presented in Table 1, the MUTCD traffic signal warrants at the intersection of Columbia Pike and Tollgate Boulevard are satisfied. This is an indication that traffic signal control is justified based upon the traffic volumes at the intersection.

B. Turn Lane Warrants

The National Cooperative Highway Research Program (NCHRP) Report 457, *Evaluating Intersection Improvements: An Engineering Study Guide* provides guidance for evaluating intersection improvements. Specific volume-based warrants have been checked to evaluate the need for a right turn deceleration lane on Columbia Pike. Right turn lane warrant analysis information is provided in Table 2 below.

TABLE 2

RIGHT TURN LANE WARRANT ANALYSIS

Location	Peak Hour	Speed	Major-Road Volume	Right-Turn Volume	Right-Turn Bay Warranted
Columbia Pike at Tollgate Boulevard	A.M.	45	631	27	No
	Midday		483	60	No
	P.M.		941	94	Yes

As shown by the data presented in Table 2, the warrant for a right turn lane on Columbia Pike is satisfied based upon existing traffic volumes in the p.m. peak hour.

C. Intersection Capacity Analysis

In order to determine the quality of existing traffic operations and identify capacity deficiencies, intersection capacity analyses were conducted at the proposed intersection of Columbia Pike and Tollgate Boulevard. Capacity analyses were conducted according to the methodology and procedures outlined in the *Highway Capacity Manual*, HCM 2010, published by Transportation Research Board. Capacity analysis results for the a.m., midday, and p.m. peak hours are shown in Table 3.

TABLE 3

INTERSECTION CAPACITY ANALYSIS RESULTS – EXISTING TRAFFIC

Intersection	Condition	Level of Service (avg. delay/vehicle – sec.)					
		A.M. Peak Hour		Midday Peak Hour		P.M. Peak Hour	
		TWSC [(1)]	Signal	TWSC [(1)]	Signal	TWSC [(1)]	Signal
Columbia Pike at Tollgate Boulevard	NB Left	A (9.6)	A (6.5)	A (8.8)	A (6.6)	B (11.5)	A (7.1)
	NB Thru	-	A (4.9)	-	A (4.3)	-	A (3.8)
	SB Thru	-	A (9.4)	-	A (9.9)	-	B (10.0)
	SB Right	-	A (3.6)	-	A (5.5)	-	A (4.2)
	EB Left	F (131.2)	C (26.7)	C (18.0)	B (14.6)	E (37.3)	C (21.8)
	EB Right	B (12.1)	C (22.1)	B (10.6)	B (13.2)	B (14.5)	C (20.2)
	Overall Intersection	-	A (8.9)	-	A (7.6)	-	A (8.6)

[(1)] TWSC = Two-way Stop Control (Existing Control)

Level of service (LOS) criteria for unsignalized intersections is shown in Table 4.

TABLE 4		
LEVEL OF SERVICE DESCRIPTIONS FOR UNSIGNALIZED INTERSECTIONS		
Level of Service	**Description**	**Control Delay (sec. /veh.)**
A	Usually no conflicting traffic	0 - 10
B	Occasionally some delay due to conflicting traffic	> 10 - 15
C	Delay is noticeable but not inconveniencing	> 15 - 25
D	Delay is noticeable and irritating, increased risk taking	> 25 - 35
E	Delay approaches tolerance level, risk taking likely	> 35 - 50
F	Delay exceeds tolerance level, high likelihood of risk taking	> 50
Source: Highway Capacity Manual, HCM 2010		

Level of service (LOS) criteria for signalized intersections is shown in Table 5.

TABLE 5		
LEVEL OF SERVICE DESCRIPTIONS FOR SIGNALIZED INTERSECTIONS		
Level of Service	**Description**	**Control Delay (sec. /veh.)**
A	Volume-to-capacity ratio is low, progression is extremely favorable, most vehicles travel through intersection without stopping.	0 - 10
B	Volume-to-capacity ratio is low, progression is good and/or short cycle lengths is present, more vehicles stop than for LOS A.	> 10 – 20
C	Progression is favorable and/or cycle length is moderate, number of vehicles stopping is significant although many still pass through intersection without stopping.	> 20 – 35
D	Volume-to-capacity ratio is high, progression is ineffective, cycle length is long, many vehicles stop.	> 35 – 55
E	Volume-to-capacity ratio is high, progression is unfavorable, cycle length is long, many vehicles stop.	> 55 – 80
F	Volume-to-capacity ratio is very high, progression is very poor, cycle length is long, most cycles fail to clear the queue.	> 80
Source: Highway Capacity Manual, HCM 2010		

To determine the available capacity at the intersection with a traffic signal installation and the development growth that could be served by the available capacity, traffic volumes for all movements through the intersection were increased until there was either no more available capacity or until a turning movement indicated an undesirable level of service. Specifically, the criteria below were used to determine when there was no more available capacity.

- A volume-to-capacity ratio (v/c ratio) greater than or equal to 1.0 for any movement
- A lane group level of service E or worse for any lane group

The 2016 existing traffic volumes were ultimately increased by a factor of 1.6 during the a.m., midday, and p.m. peak hour before there a lane group level of service reached level of service E. Table 6 below shows the intersection capacity results for the future conditions where the 2016 traffic volumes have been increased by a factor of 1.6.

TABLE 6				
INTERSECTION CAPACITY ANALYSIS RESULTS – FUTURE TRAFFIC				
Intersection	**Condition**	**Level of Service (avg. delay/vehicle – sec.)**		
		A.M. Peak Hour	**Midday Peak Hour**	**P.M. Peak Hour**
Columbia Pike at Tollgate Boulevard	NB Left	B (13.6)	A (7.0)	B (18.0)
	NB Thru	A (8.7)	A (4.3)	A (4.5)
	SB Thru	B (13.4)	B (10.0)	B (12.7)
	SB Right	A (2.2)	A (4.6)	A (2.8)
	EB Left	D (53.8)	C (20.7)	D (39.9)
	EB Right	D (42.9)	B (18.9)	D (38.9)
	Overall Intersection	B (15.1)	A (8.2)	B (12.2)

The table above indicates that the left turn from Tollgate Boulevard onto Columbia Pike during the a.m. peak hour will be the critical movement most affected by the usage of available capacity. The increase in traffic by a factor of 1.6 results in 186 new trips entering and/or exiting Tollgate Village during the a.m. peak hour. Based on the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 9th Edition*, the average trip generation rate for a single family home during the a.m. peak hour of the adjacent street is 0.75 trips per dwelling unit. Therefore, the available capacity at the intersection of Columbia Pike and Tollgate Boulevard after a traffic signal is installed will be able to serve approximately 248 additional single family homes.

The completion of 248 additional single family homes establishes a logical trigger point for the completion of a secondary access route. Additionally, new traffic counts conducted at the intersection of Columbia Pike and Tollgate Boulevard after 248 additional single family homes are complete would offer an opportunity to assess the traffic signal timing plan and implement any signal timing modifications that may improve the operation and efficiency of the traffic signal.

V. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions are based upon a review of the existing and future conditions at the intersection of Columbia Pike and Tollgate Boulevard.

- The MUTCD traffic signal warrants at the intersection of Columbia Pike and Tollgate Boulevard are satisfied. This is an indication that traffic signal control is justified based upon the traffic volumes at the intersection.

- The warrant for a right turn lane on Columbia Pike is satisfied based upon existing traffic volumes in the p.m. peak hour. This is an indication that the volume of traffic turning right onto Tollgate Boulevard will affect the progression of southbound traffic passing through the intersection without a separate deceleration lane.

- The installation of a traffic signal at the intersection of Columbia Pike and Tollgate Boulevard will provide traffic operations characterized by level of service A for the overall intersection during the a.m., midday, and p.m. peak hours.

- The available capacity at the intersection of Columbia Pike and Tollgate Boulevard after a traffic signal is installed will be able to service approximately 248 additional single family homes.

The following recommendations for traffic mitigation measures and for the schedule of improvements for traffic mitigation including a secondary access at Tollgate Village are based upon a review of the existing and future conditions at the intersection of Columbia Pike and Tollgate Boulevard.

- A traffic signal should be installed at the intersection of Columbia Pike and Tollgate Boulevard. The existing northbound lanes that merge from two to one at Tollgate Boulevard should be extended approximately 300 feet north of Tollgate Boulevard to provide merging area downstream of the new traffic signal. The Tollgate Village developer has already completed design plans for a traffic signal including the extended northbound merge area at this intersection and has submitted the plans to the Town of Thompson's Station for approval and to TDOT as part of a grading permit application.

- A southbound right turn lane should be constructed on Columbia Pike at Tollgate Boulevard. The right turn lane should have a full width storage length of 275 feet and a taper length of 100 feet. The Tollgate Village developer has already completed design plans for a southbound right turn lane at this intersection and has submitted the plans to the Town of Thompson's Station for approval and to TDOT as part of a grading permit application.

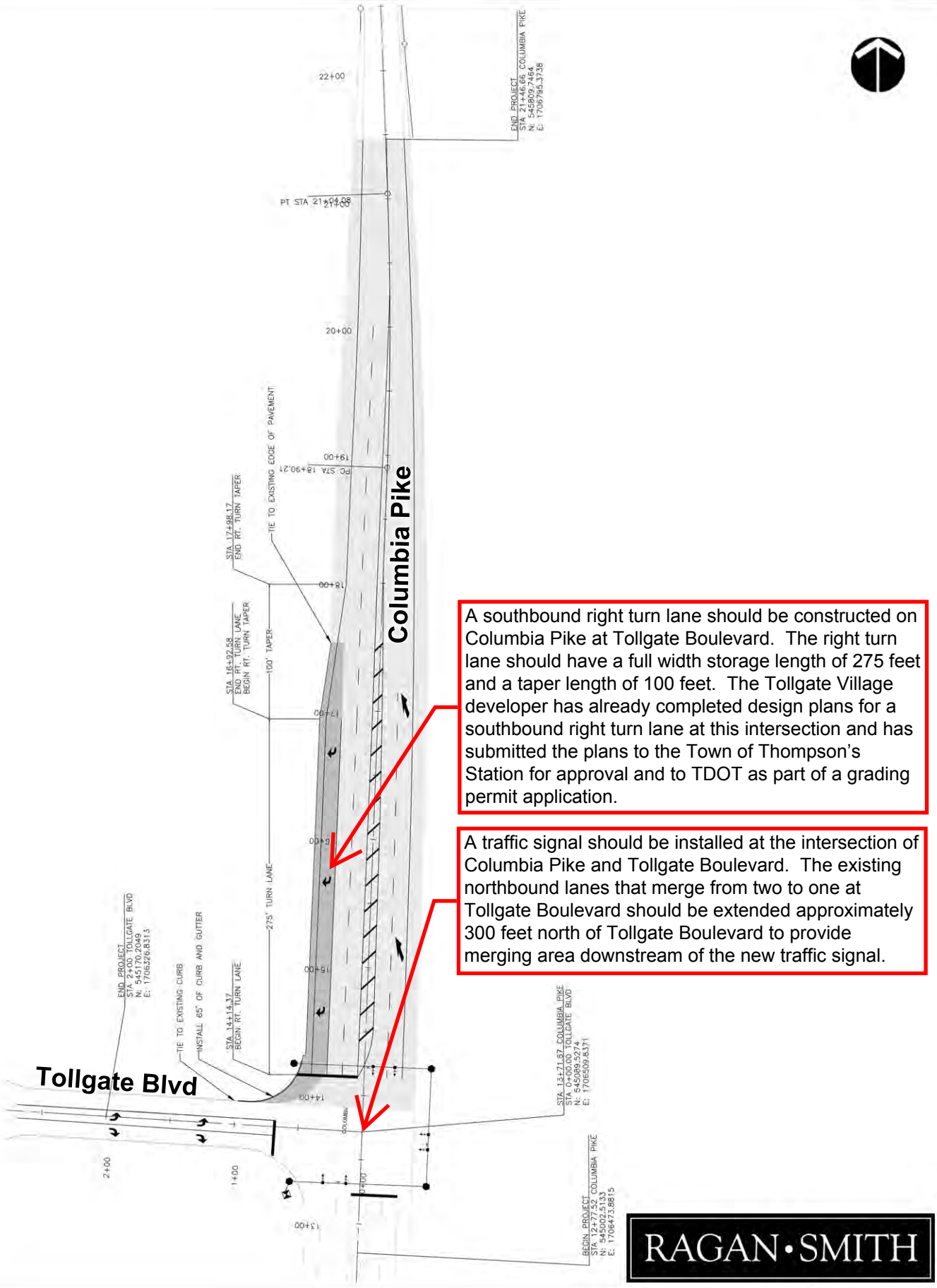
- Based upon traffic operations and the intersection capacity, a secondary access to Tollgate Village should be provided after 248 additional single family homes have been completed.

- If land uses other than single family homes are proposed for Tollgate Village before 248 additional single family homes have been completed, the current edition of the ITE *Trip Generation Manual* should be used to establish a trip generation equivalent for the proposed land use.

- The preferred option for secondary access is to Declaration Way south of Tollgate Village. This secondary access location is in close proximity to portions of Tollgate Village that are already developed and occupied and it will provide a reciprocal secondary access to Independence High School.

- New traffic counts should be conducted at the intersection of Columbia Pike and Tollgate Boulevard after 248 additional single family homes are complete in order to assess the traffic signal timing plan and implement any signal timing modifications that may improve the operation and efficiency of the traffic signal.

- Based upon recent development progress and the anticipated development schedule, the completion of 248 additional single family homes will take approximately 3 years. Therefore, the first half of 2020 can be established as a reasonable schedule for providing a secondary access to Tollgate Village.



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A traffic signal should be installed at the intersection of Columbia Pike and Tollgate Boulevard. The existing northbound lanes that merge from two to one at Tollgate Boulevard should be extended approximately 300 feet north of Tollgate Boulevard to provide merging area downstream of the new traffic signal.

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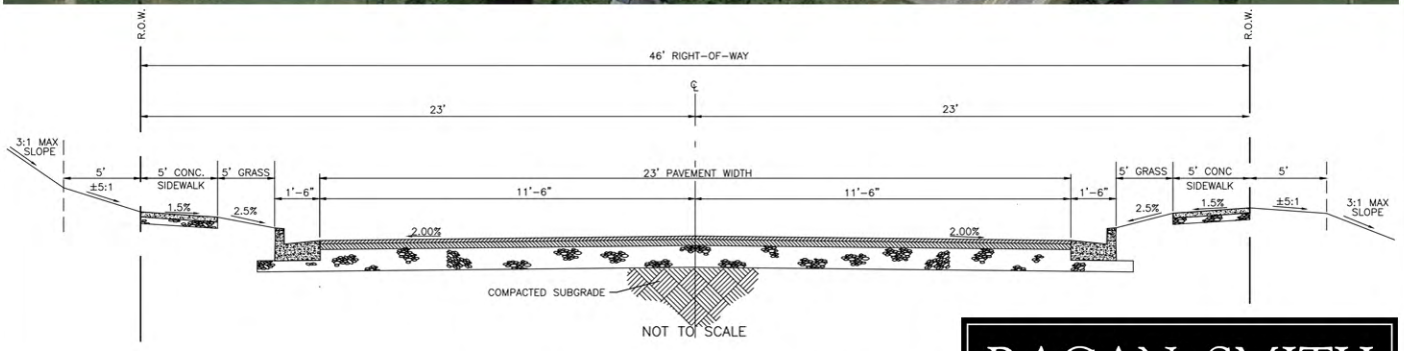
Tollgate Village
Intersection Improvement Summary

Figure
4



46' R.O.W. TYPICAL ROADWAY SECTION

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Tollgate Village
Secondary Access Conceptual Layout

Figure
5

APPENDIX

A. TRAFFIC COUNT DATA

B. TRAFFIC SIGNAL WARRANT ANALYSIS

C. RIGHT TURN REDUCTION WORKSHEETS

D. TURN LANE WARRANT WORKSHEETS

E. CAPACITY ANALYSIS WORKSHEETS - EXISTING TRAFFIC

F. CAPACITY ANALYSIS WORKSHEETS - FUTURE TRAFFIC

APPENDIX A

TRAFFIC COUNT DATA

RAGAN-SMITH-ASSOCIATES
315 Woodland Street
Nashville, Tennessee 37206-0070
P:(615)244-8591 bbaxter@ragansmith.com

File Name : Columbia@Tollgate
Site Code : 10-081 / 9260
Start Date : 11/17/2016

Groups Printed- Group 1

	Columbia Pike Northbound			Columbia Pike Southbound			Tollgate Blvd Eastbound					
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Exclu. Total	Inclu. Total	Int. Total
06:00	8	168	0	0	58	2	10	0	6	0	252	252
06:15	4	208	0	0	51	2	22	0	10	0	297	297
06:30	9	224	0	0	106	3	34	0	18	0	394	394
06:45	10	229	0	0	196	3	35	0	30	0	503	503
Total	31	829	0	0	411	10	101	0	64	0	1446	1446
07:00	21	204	0	0	241	9	30	0	40	0	545	545
07:15	11	289	0	0	111	7	29	0	17	0	464	464
07:30	13	249	0	0	83	8	34	0	13	0	400	400
07:45	26	228	0	0	89	8	32	0	21	0	404	404
Total	71	970	0	0	524	32	125	0	91	0	1813	1813
08:00	26	200	0	0	103	19	40	0	12	0	400	400
08:15	16	204	0	0	89	14	20	0	15	0	358	358
08:30	17	202	0	0	102	7	27	0	12	0	367	367
08:45	11	165	0	0	106	4	19	0	16	0	321	321
Total	70	771	0	0	400	44	106	0	55	0	1446	1446
09:00	20	142	0	0	98	12	25	0	20	0	317	317
09:15	13	123	0	0	92	10	16	0	25	0	279	279
09:30	15	128	0	0	97	8	18	0	21	0	287	287
09:45	20	117	0	0	89	10	18	0	25	0	279	279
Total	68	510	0	0	376	40	77	0	91	0	1162	1162
10:00	24	119	0	0	96	2	16	0	13	0	270	270
10:15	21	112	0	0	93	12	15	0	19	0	272	272
10:30	15	114	0	0	95	9	12	0	17	0	262	262
10:45	25	107	0	0	104	12	14	0	17	0	279	279
Total	85	452	0	0	388	35	57	0	66	0	1083	1083
11:00	10	108	0	0	106	8	21	0	18	0	271	271
11:15	20	132	0	0	85	10	17	0	25	0	289	289
11:30	15	101	0	0	104	18	17	0	21	0	276	276
11:45	14	97	0	0	92	10	20	0	11	0	244	244
Total	59	438	0	0	387	46	75	0	75	0	1080	1080
12:00	14	108	0	0	110	9	12	0	25	0	278	278
12:15	22	93	0	0	109	12	14	0	11	0	261	261
12:30	21	103	0	0	103	15	11	0	19	0	272	272
12:45	29	95	0	0	106	19	11	0	14	0	274	274
Total	86	399	0	0	428	55	48	0	69	0	1085	1085
13:00	13	113	0	0	111	15	8	0	17	0	277	277
13:15	18	132	0	0	104	13	8	0	22	0	297	297
13:30	19	102	0	0	132	16	12	0	13	0	294	294
13:45	18	108	0	0	136	16	3	0	16	0	297	297
Total	68	455	0	0	483	60	31	0	68	0	1165	1165
14:00	20	107	0	0	154	15	10	0	20	0	326	326
14:15	12	107	0	0	151	15	9	0	14	0	308	308
14:30	27	186	0	0	129	13	20	0	20	0	395	395
14:45	23	207	0	0	135	11	15	0	32	0	423	423
Total	82	607	0	0	569	54	54	0	86	0	1452	1452
15:00	22	137	0	0	158	24	18	0	24	0	383	383
15:15	25	155	0	0	162	21	9	0	20	0	392	392
15:30	22	131	0	0	204	30	10	0	18	0	415	415
15:45	25	117	0	0	177	24	9	0	26	0	378	378
Total	94	540	0	0	701	99	46	0	88	0	1568	1568

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File Name : Columbia@Tollgate
Site Code : 10-081 / 9260
Start Date : 11/17/2016

Groups Printed- Group 1

	Columbia Pike Northbound			Columbia Pike Southbound			Tollgate Blvd Eastbound					
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Exclu. Total	Inclu. Total	Int. Total
16:00	18	133	0	0	239	29	5	0	29	0	453	453
16:15	19	142	0	0	211	26	11	0	21	0	430	430
16:30	14	126	0	0	197	25	18	0	26	0	406	406
16:45	13	157	0	0	255	20	14	0	25	0	484	484
Total	64	558	0	0	902	100	48	0	101	0	1773	1773
17:00	24	160	0	0	231	25	13	0	29	0	482	482
17:15	18	118	0	0	228	23	13	0	16	0	416	416
17:30	12	128	0	0	227	26	17	0	23	0	433	433
17:45	16	111	0	0	199	34	10	0	15	0	385	385
Total	70	517	0	0	885	108	53	0	83	0	1716	1716
18:00	19	120	0	0	207	31	10	0	11	0	398	398
18:15	22	103	0	0	176	25	17	0	9	0	352	352
18:30	22	74	0	0	129	34	7	0	9	0	275	275
18:45	17	57	0	0	142	21	9	0	8	0	254	254
Total	80	354	0	0	654	111	43	0	37	0	1279	1279
Grand Total	928	7400	0	0	7108	794	864	0	974	0	18068	18068
Apprch %	11.1	88.9			90.0	10.0	47.0		53.0			
Total %	5.1	41.0			39.3	4.4	4.8		5.4	0.0	100.0	

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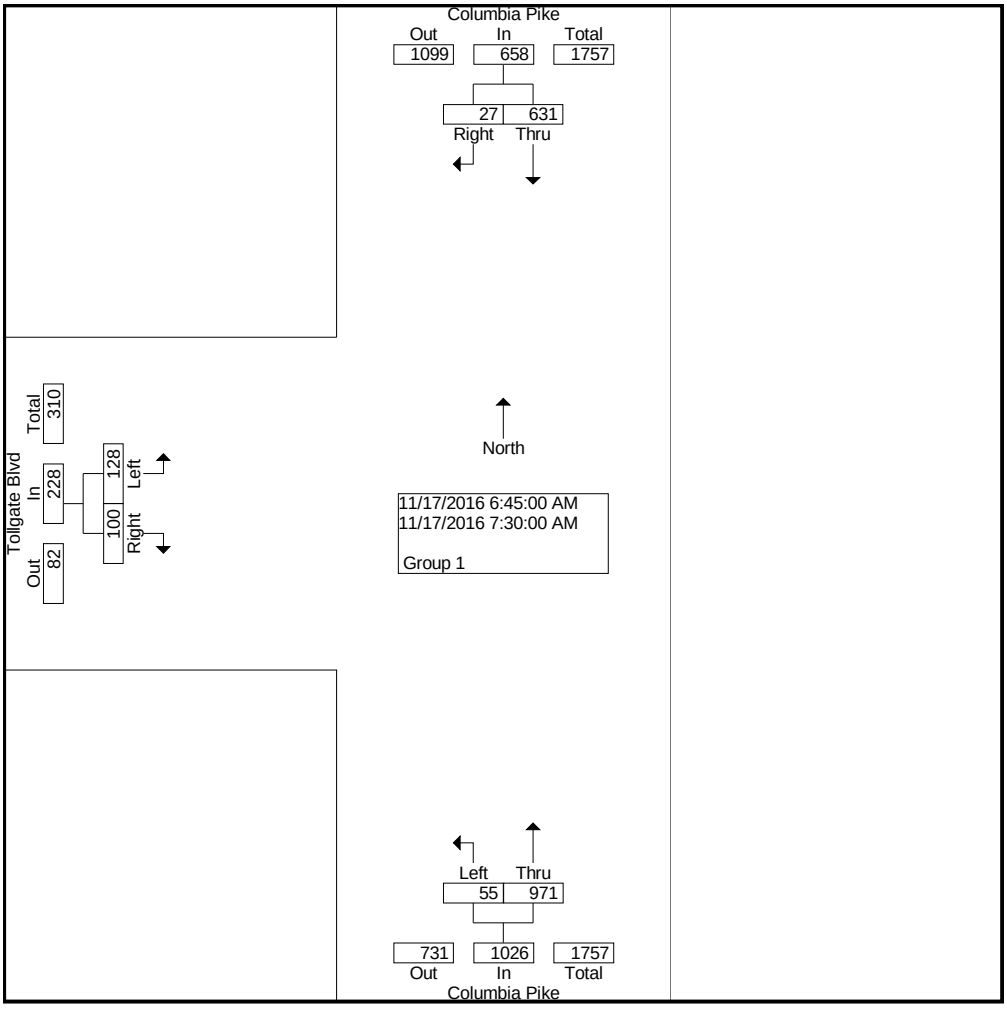
Site Code : 10-081 / 9260
Start Date : 11/17/2016

	Columbia Pike Northbound			Columbia Pike Southbound			Tollgate Blvd Eastbound				
Start Time	Left	Thru	App. Total	Thru	Right	App. Total	Left	Right	App. Total	App. Total	Int. Total
Peak Hour From 06:00 to 09:45 - Peak 1 of 1											
Intersection	06:45										
Volume	55	971	1026	631	27	658	128	100	228	0	1912
Percent	5.4	94.6		95.9	4.1		56.1	43.9			
07:00 Volume	21	204	225	241	9	250	30	40	70	0	545
Peak Factor											0.877
High Int.	07:15			07:00			07:00			5:45:00 AM	
Volume	11	289	300	241	9	250	30	40	70		
Peak Factor			0.855			0.658			0.814		



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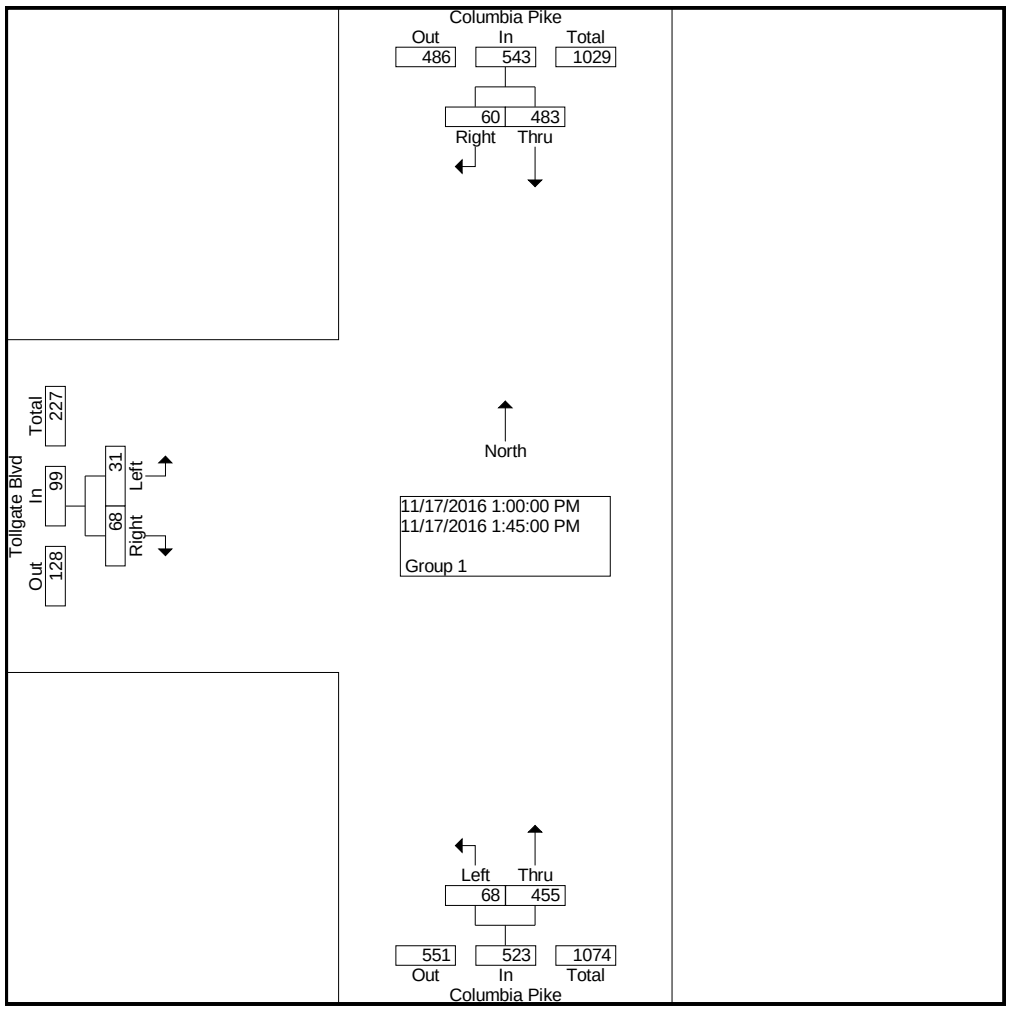
File Name : Columbia@Tollgate
Site Code : 10-081 / 9260
Start Date : 11/17/2016

	Columbia Pike Northbound			Columbia Pike Southbound			Tollgate Blvd Eastbound				
Start Time	Left	Thru	App. Total	Thru	Right	App. Total	Left	Right	App. Total	App. Total	Int. Total
Peak Hour From 10:00 to 13:45 - Peak 1 of 1											
Intersection	13:00										
Volume	68	455	523	483	60	543	31	68	99	0	1165
Percent	13.0	87.0		89.0	11.0		31.3	68.7			
13:45 Volume	18	108	126	136	16	152	3	16	19	0	297
Peak Factor											0.981
High Int.	13:15			13:45			13:15				
Volume	18	132	150	136	16	152	8	22	30		
Peak Factor			0.872			0.893			0.825		



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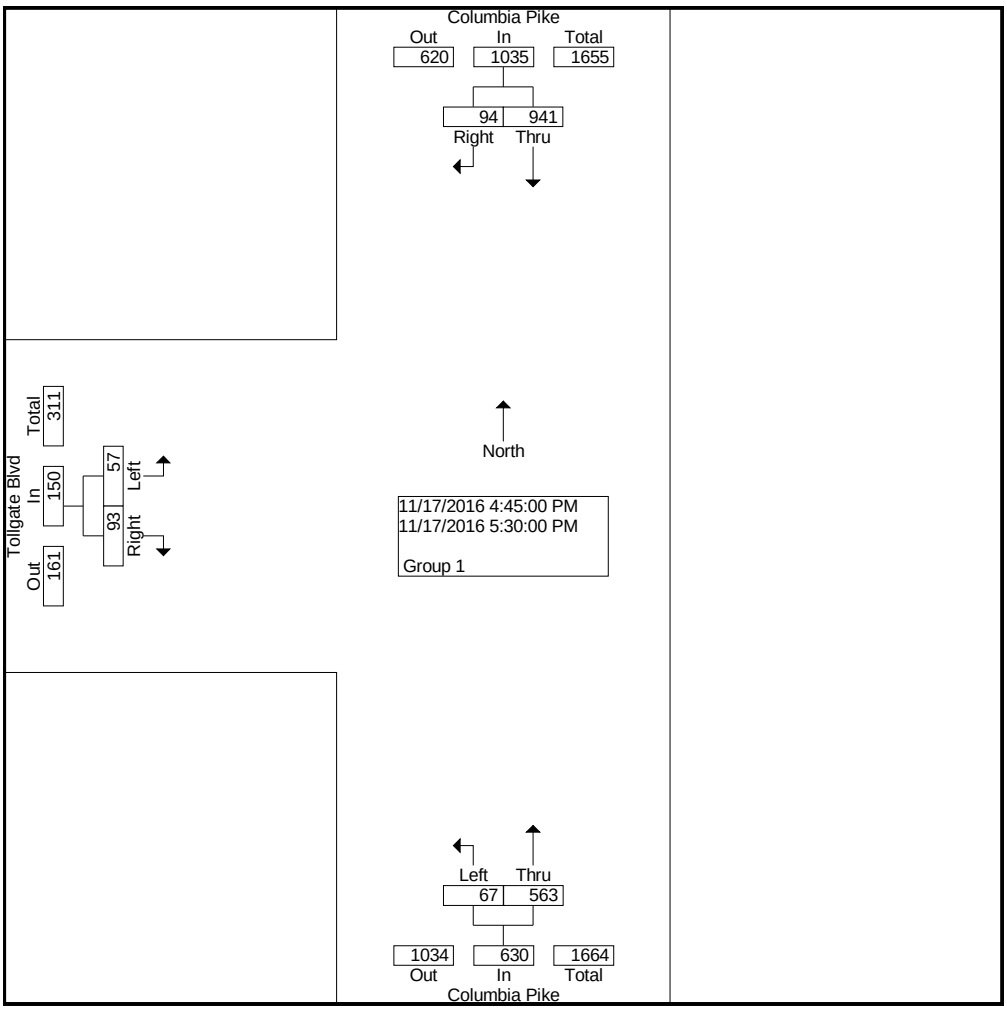
File Name : Columbia@Tollgate
Site Code : 10-081 / 9260
Start Date : 11/17/2016

	Columbia Pike Northbound			Columbia Pike Southbound			Tollgate Blvd Eastbound				
Start Time	Left	Thru	App. Total	Thru	Right	App. Total	Left	Right	App. Total	App. Total	Int. Total
Peak Hour From 14:00 to 18:45 - Peak 1 of 1											
Intersection	16:45										
Volume	67	563	630	941	94	1035	57	93	150	0	1815
Percent	10.6	89.4		90.9	9.1		38.0	62.0			
16:45 Volume	13	157	170	255	20	275	14	25	39	0	484
Peak Factor											0.938
High Int.	17:00			16:45			17:00				
Volume	24	160	184	255	20	275	13	29	42		
Peak Factor			0.856			0.941			0.893		



County: Williamson **Station Number:** 000067

Route: SR006 **Station Type:** Other Rural **Station Out:** NO

Location: NEAR THOMPSON STATION (Coverage)

Month	Year	Average Weekday Traffic	Average Daily Traffic	Annual Average Daily	Axle Adjustment Factor	Remarks
03	1985	9,366	9,834	9,342	0.95	
02	1986	9,238	10,993	10,443	0.95	
02	1987	10,049	11,456	10,883	0.95	
03	1988	10,845		11,127	0.95	
03	1989	11,699	0	7,490	0.95	ACTUAL = 12226
01	1990	7,392		8,427	0.95	
03	1991	6,937	7,492	7,117	0.95	
03	1992	7,747	8,057	7,654	0.95	
04	1993	8,722	8,548	8,121	0.95	
05	1994	11,218	10,881	10,337	0.95	
04	1995	9,852	9,556	9,079	0.95	
04	1996	10,220	9,913	9,418	0.95	
04	1997	10,416	9,999	9,499	0.95	
04	1998	12,078	11,595	11,015	0.95	
03	1999	11,154	11,489	10,915	0.95	
05	2000	14,735	13,998	13,289	0.95	CT LOOKS GOOD
05	2001	16,740	15,903	15,108	0.95	
01	2002	14,346	14,776	14,037	0.95	
03	2003	14,920	15,367	14,599	0.95	
08	2004	0	0	15,037	0.95	EST
05	2005	21,270	20,845	15,488	0.95	ACTUAL - 19802
05	2006	24,766	22,785	21,645	0.95	HIGH LAST 2 YEARS
03	2007	22,465	21,566	20,488	0.95	
03	2008	18,289	17,923	19,891	0.95	ACTUAL= 17027
04	2009	20,761	19,308	18,342	0.95	
11	2010	19,834	18,842	17,900	0.95	
04	2011	21,149	19,669	18,685	0.98	
04	2012	19,240	18,470	18,101	0.98	
03	2013	20,688	20,067	19,666	0.98	
03	2014	21,658	21,441	21,013	0.98	
03	2015	20,640	20,021	19,620	0.98	

COVERAGE COUNT DATA WITH 24 HOUR TOTALS

Station Number:	000067	**County:**	94 Williamson
Start Date:	03 / 17 / 2015	**End Date:**	03 / 18 / 2015
Start Time:	11 : 00	**End Time:**	11 : 00
Direction:	1 (Coverage)		

Time	
11:00 - 12:00	661
12:00 - 13:00	657
13:00 - 14:00	623
14:00 - 15:00	615
15:00 - 16:00	544
16:00 - 17:00	589
17:00 - 18:00	558
18:00 - 19:00	395
19:00 - 20:00	300
20:00 - 21:00	202
21:00 - 22:00	166
22:00 - 23:00	102
23:00 - 24:00	45
24:00 - 01:00	27
01:00 - 02:00	13
02:00 - 03:00	21
03:00 - 04:00	68
04:00 - 05:00	149
05:00 - 06:00	613
06:00 - 07:00	1,033
07:00 - 08:00	1,000
08:00 - 09:00	878
09:00 - 10:00	681
10:00 - 11:00	675
Total:	10,615

Peak AM	**Peak Total**	**Peak Hour Factor**	**Peak PM**	**Peak Total**	**Peak Hour Factor**
07:15 - 08:15	1432	0.92	15:45 - 16:45	1527	0.92

Peak AM %	**Dir Dist AM %**	**Peak PM %**	**Dir Dist PM %**	**Daily Peak %**	**Daily Dir Dist %**
7	71	7	62	7	62

COVERAGE COUNT DATA WITH 24 HOUR TOTALS

Station Number:	000067	**County:**	94 Williamson
Start Date:	03 / 17 / 2015	**End Date:**	03 / 18 / 2015
Start Time:	11 : 00	**End Time:**	11 : 00
Direction:	2 (Coverage)		

Time	
11:00 - 12:00	586
12:00 - 13:00	616
13:00 - 14:00	650
14:00 - 15:00	741
15:00 - 16:00	866
16:00 - 17:00	936
17:00 - 18:00	889
18:00 - 19:00	701
19:00 - 20:00	586
20:00 - 21:00	437
21:00 - 22:00	330
22:00 - 23:00	228
23:00 - 24:00	126
24:00 - 01:00	70
01:00 - 02:00	30
02:00 - 03:00	19
03:00 - 04:00	16
04:00 - 05:00	50
05:00 - 06:00	116
06:00 - 07:00	245
07:00 - 08:00	417
08:00 - 09:00	417
09:00 - 10:00	495
10:00 - 11:00	458

Total: 10,025

Peak AM	**Peak Total**	**Peak Hour Factor**	**Peak PM**	**Peak Total**	**Peak Hour Factor**
07:15 - 08:15	1432	0.92	15:45 - 16:45	1527	0.92

Peak AM %	**Dir Dist AM %**	**Peak PM %**	**Dir Dist PM %**	**Daily Peak %**	**Daily Dir Dist %**
7	71	7	62	7	62

County: Williamson **Station Number:** 000094

Route: SR006 **Station Type:** Other Rural **Station Out:** NO

Location: S OF FRANKLIN (Coverage)

Month	Year	Average Weekday Traffic	Average Daily Traffic	Annual Average Daily	Axle Adjustment Factor	Remarks
03	1985	4,172	4,422	4,334	0.98	
02	1986	4,642	5,524	5,414	0.98	
02	1987	4,367	5,197	5,093	0.98	
03	1988	5,080		5,376	0.98	
03	1989	5,157	0	5,310	0.98	ACTUAL = 5459
01	1990	5,487	0	5,600	0.98	ACTUAL = 6721
03	1991	4,509	4,915	4,817	0.98	
03	1992	4,684	4,918	4,800	0.98	
04	1993	6,214	6,090	5,968	0.98	
05	1994	6,225	6,038	5,917	0.98	
04	1995	6,916	6,639	6,506	0.98	
03	1996	8,165	8,328	8,162	0.98	
04	1997	8,850	8,496	8,326	0.98	
04	1998	8,969	8,610	8,438	0.98	
03	1999	8,781	9,044	8,863	0.98	
05	2000	9,826	9,236	9,051	0.98	DIFF MONTH
05	2001	12,271	11,657	8,968	0.98	ACTUAL = 11424
01	2002	9,633	9,922	9,724	0.98	
03	2003	14,458	14,602	10,583	0.98	ACTUAL = 14310
03	2004	9,972	10,370	10,163	0.98	
03	2005	10,927	11,036	10,816	0.98	
05	2006	14,026	12,904	12,646	0.98	UP & DOWN
03	2007	14,185	13,618	13,345	0.98	
03	2008	12,071	11,830	11,593	0.98	
06	2009	0	0	11,170	0.98	TAKEN FROM CLASS
11	2010	12,864	12,221	11,976	0.98	
04	2011	13,200	11,748	11,513	0.98	
05	2012	13,450	13,316	13,049	0.98	
01	2013	12,325	12,941	12,682	0.98	
01	2014	0	0	13,281	0.98	EST
03	2015	13,695	13,284	13,018	0.98	

COVERAGE COUNT DATA WITH 24 HOUR TOTALS

Station Number:	000094	**County:**	94 Williamson
Start Date:	03 / 17 / 2015	**End Date:**	03 / 18 / 2015
Start Time:	11 : 00	**End Time:**	11 : 00
Direction:	1 (Coverage)		

Time	
11:00 - 12:00	381
12:00 - 13:00	395
13:00 - 14:00	398
14:00 - 15:00	363
15:00 - 16:00	331
16:00 - 17:00	392
17:00 - 18:00	355
18:00 - 19:00	317
19:00 - 20:00	164
20:00 - 21:00	138
21:00 - 22:00	121
22:00 - 23:00	65
23:00 - 24:00	39
24:00 - 01:00	13
01:00 - 02:00	11
02:00 - 03:00	5
03:00 - 04:00	30
04:00 - 05:00	54
05:00 - 06:00	252
06:00 - 07:00	699
07:00 - 08:00	678
08:00 - 09:00	564
09:00 - 10:00	462
10:00 - 11:00	383
Total:	6,610

Peak AM	**Peak Total**	**Peak Hour Factor**	**Peak PM**	**Peak Total**	**Peak Hour Factor**
06:45 - 07:45	987	0.92	16:45 - 17:45	1216	0.96

Peak AM %	**Dir Dist AM %**	**Peak PM %**	**Dir Dist PM %**	**Daily Peak %**	**Daily Dir Dist %**
7	72	9	68	9	68

COVERAGE COUNT DATA WITH 24 HOUR TOTALS

Station Number: 000094 **County:** 94 Williamson
Start Date: 03 / 17 / 2015 **End Date:** 03 / 18 / 2015
Start Time: 11 : 00 **End Time:** 11 : 00
Direction: 2 (Coverage)

Time	
11:00 - 12:00	374
12:00 - 13:00	386
13:00 - 14:00	443
14:00 - 15:00	513
15:00 - 16:00	648
16:00 - 17:00	758
17:00 - 18:00	789
18:00 - 19:00	499
19:00 - 20:00	409
20:00 - 21:00	309
21:00 - 22:00	224
22:00 - 23:00	93
23:00 - 24:00	105
24:00 - 01:00	48
01:00 - 02:00	20
02:00 - 03:00	8
03:00 - 04:00	9
04:00 - 05:00	26
05:00 - 06:00	69
06:00 - 07:00	145
07:00 - 08:00	293
08:00 - 09:00	284
09:00 - 10:00	332
10:00 - 11:00	301

Total: 7,085

Peak AM	**Peak Total**	**Peak Hour Factor**	**Peak PM**	**Peak Total**	**Peak Hour Factor**
06:45 - 07:45	987	0.92	16:45 - 17:45	1216	0.96

Peak AM %	**Dir Dist AM %**	**Peak PM %**	**Dir Dist PM %**	**Daily Peak %**	**Daily Dir Dist %**
7	72	9	68	9	68

County: Williamson **Station Number:** 000095

Route: SR248 **Station Type:** Other Rural **Station Out:** NO

Location: GOOSE CR BP - S OF FRANKLIN (Coverage)

Month	Year	Average Weekday Traffic	Average Daily Traffic	Annual Average Daily	Axle Adjustment Factor	Remarks
03	1985	5,514	5,845	5,436	0.93	
02	1986	5,894	7,014	6,523	0.93	
02	1987	6,433	7,655	7,119	0.93	
03	1988	6,311		6,339	0.93	
03	1989	7,072	0	2,780	0.93	ACTUAL = 7103
01	1990	2,777		3,228	0.93	SATURN PKWY OPEN
03	1991	3,287	3,583	3,332	0.93	
03	1992	2,895	3,011	2,800	0.93	
04	1993	3,625	3,553	3,304	0.93	
04	1994	3,392	3,290	3,191	0.97	
04	1995	4,600	4,416	4,283	0.97	
03	1996	4,947	4,944	4,796	0.97	
04	1997	5,380	5,165	5,010	0.97	
04	1998	6,061	5,819	5,644	0.97	
03	1999	6,584	6,782	6,579	0.97	
05	2000	7,273	6,837	6,632	0.97	DIFF MONTH
05	2001	11,536	10,959	6,831	0.97	ACTUAL = 10630
02	2002	6,637	6,836	6,631	0.97	
03	2003	8,424	8,508	6,149	0.97	ACTUAL = 8253
03	2004	7,874	8,110	7,866	0.97	HIGH 2 YRS - KEEP
03	2005	10,007	10,107	9,804	0.97	GOING UP
05	2006	9,466	8,709	8,447	0.97	SEE 2004
11	2007	0	0	9,065	0.97	EST
03	2008	5,373	5,266	8,932	0.97	ACTUAL = 5108
06	2009	0	0	9,199	0.97	EST
11	2010	4,787	4,548	4,411	0.99	LOW LAST 2 YRS COUNTED
04	2011	5,892	5,244	5,191	0.99	SEE 2008 ACTUAL
05	2012	6,074	6,013	5,953	0.99	
01	2013	5,234	5,496	5,441	0.99	
01	2014	0	0	5,604	0.99	EST
03	2015	5,235	5,078	5,027	0.99	

COVERAGE COUNT DATA WITH 24 HOUR TOTALS

Station Number:	000095	**County:**	94 Williamson
Start Date:	03 / 17 / 2015	**End Date:**	03 / 18 / 2015
Start Time:	11 : 00	**End Time:**	11 : 00
Direction:	1 (Coverage)		

Time	
11:00 - 12:00	180
12:00 - 13:00	149
13:00 - 14:00	151
14:00 - 15:00	151
15:00 - 16:00	140
16:00 - 17:00	139
17:00 - 18:00	180
18:00 - 19:00	120
19:00 - 20:00	70
20:00 - 21:00	58
21:00 - 22:00	46
22:00 - 23:00	26
23:00 - 24:00	13
24:00 - 01:00	4
01:00 - 02:00	5
02:00 - 03:00	3
03:00 - 04:00	4
04:00 - 05:00	11
05:00 - 06:00	54
06:00 - 07:00	252
07:00 - 08:00	358
08:00 - 09:00	298
09:00 - 10:00	215
10:00 - 11:00	168
Total:	2,795

Peak AM	**Peak Total**	**Peak Hour Factor**	**Peak PM**	**Peak Total**	**Peak Hour Factor**
07:15 - 08:15	456	0.93	17:00 - 18:00	400	0.91

Peak AM %	**Dir Dist AM %**	**Peak PM %**	**Dir Dist PM %**	**Daily Peak %**	**Daily Dir Dist %**
9	75	8	55	9	75

COVERAGE COUNT DATA WITH 24 HOUR TOTALS

Station Number:	000095	**County:**	94 Williamson
Start Date:	03 / 17 / 2015	**End Date:**	03 / 18 / 2015
Start Time:	11 : 00	**End Time:**	11 : 00
Direction:	2 (Coverage)		

Time	
11:00 - 12:00	119
12:00 - 13:00	137
13:00 - 14:00	166
14:00 - 15:00	164
15:00 - 16:00	192
16:00 - 17:00	217
17:00 - 18:00	220
18:00 - 19:00	228
19:00 - 20:00	162
20:00 - 21:00	115
21:00 - 22:00	87
22:00 - 23:00	66
23:00 - 24:00	31
24:00 - 01:00	22
01:00 - 02:00	12
02:00 - 03:00	5
03:00 - 04:00	7
04:00 - 05:00	4
05:00 - 06:00	17
06:00 - 07:00	44
07:00 - 08:00	90
08:00 - 09:00	108
09:00 - 10:00	112
10:00 - 11:00	115

Total: 2,440

Peak AM	**Peak Total**	**Peak Hour Factor**	**Peak PM**	**Peak Total**	**Peak Hour Factor**
07:15 - 08:15	456	0.93	17:00 - 18:00	400	0.91

Peak AM %	**Dir Dist AM %**	**Peak PM %**	**Dir Dist PM %**	**Daily Peak %**	**Daily Dir Dist %**
9	75	8	55	9	75

APPENDIX B

TRAFFIC SIGNAL WARRANT ANALYSIS

Warrants Summary

Information			
Analyst	bsb	Intersection	Columbia Pk @ Tollgate Blvd
Agency/Co	Ragan-Smith Associates	Jurisdiction	Thompson's Station, TN
Date Performed	11/17/2016	Units	U.S. Customary
Project ID	Tollgate Village Traffic Study	Time Period Analyzed	6am - 6pm
East/West Street	Tollgate Blvd	North/South Street	Columbia Pk
File Name	Columbia@Tollgate.xhy	Major Street	North-South

Project Description *Tollgate Village Traffic Study*

General				Roadway Network	
Major Street Speed (mph)	45	☐	Population < 10,000	Two Major Routes	☐
Nearest Signal (ft)	1850	☐	Coordinated Signal System	Weekend Count	☐
Crashes (per year)	1	☐	Adequate Trials of Alternatives	5-yr Growth Factor	0

Geometry and Traffic	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N	0	0	0	0	0	0	1	2	0	0	2	0
Lane usage		LR					L	T			TR	
Vehicle Volume Averages (vph)	68	0	0	0	0	0	71	587	0	0	537	56
Peds (ped/h) / Gaps (gaps/h)	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--
Delay (s/veh) / (veh-hr)	--	15.9 / 0.3	--	--	0 / 0	--	--	1.1 / 0.2	--	--	0 / 0	--

Warrant 1: Eight-Hour Vehicular Volume	☑
1 A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--	☐
1 B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--	☑
1 (56%) Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 2: Four-Hour Vehicular Volume	☑
2 A. Four-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	☑
Warrant 3: Peak Hour	☑
3 A. Peak-Hour Conditions (Minor delay --and-- minor volume --and-- total volume) --or--	☐
3 B. Peak- Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	☑
Warrant 4: Pedestrian Volume	☐
4 A. Four Hour Volumes --or--	☐
4 B. One-Hour Volumes	☐
Warrant 5: School Crossing	☐
5. Student Volumes --and--	☐
5. Gaps Same Period	☐
Warrant 6: Coordinated Signal System	☐
6. Degree of Platooning (Predominant direction or both directions)	☐
Warrant 7: Crash Experience	☐
7 A. Adequate trials of alternatives, observance and enforcement failed --and--	☐
7 B. Reported crashes susceptible to correction by signal (12-month period) --and--	☐
7 C. (56%) Volumes for Warrants 1A, 1B --or-- 4 are satisfied	☑
Warrant 8: Roadway Network	☐
8 A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2 or 3) --or--	☐
8 B. Weekend Volume (Five hours total)	☐
Warrant 9: Grade Crossing	☐
9 A. Grade Crossing within 140 ft --and--	☐
9 B. Peak-Hour Vehicular Volumes	☐

Warrants Volume

Information

Analyst	bsb	Intersection	Columbia Pk @ Tollgate Blvd
Agency/Co	Ragan-Smith Associates	Jurisdiction	Thompson's Station, TN
Date Performed	11/17/2016	Units	U.S. Customary
Project ID	Tollgate Village Traffic Study	Time Period Analyzed	6am - 6pm
East/West Street	Tollgate Blvd	North/South Street	Columbia Pk
File Name	Columbia@Tollgate.xhy	Major Street	North-South

Project Description *Tollgate Village Traffic Study*

Warrant 1

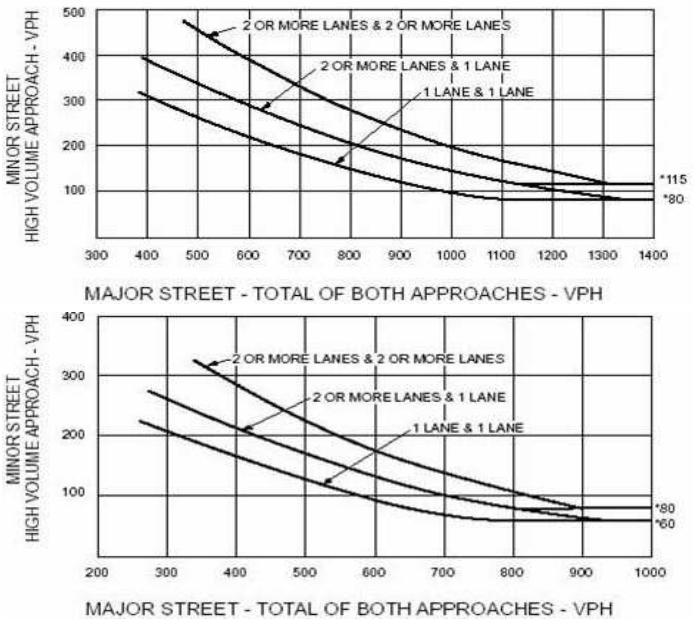
Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

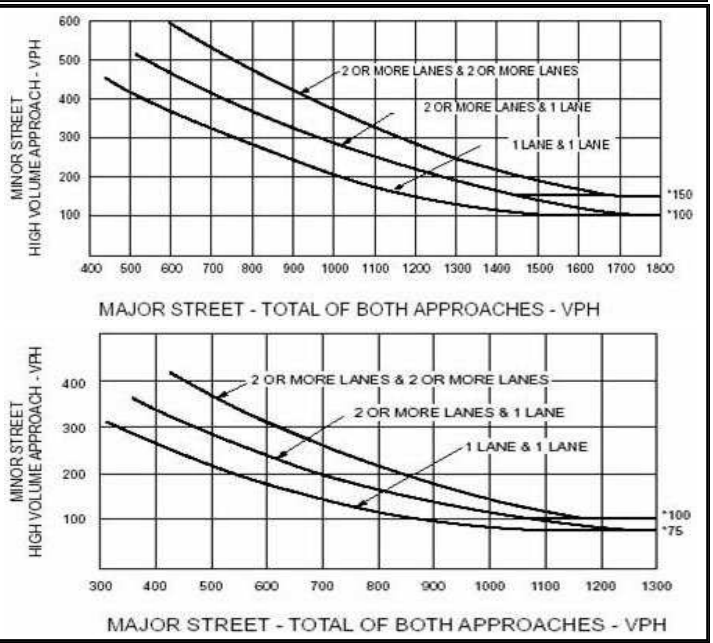
Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

Warrant 2



Warrant 3



Volume Summary

Major Street Lanes 2+ **Minor Street Lanes** 1 **Speed** 45 **Population** 10000+

Hours	Major Volume	Minor Volume	Total Volume	1A (70%)	1A (56%)	1B (70%)	1B (56%)	2 (70%)	3A (70%)	3B (70%)
06-07	1282	101	1383	No	Yes	Yes	Yes	Yes	No	Yes
07-08	1597	125	1722	Yes	Yes	Yes	Yes	Yes	No	Yes
08-09	1285	106	1391	Yes	Yes	Yes	Yes	Yes	No	Yes
09-10	994	77	1071	No	No	Yes	Yes	Yes	No	No
10-11	961	57	1018	No	No	Yes	Yes	No	No	No
11-12	931	75	1006	No	No	Yes	Yes	Yes	No	No
12-13	968	48	1016	No	No	No	Yes	No	No	No
13-14	1067	32	1099	No	No	No	No	No	No	No
14-15	1312	54	1366	No	No	Yes	Yes	No	No	No
15-16	1435	46	1481	No	No	No	Yes	No	No	No
16-17	1624	48	1672	No	No	No	Yes	No	No	No
17-18	1580	53	1633	No	No	Yes	Yes	No	No	No
Totals	15036	822	15858	2	3	8	11	5	0	3

APPENDIX C

RIGHT TURN VOLUME REDUCTION WORKSHEETS

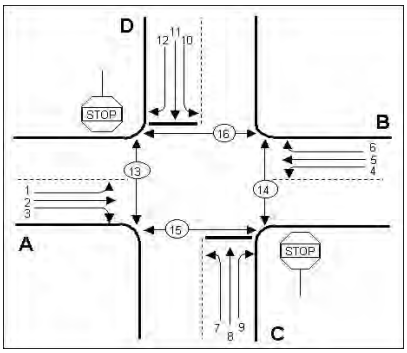
Columbia Pk @ Tollgate Blvd
6:00 - 7:00 a.m.

Figure 2 - 11. Minor-road right-turn volume reduction for warrant check.

INPUT

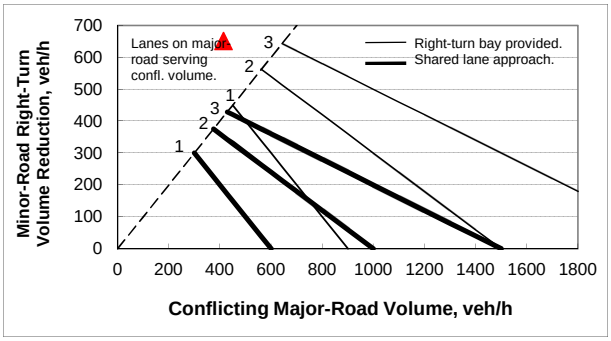
Number of lanes on major-road approach:	2
Right-turn geometry on minor-road:	Right-turn bay provided

Approach	Number	Movement	Volume
Major A	2	Through	411
	3	Right	10
Major B	5	Through	829
	6	Right	0
Minor C	7	Left	101
	8	Through	0
	9	Right	64
Minor D	10	Left	0
	11	Through	0
	12	Right	0



OUTPUT

Variable	Value
Conflicting major-road volume (V_{c9}), veh/h:	211
Conflicting major-road volume (V_{c12}), veh/h:	415
Right-turn volume reduction (V_{r9}), veh/h:	774
Right-turn volume reduction (V_{r12}), veh/h:	651
Adjusted right-turn volume reduction (V_{r9}), veh/h:	64
Adjusted right-turn volume reduction (V_{r12}), veh/h:	0
Adjusted minor-road volume, veh/h:	101
Guidance:	**Conduct warrant check again using adjusted minor road volume.**



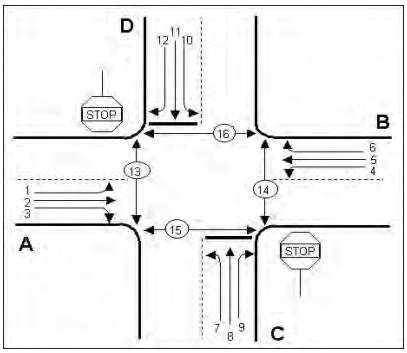
Columbia Pk @ Tollgate Blvd
7:00 - 8:00 a.m.

Figure 2 - 11. Minor-road right-turn volume reduction for warrant check.

INPUT

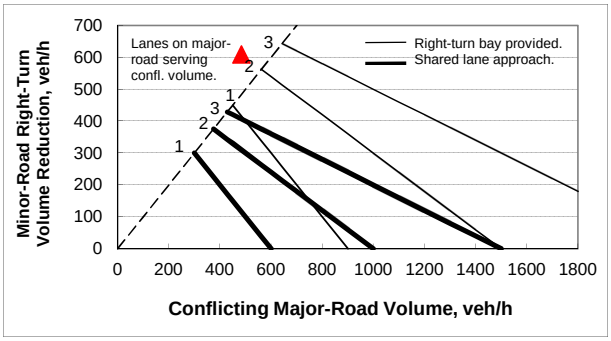
Number of lanes on major-road approach:	2
Right-turn geometry on minor-road:	Right-turn bay provided

Approach	Number	Movement	Volume
Major A	2	Through	524
	3	Right	32
Major B	5	Through	970
	6	Right	0
Minor C	7	Left	125
	8	Through	0
	9	Right	91
Minor D	10	Left	0
	11	Through	0
	12	Right	0



OUTPUT

Variable	Value
Conflicting major-road volume (V_{c9}), veh/h:	278
Conflicting major-road volume (V_{c12}), veh/h:	485
Right-turn volume reduction (V_{r9}), veh/h:	733
Right-turn volume reduction (V_{r12}), veh/h:	609
Adjusted right-turn volume reduction (V_{r9}), veh/h:	91
Adjusted right-turn volume reduction (V_{r12}), veh/h:	0
Adjusted minor-road volume, veh/h:	125
Guidance:	**Conduct warrant check again using adjusted minor road volume.**



Columbia Pk @ Tollgate Blvd
8:00 - 9:00 a.m.

Figure 2 - 11. Minor-road right-turn volume reduction for warrant check.

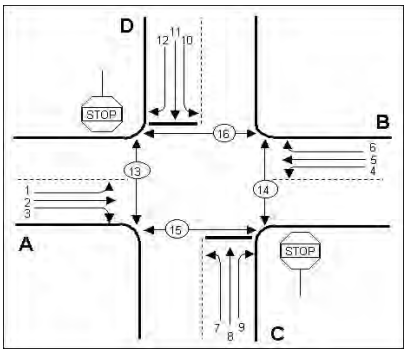
INPUT

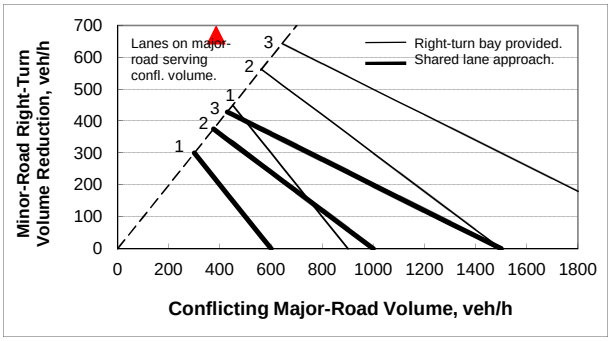
Number of lanes on major-road approach:	2
Right-turn geometry on minor-road:	Right-turn bay provided

Approach	Number	Movement	Volume
Major A	2	Through	400
	3	Right	44
Major B	5	Through	771
	6	Right	0
Minor C	7	Left	106
	8	Through	0
	9	Right	55
Minor D	10	Left	0
	11	Through	0
	12	Right	0

OUTPUT

Variable	Value
Conflicting major-road volume (V_{c9}), veh/h:	222
Conflicting major-road volume (V_{c12}), veh/h:	386
Right-turn volume reduction (V_{r9}), veh/h:	767
Right-turn volume reduction (V_{r12}), veh/h:	669
Adjusted right-turn volume reduction (V_{r9}), veh/h:	55
Adjusted right-turn volume reduction (V_{r12}), veh/h:	0
Adjusted minor-road volume, veh/h:	106
Guidance:	**Conduct warrant check again using adjusted minor road volume.**





Columbia Pk @ Tollgate Blvd
9:00 - 10:00 a.m.

Figure 2 - 11. Minor-road right-turn volume reduction for warrant check.

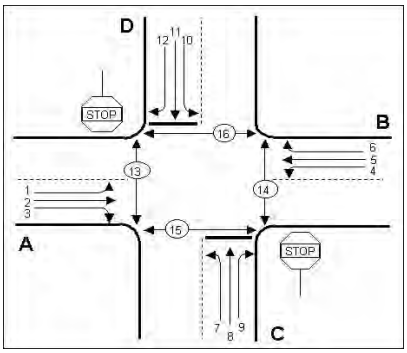
INPUT

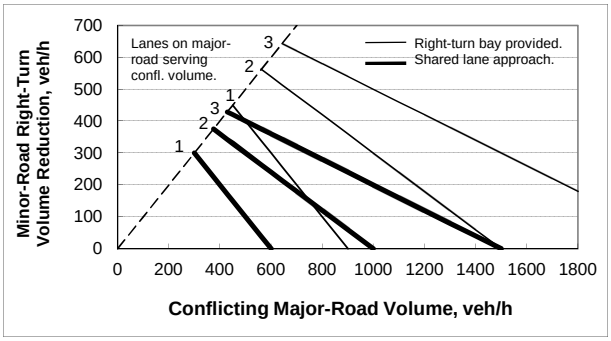
Number of lanes on major-road approach:	2
Right-turn geometry on minor-road:	Right-turn bay provided

Approach	Number	Movement	Volume
Major A	2	Through	376
	3	Right	40
Major B	5	Through	510
	6	Right	0
Minor C	7	Left	77
	8	Through	0
	9	Right	91
Minor D	10	Left	0
	11	Through	0
	12	Right	0

OUTPUT

Variable	Value
Conflicting major-road volume (V_{c9}), veh/h:	208
Conflicting major-road volume (V_{c12}), veh/h:	255
Right-turn volume reduction (V_{r9}), veh/h:	775
Right-turn volume reduction (V_{r12}), veh/h:	747
Adjusted right-turn volume reduction (V_{r9}), veh/h:	91
Adjusted right-turn volume reduction (V_{r12}), veh/h:	0
Adjusted minor-road volume, veh/h:	77
Guidance:	**Conduct warrant check again using adjusted minor road volume.**





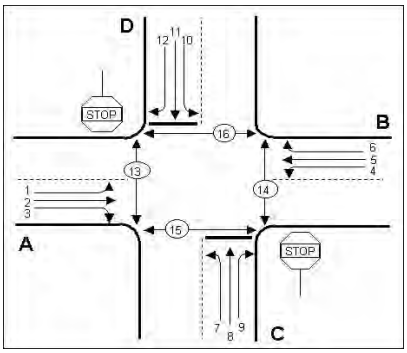
Columbia Pk @ Tollgate Blvd
10:00 - 11:00 a.m.

Figure 2 - 11. Minor-road right-turn volume reduction for warrant check.

INPUT

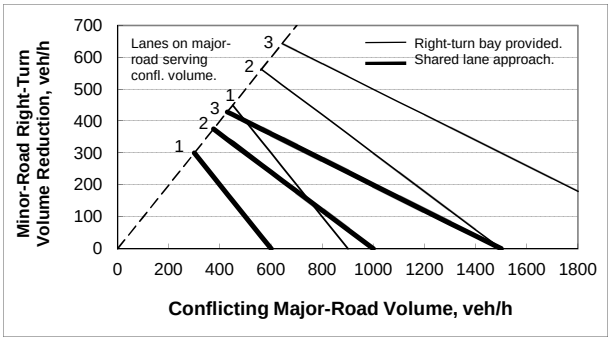
Number of lanes on major-road approach:	2
Right-turn geometry on minor-road:	Right-turn bay provided

Approach	Number	Movement	Volume
Major A	2	Through	388
	3	Right	35
Major B	5	Through	452
	6	Right	0
Minor C	7	Left	57
	8	Through	0
	9	Right	66
Minor D	10	Left	0
	11	Through	0
	12	Right	0



OUTPUT

Variable	Value
Conflicting major-road volume (V_{c9}), veh/h:	212
Conflicting major-road volume (V_{c12}), veh/h:	226
Right-turn volume reduction (V_{r9}), veh/h:	773
Right-turn volume reduction (V_{r12}), veh/h:	764
Adjusted right-turn volume reduction (V_{r9}), veh/h:	66
Adjusted right-turn volume reduction (V_{r12}), veh/h:	0
Adjusted minor-road volume, veh/h:	57
Guidance:	**Conduct warrant check again using adjusted minor road volume.**



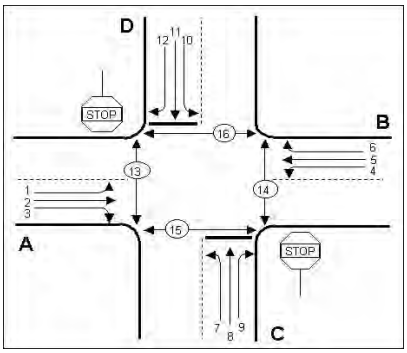
Columbia Pk @ Tollgate Blvd
11:00 a.m. - 12:00 p.m.

Figure 2 - 11. Minor-road right-turn volume reduction for warrant check.

INPUT

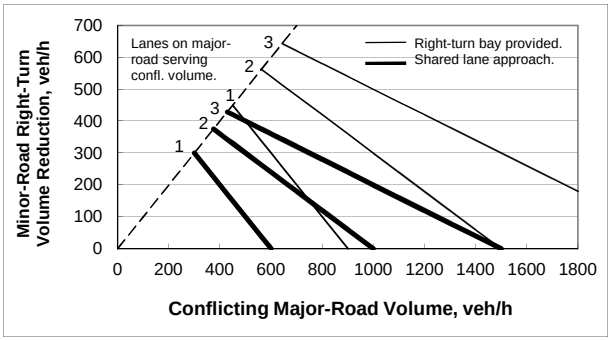
Number of lanes on major-road approach:	2
Right-turn geometry on minor-road:	Right-turn bay provided

Approach	Number	Movement	Volume
Major A	2	Through	387
	3	Right	46
Major B	5	Through	438
	6	Right	0
Minor C	7	Left	75
	8	Through	0
	9	Right	75
Minor D	10	Left	0
	11	Through	0
	12	Right	0



OUTPUT

Variable	Value
Conflicting major-road volume (V_{c9}), veh/h:	217
Conflicting major-road volume (V_{c12}), veh/h:	219
Right-turn volume reduction (V_{r9}), veh/h:	770
Right-turn volume reduction (V_{r12}), veh/h:	769
Adjusted right-turn volume reduction (V_{r9}), veh/h:	75
Adjusted right-turn volume reduction (V_{r12}), veh/h:	0
Adjusted minor-road volume, veh/h:	75
Guidance:	**Conduct warrant check again using adjusted minor road volume.**



Columbia Pk @ Tollgate Blvd
12:00 - 1:00 p.m.

Figure 2 - 11. Minor-road right-turn volume reduction for warrant check.

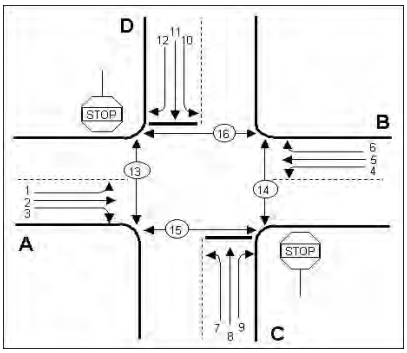
INPUT

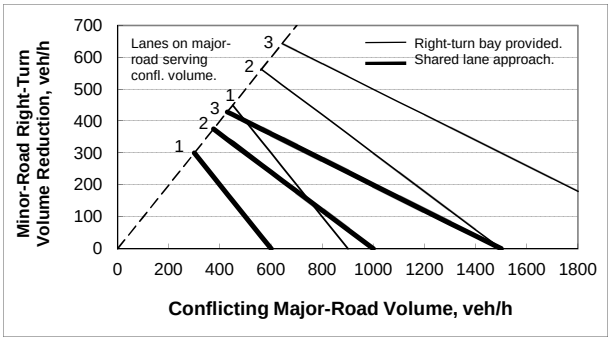
Number of lanes on major-road approach:	2
Right-turn geometry on minor-road:	Right-turn bay provided

Approach	Number	Movement	Volume
Major A	2	Through	428
	3	Right	55
Major B	5	Through	399
	6	Right	0
Minor C	7	Left	48
	8	Through	0
	9	Right	69
Minor D	10	Left	0
	11	Through	0
	12	Right	0

OUTPUT

Variable	Value
Conflicting major-road volume (V_{c9}), veh/h:	242
Conflicting major-road volume (V_{c12}), veh/h:	200
Right-turn volume reduction (V_{r9}), veh/h:	755
Right-turn volume reduction (V_{r12}), veh/h:	780
Adjusted right-turn volume reduction (V_{r9}), veh/h:	69
Adjusted right-turn volume reduction (V_{r12}), veh/h:	0
Adjusted minor-road volume, veh/h:	48
Guidance:	**Conduct warrant check again using adjusted minor road volume.**





Columbia Pk @ Tollgate Blvd
1:00 - 2:00 p.m.

Figure 2 - 11. Minor-road right-turn volume reduction for warrant check.

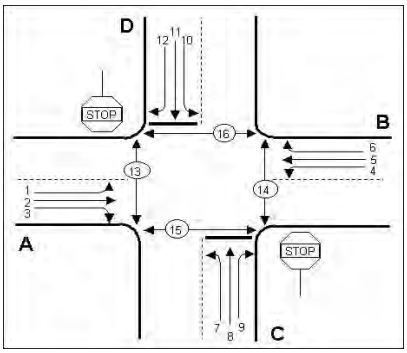
INPUT

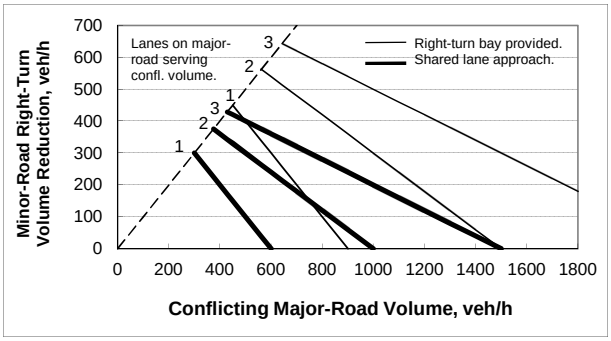
Number of lanes on major-road approach:	2
Right-turn geometry on minor-road:	Right-turn bay provided

Approach	Number	Movement	Volume
Major A	2	Through	483
	3	Right	60
Major B	5	Through	455
	6	Right	0
Minor C	7	Left	32
	8	Through	0
	9	Right	68
Minor D	10	Left	0
	11	Through	0
	12	Right	0

OUTPUT

Variable	Value
Conflicting major-road volume (V_{c9}), veh/h:	272
Conflicting major-road volume (V_{c12}), veh/h:	228
Right-turn volume reduction (V_{r9}), veh/h:	737
Right-turn volume reduction (V_{r12}), veh/h:	764
Adjusted right-turn volume reduction (V_{r9}), veh/h:	68
Adjusted right-turn volume reduction (V_{r12}), veh/h:	0
Adjusted minor-road volume, veh/h:	32
Guidance:	**Conduct warrant check again using adjusted minor road volume.**





Columbia Pk @ Tollgate Blvd
2:00 - 3:00 p.m.

Figure 2 - 11. Minor-road right-turn volume reduction for warrant check.

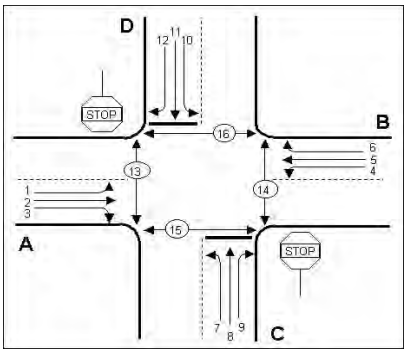
INPUT

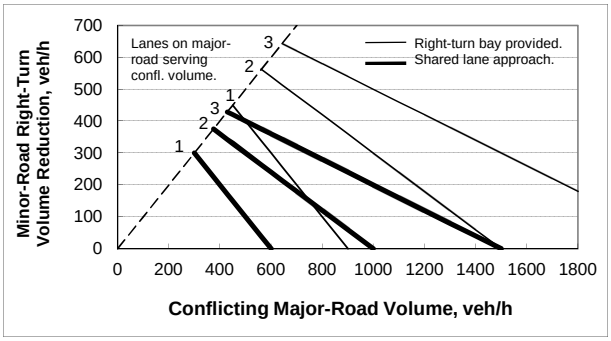
Number of lanes on major-road approach:	2
Right-turn geometry on minor-road:	Right-turn bay provided

Approach	Number	Movement	Volume
Major A	2	Through	569
	3	Right	54
Major B	5	Through	607
	6	Right	0
Minor C	7	Left	54
	8	Through	0
	9	Right	86
Minor D	10	Left	0
	11	Through	0
	12	Right	0

OUTPUT

Variable	Value
Conflicting major-road volume (V_{c9}), veh/h:	312
Conflicting major-road volume (V_{c12}), veh/h:	304
Right-turn volume reduction (V_{r9}), veh/h:	713
Right-turn volume reduction (V_{r12}), veh/h:	718
Adjusted right-turn volume reduction (V_{r9}), veh/h:	86
Adjusted right-turn volume reduction (V_{r12}), veh/h:	0
Adjusted minor-road volume, veh/h:	54
Guidance:	**Conduct warrant check again using adjusted minor road volume.**





Columbia Pk @ Tollgate Blvd
3:00 - 4:00 p.m.

Figure 2 - 11. Minor-road right-turn volume reduction for warrant check.

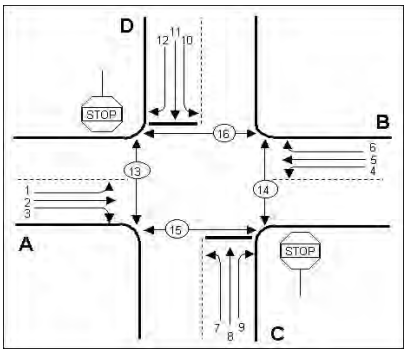
INPUT

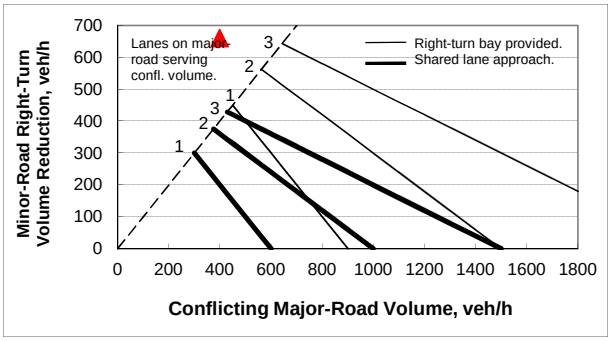
Number of lanes on major-road approach:	2
Right-turn geometry on minor-road:	Right-turn bay provided

Approach	Number	Movement	Volume
Major A	2	Through	701
	3	Right	99
Major B	5	Through	540
	6	Right	0
Minor C	7	Left	46
	8	Through	0
	9	Right	88
Minor D	10	Left	0
	11	Through	0
	12	Right	0

OUTPUT

Variable	Value
Conflicting major-road volume (V_{c9}), veh/h:	400
Conflicting major-road volume (V_{c12}), veh/h:	270
Right-turn volume reduction (V_{r9}), veh/h:	660
Right-turn volume reduction (V_{r12}), veh/h:	738
Adjusted right-turn volume reduction (V_{r9}), veh/h:	88
Adjusted right-turn volume reduction (V_{r12}), veh/h:	0
Adjusted minor-road volume, veh/h:	46
Guidance:	**Conduct warrant check again using adjusted minor road volume.**





Columbia Pk @ Tollgate Blvd
4:00 - 5:00 p.m.

Figure 2 - 11. Minor-road right-turn volume reduction for warrant check.

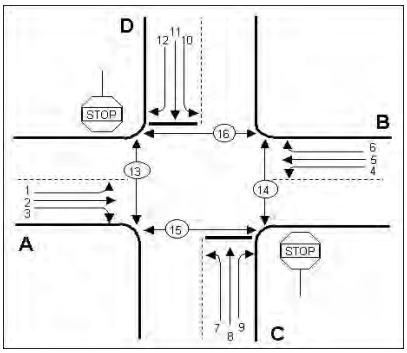
INPUT

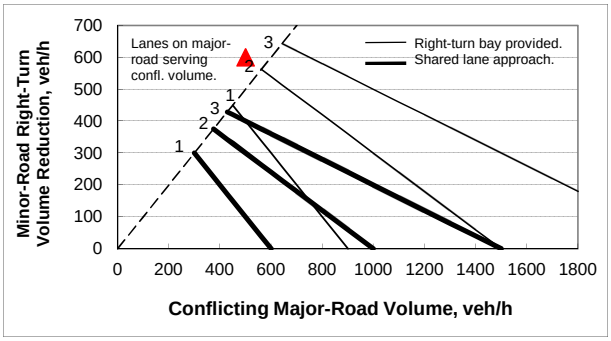
Number of lanes on major-road approach:	2
Right-turn geometry on minor-road:	Right-turn bay provided

Approach	Number	Movement	Volume
Major A	2	Through	902
	3	Right	100
Major B	5	Through	558
	6	Right	0
Minor C	7	Left	48
	8	Through	0
	9	Right	101
Minor D	10	Left	0
	11	Through	0
	12	Right	0

OUTPUT

Variable	Value
Conflicting major-road volume (V_{c9}), veh/h:	501
Conflicting major-road volume (V_{c12}), veh/h:	279
Right-turn volume reduction (V_{r9}), veh/h:	599
Right-turn volume reduction (V_{r12}), veh/h:	733
Adjusted right-turn volume reduction (V_{r9}), veh/h:	101
Adjusted right-turn volume reduction (V_{r12}), veh/h:	0
Adjusted minor-road volume, veh/h:	48
Guidance:	**Conduct warrant check again using adjusted minor road volume.**





Columbia Pk @ Tollgate Blvd
5:00 - 6:00 p.m.

Figure 2 - 11. Minor-road right-turn volume reduction for warrant check.

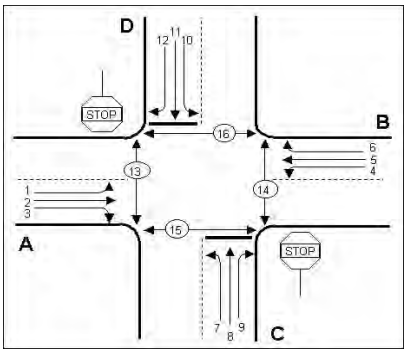
INPUT

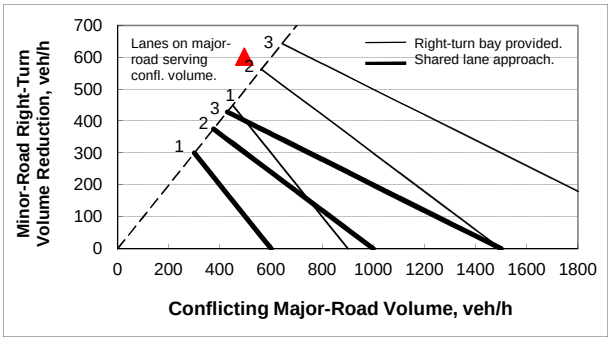
Number of lanes on major-road approach:	2
Right-turn geometry on minor-road:	Right-turn bay provided

Approach	Number	Movement	Volume
Major A	2	Through	885
	3	Right	108
Major B	5	Through	517
	6	Right	0
Minor C	7	Left	53
	8	Through	0
	9	Right	83
Minor D	10	Left	0
	11	Through	0
	12	Right	0

OUTPUT

Variable	Value
Conflicting major-road volume (V_{c9}), veh/h:	497
Conflicting major-road volume (V_{c12}), veh/h:	259
Right-turn volume reduction (V_{r9}), veh/h:	602
Right-turn volume reduction (V_{r12}), veh/h:	745
Adjusted right-turn volume reduction (V_{r9}), veh/h:	83
Adjusted right-turn volume reduction (V_{r12}), veh/h:	0
Adjusted minor-road volume, veh/h:	53
Guidance:	**Conduct warrant check again using adjusted minor road volume.**





APPENDIX D

TURN LANE WARRANT WORKSHEETS

Columbia Pk @ Tollgate Blvd
A.M. Peak Hour

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

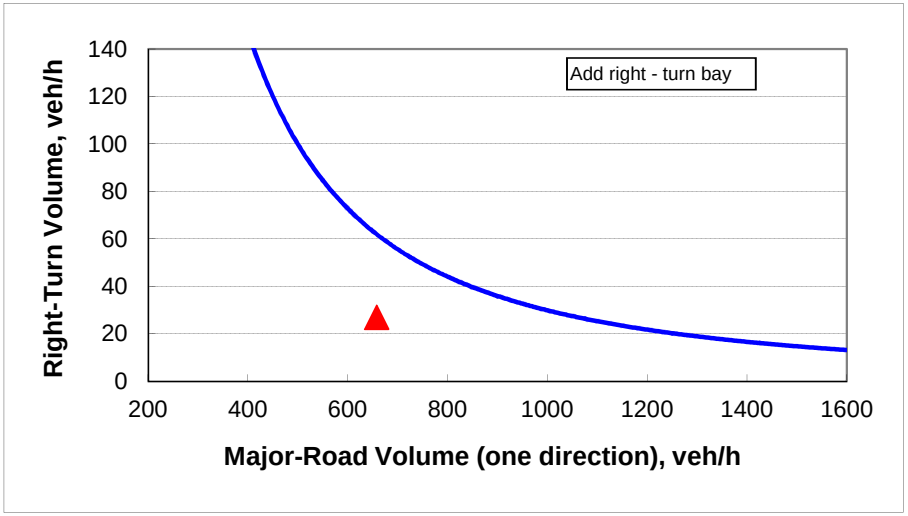
INPUT

Roadway geometry:	4-lane roadway

Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	658
Right-turn volume, veh/h:	27

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	62
Guidance for determining the need for a major-road right-turn bay for a 4-lane roadway:	
Do NOT add right-turn bay.	



Columbia Pk @ Tollgate Blvd
Midday Peak Hour

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

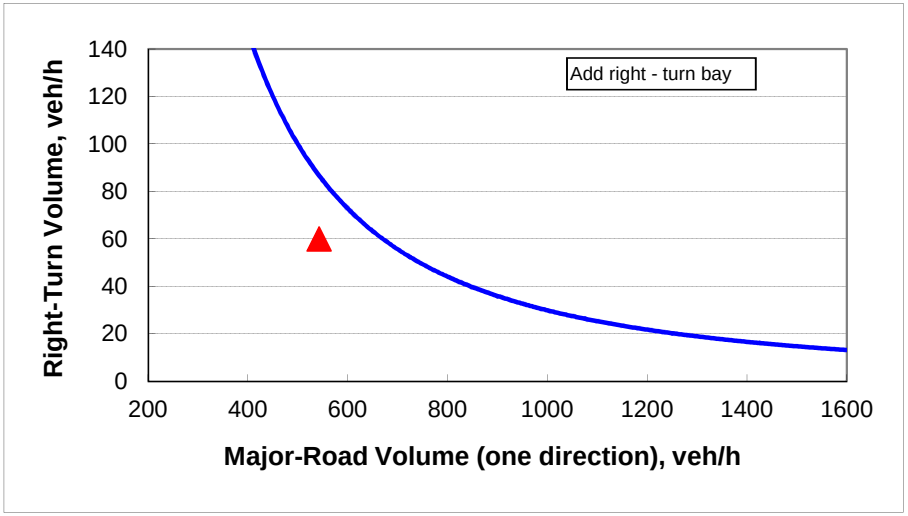
INPUT

Roadway geometry:	4-lane roadway

Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	543
Right-turn volume, veh/h:	60

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	87
Guidance for determining the need for a major-road right-turn bay for a 4-lane roadway:	
Do NOT add right-turn bay.	



Columbia Pk @ Tollgate Blvd
PM Peak Hour

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

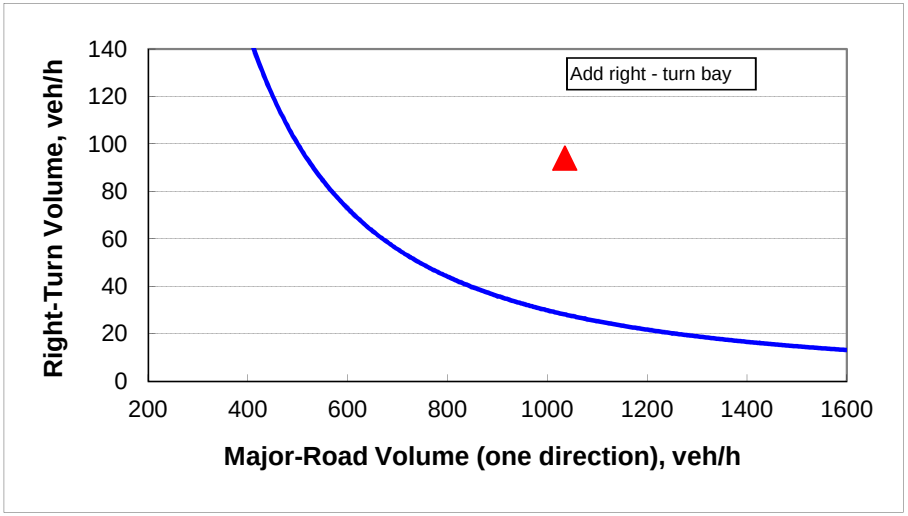
INPUT

Roadway geometry:	4-lane roadway

Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	1035
Right-turn volume, veh/h:	94

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	28
Guidance for determining the need for a major-road right-turn bay for a 4-lane roadway:	
Add right-turn bay.	



APPENDIX E

CAPACITY ANALYSIS WORKSHEETS
EXISTING TRAFFIC

HCS 2010 Two-Way Stop Control Summary Report

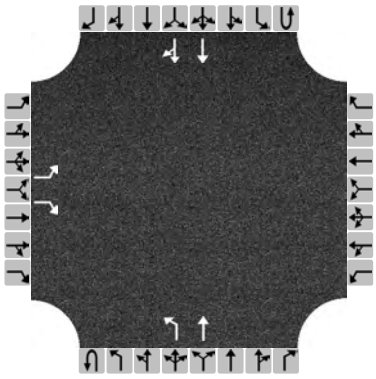
General Information

Analyst	bsb
Agency/Co.	Ragan-Smith Associates
Date Performed	12/19/2016
Analysis Year	2016
Time Analyzed	AM Peak Hour
Intersection Orientation	North-South
Project Description	Tollgate Village

Site Information

Intersection	Columbia Pk/Tollgate Blvd
Jurisdiction	Thompson's Station, TN
East/West Street	Tollgate Blvd
North/South Street	Columbia Pk
Peak Hour Factor	0.88
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	0	1		0	0	0	0	1	1	0	0	0	2	0
Configuration		L		R						L	T				T	TR
Volume (veh/h)		128		100						55	971				631	27
Percent Heavy Vehicles		3		3						3						
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		145		114						62						
Capacity		147		621						850						
v/c Ratio		0.99		0.18						0.07						
95% Queue Length		7.3		0.7						0.2						
Control Delay (s/veh)		131.2		12.1						9.6						
Level of Service (LOS)		F		B						A						
Approach Delay (s/veh)	78.8								0.5							
Approach LOS	F															

HCS 2010 Two-Way Stop Control Summary Report

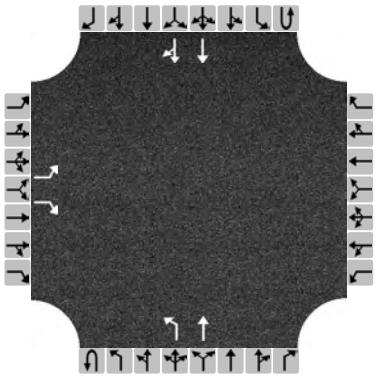
General Information

Analyst	bsb
Agency/Co.	Ragan-Smith Associates
Date Performed	12/19/2016
Analysis Year	2016
Time Analyzed	Midday Peak Hour
Intersection Orientation	North-South
Project Description	Tollgate Village

Site Information

Intersection	Columbia Pk/Tollgate Blvd
Jurisdiction	Thompson's Station, TN
East/West Street	Tollgate Blvd
North/South Street	Columbia Pk
Peak Hour Factor	0.98
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	0	1		0	0	0	0	1	1	0	0	0	2	0
Configuration		L		R						L	T				T	TR
Volume (veh/h)		31		68						68	455				483	60
Percent Heavy Vehicles		3		3						3						
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		32		69						69						
Capacity		309		717						1006						
v/c Ratio		0.10		0.10						0.07						
95% Queue Length		0.3		0.3						0.2						
Control Delay (s/veh)		18.0		10.6						8.8						
Level of Service (LOS)		C		B						A						
Approach Delay (s/veh)	12.9								1.1							
Approach LOS	B															

HCS 2010 Two-Way Stop Control Summary Report

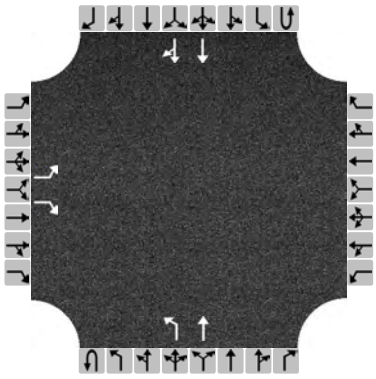
General Information

Analyst	bsb
Agency/Co.	Ragan-Smith Associates
Date Performed	12/19/2016
Analysis Year	2016
Time Analyzed	PM Peak Hour
Intersection Orientation	North-South
Project Description	Tollgate Village

Site Information

Intersection	Columbia Pk/Tollgate Blvd
Jurisdiction	Thompson's Station, TN
East/West Street	Tollgate Blvd
North/South Street	Columbia Pk
Peak Hour Factor	0.94
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	0	1		0	0	0	0	1	1	0	0	0	2	0
Configuration		L		R						L	T				T	TR
Volume (veh/h)		57		93						67	563				941	94
Percent Heavy Vehicles		3		3						3						
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

Delay, Queue Length, and Level of Service

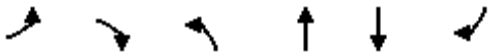
Flow Rate (veh/h)		61		99						71						
Capacity		171		476						624						
v/c Ratio		0.36		0.21						0.11						
95% Queue Length		1.5		0.8						0.4						
Control Delay (s/veh)		37.3		14.5						11.5						
Level of Service (LOS)		E		B						B						
Approach Delay (s/veh)	23.2								1.2							
Approach LOS	C															

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	128	100	55	971	631	27
Future Volume (veh/h)	128	100	55	971	631	27
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1863	1863	1900
Adj Flow Rate, veh/h	158	123	64	1129	956	41
Adj No. of Lanes	1	1	1	2	2	1
Peak Hour Factor	0.81	0.81	0.86	0.86	0.66	0.66
Percent Heavy Veh, %	0	0	0	2	2	0
Cap, veh/h	244	290	400	2360	1837	1056
Arrive On Green	0.13	0.13	0.04	0.67	0.52	0.52
Sat Flow, veh/h	1810	1615	1810	3632	3632	1615
Grp Volume(v), veh/h	158	123	64	1129	956	41
Grp Sat Flow(s),veh/h/ln	1810	1615	1810	1770	1770	1615
Q Serve(g_s), s	4.8	3.9	0.9	9.1	10.3	0.5
Cycle Q Clear(g_c), s	4.8	3.9	0.9	9.1	10.3	0.5
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	244	290	400	2360	1837	1056
V/C Ratio(X)	0.65	0.42	0.16	0.48	0.52	0.04
Avail Cap(c_a), veh/h	920	893	1068	6953	5123	2556
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.8	21.2	6.3	4.7	9.2	3.6
Incr Delay (d2), s/veh	2.9	1.0	0.2	0.2	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	0.1	0.4	4.4	5.0	0.3
LnGrp Delay(d),s/veh	26.7	22.1	6.5	4.9	9.4	3.6
LnGrp LOS	C	C	A	A	A	A
Approach Vol, veh/h	281			1193	997	
Approach Delay, s/veh	24.7			5.0	9.2	
Approach LOS	C			A	A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		44.7		13.3	8.6	36.1		
Change Period (Y+Rc), s		* 6		5.5	* 6	* 6		
Max Green Setting (Gmax), s		* 1.1E2		29.5	* 24	* 84		
Max Q Clear Time (g_c+I1), s		11.1		6.8	2.9	12.3		
Green Ext Time (p_c), s		18.3		1.1	0.2	17.8		

Intersection Summary	
HCM 2010 Ctrl Delay	8.9
HCM 2010 LOS	A

Notes



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	128	100	55	971	631	27
Future Volume (vph)	128	100	55	971	631	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	200	160			275
Storage Lanes	1	1	1			1
Taper Length (ft)	110		70			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1805	1615	1805	3539	3539	1615
Flt Permitted	0.950		0.159			
Satd. Flow (perm)	1805	1615	302	3539	3539	1615
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		105				41
Link Speed (mph)	30			25	45	
Link Distance (ft)	275			925	685	
Travel Time (s)	6.3			25.2	10.4	
Peak Hour Factor	0.81	0.81	0.86	0.86	0.66	0.66
Heavy Vehicles (%)	0%	0%	0%	2%	2%	0%
Adj. Flow (vph)	158	123	64	1129	956	41
Shared Lane Traffic (%)						
Lane Group Flow (vph)	158	123	64	1129	956	41
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane				Yes	Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1	1	1	1	1	1
Detector Template	Left	Right	Left	Thru	Thru	Right
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	pm+ov
Protected Phases	4	5	5	2	6	4
Permitted Phases		4	2			6
Detector Phase	4	5	5	2	6	4
Switch Phase						
Minimum Initial (s)	7.0	4.0	4.0	10.0	10.0	7.0
Minimum Split (s)	12.5	10.0	10.0	16.0	16.0	12.5

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Total Split (s)	35.0	30.0	30.0	120.0	90.0	35.0
Total Split (%)	22.6%	19.4%	19.4%	77.4%	58.1%	22.6%
Maximum Green (s)	29.5	24.0	24.0	114.0	84.0	29.5
Yellow Time (s)	3.2	4.3	4.3	4.3	4.3	3.2
All-Red Time (s)	2.3	1.7	1.7	1.7	1.7	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	6.0	6.0	6.0	6.0	5.5
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	Min	Min	None
Act Effct Green (s)	11.5	24.7	37.8	37.8	24.1	41.8
Actuated g/C Ratio	0.19	0.40	0.62	0.62	0.39	0.68
v/c Ratio	0.46	0.17	0.17	0.52	0.69	0.04
Control Delay	28.6	5.0	6.0	7.6	18.4	1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.6	5.0	6.0	7.6	18.4	1.1
LOS	C	A	A	A	B	A
Approach Delay	18.3			7.5	17.7	
Approach LOS	B			A	B	
Queue Length 50th (ft)	52	4	8	102	145	0
Queue Length 95th (ft)	106	28	22	163	154	4
Internal Link Dist (ft)	195			845	605	
Turn Bay Length (ft)		200	160			275
Base Capacity (vph)	895	1138	793	3539	3539	1563
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.11	0.08	0.32	0.27	0.03

Intersection Summary			
Area Type:	Other		
Cycle Length: 155			
Actuated Cycle Length: 61.1			
Natural Cycle: 50			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.69			
Intersection Signal Delay: 12.9		Intersection LOS: B	
Intersection Capacity Utilization 43.5%		ICU Level of Service A	
Analysis Period (min) 15			

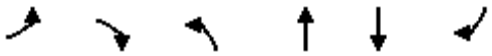
Splits and Phases: 1: Columbia Pk & Tollgate Blvd

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	31	68	68	455	483	60
Future Volume (veh/h)	31	68	68	455	483	60
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1863	1863	1900
Adj Flow Rate, veh/h	37	82	78	523	543	67
Adj No. of Lanes	1	1	1	2	2	1
Peak Hour Factor	0.83	0.83	0.87	0.87	0.89	0.89
Percent Heavy Veh, %	0	0	0	2	2	0
Cap, veh/h	241	311	480	1976	1195	760
Arrive On Green	0.13	0.13	0.06	0.56	0.34	0.34
Sat Flow, veh/h	1810	1615	1810	3632	3632	1615
Grp Volume(v), veh/h	37	82	78	523	543	67
Grp Sat Flow(s),veh/h/ln	1810	1615	1810	1770	1770	1615
Q Serve(g_s), s	0.7	1.6	0.9	2.9	4.5	0.9
Cycle Q Clear(g_c), s	0.7	1.6	0.9	2.9	4.5	0.9
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	241	311	480	1976	1195	760
V/C Ratio(X)	0.15	0.26	0.16	0.26	0.45	0.09
Avail Cap(c_a), veh/h	1433	1375	1539	10832	7981	3857
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.3	12.8	6.5	4.3	9.7	5.4
Incr Delay (d2), s/veh	0.3	0.4	0.2	0.1	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	1.6	0.5	1.4	2.2	0.5
LnGrp Delay(d),s/veh	14.6	13.2	6.6	4.3	9.9	5.5
LnGrp LOS	B	B	A	A	A	A
Approach Vol, veh/h	119			601	610	
Approach Delay, s/veh	13.7			4.6	9.4	
Approach LOS	B			A	A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		26.8		10.5	8.2	18.6		
Change Period (Y+Rc), s		* 6		5.5	* 6	* 6		
Max Green Setting (Gmax), s		* 1.1E2		29.5	* 24	* 84		
Max Q Clear Time (g_c+I1), s		4.9		3.6	2.9	6.5		
Green Ext Time (p_c), s		6.1		0.4	0.2	6.1		

Intersection Summary	
HCM 2010 Ctrl Delay	7.6
HCM 2010 LOS	A

Notes



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	31	68	68	455	483	60
Future Volume (vph)	31	68	68	455	483	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	200	160			275
Storage Lanes	1	1	1			1
Taper Length (ft)	110		70			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1805	1615	1805	3539	3539	1615
Flt Permitted	0.950		0.330			
Satd. Flow (perm)	1805	1615	627	3539	3539	1615
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		82				67
Link Speed (mph)	30			25	45	
Link Distance (ft)	275			925	685	
Travel Time (s)	6.3			25.2	10.4	
Peak Hour Factor	0.83	0.83	0.87	0.87	0.89	0.89
Heavy Vehicles (%)	0%	0%	0%	2%	2%	0%
Adj. Flow (vph)	37	82	78	523	543	67
Shared Lane Traffic (%)						
Lane Group Flow (vph)	37	82	78	523	543	67
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane				Yes	Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1	1	1	1	1	1
Detector Template	Left	Right	Left	Thru	Thru	Right
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	pm+ov
Protected Phases	4	5	5	2	6	4
Permitted Phases		4	2			6
Detector Phase	4	5	5	2	6	4
Switch Phase						
Minimum Initial (s)	7.0	4.0	4.0	10.0	10.0	7.0
Minimum Split (s)	12.5	10.0	10.0	16.0	16.0	12.5

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Total Split (s)	35.0	30.0	30.0	120.0	90.0	35.0
Total Split (%)	22.6%	19.4%	19.4%	77.4%	58.1%	22.6%
Maximum Green (s)	29.5	24.0	24.0	114.0	84.0	29.5
Yellow Time (s)	3.2	4.3	4.3	4.3	4.3	3.2
All-Red Time (s)	2.3	1.7	1.7	1.7	1.7	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	6.0	6.0	6.0	6.0	5.5
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	Min	Min	None
Act Effct Green (s)	7.3	17.0	26.9	28.6	18.2	28.1
Actuated g/C Ratio	0.17	0.40	0.63	0.67	0.43	0.66
v/c Ratio	0.12	0.12	0.13	0.22	0.36	0.06
Control Delay	18.5	3.0	4.5	4.4	13.5	1.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.5	3.0	4.5	4.4	13.5	1.7
LOS	B	A	A	A	B	A
Approach Delay	7.8			4.4	12.2	
Approach LOS	A			A	B	
Queue Length 50th (ft)	8	0	7	28	60	0
Queue Length 95th (ft)	27	15	18	44	103	10
Internal Link Dist (ft)	195			845	605	
Turn Bay Length (ft)		200	160			275
Base Capacity (vph)	1284	1312	1079	3539	3539	1600
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.06	0.07	0.15	0.15	0.04

Intersection Summary			
Area Type:	Other		
Cycle Length: 155			
Actuated Cycle Length: 42.6			
Natural Cycle: 40			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.36			
Intersection Signal Delay: 8.3		Intersection LOS: A	
Intersection Capacity Utilization 37.5%		ICU Level of Service A	
Analysis Period (min) 15			

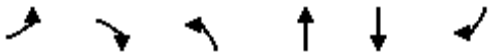
Splits and Phases: 1: Columbia Pk & Tollgate Blvd

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	57	93	67	563	941	94
Future Volume (veh/h)	57	93	67	563	941	94
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1863	1863	1900
Adj Flow Rate, veh/h	69	112	77	647	1057	106
Adj No. of Lanes	1	1	1	2	2	1
Peak Hour Factor	0.83	0.83	0.87	0.87	0.89	0.89
Percent Heavy Veh, %	0	0	0	2	2	0
Cap, veh/h	224	282	365	2329	1744	995
Arrive On Green	0.12	0.12	0.05	0.66	0.49	0.49
Sat Flow, veh/h	1810	1615	1810	3632	3632	1615
Grp Volume(v), veh/h	69	112	77	647	1057	106
Grp Sat Flow(s),veh/h/ln	1810	1615	1810	1770	1770	1615
Q Serve(g_s), s	1.8	3.2	1.0	4.0	11.4	1.4
Cycle Q Clear(g_c), s	1.8	3.2	1.0	4.0	11.4	1.4
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	224	282	365	2329	1744	995
V/C Ratio(X)	0.31	0.40	0.21	0.28	0.61	0.11
Avail Cap(c_a), veh/h	1014	988	1098	7665	5648	2777
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.0	19.3	6.8	3.8	9.7	4.1
Incr Delay (d2), s/veh	0.8	0.9	0.3	0.1	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	3.0	0.5	1.9	5.5	0.8
LnGrp Delay(d),s/veh	21.8	20.2	7.1	3.8	10.0	4.2
LnGrp LOS	C	C	A	A	B	A
Approach Vol, veh/h	181			724	1163	
Approach Delay, s/veh	20.8			4.2	9.5	
Approach LOS	C			A	A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		40.6		12.0	8.7	31.9		
Change Period (Y+Rc), s		* 6		5.5	* 6	* 6		
Max Green Setting (Gmax), s		* 1.1E2		29.5	* 24	* 84		
Max Q Clear Time (g_c+I1), s		6.0		5.2	3.0	13.4		
Green Ext Time (p_c), s		12.7		0.7	0.2	12.6		

Intersection Summary	
HCM 2010 Ctrl Delay	8.6
HCM 2010 LOS	A

Notes



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	57	93	67	563	941	94
Future Volume (vph)	57	93	67	563	941	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	200	160			275
Storage Lanes	1	1	1			1
Taper Length (ft)	110		70			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1805	1615	1805	3539	3539	1615
Flt Permitted	0.950		0.133			
Satd. Flow (perm)	1805	1615	253	3539	3539	1615
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		81				106
Link Speed (mph)	30			25	45	
Link Distance (ft)	275			925	685	
Travel Time (s)	6.3			25.2	10.4	
Peak Hour Factor	0.83	0.83	0.87	0.87	0.89	0.89
Heavy Vehicles (%)	0%	0%	0%	2%	2%	0%
Adj. Flow (vph)	69	112	77	647	1057	106
Shared Lane Traffic (%)						
Lane Group Flow (vph)	69	112	77	647	1057	106
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane				Yes	Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1	1	1	1	1	1
Detector Template	Left	Right	Left	Thru	Thru	Right
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	pm+ov
Protected Phases	4	5	5	2	6	4
Permitted Phases		4	2			6
Detector Phase	4	5	5	2	6	4
Switch Phase						
Minimum Initial (s)	7.0	4.0	4.0	10.0	10.0	7.0
Minimum Split (s)	12.5	10.0	10.0	16.0	16.0	12.5

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Total Split (s)	35.0	30.0	30.0	120.0	90.0	35.0
Total Split (%)	22.6%	19.4%	19.4%	77.4%	58.1%	22.6%
Maximum Green (s)	29.5	24.0	24.0	114.0	84.0	29.5
Yellow Time (s)	3.2	4.3	4.3	4.3	4.3	3.2
All-Red Time (s)	2.3	1.7	1.7	1.7	1.7	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	6.0	6.0	6.0	6.0	5.5
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	Min	Min	None
Act Effct Green (s)	8.5	22.4	38.5	38.5	24.0	38.6
Actuated g/C Ratio	0.14	0.38	0.66	0.66	0.41	0.66
v/c Ratio	0.27	0.17	0.20	0.28	0.73	0.10
Control Delay	27.6	6.4	4.8	4.5	18.2	1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.6	6.4	4.8	4.5	18.2	1.1
LOS	C	A	A	A	B	A
Approach Delay	14.5			4.6	16.6	
Approach LOS	B			A	B	
Queue Length 50th (ft)	22	7	8	39	153	0
Queue Length 95th (ft)	57	33	20	64	246	12
Internal Link Dist (ft)	195			845	605	
Turn Bay Length (ft)		200	160			275
Base Capacity (vph)	926	1089	814	3539	3539	1594
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.10	0.09	0.18	0.30	0.07

Intersection Summary			
Area Type:	Other		
Cycle Length: 155			
Actuated Cycle Length: 58.7			
Natural Cycle: 45			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.73			
Intersection Signal Delay: 12.2		Intersection LOS: B	
Intersection Capacity Utilization 50.1%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 1: Columbia Pk & Tollgate Blvd

APPENDIX F

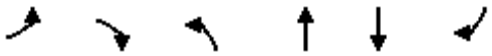
CAPACITY ANALYSIS WORKSHEETS
FUTURE TRAFFIC

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	205	160	88	1554	1010	43
Future Volume (veh/h)	205	160	88	1554	1010	43
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1863	1863	1900
Adj Flow Rate, veh/h	253	198	102	1807	1530	65
Adj No. of Lanes	1	1	1	2	2	1
Peak Hour Factor	0.81	0.81	0.86	0.86	0.66	0.66
Percent Heavy Veh, %	0	0	0	2	2	0
Cap, veh/h	302	329	250	2592	2275	1307
Arrive On Green	0.17	0.17	0.04	0.73	0.64	0.64
Sat Flow, veh/h	1810	1615	1810	3632	3632	1615
Grp Volume(v), veh/h	253	198	102	1807	1530	65
Grp Sat Flow(s),veh/h/ln	1810	1615	1810	1770	1770	1615
Q Serve(g_s), s	15.4	12.7	2.1	31.8	31.0	0.9
Cycle Q Clear(g_c), s	15.4	12.7	2.1	31.8	31.0	0.9
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	302	329	250	2592	2275	1307
V/C Ratio(X)	0.84	0.60	0.41	0.70	0.67	0.05
Avail Cap(c_a), veh/h	469	478	565	3543	2610	1460
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.0	41.2	12.5	8.3	12.8	2.2
Incr Delay (d2), s/veh	7.8	1.8	1.1	0.4	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.4	11.4	1.4	15.4	15.1	0.8
LnGrp Delay(d),s/veh	53.8	42.9	13.6	8.7	13.4	2.2
LnGrp LOS	D	D	B	A	B	A
Approach Vol, veh/h	451			1909	1595	
Approach Delay, s/veh	49.0			9.0	12.9	
Approach LOS	D			A	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		89.4		24.5	10.2	79.2		
Change Period (Y+Rc), s		* 6		5.5	* 6	* 6		
Max Green Setting (Gmax), s		* 1.1E2		29.5	* 24	* 84		
Max Q Clear Time (g_c+I1), s		33.8		17.4	4.1	33.0		
Green Ext Time (p_c), s		49.6		1.6	0.3	37.0		

Intersection Summary	
HCM 2010 Ctrl Delay	15.1
HCM 2010 LOS	B

Notes



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	205	160	88	1554	1010	43
Future Volume (vph)	205	160	88	1554	1010	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	200	160			275
Storage Lanes	1	1	1			1
Taper Length (ft)	110		70			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1805	1615	1805	3539	3539	1615
Flt Permitted	0.950		0.068			
Satd. Flow (perm)	1805	1615	129	3539	3539	1615
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		24				65
Link Speed (mph)	30			25	45	
Link Distance (ft)	275			925	685	
Travel Time (s)	6.3			25.2	10.4	
Peak Hour Factor	0.81	0.81	0.86	0.86	0.66	0.66
Heavy Vehicles (%)	0%	0%	0%	2%	2%	0%
Adj. Flow (vph)	253	198	102	1807	1530	65
Shared Lane Traffic (%)						
Lane Group Flow (vph)	253	198	102	1807	1530	65
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane				Yes	Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1	1	1	1	1	1
Detector Template	Left	Right	Left	Thru	Thru	Right
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	pm+ov
Protected Phases	4	5	5	2	6	4
Permitted Phases		4	2			6
Detector Phase	4	5	5	2	6	4
Switch Phase						
Minimum Initial (s)	7.0	4.0	4.0	10.0	10.0	7.0
Minimum Split (s)	12.5	10.0	10.0	16.0	16.0	12.5

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Total Split (s)	35.0	30.0	30.0	120.0	90.0	35.0
Total Split (%)	22.6%	19.4%	19.4%	77.4%	58.1%	22.6%
Maximum Green (s)	29.5	24.0	24.0	114.0	84.0	29.5
Yellow Time (s)	3.2	4.3	4.3	4.3	4.3	3.2
All-Red Time (s)	2.3	1.7	1.7	1.7	1.7	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	6.0	6.0	6.0	6.0	5.5
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	Min	Min	None
Act Effct Green (s)	21.0	36.3	68.5	68.5	52.7	79.9
Actuated g/C Ratio	0.21	0.36	0.67	0.67	0.52	0.79
v/c Ratio	0.68	0.33	0.42	0.76	0.83	0.05
Control Delay	49.8	24.6	15.9	13.7	25.8	0.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.8	24.6	15.9	13.7	25.8	0.7
LOS	D	C	B	B	C	A
Approach Delay	38.7			13.8	24.8	
Approach LOS	D			B	C	
Queue Length 50th (ft)	148	79	20	358	408	0
Queue Length 95th (ft)	263	154	63	504	375	3
Internal Link Dist (ft)	195			845	605	
Turn Bay Length (ft)		200	160			275
Base Capacity (vph)	550	837	502	3421	2952	1437
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.46	0.24	0.20	0.53	0.52	0.05

Intersection Summary			
Area Type:	Other		
Cycle Length: 155			
Actuated Cycle Length: 101.5			
Natural Cycle: 65			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.83			
Intersection Signal Delay: 21.1		Intersection LOS: C	
Intersection Capacity Utilization 63.9%		ICU Level of Service B	
Analysis Period (min) 15			

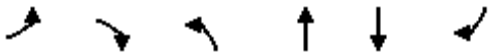
Splits and Phases: 1: Columbia Pk & Tollgate Blvd

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	50	109	109	728	773	96
Future Volume (veh/h)	50	109	109	728	773	96
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1863	1863	1900
Adj Flow Rate, veh/h	60	131	125	837	869	108
Adj No. of Lanes	1	1	1	2	2	1
Peak Hour Factor	0.83	0.83	0.87	0.87	0.89	0.89
Percent Heavy Veh, %	0	0	0	2	2	0
Cap, veh/h	232	313	429	2289	1640	955
Arrive On Green	0.13	0.13	0.07	0.65	0.46	0.46
Sat Flow, veh/h	1810	1615	1810	3632	3632	1615
Grp Volume(v), veh/h	60	131	125	837	869	108
Grp Sat Flow(s),veh/h/ln	1810	1615	1810	1770	1770	1615
Q Serve(g_s), s	1.5	3.6	1.6	5.6	8.9	1.5
Cycle Q Clear(g_c), s	1.5	3.6	1.6	5.6	8.9	1.5
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	232	313	429	2289	1640	955
V/C Ratio(X)	0.26	0.42	0.29	0.37	0.53	0.11
Avail Cap(c_a), veh/h	1046	1040	1161	7905	5825	2865
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.1	18.1	6.6	4.2	9.7	4.6
Incr Delay (d2), s/veh	0.6	0.9	0.4	0.1	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.1	0.8	2.7	4.3	0.9
LnGrp Delay(d),s/veh	20.7	18.9	7.0	4.3	10.0	4.6
LnGrp LOS	C	B	A	A	B	A
Approach Vol, veh/h	191			962	977	
Approach Delay, s/veh	19.5			4.6	9.4	
Approach LOS	B			A	A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		39.0		12.0	9.4	29.6		
Change Period (Y+Rc), s		* 6		5.5	* 6	* 6		
Max Green Setting (Gmax), s		* 1.1E2		29.5	* 24	* 84		
Max Q Clear Time (g_c+I1), s		7.6		5.6	3.6	10.9		
Green Ext Time (p_c), s		12.8		0.7	0.4	12.7		

Intersection Summary	
HCM 2010 Ctrl Delay	8.2
HCM 2010 LOS	A

Notes



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	50	109	109	728	773	96
Future Volume (vph)	50	109	109	728	773	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	200	160			275
Storage Lanes	1	1	1			1
Taper Length (ft)	110		70			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1805	1615	1805	3539	3539	1615
Flt Permitted	0.950		0.176			
Satd. Flow (perm)	1805	1615	334	3539	3539	1615
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		131				108
Link Speed (mph)	30			25	45	
Link Distance (ft)	275			925	685	
Travel Time (s)	6.3			25.2	10.4	
Peak Hour Factor	0.83	0.83	0.87	0.87	0.89	0.89
Heavy Vehicles (%)	0%	0%	0%	2%	2%	0%
Adj. Flow (vph)	60	131	125	837	869	108
Shared Lane Traffic (%)						
Lane Group Flow (vph)	60	131	125	837	869	108
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane				Yes	Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1	1	1	1	1	1
Detector Template	Left	Right	Left	Thru	Thru	Right
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	pm+ov
Protected Phases	4	5	5	2	6	4
Permitted Phases		4	2			6
Detector Phase	4	5	5	2	6	4
Switch Phase						
Minimum Initial (s)	7.0	4.0	4.0	10.0	10.0	7.0
Minimum Split (s)	12.5	10.0	10.0	16.0	16.0	12.5

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Total Split (s)	35.0	30.0	30.0	120.0	90.0	35.0
Total Split (%)	22.6%	19.4%	19.4%	77.4%	58.1%	22.6%
Maximum Green (s)	29.5	24.0	24.0	114.0	84.0	29.5
Yellow Time (s)	3.2	4.3	4.3	4.3	4.3	3.2
All-Red Time (s)	2.3	1.7	1.7	1.7	1.7	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	6.0	6.0	6.0	6.0	5.5
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	Min	Min	None
Act Effct Green (s)	7.9	23.0	35.1	35.1	19.5	33.6
Actuated g/C Ratio	0.14	0.42	0.64	0.64	0.36	0.61
v/c Ratio	0.23	0.17	0.27	0.37	0.69	0.10
Control Delay	25.3	3.3	5.2	5.1	18.4	1.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.3	3.3	5.2	5.1	18.4	1.4
LOS	C	A	A	A	B	A
Approach Delay	10.2			5.1	16.5	
Approach LOS	B			A	B	
Queue Length 50th (ft)	17	0	12	52	119	0
Queue Length 95th (ft)	48	22	28	81	196	14
Internal Link Dist (ft)	195			845	605	
Turn Bay Length (ft)		200	160			275
Base Capacity (vph)	989	1159	870	3539	3539	1589
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.11	0.14	0.24	0.25	0.07

Intersection Summary			
Area Type:	Other		
Cycle Length: 155			
Actuated Cycle Length: 54.7			
Natural Cycle: 45			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.69			
Intersection Signal Delay: 10.8		Intersection LOS: B	
Intersection Capacity Utilization 47.8%		ICU Level of Service A	
Analysis Period (min) 15			

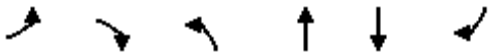
Splits and Phases: 1: Columbia Pk & Tollgate Blvd

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	91	149	107	901	1506	150
Future Volume (veh/h)	91	149	107	901	1506	150
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1863	1863	1900
Adj Flow Rate, veh/h	110	180	123	1036	1692	169
Adj No. of Lanes	1	1	1	2	2	1
Peak Hour Factor	0.83	0.83	0.87	0.87	0.89	0.89
Percent Heavy Veh, %	0	0	0	2	2	0
Cap, veh/h	244	290	233	2642	2266	1252
Arrive On Green	0.13	0.13	0.04	0.75	0.64	0.64
Sat Flow, veh/h	1810	1615	1810	3632	3632	1615
Grp Volume(v), veh/h	110	180	123	1036	1692	169
Grp Sat Flow(s),veh/h/ln	1810	1615	1810	1770	1770	1615
Q Serve(g_s), s	5.4	10.0	2.1	10.2	32.0	2.5
Cycle Q Clear(g_c), s	5.4	10.0	2.1	10.2	32.0	2.5
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	244	290	233	2642	2266	1252
V/C Ratio(X)	0.45	0.62	0.53	0.39	0.75	0.14
Avail Cap(c_a), veh/h	551	563	600	4161	3066	1617
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.6	36.7	16.2	4.4	12.0	2.7
Incr Delay (d2), s/veh	1.3	2.2	1.9	0.1	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.8	9.0	2.3	4.9	15.5	1.8
LnGrp Delay(d),s/veh	39.9	38.9	18.0	4.5	12.7	2.8
LnGrp LOS	D	D	B	A	B	A
Approach Vol, veh/h	290			1159	1861	
Approach Delay, s/veh	39.3			5.9	11.8	
Approach LOS	D			A	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		78.4		18.6	10.3	68.1		
Change Period (Y+Rc), s		* 6		5.5	* 6	* 6		
Max Green Setting (Gmax), s		* 1.1E2		29.5	* 24	* 84		
Max Q Clear Time (g_c+I1), s		12.2		12.0	4.1	34.0		
Green Ext Time (p_c), s		36.9		1.1	0.4	28.1		

Intersection Summary	
HCM 2010 Ctrl Delay	12.2
HCM 2010 LOS	B

Notes



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	91	149	107	901	1506	150
Future Volume (vph)	91	149	107	901	1506	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	200	160			275
Storage Lanes	1	1	1			1
Taper Length (ft)	110		70			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1805	1615	1805	3539	3539	1615
Flt Permitted	0.950		0.065			
Satd. Flow (perm)	1805	1615	124	3539	3539	1615
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		15				169
Link Speed (mph)	30			25	45	
Link Distance (ft)	275			925	685	
Travel Time (s)	6.3			25.2	10.4	
Peak Hour Factor	0.83	0.83	0.87	0.87	0.89	0.89
Heavy Vehicles (%)	0%	0%	0%	2%	2%	0%
Adj. Flow (vph)	110	180	123	1036	1692	169
Shared Lane Traffic (%)						
Lane Group Flow (vph)	110	180	123	1036	1692	169
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane				Yes	Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1	1	1	1	1	1
Detector Template	Left	Right	Left	Thru	Thru	Right
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	pm+ov	pm+pt	NA	NA	pm+ov
Protected Phases	4	5	5	2	6	4
Permitted Phases		4	2			6
Detector Phase	4	5	5	2	6	4
Switch Phase						
Minimum Initial (s)	7.0	4.0	4.0	10.0	10.0	7.0
Minimum Split (s)	12.5	10.0	10.0	16.0	16.0	12.5

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Total Split (s)	35.0	30.0	30.0	120.0	90.0	35.0
Total Split (%)	22.6%	19.4%	19.4%	77.4%	58.1%	22.6%
Maximum Green (s)	29.5	24.0	24.0	114.0	84.0	29.5
Yellow Time (s)	3.2	4.3	4.3	4.3	4.3	3.2
All-Red Time (s)	2.3	1.7	1.7	1.7	1.7	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	6.0	6.0	6.0	6.0	5.5
Lead/Lag		Lead	Lead		Lag	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	Min	Min	None
Act Effct Green (s)	12.7	31.7	74.9	74.9	55.4	74.4
Actuated g/C Ratio	0.13	0.32	0.75	0.75	0.56	0.75
v/c Ratio	0.48	0.34	0.39	0.39	0.86	0.14
Control Delay	53.2	28.7	15.6	4.8	24.5	0.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.2	28.7	15.6	4.8	24.5	0.8
LOS	D	C	B	A	C	A
Approach Delay	38.0			5.9	22.3	
Approach LOS	D			A	C	
Queue Length 50th (ft)	64	76	17	97	443	0
Queue Length 95th (ft)	142	164	79	146	670	14
Internal Link Dist (ft)	195			845	605	
Turn Bay Length (ft)		200	160			275
Base Capacity (vph)	565	719	521	3417	2986	1506
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.25	0.24	0.30	0.57	0.11

Intersection Summary			
Area Type:	Other		
Cycle Length: 155			
Actuated Cycle Length: 99.8			
Natural Cycle: 60			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.86			
Intersection Signal Delay: 18.0		Intersection LOS: B	
Intersection Capacity Utilization 68.0%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 1: Columbia Pk & Tollgate Blvd

RPM Transportation Consultants, LLC
1101 Seventeenth Avenue S. • Nashville, TN 37212 • (615) 370-8410 • Fax (615) 370-8455

January 6, 2017

Ms. Wendy Deats
Town Planner
Town of Thompsons Station
1550 Thompsons Station Road West
Thompsons Station, TN 37179

Re: Tollgate Village – Traffic Impact Study Review
Thompson's Station, Tennessee

Dear Wendy:

I am writing this letter to summarize our review of the Traffic Impact Study (TIS) for the Tollgate Village development on Tollgate Boulevard. On December 21st, 2016, RPM received a copy of the TIS for the development prepared by Ragan-Smith Associates, Inc. This report is dated December 20, 2016.

The Tollgate Village residential development is located on Tollgate Boulevard on the west side of Columbia Pike, approximately 0.5 miles north of the State Route 840 interchange. Based on information included in the TIS, the purpose of the study is to evaluate the need for a traffic signal at the intersection of Columbia Pike and Tollgate Boulevard, as well as establishing a schedule of improvements for traffic mitigation as the development progresses. The traffic mitigation measures recommended in the TIS are, (1) a secondary access to the Tollgate Village community and, (2) the addition of a right turn lane on Columbia Pike at the intersection with Tollgate Boulevard.

I have divided my comments into two different sections. The first includes comments related to technical aspects of the study and its methodologies. The second includes comments related to the interpretation of the results of the analyses and the study's recommendations.

Technical Aspects of the TIS

In order to perform the analyses involved in this study, a traffic count was conducted at the intersection of Columbia Pike and Tollgate Boulevard on November 17, 2016. According to the Town of Thompson's Station, construction of a separate project was underway during the date of this count at the intersection of Columbia Pike and Critz Lane, south of the project site, which might have affected traffic volumes at the study intersection. The study intersection was previously counted by Ragan-Smith in 2014 as part of a 2015 traffic study for the same residential development. The 2016 through movement volumes along Columbia Pike were found to be within approximately 5% of the 2014 through movement volumes during both the A.M. and P.M. peak hours, with

one exception. The traffic volume for the northbound through movement at the study intersection during the A.M. peak hour decreased by approximately 28% from 2014 to 2016. However, according to the Town of Thompson's Station, the previously mentioned construction site should not affect traffic coming from Critz Lane turning north onto Columbia Pike. Therefore, these counts remain valid for use and were collected during a typical weekday when school was in session.

In evaluating the need for a traffic signal at the intersection of Columbia Pike and Tollgate Boulevard, standard methodologies were used. This analysis was conducted in accordance with procedures outlined in the Manual on Uniform Traffic Control Devices (MUTCD) and the National Cooperative Highway Research Program (NCHRP) Report 457, *Evaluating Intersection Improvements: An Engineering Study Guide*. It was found that multiple traffic signal warrants were satisfied based on existing traffic volumes at the study intersection.

The capacity analyses for the existing and future traffic conditions were prepared according to standard traffic engineering methodologies as outlined in the *Highway Capacity Manual 2010*. In order to establish a schedule for introducing a secondary access point, traffic volumes were increased until there was either no more available capacity or until a turning movement indicated an undesirable level of service at the intersection Columbia Pike and Tollgate Boulevard. Ultimately, the traffic volumes of all approaches were increased by a factor of 1.6, resulting in the eastbound left turning movement operating at LOS E in the A.M. peak hour. The total number of trips in and out of Tollgate Village caused by this increase was 186 trips. Using the standard rate for a single-family detached housing development from ITE's Trip Generation Manual, the number of additional single-family homes needed to produce 186 new trips was calculated to be 248 homes. It should be noted that the 95th percentile queue length resulting from this additional traffic is 263 feet, which exceeds the available storage length and would, on occasion, block the intersection of Tollgate Boulevard and Elliston Way. However, the traffic volume increase by a factor of 1.6 on all approaches represents a conservative projection based on historical trends in the area. Therefore, the methodology used in this traffic study sufficiently provides a logical trigger point for the necessity of a secondary access.

The need for a southbound right turn lane on Columbia Pike at the intersection with Tollgate Boulevard was also analyzed. It was found that the warrant for a southbound right turn lane was satisfied based on existing traffic volumes in the P.M. peak hour. The methodology used in the traffic study complies with standards defined in NCHRP Report 457, *Evaluating Intersection Improvements: An Engineering Study Guide*. It was noted that the values shown in the "Major-Road Volume" column of Table 2 are inconsistent with the values used in Appendix D. The values shown in Table 2 represent the southbound through movement volumes in each peak hour while the values used in Appendix D represent the total combined traffic volumes for all southbound movements in each peak hour. The figures found in Appendix D are correct and this discrepancy does not affect the findings of the analysis.

Recommendations of the TIS

We agree with the findings of the assessment and its recommendations at the intersection of Columbia Pike and Tollgate Boulevard. These recommendations include the installation of a traffic signal, the extension of the northbound merge area approximately 300 feet north of the intersection, and the construction of a southbound right turn lane with a storage length of 275 feet and 100 feet of taper length. The TIS also recommends the removal of the two-way left turn lane pavement markings along Columbia Pike north of the Tollgate Boulevard intersection. According to the study, no westbound approach exists at the study intersection; however, we did not conduct a site visit to confirm this assessment.

The traffic study also includes recommendations for a schedule of traffic mitigation measures, including a secondary access location from Declaration Way by an extension of Bransford Place. The conclusion drawn in the traffic study is that the need for a secondary access will be exist when 248 additional single family homes are constructed. We agree with the assessment that 248 homes is a logical trigger point for the necessity of a secondary access, based on capacity considerations.

Additionally, the study states that recent development progress and the anticipated development schedule indicates that construction of 248 homes will take approximately 3 years. The study also states that an access point at Declaration Way is the preferred option based on the close proximity to portions of Tollgate Village that are already developed and that it will provide a reciprocal secondary access to Independence High School. However, there is no information provided in the report about the full build-out schedule. Furthermore, the impact of additional traffic being assigned to Declaration Way or any issues pertaining to the secondary access location was not addressed in this study.

In summary, we agree with the following recommendations included in the Tollgate Village TIS, dated December 20, 2016:

- A traffic signal is warranted at the intersection of Columbia Pike and Tollgate Boulevard under the current traffic conditions. Because Columbia Pike is a state route, the proposed traffic signal will also need approval from TDOT.

- A right turn lane along Columbia Pike at the Tollgate Boulevard intersection is warranted based on the current traffic conditions. The recommended 275 feet of storage length and 100 feet of taper is sufficient to serve the existing traffic volumes.

- It is recommended that the northbound merge area along Columbia Pike be extended approximately 300 feet north of the Tollgate Boulevard intersection. Additionally, the two-way left turn lane pavement markings along Columbia Pike north of the Tollgate Boulevard intersection should be removed.

- The development will require construction of a secondary access after a generation of 186 new A.M. peak hour trips, which is equivalent to an addition

of 248 single family homes.

We also submit the following considerations that would provide a more comprehensive understanding of any additional impacts and improvements under a future full-build scenario, if desired by the Town:

- The full build-out schedule should be included in the report to show a logical timeline for when construction of 248 additional homes can be anticipated as the development progresses. Additionally, a count figure showing the future traffic volumes produced by the 248 new homes expected at the study intersection should be included in the study.

- An analysis of the impacts associated with the new traffic assignment at the secondary access on Declaration Way should be included in the traffic study. This analysis should consider current traffic volumes produced by Independence High School, as well as traffic produced by any future developments planned for the area. Recommendations for traffic control improvements should be provided to mitigate any issues that arise from redirecting Tollgate Village traffic onto Declaration Way. Both the intersection of Declaration Way and Bransford Place and the intersection of Columbia Pike and Declaration Way should be included in this analysis.

Please contact me if you have any questions regarding this review or if you need any additional information.

Sincerely,
RPM TRANSPORTATION CONSULTANTS

Jeff Hammond, P.E

January 11, 2017

Tollgate Residents,

We hope everyone enjoyed a nice holiday season. We wanted to provide you all with some updates on our end.

Significant Road Repairs: As you may have noticed, our road contractor has been in Tollgate repairing the roadways in most dire need of repair (Newark Lane and the connection between Millerton Way and Americus Drive). The contractor has been significant delayed as a result of the holidays and the recent wet weather; they need a certain number of dry days in a row to be able to finalize these repairs. They will finish the repairs as soon as the weather permits.

Final Road Repair and Paving: We have received contractor bids and are ready to move forward with the completion of all the remaining road repairs and top coating of the older section roads at Tollgate. The only thing left to do is to get on the contractor's schedule for final paving in early 2017, which we are prepared to do immediately following the approval of our plat submissions in late January (discussed further below).

Traffic Signal: We are pleased to report that we have received all necessary approvals from TDOT to install a traffic light and turning lane at the entrance to Tollgate. This is great news and the result of a lot of hard work by our engineers in collaboration with the Town and TDOT. After receiving the approval last month, we sent bid packages out to four contractors to price the installation work, with bids due to us this week. Once we receive the bids, we will pick a contractor and get on their schedule for the installation immediately following the approval of our plat submissions in late January. Keep in mind that it will take some time to get the light up and working as there is a significant amount of work necessary to reconfigure the Columbia Pike layout, which will require permitting and potential lane closures and detours, all controlled by TDOT. We will give you a definite time table once we have reviewed the bids and have feedback from TDOT as to the scheduling of the work. We are cautiously optimistic that our contractor can complete the work in 16-20 weeks once we get on their schedule and TDOT gives them the go-ahead to begin.

Second Entrance to Tollgate: We have fielded a lot of questions on the completion of a second entrance at Tollgate. Per a request from Thompson's Station, we recently commissioned a traffic study, which has been shared with Town staff, to help understand the need and timing for a second entrance. Per the traffic engineers' review, they have concluded that traffic patterns do not necessitate a secondary entrance at Tollgate until another 250 homes are built and occupied (likely several years).

In spite of the need for this second entrance technically being several years in the future, this is nonetheless an issue at the forefront of our minds, though something that is somewhat out of our control at this point. We have been exploring two potential options. For one, we approached Williamson County Schools (WCS) about the possibility of connecting Declaration Way with the road to

Independence High School to satisfy the ultimate need for a secondary access point at Tollgate. We have reached out to WCS several times to date, and have received no response back other than something to the effect of "they are looking into it." We, and the Town of Thompson's Station for that matter, have no control over WCS's approval and are thus forced to wait patiently for their response.

The other potential secondary access point is on the north side of Tollgate next to the old bridge on Columbia Pike. As we believe many of you know, this is not a viable option right now due to the necessity of widening the bridge, which is a multi-million dollar project that we understand to be on TDOT's list of future infrastructure improvement projects. Unfortunately, we do not have a timetable for when TDOT will be completing the upgrade to this bridge; all we know is that they recognize that the bridge, which is part of a state road that they control, needs to be modernized and will eventually get around to it. Thus, we are all at the mercy of their schedule and budget, and could be waiting for a while.

We continue to try to be creative and think through other potential options, but at this point we are all in a holding pattern that is dependent upon the timetables/budgets of two different government entities over which neither we nor Thompson's Station has control. The great news, though, is that the traffic light installation should significantly mitigate the traffic issues with regard to entry into and egress from the neighborhood.

Plat Approvals: In late January we will go in front of the Thompson's Station Planning Commission for approval of our final plat on Section 15 (the 80 or so single family lots you see being developed right now) and preliminary plats for Sections 16 and 17 (the remaining ~175 single family lots to be developed in the back of Tollgate). We fully expect approval of these three plats by the Planning Commission, without any extraneous conditions attached to them, as they comply with the zoning ordinance. **Coterminous with the approval of these three plats, we will put up surety/bonding for both the remaining road repairs and final paving required and for the traffic light and turning lane into Tollgate, as requested by the Town of Thompson's Station. More importantly, once the bonding is in place, we will sign the contracts and, as soon as we can, get onto the schedules of the contractors to initiate final paving of the old sections at Tollgate and complete the installation of the traffic light.**

In order to get in front of any potential issues with respect to these plats, we have been communicating directly with Town officials and your elected representatives and have asked for any issues or concerns they have to be sent to us now and worked out collaboratively ahead of time. **We want nothing more than to get your traffic light installed and roads paved as soon as possible. A denial or deferment of approval (preliminary or final) of any of these three plats, in spite of MBSC complying with all applicable ordinances and reasonable conditions, will unfortunately and unnecessarily delay final paving and traffic light installation at Tollgate. We, and we're sure you, don't want that to happen.**

Front of Tollgate: We do not have much of an update at this time. We are trying to finalize the above issues (paving, traffic light, plat approvals) before tackling the front of Tollgate with the Town.

Please continue to send any questions to us at tollgatevillagets@gmail.com, and we will get them answered as best we can. We understand that many of you are likely not well versed in development issues facing both developers and local jurisdictions and that some of the items I discuss or that you might read on community message boards may be complicated or at odds with one another. To that end, and in the spirit of complete transparency, if there are enough people who are interested, we are also happy to host an in-person Q&A session sometime this month or next to provide further answers to questions, clear up any confusions, and offer our views on Tollgate in general.

Happy New Year to all.

Sincerely,

Daniel Gluck

MBSC

10-081
9260

RAGAN SMITH

January 17, 2017

VIA ELECTRONIC MAIL: **wdeats@thompsons-station.com**

Ms. Wendy Deats, AICP
Town Planner
Town of Thompson's Station
1550 Thompson's Station Road West
P.O. Box 100
Thompson's Station, Tennessee 37179

RE: TOLLGATE VILLAGE SIGNAL WARRANT AND SECONDARY ACCESS STUDY REVIEW RESPONSE AND ADDITIONAL INFORMATION TOWN OF THOMPSON'S STATION, TENNESSEE

Dear Wendy:

The purpose of this letter is to respond and provide additional information to the Town's review of the Tollgate Village signal warrant and secondary access traffic study completed by Ragan-Smith. Comments were received from the Town on January 11, 2017. A listing of these comments and our response or acknowledgement to each is provided below.

RPM Transportation Consultants comments:

1. *"The full build out schedule should be included in the report to show a logical timeline for when the construction of 248 additional homes can be anticipated as the development progresses. Additionally, a count figure showing the future traffic volumes produced by the 248 new homes expected at the study intersection should be included in the study."*
   RESPONSE: The build out schedule for any development is determined by market conditions that will increase or decrease the rate at which new homes or other uses are completed. As indicated by the conclusions of the submitted traffic study, the construction of 248 additional homes represents approximately 3 years of build out. The referenced future traffic volumes are currently shown in the appendix of the study and a figure can be prepared to illustrate those volumes.

2. *"An analysis of the impacts associated with the new traffic assignment at the secondary access on Declaration Way should be included in the traffic study. This analysis should consider current traffic volumes produced by any future developments planned for the area. Recommendations for traffic control improvements should be provide to mitigate any issues that arise from redirecting Tollgate Village traffic onto Declaration Way. Both the intersection of Declaration Way and Branford Place and the intersection of Columbia Pike and Declaration Way should be included in the analysis."*
   RESPONSE: The focus of the traffic study was the existing intersection of Columbia Pike and Tollgate Boulevard specifically related to establishing a schedule for providing a secondary access at Tollgate Village. Additionally, traffic signal warrant analysis was conducted to confirm the signal warrant analysis conducted by TDOT in 2014. Providing specific recommendations for Declaration Way at this time would be premature because coordination must take place with Williamson County Schools to establish an agreement and the feasibility/responsibility of the secondary access connection improvements.

Town staff comments:

1. *"The traffic study doesn't include a project description. Provide information related to the number of dwelling units, proposed commercial and office square footage per the approved site development plan in order to analyze trip generation."*

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RESPONSE: A development description was not included because the purpose of the traffic study was focused on the intersection control at Columbia Pike and Tollgate Boulevard. Proposed development plan impacts or the impact of development plan modifications were not within the scope of the traffic study.

2. *"The 2015 traffic study stated "it is important to note that the installation of the traffic signal at this intersection will require the widening of Columbia Pike north of the bridge over the West Harpeth River and will require bridge widening to accomplish." However, the 2016 traffic study does not address the need for this traffic improvement as part of the installation of the traffic signal. Please provide additional analysis regarding the necessary improvements related to the bridge."*
RESPONSE: Based on TDOT design guidelines, the statement in the 2015 traffic study is correct. However, at a meeting on March 24, 2015, TDOT staff indicated that alternatives to the required widening would be considered so that the installation of the traffic signal at Tollgate Boulevard could be completed prior to the bridge being widened. The roadway and traffic signal plans prepared in July 2016 include modifications to the laneage on Columbia Pike to provide the merging and transition area south of the West Harpeth River bridge. TDOT has reviewed these plans and is ready to issue a grading permit for the Columbia Pike improvements.

3. *"Conclusion #2 states that a southbound right turn lane should be constructed with 275 feet of storage with a 100-foot taper, whereas the 2015 report states 250 feet of storage. Please explain the reasons for the change."*
RESPONSE: This is a minor change resulting from the intersection capacity and operational analysis of design hour traffic volumes provided by TDOT in 2014 that were utilized in the 2015 traffic study and updated traffic count volumes that were collected by Ragan-Smith in November 2016 and utilized in the 2016 traffic study.

4. *"Conclusion #3 states that 248 additional SF dwellings can be added prior to a secondary access being necessary. However, the study does not specify existing unit count. Please provide the existing and proposed unit counted utilized for the traffic study. In addition, the study does not include any analysis of non-residential land uses which may trigger the need for secondary access at a different phase/timing."*
RESPONSE: The traffic volumes used in the traffic study are based upon actual turning movement traffic counts and not upon a trip generation estimate for the amount of existing development. Based upon available information, in October 2016 Tollgate Village included approximately 370 detached or attached homes, 91 condominium/townhome units, 201 apartment units, and 76,800 sf of office or medical office space.

Related to the analysis of non-residential land uses, the traffic study does address this issue by recommending that the current edition of the ITE Trip Generation Manual be used to establish a trip generation equivalent for the proposed land use. A threshold tied to trip generation estimates will provide a better unit of measure than a specific land use scenario forecast that is likely to be impacted by the passing of time and changing market conditions.

5. *"Conclusion #5 states that the preferred secondary access is at Declaration Way. Declaration Way is a private road (Williamson County Schools) that provides access to Independence High School. Provide information on the accessibility of connecting to Declaration Way and the impacts that would occur to existing school traffic."*
RESPONSE: Coordination with Williamson County Schools to establish an agreement and the feasibility/responsibility of the secondary access connection improvements is needed before specific information on the accessibility and impacts of the proposed connection can be analyzed and reported. It is important to note that since Declaration

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Way is a private road, the developer must obtain an agreement for joint access and use from Williamson County Schools prior to completing any connection.

6. *"Please provide analysis to explain why this secondary access is "preferred' to another direct access onto Columbia Pike as shown on the approved site development plan and discussed in the original traffic study. The 2003 traffic study noted that the access to Declaration Way was to provide reciprocal access between Tollgate Village and the school, not for improved access to Columbia Pike. Furthermore, the 2015 study indicates the conflict with the bridge and the need for bridge improvements, thereby recommending that the secondary access by shifted south on Columbia Pike by 240 feet. Additional analysis related to the need, timing and location of the secondary access is necessary. In addition, the 2015 study states that access at Declaration Way would provide "a marginally beneficial ingress/egress for the multi-family and commercial uses located on the southeastern portion of the Tollgate Village site." This study furthers states that access would be provided to an unsignalized intersection and that this access point would likely be a means of connecting to Tollgate Boulevard to access the signal. Therefore, Staff has concerns with the recommendation to utilize Declaration Way as the only secondary access without analysis demonstrating that this will result in improved connectivity and access for the development."*
RESPONSE: The 2015 traffic study was prepared to assess the impacts of a proposed update to the Tollgate Village Concept Plan. The proposed concept plan update included changes to the proposed land uses and number of units to address growth demands and to increase the viability of undeveloped sections at Tollgate Village. It is important to understand the purpose and context of the 2015 traffic study when making comparisons and drawing conclusions.

Additionally, remaining portions of Sections 6 and 7 of the Towne Village at Tollgate and the Vintage Tollgate Apartments have been constructed since the 2015 traffic study was prepared. These sections, especially the Vintage Tollgate Apartments, are in close proximity to the proposed Declaration Way access. For the proposed Columbia Pike secondary access north of Tollgate Boulevard, there has been no discussion or proposed recommendation to have it removed from the Tollgate Village Concept Plan. Better clarity about the proposed update to the Tollgate Village Concept Plan in the area north of Tollgate Boulevard along Branford Place, Elliston Way, and Columbia Pike is needed to understand the design and operational needs for this access including the impacts of proposed Columbia Pike modifications and the schedule for TDOT improvements to the West Harpeth River bridge on Columbia Pike. It is important to note that the developer does not have the authority or responsibility to modify the existing structure on Columbia Pike over the West Harpeth River.

7. *"On Page 2, the Town's General Plan does list Columbia Pike as an arterial."*
RESPONSE: Acknowledged.

8. *"Provide timing for the installation of the traffic signal at Columbia Pike/Tollgate Boulevard."*
RESPONSE: Due to the scope of work on this project that includes roadway grading/ paving and traffic signal element fabrication and electrical installation, coordination will be required directly with the selected contractor about their schedule. The schedule for some items, such as the fabrication of the steel strain poles as one example, can change based upon the demands and production abilities of the vendor from which the contractor orders the poles. Based upon currently available information, the turn lane and traffic signal can be constructed within approximately 6 months after the project is awarded to a contractor.

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If you have any comments or if you need any additional information related to this project, we would be happy to discuss or review them with you at your convenience.

Sincerely,

RAGAN-SMITH ASSOCIATES, INC.

Brandon S. Baxter, P.E., PTOE
Associate

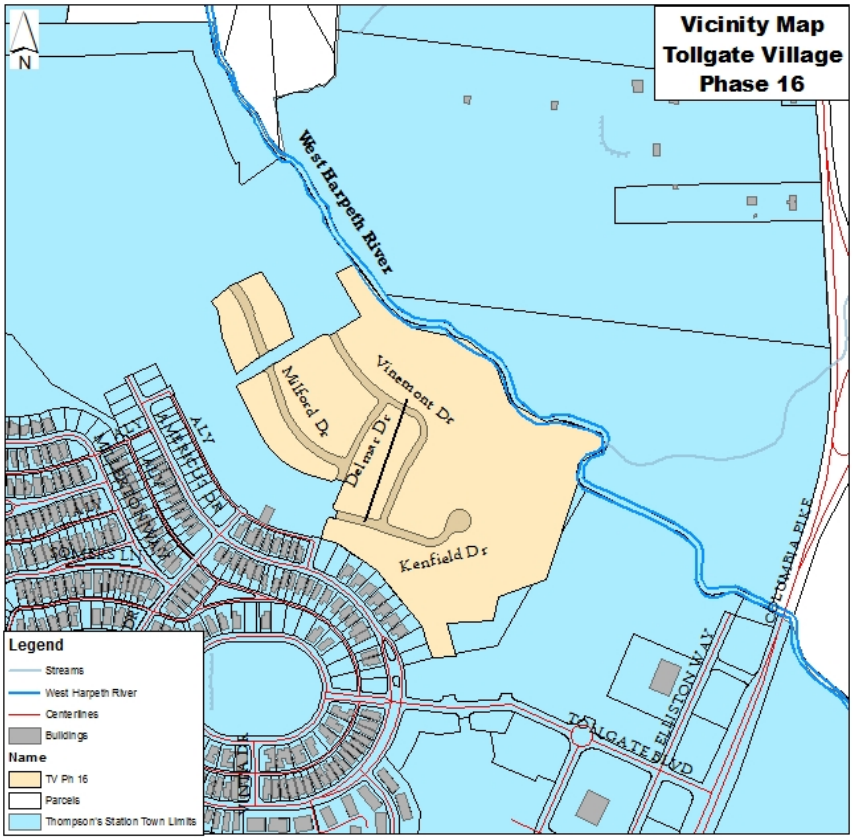
BSB:djb

Thompson's Station Planning Commission
Staff Report –Item 3 (PP 2017-001)
January 24, 2017

Preliminary plat for Phase 16 to create 105 single family lots, six open space lots and approval for the removal of eight trees exceeding 24 inches in diameter.

PROJECT DESCRIPTION

A request to approve the preliminary plat for Phase 16 of Tollgate Village to create 105 single family lots, six open space lots and removal of eight trees exceeding 24 inches in diameter.



BACKGROUND

On September 27, 2016, the Planning Commission suspended all plats within Tollgate Village due to issues related to infrastructure in several sections of the Tollgate Village which have not been completed by the developer and no sureties in place to ensure completion of the improvements. There are no completed public roads to access this phase of the development and no sureties in place to guarantee that such infrastructure will be completed. Therefore, until these issues are addressed and the plat suspension is resolved and lifted, Staff cannot recommend favorably for any plats within Tollgate Village.

On January 11, 2017, the developer sent a letter to the Tollgate residents committing to make the necessary repairs to these older phases of Tollgate upon approval of plats (See attached letter). However, again, the Town has not received any assurances from the developer for completion of these roads.

ANALYSIS

Preliminary Plat

The preliminary plat provides an analysis of the site's special features and the response to those features (LDO Section 5.4.3). This preliminary plat for phase 16 includes the creation of 105 single family lots

and six open space lots totaling approximately 21 acres of open space. However, the layout of this phase is not consistent with the approved development plan (dated 4-15-14). Changes include a revision to the layout of the roads, including roads not identified on the development plan, removal of two open space areas, the addition of another open space lot and the phase is shifted eastward up the hill previously identified as open space. The applicant has submitted an open space exhibit showing that the shift is due to stormwater infrastructure and that 120 acres (35%) of the land will still be platted as open space.

Roadways
The standard for local roadways is 50 feet. The Planning Commission approved 46 foot roadways with a five-foot grass strip for other roadways within this subdivision. The applicant is requesting the Planning Commission approve the 46-foot width for the roadways within this phase to be consistent with these approved right-of-way widths to continue/maintain the existing streetscape that has been established.

Critical Lots
Lots 1601-1602, 1607-1608, 1610-1613, 1617-1620, 1631-1639, 1646-1658, 1670-1674, 1679-1681, 1683-1686, 1688-1695, 1700 and 1704 are designated as critical lots on the plat. The slope identified on the plan indicates that these lots have slopes between 15 and 25%. The plan illustrates that areas exceeding 25% slope are within the proposed open space. All critical lots will require engineered site plans to address all site specific issues.

Lot Standards
The single family lots will vary in size from .16 acres to .38 acres with a minimum of 50 feet for lot widths. Proposed setbacks are 10 feet for the front yard, 7.5 feet for the side yard and 20 feet for the rear yard with a minimum of a 20-foot driveway. Block lengths do not exceed 800 feet, except where adjacent to open space as permitted within the ordinance. Blocks that exceed 500 feet in length will have a 16-foot pedestrian access provided.

<u>Traffic Improvements</u>
In 2015, a revised concept plan was submitted along with an updated traffic study (See attached study). The plan was not approved and the traffic study was not accepted or approved. In 2016, an updated traffic study, as required for approval of the phase 15 preliminary plat, was submitted in December. A "preferred" secondary access was noted in the report as a connection to Declaration Way. The schedule for the incorporating this secondary access is recommended after 248 additional units are constructed. The Town's Consulting Traffic Engineer reviewed the traffic study and submitted comments to Staff (See attached RPM letter dated January 6, 2017).

In addition, staff has the following concerns:

1. The traffic study doesn't include a project description to evaluate trip generation for differing land uses and the directional distribution of the trips.
2. The 2015 traffic study stated "it is important to note that the installation of the traffic signal at this intersection will require the widening of Columbia Pike north of the bridge over the West Harpeth River and will require bridge widening to accomplish." However, the study did not address the need for any bridge improvements. In addition, the need for the signal is stated, however, the timing of the signal is not specified.
3. The report states that 248 additional SF dwellings can be added prior to a secondary access being necessary. However, the study does not specify existing unit count, therefore there is not a base number for adding the additional units. In addition, the study does not include non-residential land uses and how they may affect secondary access timing and location.
4. The report states that the "preferred" secondary access is at Declaration Way. Declaration Way is a private road (Williamson County Schools) providing access to the high school and analysis

was not provided related to impacts from the connection. In addition, there is not analysis to explain why this secondary access is "preferred' to direct access onto Columbia Pike as shown on the approved site development plan and discussed in the original traffic study. The 2003 traffic study noted that the access was to provide reciprocal access between Tollgate Village and the school, not for improved access to Columbia Pike. Furthermore, the 2015 study indicates the conflict with the bridge and the need for bridge improvements, thereby recommending that the secondary access by shifted south on Columbia Pike by 240 feet. Additional analysis related to the need, timing and location of the secondary access is necessary. In addition, the 2015 study states that access at Declaration Way would provide "a marginally beneficial ingress/egress for the multi-family and commercial uses located on the southeastern portion of the Tollgate Village site." This study furthers states that access would be provided to an unsignalized intersection and that this access point would likely be a means of connecting to Tollgate Boulevard to access the signal. Therefore, Staff has concerns with the recommendation to utilize Declaration Way as the only secondary access without analysis demonstrating that this will result in improved connectivity and access for the development.

On January 17, 2017, the applicant submitted responses to these comments and they are under review by our Traffic Engineer. Staff is awaiting response, however at this time, Staff has concerns that the study does not satisfy the contingency for "a specific scope being a schedule of improvements for traffic mitigation including a secondary access shall be reviewed and approved by the Town."

Traffic Signal

The traffic signal at Tollgate Boulevard/Columbia Pike was approved by the Planning Commission in November 2015. The Planning Commission approved the signal with the following contingencies:

1. Prior to the approval of installation of the traffic improvements, the Town Engineer shall approve the construction plans.
2. Prior to the approval of construction plans, the applicant shall post a surety in the amount of $126,000 for the traffic signal.
3. Prior to the approval of the construction plans, the applicant shall post a surety in the amount of $95,000 which could be waived if TDOT requires a surety that meets or exceeds this amount for the turn lane improvements.
4. The signalization shall include a controller compatible with signal synchronization within Thompson's' Station.

TDOT has received the submittal package and is awaiting additional materials from the developer. Once those materials are submitted and a surety posted, the grading permit will be issued. Since TDOT will be requiring a $150,000 surety, contingency #3 will be satisfied. Staff recommends that prior to any future final plat approvals, a contingency for installation and operation of the signal be incorporated.

<u>Sewer</u>

During the construction drawing approval phase, it was noted that an analysis of the wastewater system was needed for Tollgate Village. The development team has a pump test scheduled and are working with Staff to identify the necessary improvements. Prior to any plat approvals, all necessary upgrades should be identified with a contingency for completion of the improvements prior to final plat approvals.

<u>Tree Removal</u>

Development of phase 16 requires the removal of eight trees for a total of 218 inches. The Land Development Ordinance requires the replacement of trees exceeding 24 inches at a ratio of one and a half inches for every inch removed. Therefore, 327 inches of trees is required to be replaced on the site. The replacement plan includes 164 trees to be planted within the open space on the eastern edge of phase 16. The replacement trees will be 2-inch caliper in size and are a variety of deciduous and

evergreen trees such as American Sycamore, Southern Magnolia, Leylandi Cypress, Red Oak, White Pine, American Sweet Gum, and Eastern Red Bud. Total tree replacement will be 328 inches.

RECOMMENDATION

Staff recommends that the Planning Commission deny the application for preliminary plat and tree removal for phase 16 of Tollgate Village for the following reasons:

- There are no completed public roads to access this phase of the development and no sureties in place to guarantee that such infrastructure will be completed. The Planning Commission previously suspended all future plat approvals within Tollgate until this issue was resolved.
- The plat does not provide for the construction of a secondary access as shown on the approved site development plan and the developer does not have the ability to access Declaration Way at this time. The proposed traffic study does not adequately address the issue of when a secondary access should be required to be installed. Based on the most recently approved traffic study, a secondary access should be installed prior to final plat approval for Phase 16.
- It has not been determined whether the existing wastewater infrastructure in Tollgate can support this phase of the development.

In the alternative, the Planning Commission may defer this request for preliminary plat approval to the February Planning Commission meeting to allow the developer to address the above issues.

Please note, once plat suspension is lifted, the traffic signal, secondary access and all sewer improvements must be installed prior to any final plat approvals along with any other contingencies such as development agreements, tree removal and sureties that are required by the Planning Commission.

ATTACHMENTS

Preliminary Plat
Site Development Plan (4/15/2014)
2003 Tollgate Village Traffic Study
2015 Tollgate Village Traffic Study
2016 Tollgate Village Traffic Study
RPM letter dated January 6, 2017
Developer letter dated January 11, 2017
Developer Traffic Response dated January 17, 2017

GENERAL NOTES

1. THE PURPOSE OF THIS PLAT IS TO CREATE 105 RESIDENTIAL SINGLE-FAMILY LOTS AND SIX OPEN SPACE TRACTS.

2. BEARINGS SHOWN HEREON ARE BASED ON THE TENNESSEE COORDINATE SYSTEM OF 1983. GPS EQUIPMENT WAS USED DURING THE COURSE OF THE SURVEY ON THE SITE TO DETERMINE THE POSITION OF TWO CONTROL POINTS FOR ESTABLISHING THE BEARING BASE. THE EQUIPMENT USED: LEICA, MODEL GX 1230, DUAL FREQUENCY RECEIVER. THE TYPE OF SURVEY: NETWORK ADJUSTED REAL TIME KINEMATIC. CONTROL POINTS FOR BEARING BASE FOR PROJECT AND ROAD LOCATION IMPROVEMENTS

3. THIS SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES. ABOVE GRADE AND UNDERGROUND UTILITIES SHOWN WERE TAKEN FROM VISIBLE APPURTENANCES, PUBLIC RECORDS, AND/OR MAPS PREPARED BY OTHERS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. THEREFORE, RELIANCE UPON THE TYPE, SIZE AND LOCATION OF UTILITIES SHOWN SHOULD BE DONE SO WITH THIS CIRCUMSTANCE CONSIDERED. DETAILED VERIFICATION OF EXISTENCE, LOCATION AND DEPTH SHOULD ALSO BE MADE PRIOR TO ANY DECISION RELATIVE THERETO IS MADE. AVAILABILITY AND COST OF SERVICE SHOULD BE CONFIRMED WITH THE APPROPRIATE UTILITY COMPANY. IN TENNESSEE, IT IS A REQUIREMENT, PER "THE UNDERGROUND UTILITY DAMAGE PREVENTION ACT", THAT ANYONE WHO ENGAGES IN EXCAVATION MUST NOTIFY ALL KNOWN UNDERGROUND UTILITY OWNERS NO LESS THAN THREE (3) NOR MORE THAN TEN (10) WORKING DAYS PRIOR TO THE DATE OF THEIR INTENT TO EXCAVATE AND ALSO TO AVOID ANY POSSIBLE HAZARD OR CONFLICT. TENNESSEE ONE CALL, DIAL 811.

4. THIS PROPERTY IS CURRENTLY ZONED D3 (HIGH DENSITY RESIDENTIAL). MAXIMUM LOT COVERAGE – 55%.
MINIMUM BUILDING SETBACKS PER TOWN OF THOMPSON'S STATION LAND DEVELOPMENT ORDINANCE DATED AUGUST 9, 2015:
FRONT: 10'*
REAR: 20'
SIDE: 7.5'
*20' MINIMUM DRIVEWAY LENGTH, EXCLUSIVE OF SIDEWALKS

5. ELEVATIONS SHOWN HEREON ARE BASED ON NAVD 88. CONTOURS ARE AT TWO FOOT INTERVALS AND ARE BASED ON A FIELD RUN SURVEY BY RAGAN-SMITH ASSOCIATES ON JULY 12, 2016 USING RANDOM SPOT ELEVATIONS. CONTOURS WERE DERIVED USING SURFACE MODELING TECHNIQUES.

6. BY SCALED MAP LOCATION AND GRAPHIC PLOTTING ONLY, THIS PROPERTY LIES WITHIN FLOOD ZONES "AE", "X" (OTHER FLOOD AREAS) AND "X" (OTHER AREAS), AS DESIGNATED ON CURRENT FEDERAL EMERGENCY MANAGEMENT AGENCY MAP NO. 47187C0335F, WITH AN EFFECTIVE DATE OF SEPTEMBER 29, 2006, WHICH MAKES UP A PART OF THE NATIONAL FLOOD INSURANCE ADMINISTRATION REPORT; COMMUNITY NO. 470424, PANEL NO. 0335, SUFFIX F, WHICH IS THE CURRENT FLOOD INSURANCE RATE MAP FOR THE COMMUNITY IN WHICH SAID PREMISES IS SITUATED. SAID MAP DEFINES ZONE "AE" UNDER "SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD" AS BASE FLOOD ELEVATIONS DETERMINED. SAID MAP DEFINES ZONE "X" (OTHER FLOOD AREAS) UNDER "OTHER FLOOD AREAS" AS AREAS OF 0.2% ANNUAL CHANCE FLOOD; AREAS OF 1% ANNUAL CHANCE FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 1% ANNUAL CHANCE FLOOD. SAID MAP DEFINES ZONE "X" (OTHER AREAS) UNDER "OTHER AREAS" AS AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

7. ALL STREETS ARE DESIGNATED PUBLIC AND AS SUCH ARE PUBLIC UTILITY, ACCESS AND DRAINAGE EASEMENTS.

8. ALL PUBLIC STREETS AND DRAINAGE STRUCTURES WITHIN THE RIGHTS-OF-WAY WILL BE MAINTAINED BY THE TOWN OF THOMPSON'S STATION.

9. OPEN SPACE AREAS, PUBLIC UTILITY AND DRAINAGE EASEMENTS (INCLUDING DRAINAGE AND DETENTION STRUCTURES), ALLEYS AND ALL LANDSCAPING WITHIN ROADWAY MEDIANS WILL BE MAINTAINED BY THE HOMEOWNERS' ASSOCIATION.

10. SANITARY SEWER LINES AND STORM LINES SHOWN HEREON WERE TAKEN FROM A PRELIMINARY DESIGN FOR THIS SECTION. FINAL PLACEMENT OF UTILITIES WILL BE DEPICTED ON THE FINAL PLAT.

11. DOMESTIC WATER SUPPLY INFORMATION SHOWN HEREON IS BASED ON A PRELIMINARY DESIGN FOR THIS SECTION. FINAL PLACEMENT TO BE DESIGNED BY OTHERS AND INCLUDED ON THE FINAL PLAT. WATER TO BE PROVIDED BY H.B.&T.S.

12. LOTS SHOWN THUS (*) ARE DESIGNATED AS CRITICAL LOTS AND HAVE MANMADE SLOPES (LOTS 1601, 1602, 1607, 1608, 1610–1613, 1617–1620, 1631, 1639, 1688–1695, 1699, 1700 AND 1704) AND NATURAL SLOPES (LOTS 11645–1658 AND 1670–1674) IN EXCESS OF 15%. PER SECTION 3.3.7 OF THE SUBDIVISION REGULATIONS, PRIOR TO THE ISSUANCE OF A BUILDING PERMIT, A SITE GRADING PLAN FOR DEVELOPMENT OF THE LOT SHALL BE SUBMITTED ADDRESSING SITE SPECIFIC NATURAL RESOURCE ISSUES TO THE TOWN OF THOMPSON'S STATION FOR REVIEW AND APPROVAL. NO BUILDING PERMIT WILL BE ISSUED ON SAID LOTS UNTIL AND UNLESS THE TOWN ENGINEER HAS RECEIVED AND REVIEWED THE SITE PLAN.

13. THE BLOCK LENGTHS IN THIS SECTION DO NOT EXCEED THE MAXIMUM LENGTH (800') FOR THE D3 ZONING DISTRICT.

14. I HEREBY STATE THAT THIS SURVEY WAS DONE IN COMPLIANCE WITH THE CURRENT TENNESSEE MINIMUM STANDARDS OF PRACTICE AND THIS IS A CATEGORY I SURVEY AND THE RATIO OF PRECISION OF THE UNADJUSTED SURVEY IS 1:43,595.

BY: _____ DATE: 01-16-17
JOHN T. DARNALL, TN RLS #1571

PHASE 16
LOTS 1601–1705
OPEN SPACE 1794–1799

SITE DATA TABLE (PHASE 16)

TOTAL LOT AREA	– 23.28 AC.±
TOTAL R.O.W. AREA	– 4.21 AC.±
OPEN SPACE AREA	– 20.76 AC.±
TOTAL SITE AREA	– 48.25 AC.±
TOTAL LINEAR FEET OF ROAD	– 3,827 FT.

SURVEYOR:
RAGAN-SMITH ASSOCIATES, INC.
TOM DARNALL, RLS
315 WOODLAND STREET
NASHVILLE, TENNESSEE 37206
(615) 244-8591

OWNER / DEVELOPER
MBSC TN HOMEBUILDER, LLC
C/O BRIAN ROWE
312 S. GAY STREET, SUITE 200
KNOXVILLE, TENNESSEE 37902
(865) 408-8322

LEGEND

OS	OPEN SPACE
R.O.W.	R.O.W.
R.O.W.C.T.	REGISTER'S OFFICE WILLIAMSON COUNTY, TENNESSEE
*	CRITICAL LOT (SEE NOTE 12)

DEED REFERENCE

BEING A PORTION OF THE SAME PROPERTY CONVEYED TO MBSC TN HOMEBUILDER, LLC, FROM TGF 2010, LLC OF RECORD IN BOOK 5264, PAGE 242, REGISTER'S OFFICE FOR WILLIAMSON COUNTY, TENNESSEE.

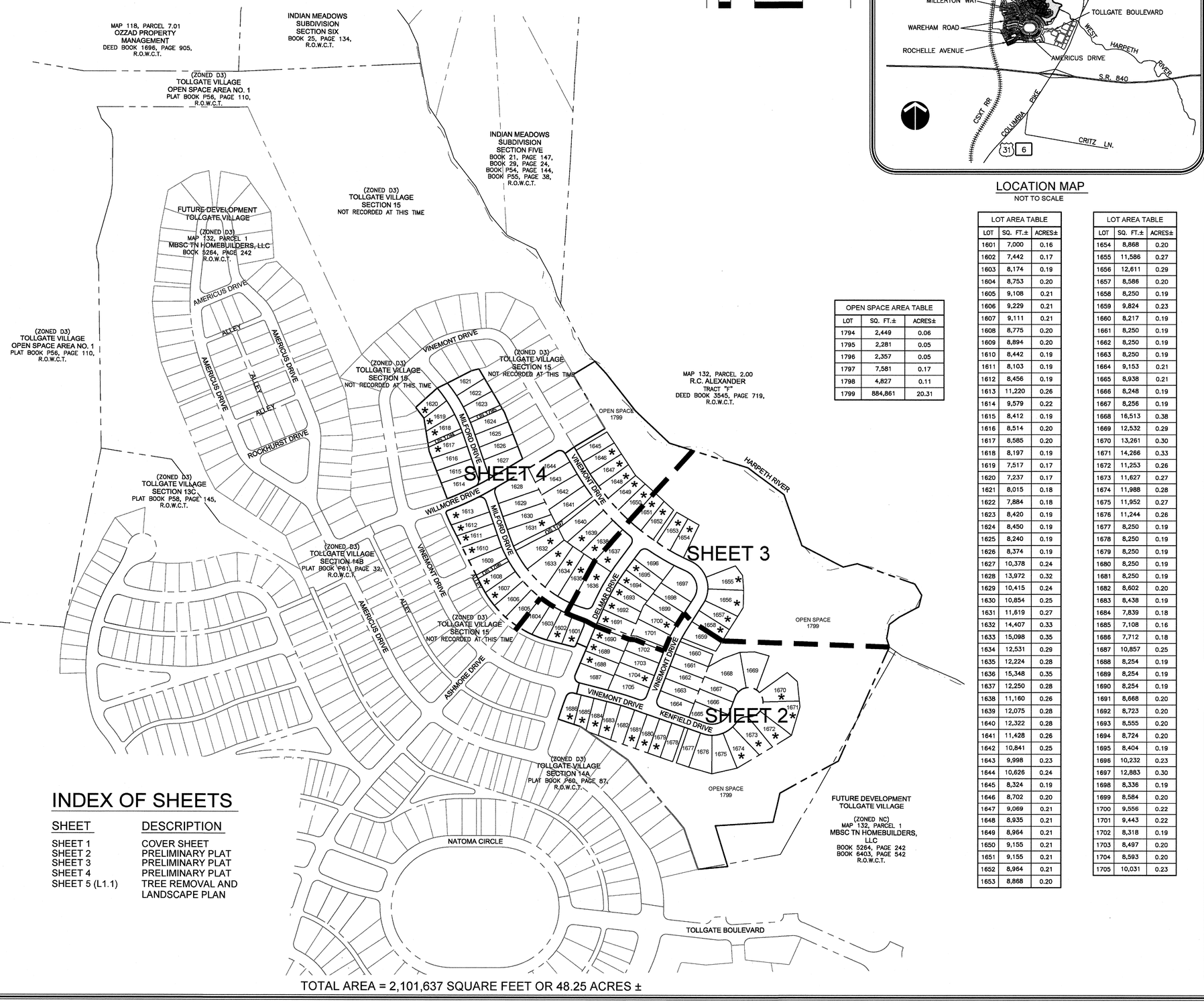
BEING THE SAME PROPERTY CONVEYED TO MBSC TN HOMEBUILDER, LLC FROM MBSC TN HOMEBUILDER, LLC BY CORRECTIVE QUITCLAIM DEED OF RECORD IN BOOK 6403, PAGE 542, REGISTER'S OFFICE FOR WILLIAMSON COUNTY, TENNESSEE.

PROPERTY MAP REFERENCE

BEING A PORTION OF PARCEL 1 AS SHOWN ON WILLIAMSON COUNTY PROPERTY MAP 132.

(SEE NOTE 2)

0 200 400 600



INDEX OF SHEETS

TOTAL AREA = 2,101,637 SQUARE FEET OR 48.25 ACRES ±

LOCATION MAP

NOT TO SCALE

OPEN SPACE AREA TABLE		
LOT	SQ. FT.±	ACRES±
1794	2,449	0.06
1795	2,281	0.05
1796	2,357	0.05
1797	7,581	0.17
1798	4,827	0.11
1799	884,861	20.31

LOT AREA TABLE		
LOT	SQ. FT.±	ACRES±
1601	7,000	0.16
1602	7,442	0.17
1603	8,174	0.19
1604	8,753	0.20
1605	9,108	0.21
1606	9,229	0.21
1607	9,111	0.21
1608	8,775	0.20
1609	8,894	0.20
1610	8,442	0.19
1611	8,103	0.19
1612	8,456	0.19
1613	11,220	0.26
1614	9,579	0.22
1615	8,412	0.19
1616	8,514	0.20
1617	8,585	0.20
1618	8,197	0.19
1619	7,517	0.17
1620	7,237	0.17
1621	8,015	0.18
1622	7,884	0.18
1623	8,420	0.19
1624	8,450	0.19
1625	8,240	0.19
1626	8,374	0.19
1627	10,378	0.24
1628	13,972	0.32
1629	10,415	0.24
1630	10,854	0.25
1631	11,619	0.27
1632	14,407	0.33
1633	15,098	0.35
1634	12,531	0.29
1635	12,224	0.28
1636	15,348	0.35
1637	12,250	0.28
1638	11,160	0.26
1639	12,075	0.28
1640	12,322	0.28
1641	11,428	0.26
1642	10,841	0.25
1643	9,998	0.23
1644	10,626	0.24
1645	8,324	0.19
1646	8,702	0.20
1647	9,069	0.21
1648	8,935	0.21
1649	8,964	0.21
1650	9,155	0.21
1651	9,155	0.21
1652	8,964	0.21
1653	8,868	0.20

LOT AREA TABLE		
LOT	SQ. FT.±	ACRES±
1654	8,868	0.20
1655	11,586	0.27
1656	12,611	0.29
1657	8,586	0.20
1658	8,250	0.19
1659	9,824	0.23
1660	8,217	0.19
1661	8,250	0.19
1662	8,250	0.19
1663	8,250	0.19
1664	9,153	0.21
1665	8,938	0.21
1666	8,248	0.19
1667	8,256	0.19
1668	16,513	0.38
1669	12,532	0.29
1670	13,261	0.30
1671	14,266	0.33
1672	11,253	0.26
1673	11,627	0.27
1674	11,988	0.28
1675	11,952	0.27
1676	11,244	0.26
1677	8,250	0.19
1678	8,250	0.19
1679	8,250	0.19
1680	8,250	0.19
1681	8,250	0.19
1682	8,602	0.20
1683	8,438	0.19
1684	7,839	0.18
1685	7,108	0.16
1686	7,712	0.18
1687	10,857	0.25
1688	8,254	0.19
1689	8,254	0.19
1690	8,254	0.19
1691	8,668	0.20
1692	8,723	0.20
1693	8,555	0.20
1694	8,724	0.20
1695	8,404	0.19
1696	10,232	0.23
1697	12,883	0.30
1698	8,336	0.19
1699	8,584	0.20
1700	9,556	0.22
1701	9,443	0.22
1702	8,318	0.19
1703	8,497	0.20
1704	8,593	0.20
1705	10,031	0.23

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(423) 490-9600
• www.ragansmith.com •

JOHN T. DARNALL
REGISTERED
LAND SURVEYOR
TENNESSEE
NO. 1571

TOLLGATE VILLAGE - PHASE 16

FOR

MBSC TN HOMEBUILDER, LLC

TOWN OF THOMPSON'S STATION, WILLIAMSON COUNTY, TENNESSEE

JOB NO. 10-081	WK. ORDER 9260		
APPROVED:	JTD	2 01-16-2017 (MM) REV. PER STAFF COMMENTS	
DRAWN:	AMR	1 09-14-2016 (AMR) REV. PER STAFF COMMENTS	
SCALE:	1" = 200'		REVISIONS
DATE:	AUGUST 23, 2016		

PRELIMINARY PLAT

1 OF 5

G:\10081-02601-SURVEY\PLAT\SECTION 16\SEC 16 PRELIM PLAT.DWG
PLOTTED BY DAVID BINLEY ON 1/16/2017 2:45 PM LAST UPDATED BY DOR ON: 1/16/2017 2:42 PM

GENERAL NOTES
1. SEE SHEET 1 OF 5 FOR NOTES, REFERENCES AND AREA TABLES.

LEGEND

MONUMENT (NEW) (1/2" DIAMETER ALUMINUM RBC W/ 3/4" IRON ROD MARKED "RAGAN SMITH")
IRON ROD (NEW) (UNLESS NOTED OTHERWISE)
IRON ROD (OLD)
IRON PIN (OLD) (UNLESS NOTED OTHERWISE)
CABLE TV BOX
ELECTRIC BOX
CATCH BASIN
SANITARY SEWER MANHOLE
LIGHT STANDARD
LOT NUMBER
R.O.W. RIGHT-OF-WAY
DECIDUOUS TREE
EVERGREEN TREE
M.T.E.M.C.E./ P.U.D.E.
MIDDLE TENN ELECTRIC MEMBERSHIP/ PUBLIC UTILITY DRAINAGE EASEMENT
R.O.W.
RIGHT-OF-WAY
M.B.S.L.
MINIMUM BUILDING SETBACK LINE
CONCRETE SURFACE
R.O.W.C.T.
REGISTER'S OFFICE FOR WILLIAMSON COUNTY, TN
15%-25% SLOPES
SLOPES IN EXCESS OF 25%
CENTRAL LOT (SEE NOTE 12)
FIRE HYDRANT
WATER VALVE
WATER METER
SANITARY SEWER LINE
REINFORCED CONCRETE PIPE

SEE SHEET 4 MATCHLINE
SEE SHEET 3 MATCHLINE
SEE SHEET 3 MATCHLINE
VINEMONT DRIVE
DELMAR DRIVE
KENFIELD DRIVE
ALLEY
OPEN SPACE 1799
(ZONED: D3) TOLLGATE VILLAGE SECTION 16A P.B.M.C.I. PAGE 87.
FUTURE DEVELOPMENT TOLLGATE VILLAGE
(ZONED: NC) PARCEL 1 MAP MBSC TN HOMEBUILDERS, LLC BOOK 5264, PAGE 242 R.O.M.C.T.
(ZONED: NC) PARCEL 1 MAP MBSC TN HOMEBUILDERS, LLC BOOK 6403, PAGE 542 R.O.M.C.T.
DEED LINE - BOOK 5264, PAGE 242, R.O.M.C.T. BOOK 6403, PAGE 542, R.O.M.C.T.
ZONING LINE ZONE: D3 ZONE: NC
ZONE AE
ZONE X (OTHER FLOOD AREAS)
FEMA FI
(SEE NOTE 2)
0 50 100 150

CURVE TABLE						
CURVE	RADIUS	LENGTH	DELTA	TANGENT	CHORD	CHD BRG
C1	927.00'	59.41'	3°40'18"	29.71	59.40'	S20°11'55"W
C2	25.00'	35.81'	82°03'33"	21.75	32.82'	S83°03'30"W
C3	25.00'	43.15'	98°53'03"	29.21	37.99'	S26°28'11"E
C4	10.00'	14.16'	81°06'57"	8.56	13.00'	N83°31'49"E
C5	437.00'	375.59'	49°14'40"	200.28	364.14'	S51°17'23"E
C16	25.00'	41.69'	95°32'39"	27.54	37.07'	N24°47'34"W
C27	323.00'	101.58'	11°07'40"	50.95	101.42'	S28°42'31"W
C28	25.00'	39.38'	87°58'02"	24.13	34.72'	N65°08'02"E
C29	973.00'	88.41'	5°01'47"	42.73	85.38'	N73°23'50"W
C30	927.00'	81.38'	5°01'47"	40.71	81.35'	N73°23'50"W
C31	123.00'	162.48'	75°41'20"	95.56	150.93'	N71°16'23"E
C32	50.00'	53.05'	60°47'09"	29.33	50.59'	S63°49'18"W
C33	60.00'	265.01'	253°03'32"	80.99	98.42'	N32°19'03"W
C34	77.00'	118.22'	87°58'02"	74.32	106.95'	N65°08'02"E
C35	25.00'	40.16'	92°01'58"	25.90	35.88'	S24°51'58"E
C36	477.00'	92.64'	11°07'40"	46.47	92.50'	S28°42'31"W

LINE TABLE		
LINE	BEARING	DISTANCE
L1	N22°58'20"E	10.32'

JOB NO. 10-081	WK. ORDER 9260	
APPROVED:	JTD	
DRAWN:	AMR	
SCALE:	1" = 50'	
DATE:	AUGUST 23, 2016	

01-16-2017 (CDB) REV. PER STAFF COMMENTS
09-14-2016 (AMR) REV. PER STAFF COMMENTS
REVISIONS

PRELIMINARY PLAT

2 OF 5

TOLLGATE VILLAGE - PHASE 16

FOR

MBSC TN HOMEBUILDER, LLC

TOWN OF THOMPSON'S STATION, WILLIAMSON COUNTY, TENNESSEE

STATE OF TENNESSEE JOHN T. DARBY, JR. REGISTERED LAND SURVEYOR No. 1571

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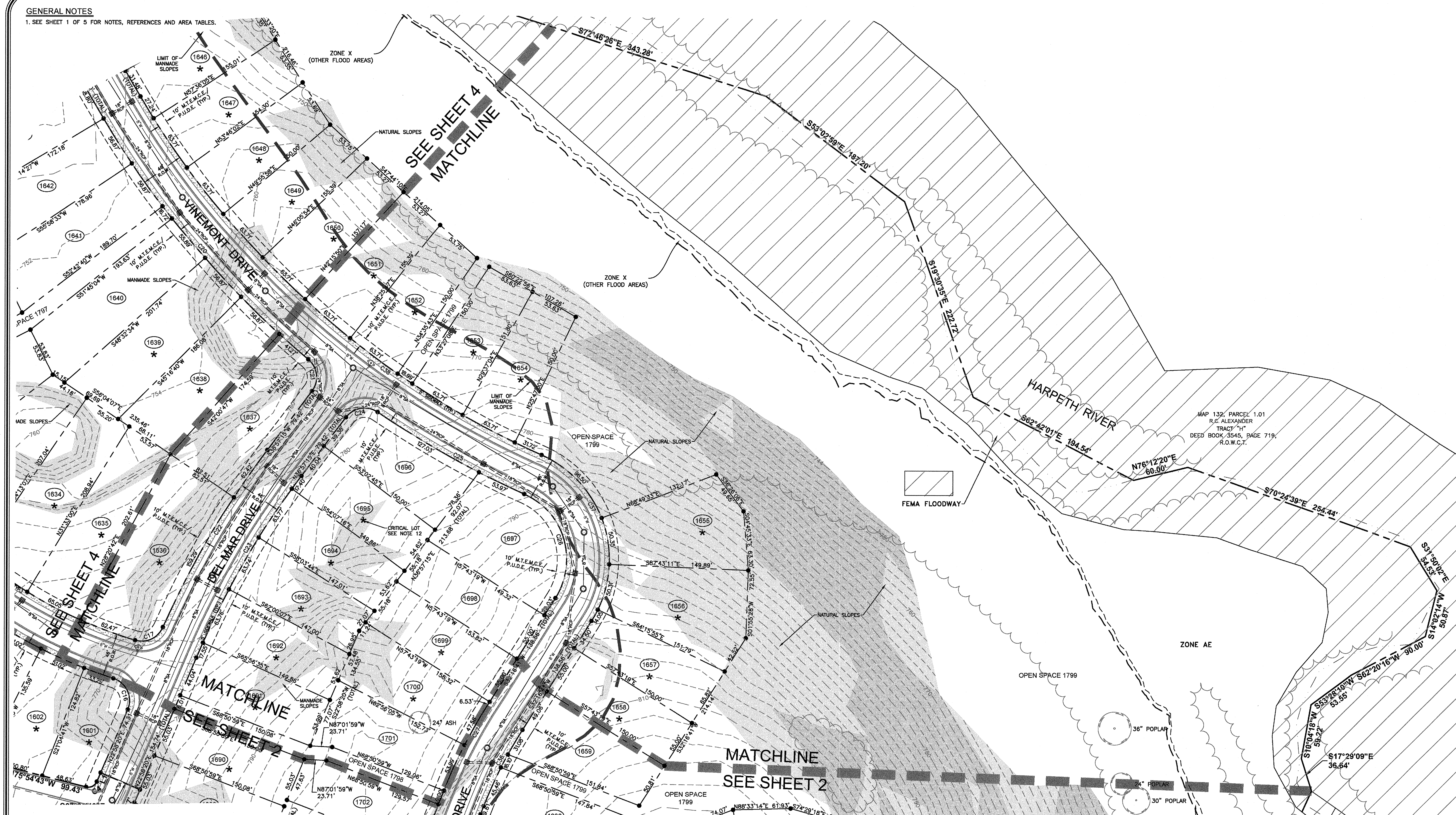
GENERAL NOTES

1. SEE SHEET 1 OF 5 FOR NOTES, REFERENCES AND AREA TABLES.



LEGEND

Symbol	Description	Symbol	Description
■	MONUMENT (NEW) (4" DIAMETER ALUMINUM DISC W/ 5/8" IRON ROD MARKED "RAGAN-SMITH ASSOCIATES")		FIRE HYDRANT
●	IRON ROD (NEW) (5/8" X 18" W/CAP STAMPED "RAGAN SMITH & ASSOCIATES")	⋈	WATER VALVE
○	IRON ROD (OLD)		WATER METER
C	CABLE TV BOX	—SA—	SANITARY SEWER LINE
E	ELECTRIC BOX	RCP	REINFORCED CONCRETE PIPE
	CATCH BASIN	M.T.E.M.C.E./ P.U.D.E.	MIDDLE TENN ELECTRIC MEMBERSHIP CORP EASEMENT/ PUBLIC UTILITY DRAINAGE EASEMENT
	SANITARY SEWER MANHOLE	R.O.W.	RIGHT-OF-WAY
	LIGHT STANDARD	M.B.S.L.	MINIMUM BUILDING SETBACK LINE
(XXX)	LOT NUMBER		CONCRETE SURFACE
R.O.W.	RIGHT-OF-WAY	R.O.W.C.T.	REGISTER'S OFFICE FOR WILLIAMSON COUNTY, TN
	DECIDUOUS TREE		15%-25% SLOPES
	EVERGREEN TREE		SLOPES IN EXCESS OF 25%
		*	CRITICAL LOT (SEE NOTE 12)

811
Know what's **below.**
Call before you dig.

CURVE TABLE

CURVE	RADIUS	LENGTH	DELTA	TANGENT	CHORD	CHD BRG
C16	25.00'	41.69'	95°32'29"	27.54	37.02'	N24°47'54"W
C17	25.00'	35.92'	82°20'02"	21.86	32.91'	N65°03'56"E
C21	25.00'	38.10'	87°18'38"	23.85	34.52'	N06°42'04"W
C22	973.00'	221.71'	13°03'21"	111.34	221.23'	S30°25'35"W
C23	927.00'	226.22'	13°58'55"	113.67	225.66'	S29°57'48"W
C24	25.00'	38.10'	87°18'38"	23.85	34.52'	S80°36'35"W
C25	998.00'	180.99'	10°23'26"	90.74	180.74'	S60°55'49"E
C26	77.00'	132.25'	98°24'13"	89.21	116.58'	N16°55'25"W
C37	123.00'	211.25'	98°24'13"	142.51	186.23'	N16°55'25"W
C38	952.00'	587.63'	35°21'59"	303.51	578.35'	S48°26'33"E

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JOHN T. DARNALL
REGISTERED LAND SURVEYOR
TENNESSEE NO. 1571

TOLLGATE VILLAGE - PHASE 16

FOR

MBSC TN HOMEBUILDER, LLC

TOWN OF THOMPSON'S STATION, WILLIAMSON COUNTY, TENNESSEE

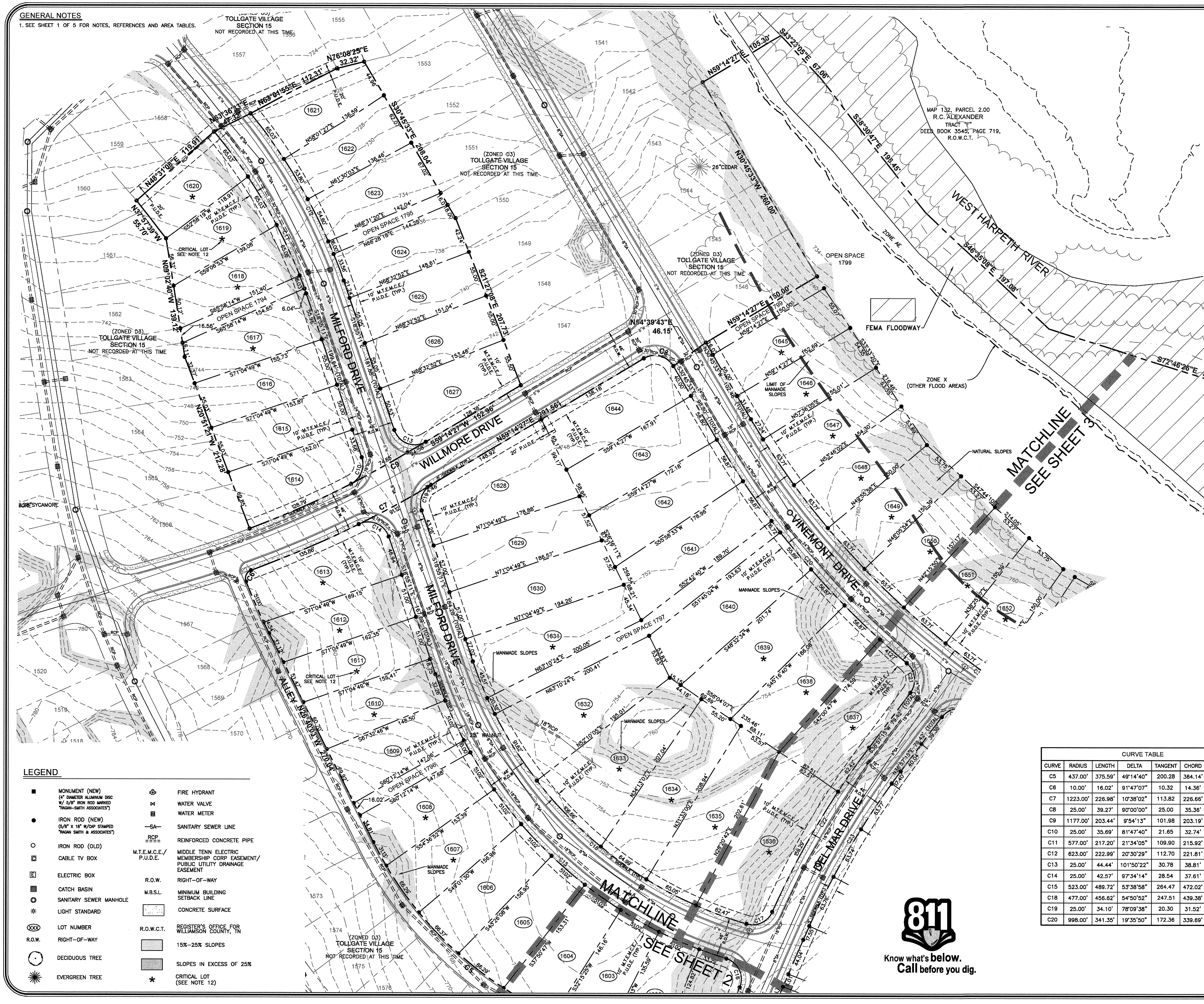
JOB NO. 10-081	WK. ORDER 9260
APPROVED:	JTD
DRAWN:	AMR
SCALE:	1" = 50'
DATE:	AUGUST 23, 2016

REVISIONS
1. 09-14-2016 (AMR) REV. PER STAFF COMMENTS
2. 01-16-2017 (DDB) REV. PER STAFF COMMENTS

PRELIMINARY PLAT

GENERAL NOTES

1. SEE SHEET 1 OF 5 FOR NOTES, REFERENCES AND AREA TABLES.



LEGEND

Symbol	Description	Symbol	Description
■	MONUMENT (NEW) (4" DIAMETER ALUMINUM DISC W/ 5/8" IRON ROD MARKED "RAGAN-SMITH ASSOCIATES")		FIRE HYDRANT
●	IRON ROD (NEW) (5/8" X 18" W/CAP STAMPED "RAGAN SMITH & ASSOCIATES")	⋈	WATER VALVE
		W	WATER METER
		—SA—	SANITARY SEWER LINE
		RCP	REINFORCED CONCRETE PIPE
○	IRON ROD (OLD)	M.T.E.M.C.E./ P.U.D.E.	MIDDLE TENN ELECTRIC MEMBERSHIP CORP EASEMENT/ PUBLIC UTILITY DRAINAGE EASEMENT
C	CABLE TV BOX		
E	ELECTRIC BOX	R.O.W.	RIGHT-OF-WAY
	CATCH BASIN	M.B.S.L.	MINIMUM BUILDING SETBACK LINE
◎	SANITARY SEWER MANHOLE		CONCRETE SURFACE
☼	LIGHT STANDARD		
(XXX)	LOT NUMBER	R.O.W.C.T.	REGISTER'S OFFICE FOR WILLIAMSON COUNTY, TN
R.O.W.	RIGHT-OF-WAY		15%-25% SLOPES
	DECIDUOUS TREE		SLOPES IN EXCESS OF 25%
	EVERGREEN TREE	*	CRITICAL LOT (SEE NOTE 12)

CURVE TABLE

CURVE	RADIUS	LENGTH	DELTA	TANGENT	CHORD	CHD BRG
C5	437.00'	375.59'	49°14'40"	200.28	364.14'	S51°17'23"E
C6	10.00'	16.02'	91°47'07"	10.32	14.36'	S23°58'55"W
C7	1223.00'	226.98'	10°38'02"	113.82	226.66'	N64°33'28"E
C8	25.00'	39.27'	90°00'00"	25.00	35.36'	N75°45'33"W
C9	1177.00'	203.44'	9°54'13"	101.98	203.19'	N64°11'33"E
C10	25.00'	35.69'	81°47'40"	21.65	32.74'	N21°58'39"E
C11	577.00'	217.20'	21°34'05"	109.90	215.92'	N29°42'14"W
C12	623.00'	222.99'	20°30'29"	112.70	221.81'	N29°10'26"W
C13	25.00'	44.44'	101°50'22"	30.78	38.81'	S69°50'22"E
C14	25.00'	42.57'	97°34'14"	28.54	37.61'	N67°42'18"W
C15	523.00'	489.72'	53°38'58"	264.47	472.02'	S45°44'40"E
C18	477.00'	456.62'	54°50'52"	247.51	439.38'	S46°20'37"E
C19	25.00'	34.10'	78°09'38"	20.30	31.52'	S20°09'38"W
C20	998.00'	341.35'	19°35'50"	172.36	339.69'	S40°33'28"E

811
Know what's **below.**
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JOHN T. DARNALL
REGISTERED LAND SURVEYOR
TENNESSEE NO. 1571

TOLLGATE VILLAGE - PHASE 16

FOR

MBSC TN HOMEBUILDER, LLC

TOWN OF THOMPSON'S STATION, WILLIAMSON COUNTY, TENNESSEE

JOB NO. 10-081	WK. ORDER 9260
APPROVED:	JTD
DRAWN:	AMR
SCALE:	1" = 50'
DATE:	AUGUST 23, 2016

REVISIONS

1. 09-14-2016 (AMR) REV. PER STAFF COMMENTS
2. 01-16-2017 (DDB) REV. PER STAFF COMMENTS

PRELIMINARY PLAT

Tree Protection / Replacement Data Table

Tree Units Provided from Existing Trees		
Removed Tree Sizes	Quantity	Units Per Tree
24"	6	144
26"	1	26
48"	1	48
Total Trees to be removed	**8**	
Total Units From Trees to be removed		218
Total Replacment Units Required		**218 x 1.5 = 327**
Total Replacment Units Provided		**328**

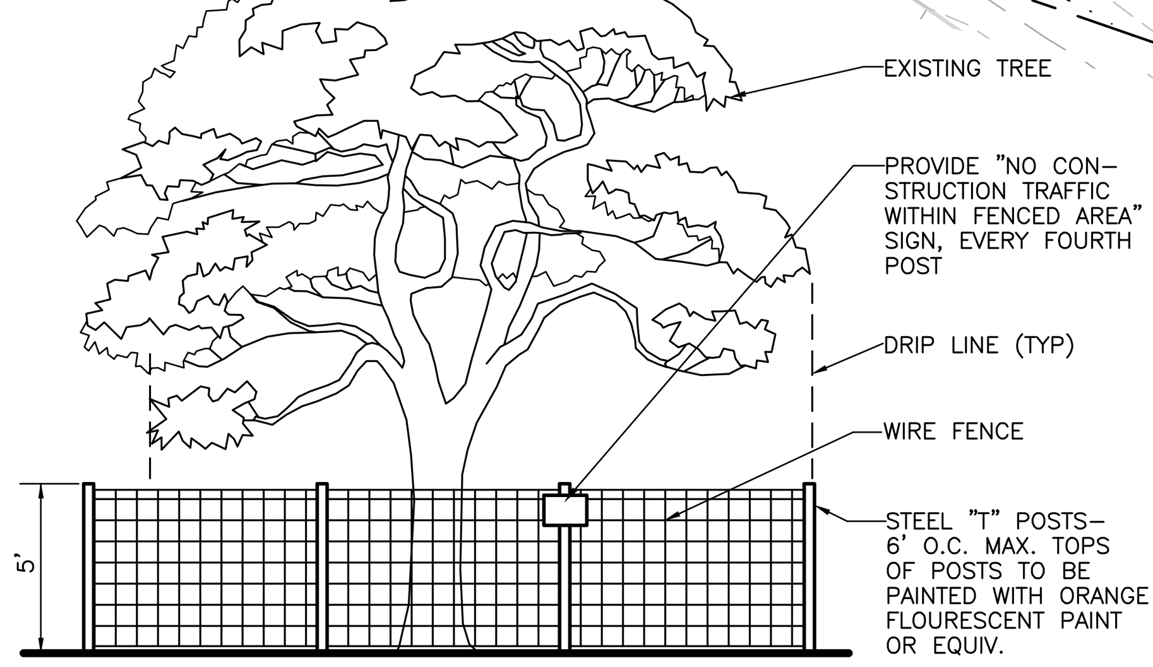
Know what's **below.** **Call** before you dig.

PLANT SCHEDULE

TREES	QTY	BOTANICAL NAME / COMMON NAME	TYPE	SIZE	SPACING	REMARKS
AG	9	AMELANCHIER X GRANDIFLORA 'AUTUMN BRILLIANCE' / 'AUTUMN BRILLIANCE' SERVICEBERRY	DECIDUOUS	2" CAL.	AS SHOWN	B&B
CD	31	CEDRUS DEODARA / DEODAR CEDAR	EVERGREEN	2" CAL.	AS SHOWN	FULL TO BASE
CC	7	CERCIS CANADENSIS / EASTERN REDBUD	DECIDUOUS	2" CAL.	AS SHOWN	B&B
LS	9	LIQUIDAMBAR STYRACIFLUA / AMERICAN SWEET GUM	DECIDUOUS	2" CAL.	AS SHOWN	B&B
MG	8	MAGNOLIA GRANDIFLORA / SOUTHERN MAGNOLIA	EVERGREEN	2" CAL.	AS SHOWN	FULL TO BASE
PS	26	PINUS STROBUS / WHITE PINE	EVERGREEN	2" CAL.	AS SHOWN	FULL TO BASE
PO	10	PLATANUS OCCIDENTALIS / AMERICAN SYCAMORE	DECIDUOUS	2" CAL.	AS SHOWN	B&B
QR	13	QUERCUS RUBRA / RED OAK	DECIDUOUS	2" CAL.	AS SHOWN	B&B
CL	51	X CUPRESSOCYPARIS LEYLANDII / LEYLANDI CYPRESS	EVERGREEN	2" CAL.	AS SHOWN	FULL TO BASE

PLANTING NOTES

1. ANY SERIES OF TREES TO BE PLACED IN A PARTICULAR ARRANGEMENT WILL BE FIELD CHECKED FOR ACCURACY. ANY PLANTS MISARRANGED WILL BE RELOCATED.
2. SOIL USED IN BACKFILLING PLANTING PITS SHALL BE TOPSOIL AND MIXED WITH 25% PEAT BY VOLUME. EXCEPT FOR ERICACEOUS PLANTS, VERY ACID OR SOUR SOIL (SOIL HAVING A pH less than 6) SHALL BE MIXED WITH SUFFICIENT LIME TO PRODUCE A SLIGHTLY ACID REACTION (A pH of 6.0 to 6.5). ADD 10–10–10 COMMERCIAL FERTILIZER AT THE RATE OF 2 POUNDS PER CUBIC YARD. MIX BOTH FERTILIZER AND PEAT THOROUGHLY BY HAND OR ROTARY TILLER.
3. SOIL USED IN BACKFILLING ERICACEOUS PLANTS SHALL BE TOPSOIL MIXED WITH 50% PEAT BY VOLUME. ADD 5–10–5 COMMERCIAL FERTILIZER AT THE RATE OF 5 POUNDS PER CUBIC YARD. MIX BOTH FERTILIZER AND PEAT THOROUGHLY BY HAND OR ROTARY TILLER.
4. UPON SECURING PLANT MATERIAL AND BEFORE INSTALLATION, THE CONTRACTOR SHALL NOTIFY THE LANDSCAPE ARCHITECT OR OWNER'S REPRESENTATIVE FOR A PRE–INSTALLATION INSPECTION TO VERIFY ALL PLANT MATERIAL MEETS SPECIFICATION. MATCH TREES OF SAME SPECIES IN GROWTH CHARACTER AND UNIFORMITY.
5. APPLY HERBICIDE (TREFLAN OR EQUIVALENT) TO ALL PLANT BEDS PRIOR TO PLANTING FOR NOXIOUS WEED CONTROL AT A RATE OF 2 POUNDS PER 1,000 SQUARE FEET.
6. CONTRACTOR SHALL SUBMIT A 10 OUNCE SAMPLE OF THE TOPSOIL PROPOSED TO A TESTING LABORATORY FOR ANALYSIS. SUBMIT TEST RESULTS WITH RECOMMENDATIONS FOR SUITABILITY TO THE OWNER'S REPRESENTATIVE FOR APPROVAL.
7. PLANTS SHALL BE ORIENTED FOR BEST APPEARANCE AND VERTICAL. ALL NON–BIODEGRADABLE ROOT CONTAINERS SHALL BE REMOVED.
8. SELECTIVELY TRIM TREE BRANCHES BY 25%, MAINTAINING NATURAL SHAPE. PRUNE ALL DEAD AND BROKEN BRANCHES IN TREES AND SHRUBS. REMOVE TAGS, TWINE OR OTHER NON–BIODEGRADABLE MATERIAL.
9. SCARIFY SUBSOIL IN PLANTING BEDS TO A DEPTH OF 3 INCHES. ALL PLANTING BEDS SHALL RECEIVE A MINIMUM OF 6 INCHES OF TOPSOIL.
10. CONTRACTOR SHALL PROVIDE SMOOTH, NEATLY TRENCHED (3 INCH DEEP) BED EDGES.
11. ALL PLANTING BEDS TO HAVE A MINIMUM 4 INCH DEEP PINE BARK MULCH, PINE STRAW MULCH OR OTHER MULCH AS SPECIFIED.
12. DIMENSIONS FOR TRUNK CALIPER, HEIGHTS, AND SPREAD SPECIFIED ON THE MATERIAL SCHEDULE ARE A GENERAL GUIDE FOR THE MINIMUM REQUIRED SIZE OF EACH PLANT. QUALITY AND SIZE OF PLANTS, SPREAD OF ROOTS AND SIZE OF BALLS SHALL BE IN ACCORDANCE WITH A.N.S.I. Z80 "AMERICAN STANDARD FOR NURSERY STOCK" (CURRENT EDITION) AS PUBLISHED BY THE AMERICAN ASSOCIATION OF NURSERYMEN, INC.
13. THE QUANTITIES INDICATED ON THE MATERIAL SCHEDULE ARE PROVIDED FOR THE BENEFIT OF THE CONTRACTOR, BUT SHOULD NOT BE ASSUMED TO ALWAYS BE CORRECT. IN THE EVENT OF A DISCREPANCY, THE PLANTING PLAN (PLANT SYMBOLS) WILL TAKE PRECEDENCE OVER THE MATERIAL SCHEDULE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR HIS/HER OWN QUANTITY CALCULATIONS AND THE LIABILITY PERTAINING TO THOSE QUANTITIES AND ANY RELATED CONTRACT DOCUMENTS AND/OR PRICE QUOTATIONS.
14. CONTRACTOR TO WARRANTY ALL MATERIAL FOR ONE YEAR AFTER DATE OF FINAL ACCEPTANCE.



TREE PROTECTION DETAIL

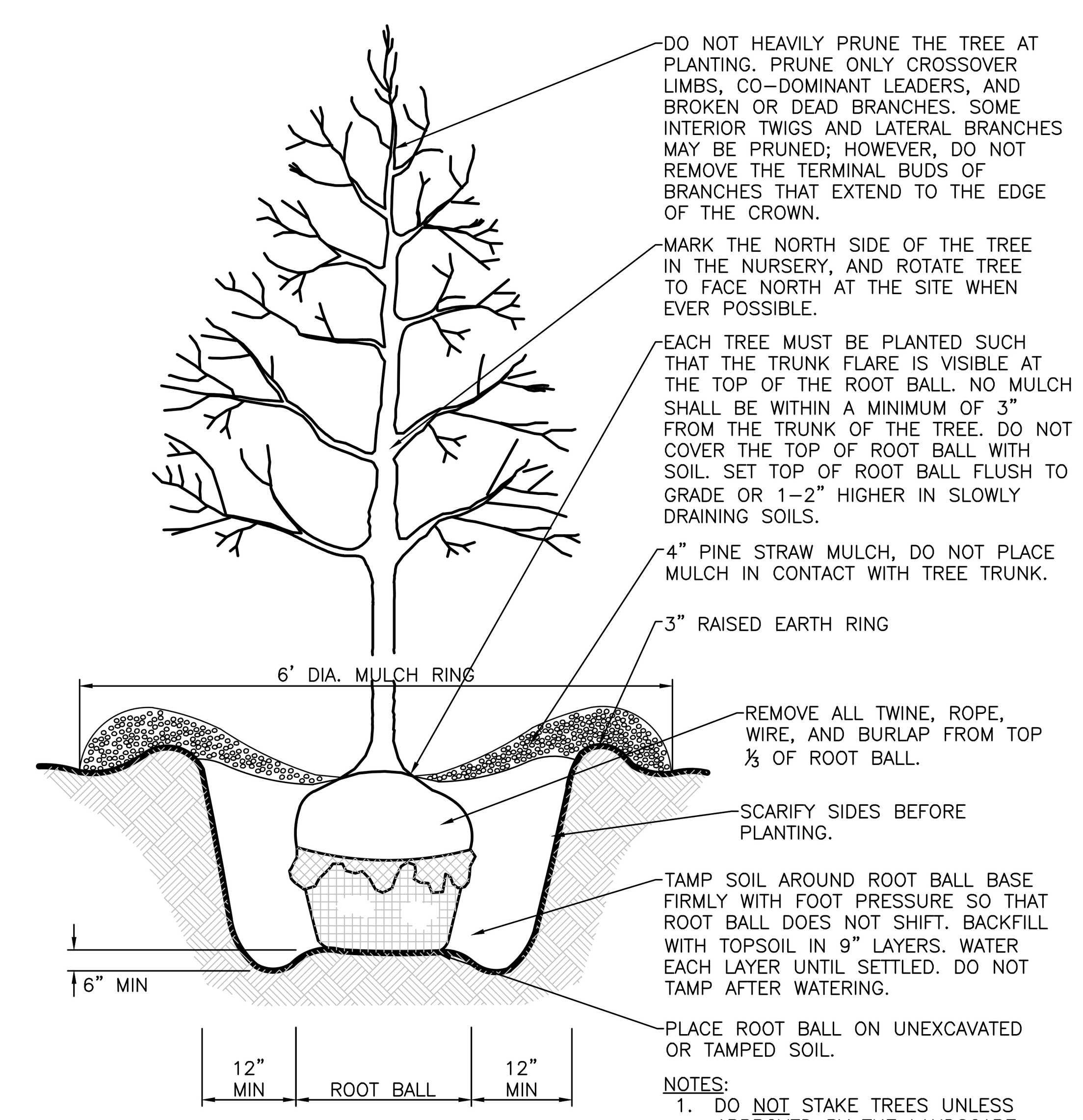
NOT TO SCALE

NOTE:

POSTS TO BE PLACED AT 1.5 x DRIP LINE– SEE PLANS FOR FENCE LOCATION.

NOTE:

ALL TREE PROTECTION FENCING SHALL BE IN PLACE PRIOR TO THE ISSUANCE OF A GRADING PERMIT.



DO NOT HEAVILY PRUNE THE TREE AT PLANTING. PRUNE ONLY CROSSOVER LIMBS, CO–DOMINANT LEADERS, AND BROKEN OR DEAD BRANCHES. SOME INTERIOR TWIGS AND LATERAL BRANCHES MAY BE PRUNED; HOWEVER, DO NOT REMOVE THE TERMINAL BUDS OF BRANCHES THAT EXTEND TO THE EDGE OF THE CROWN.
MARK THE NORTH SIDE OF THE TREE IN THE NURSERY, AND ROTATE TREE TO FACE NORTH AT THE SITE WHEN EVER POSSIBLE.
EACH TREE MUST BE PLANTED SUCH THAT THE TRUNK FLARE IS VISIBLE AT THE TOP OF THE ROOT BALL. NO MULCH SHALL BE WITHIN A MINIMUM OF 3" FROM THE TRUNK OF THE TREE. DO NOT COVER THE TOP OF ROOT BALL WITH SOIL. SET TOP OF ROOT BALL FLUSH TO GRADE OR 1–2" HIGHER IN SLOWLY DRAINING SOILS.
4" PINE STRAW MULCH, DO NOT PLACE MULCH IN CONTACT WITH TREE TRUNK.
3" RAISED EARTH RING
6' DIA. MULCH RING
REMOVE ALL TWINE, ROPE, WIRE, AND BURLAP FROM TOP ⅓ OF ROOT BALL.
SCARIFY SIDES BEFORE PLANTING.
TAMP SOIL AROUND ROOT BALL BASE FIRMLY WITH FOOT PRESSURE SO THAT ROOT BALL DOES NOT SHIFT. BACKFILL WITH TOPSOIL IN 9" LAYERS. WATER EACH LAYER UNTIL SETTLED. DO NOT TAMP AFTER WATERING.
PLACE ROOT BALL ON UNEXCAVATED OR TAMPED SOIL.
6" MIN
12" MIN
ROOT BALL
12" MIN

TREE PLANTING

NOT TO SCALE

NOTES:

1. DO NOT STAKE TREES UNLESS APPROVED BY THE LANDSCAPE ARCHITECT. IF STAKED, REMOVE AFTER ONE GROWING SEASON.
2. DO NOT WRAP TREE TRUNKS UNLESS APPROVED BY THE LANDSCAPE ARCHITECT. REMOVE WRAP AFTER PLANTING.
3. NON–BIODEGRADABLE BURLAP TO BE REMOVED OR ROLLED UNDER ROOT BALL AFTER PLANT IS PLACED IN HOLE.

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BRETT ALAN SMITH — REGISTERED LANDSCAPE ARCHITECT — TENNESSEE

SECTION 16 CONSTRUCTION PLANS

THOMPSON'S STATION, WILLIAMSON COUNTY, TENNESSEE

TOLLGATE Village

JOB NO.	WK. ORDER
10081	9260
DESIGNED:	B. SMITH
DRAWN:	T. GARDNER
SCALE:	1"=50'
DATE:	AUGUST 24, 2016

REVISIONS

TREE REMOVAL & LANDSCAPE PLAN

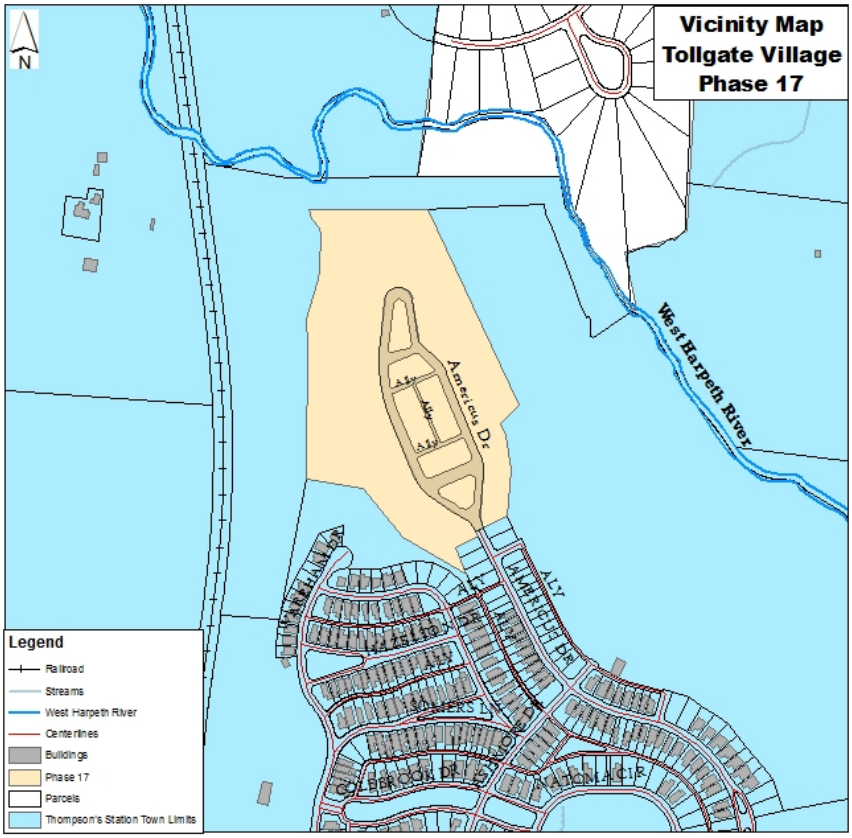
L1.1

Thompson's Station Planning Commission
Staff Report –Item 4 (PP 2017-002)
January 24, 2017

Preliminary plat for Phase 17 to create 71 single family lots, five open space lots and approval for the removal of seven trees exceeding 24 inches in diameter.

PROJECT DESCRIPTION

A request to approve the preliminary plat for Phase 17 of Tollgate Village to create 71 single family lots, five open space lots and removal of seven trees exceeding 24 inches in diameter.



BACKGROUND

On September 27, 2016, the Planning Commission suspended all plats within Tollgate Village due to issues related to infrastructure in several sections of the Tollgate Village which have not been completed by the developer and no sureties in place to ensure completion of the improvements. There are no completed public roads to access this phase of the development and no sureties in place to guarantee that such infrastructure will be completed. Therefore, until these issues are addressed and the plat suspension is resolved and lifted, Staff cannot recommend favorably for any plats within Tollgate Village.

On January 11, 2017, the developer sent a letter to the Tollgate residents committing to make the necessary repairs to these older phases of Tollgate upon approval of plats (See attached letter). However, again, the Town has not received any assurances from the developer for completion of these roads.

ANALYSIS

Preliminary Plat

The preliminary plat provides an analysis of the site's special features and the response to those features (LDO Section 5.4.3). This preliminary plat for phase 17 includes the creation of 71 single family lots

and five open space lots totaling 16.8 acres of open space. However, the layout of this phase is modified from the approved development plan (dated 4-15-14). Changes include a revision to the layout of the roads and alleys and the addition of another open space lot.

Roadways
The standard for local roadways is 50 feet. The Planning Commission approved 46 foot roadways with a five-foot grass strip for other roadways within this subdivision. The applicant is requesting the Planning Commission approve the 46-foot width for the roadways within this phase to be consistent with these approved right-of-way widths to continue/maintain the existing streetscape that has been established.

Critical Lots
Lots 1709-1710, 1716-1731, 1734-1738, 1745-1750, 1755-1756, 1759, and 1764-1776 are designated as critical lots on the plat. The slope identified on the plan indicates that these lots have slopes between 15 and 25%. The plan illustrates that areas exceeding 25% slope are within the proposed open space. All critical lots will require engineered site plans to address all site specific issues.

Lot Standards
The single family lots will vary in size from .14 acres to .34 acres with a minimum of 50 feet for lot widths. Proposed setbacks are 10 feet for the front yard, 7.5 feet for the side yard and 20 feet for the rear yard with a minimum of a 20-foot driveway. Block lengths do not exceed 800 feet, except where adjacent to open space or where a preexisting block occurs as permitted within the ordinance. Blocks that exceed 500 feet in length will have a 16-foot pedestrian access provided.

<u>Traffic Improvements</u>
In 2015, a revised concept plan was submitted along with an updated traffic study (See attached study). The plan was not approved and the traffic study was not accepted or approved. In 2016, an updated traffic study, as required for approval of the phase 15 preliminary plat, was submitted in December. A "preferred" secondary access was noted in the report as a connection to Declaration Way. The schedule for the incorporating this secondary access is recommended after 248 additional units are constructed. The Town's Consulting Traffic Engineer reviewed the traffic study and submitted comments to Staff (See attached RPM letter dated January 6, 2017).

In addition, staff has the following concerns:

1. The traffic study doesn't include a project description to evaluate trip generation for differing land uses and the directional distribution of the trips.
2. The 2015 traffic study stated "it is important to note that the installation of the traffic signal at this intersection will require the widening of Columbia Pike north of the bridge over the West Harpeth River and will require bridge widening to accomplish." However, the study did not address the need for any bridge improvements. In addition, the need for the signal is stated, however, the timing of the signal is not specified.
3. The report states that 248 additional SF dwellings can be added prior to a secondary access being necessary. However, the study does not specify existing unit count, therefore there is not a base number for adding the additional units. In addition, the study does not include non-residential land uses and how they may affect secondary access timing and location.
4. The report states that the "preferred" secondary access is at Declaration Way. Declaration Way is a private road (Williamson County Schools) providing access to the high school and analysis was not provided related to impacts from the connection. In addition, there is not analysis to explain why this secondary access is "preferred' to direct access onto Columbia Pike as shown on the approved site development plan and discussed in the original traffic study. The 2003 traffic study noted that the access was to provide reciprocal access between Tollgate Village and the school, not for improved access to Columbia Pike. Furthermore, the 2015 study

indicates the conflict with the bridge and the need for bridge improvements, thereby recommending that the secondary access by shifted south on Columbia Pike by 240 feet. Additional analysis related to the need, timing and location of the secondary access is necessary. In addition, the 2015 study states that access at Declaration Way would provide "a marginally beneficial ingress/egress for the multi-family and commercial uses located on the southeastern portion of the Tollgate Village site." This study furthers states that access would be provided to an unsignalized intersection and that this access point would likely be a means of connecting to Tollgate Boulevard to access the signal. Therefore, Staff has concerns with the recommendation to utilize Declaration Way as the only secondary access without analysis demonstrating that this will result in improved connectivity and access for the development.

On January 17, 2017, the applicant submitted responses to these comments and they are under review by our Traffic Engineer. Staff is awaiting response, however at this time, Staff has concerns that the study does not satisfy the contingency for "a specific scope being a schedule of improvements for traffic mitigation including a secondary access shall be reviewed and approved by the Town."

Traffic Signal

The traffic signal at Tollgate Boulevard/Columbia Pike was approved by the Planning Commission in November 2015. The Planning Commission approved the signal with the following contingencies:

1. Prior to the approval of installation of the traffic improvements, the Town Engineer shall approve the construction plans.
2. Prior to the approval of construction plans, the applicant shall post a surety in the amount of $126,000 for the traffic signal.
3. Prior to the approval of the construction plans, the applicant shall post a surety in the amount of $95,000 which could be waived if TDOT requires a surety that meets or exceeds this amount for the turn lane improvements.
4. The signalization shall include a controller compatible with signal synchronization within Thompson's' Station.

TDOT has received the submittal package and is awaiting additional materials from the developer. Once those materials are submitted and a surety posted, the grading permit will be issued. Since TDOT will be requiring a $150,000 surety, contingency #3 will be satisfied. Staff recommends that prior to any future final plat approvals, a contingency for installation and operation of the signal be incorporated.

Sewer

During the construction drawing approval phase, it was noted that an analysis of the wastewater system was needed for Tollgate Village. The development team has a pump test scheduled and are working with Staff to identify the necessary improvements. Prior to any plat approvals, all necessary upgrades should be identified with a contingency for completion of the improvements prior to final plat approvals.

Tree Removal

Development of phase 17 requires the removal of seven trees for a total of 264 inches. The Land Development Ordinance requires the replacement of trees exceeding 24 inches at a ratio of one and a half inches for every inch removed. Therefore, 396 inches of trees is required to be replaced on the site. The replacement plan includes 105 trees to be planted within the two open space lots of phase 17. The replacement trees will be either 2 or 3-inch caliper in size and are a variety of deciduous and evergreen trees such as American Sycamore, Southern Magnolia, Leylandi Cypress, Red Oak, White Pine, American Sweet Gum, and Eastern Red Bud. Total tree replacement from these 105 trees is 290 inches within phase 17. The developer is requesting that the 61 inches of trees to satisfy tree replacement be planted within the open space for Section 7. These trees will be between 2, 3 or 4-inch caliper in size with one 6-inch caliper tree as a specimen tree. The variety will consist of an Allee Elm as the six-inch

specimen tree, Shumard Oak, Zelkova and Nuttall Oak. And lastly, the remaining 45 inches will be planted in the open space along Americus Drive and in the alley open space lot of Section 12. Total tree replacement will be 396 inches.

RECOMMENDATION

Staff recommends that the Planning Commission deny the application for preliminary plat and tree removal for phase 17 of Tollgate Village for the following reasons:

- There are no completed public roads to access this phase of the development and no sureties in place to guarantee that such infrastructure will be completed. The Planning Commission previously suspended all future plat approvals within Tollgate until this issue was resolved.
- The plat does not provide for the construction of a secondary access as shown on the approved site development plan and the developer does not have the ability to access Declaration Way at this time. The proposed traffic study does not adequately address the issue of when a secondary access should be required to be installed. Based on the most recently approved traffic study, a secondary access should be installed prior to final plat approval for phase 17.
- It has not been determined whether the existing wastewater infrastructure in Tollgate can support this phase of the development.

In the alternative, the Planning Commission may defer this request for preliminary plat approval to the February Planning Commission meeting to allow the developer to address the above issues.

Please note, once plat suspension is lifted, the traffic signal, secondary access and all sewer improvements must be installed prior to any final plat approvals along with any other contingencies such as development agreements, tree removal and sureties that are required by the Planning Commission.

ATTACHMENT

Preliminary Plat
Site Development Plan (4/15/2014)
2003 Tollgate Village Traffic Study
2015 Tollgate Village Traffic Study
2016 Tollgate Village Traffic Study
RPM letter dated January 6, 2017
Developer letter dated January 11, 2017
Developer Traffic Response dated January 17, 2017

GENERAL NOTES

1. THE PURPOSE OF THIS PLAT IS TO CREATE 71 RESIDENTIAL SINGLE-FAMILY LOTS AND FIVE OPEN SPACE TRACTS.
2. BEARINGS SHOWN HEREON ARE BASED ON THE TENNESSEE COORDINATE SYSTEM OF 1983. GPS EQUIPMENT WAS USED DURING THE COURSE OF THE SURVEY ON THE SITE TO DETERMINE THE POSITION OF TWO CONTROL POINTS FOR ESTABLISHING THE BEARING BASE. THE EQUIPMENT USED: LEICA, MODEL GX 1230, DUAL FREQUENCY RECEIVER. THE TYPE OF SURVEY: NETWORK ADJUSTED REAL TIME KINEMATIC. CONTROL POINTS FOR BEARING BASE FOR PROJECT AND ROAD LOCATION IMPROVEMENTS
3. THIS SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES. ABOVE GRADE AND UNDERGROUND UTILITIES SHOWN WERE TAKEN FROM VISIBLE APPURTENANCES, PUBLIC RECORDS, AND/OR MAPS PREPARED BY OTHERS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. THEREFORE, RELIANCE UPON THE TYPE, SIZE AND LOCATION OF UTILITIES SHOWN SHOULD BE DONE SO WITH THIS CIRCUMSTANCE CONSIDERED. DETAILED VERIFICATION OF EXISTENCE, LOCATION AND DEPTH SHOULD ALSO BE MADE PRIOR TO ANY DECISION RELATIVE THERETO IS MADE. AVAILABILITY AND COST OF SERVICE SHOULD BE CONFIRMED WITH THE APPROPRIATE UTILITY COMPANY. IN TENNESSEE, IT IS A REQUIREMENT, PER "THE UNDERGROUND UTILITY DAMAGE PREVENTION ACT", THAT ANYONE WHO ENGAGES IN EXCAVATION MUST NOTIFY ALL KNOWN UNDERGROUND UTILITY OWNERS NO LESS THAN THREE (3) NOR MORE THAN TEN (10) WORKING DAYS PRIOR TO THE DATE OF THEIR INTENT TO EXCAVATE AND ALSO TO AVOID ANY POSSIBLE HAZARD OR CONFLICT. TENNESSEE ONE CALL, DIAL 811.
4. THIS PROPERTY IS CURRENTLY ZONED D3 (HIGH DENSITY RESIDENTIAL). MAXIMUM LOT COVERAGE – 55%.
   MINIMUM BUILDING SETBACKS PER TOWN OF THOMPSON'S STATION LAND DEVELOPMENT ORDINANCE DATED AUGUST 9, 2015:
   FRONT: 10'*
   REAR: 20'
   SIDE: 7.5'
   *20' MINIMUM DRIVEWAY LENGTH, EXCLUSIVE OF SIDEWALKS
5. ELEVATIONS SHOWN HEREON ARE BASED ON NAVD 88. CONTOURS ARE AT TWO FOOT INTERVALS AND ARE BASED ON A FIELD RUN SURVEY BY RAGAN-SMITH ASSOCIATES ON JANUARY 26, 2015 USING RANDOM SPOT ELEVATIONS. CONTOURS WERE DERIVED USING SURFACE MODELING TECHNIQUES.
6. BY SCALED MAP LOCATION AND GRAPHIC PLOTTING ONLY, THIS PROPERTY LIES WITHIN FLOOD ZONES "AE", AND "X" (OTHER AREAS), AS DESIGNATED ON CURRENT FEDERAL EMERGENCY MANAGEMENT AGENCY MAP NO. 47187C0335F, WITH AN EFFECTIVE DATE OF SEPTEMBER 29, 2006, WHICH MAKES UP A PART OF THE NATIONAL FLOOD INSURANCE ADMINISTRATION REPORT; COMMUNITY NO. 470424, PANEL NO. 0335, SUFFIX F, WHICH IS THE CURRENT FLOOD INSURANCE RATE MAP FOR THE COMMUNITY IN WHICH SAID PREMISES IS SITUATED. SAID MAP DEFINES ZONE "AE" UNDER "SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD" AS BASE FLOOD ELEVATIONS DETERMINED. SAID MAP DEFINES ZONE "X" (OTHER AREAS) UNDER "OTHER AREAS" AS AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.
7. ALL STREETS ARE DESIGNATED PUBLIC AND AS SUCH ARE PUBLIC UTILITY, ACCESS AND DRAINAGE EASEMENTS.
8. ALL PUBLIC STREETS AND DRAINAGE STRUCTURES WITHIN THE RIGHTS-OF-WAY WILL BE MAINTAINED BY THE TOWN OF THOMPSON'S STATION.
9. OPEN SPACE AREAS, PUBLIC UTILITY AND DRAINAGE EASEMENTS (INCLUDING DRAINAGE AND DETENTION STRUCTURES), ALLEYS AND ALL LANDSCAPING WITHIN ROADWAY MEDIANS WILL BE MAINTAINED BY THE HOMEOWNERS' ASSOCIATION.
10. SANITARY SEWER LINES AND STORM LINES SHOWN HEREON WERE TAKEN FROM A PRELIMINARY DESIGN FOR THIS SECTION. FINAL PLACEMENT OF UTILITIES WILL BE DEPICTED ON THE FINAL PLAT.
11. DOMESTIC WATER SUPPLY INFORMATION SHOWN HEREON IS BASED ON A PRELIMINARY DESIGN FOR THIS SECTION. FINAL PLACEMENT TO BE DESIGNED BY OTHERS AND INCLUDED ON THE FINAL PLAT. WATER TO BE PROVIDED BY H.B.&T.S.
12. LOTS SHOWN THUS (*) ARE DESIGNATED AS CRITICAL LOTS AND HAVE MANMADE SLOPES IN EXCESS OF 15%. PER SECTION 3.3.7 OF THE SUBDIVISION REGULATIONS, PRIOR TO THE ISSUANCE OF A BUILDING PERMIT, A SITE GRADING PLAN FOR DEVELOPMENT OF THE LOT SHALL BE SUBMITTED ADDRESSING SITE SPECIFIC NATURAL RESOURCE ISSUES TO THE TOWN OF THOMPSON'S STATION FOR REVIEW AND APPROVAL. NO BUILDING PERMIT WILL BE ISSUED ON SAID LOTS UNTIL AND UNLESS THE TOWN ENGINEER HAS RECEIVED AND REVIEWED THE SITE PLAN.
13. THE BLOCK LENGTHS IN THIS SECTION DO NOT EXCEED THE MAXIMUM LENGTH (800') FOR THE D3 ZONING DISTRICT.
14. I HEREBY STATE THAT THIS SURVEY WAS DONE IN COMPLIANCE WITH THE CURRENT TENNESSEE MINIMUM STANDARDS OF PRACTICE AND THIS IS A CATEGORY I SURVEY AND THE RATIO OF PRECISION OF THE UNADJUSTED SURVEY IS 1:43,595.

BY: _____ DATE: 01-16-17
JOHN T. DARNALL, TN RLS #1571

PHASE 17
LOTS 1706-1755
OPEN SPACE 1789-1793

SITE DATA TABLE (PHASE 17)

TOTAL LOT AREA	–	13.76 ACRES±
TOTAL R.O.W. AREA	–	3.73 ACRES±
OPEN SPACE AREA	–	16.80 ACRES±
TOTAL SITE AREA	–	34.29 ACRES±
TOTAL LINEAR FEET OF ROAD	–	4322 FEET

SURVEYOR:
RAGAN-SMITH ASSOCIATES, INC.
TOM DARNALL, RLS
315 WOODLAND STREET
NASHVILLE, TENNESSEE 37206
(615) 244-8591

OWNER / DEVELOPER
MBSC TN HOMEBUILDER, LLC
C/O BRIAN ROWE
312 S. GAY STREET, SUITE 200
KNOXVILLE, TENNESSEE 37902
(865) 408-8322

LEGEND

OS	OPEN SPACE
R.O.W.	R.O.W.
R.O.W.C.T.	REGISTER'S OFFICE WILLIAMSON COUNTY, TENNESSEE
*	CRITICAL LOT (SEE NOTE 12)

LOT AREA TABLE		
LOT	SQ. FT.±	ACRES±
1706	8,261	0.19
1707	8,316	0.19
1708	8,298	0.19
1709	8,274	0.19
1710	8,804	0.20
1711	10,603	0.24
1712	10,679	0.25
1713	9,148	0.21
1714	8,250	0.19
1715	8,250	0.19
1716	8,250	0.19
1717	8,250	0.19
1718	8,250	0.19
1719	8,716	0.20
1720	9,031	0.21
1721	9,132	0.21
1722	9,202	0.21
1723	9,197	0.21
1724	9,345	0.21
1725	9,243	0.21
1726	8,614	0.20
1727	8,250	0.19
1728	8,250	0.19
1729	8,250	0.19
1730	9,841	0.23
1731	13,716	0.31
1732	12,940	0.30
1733	14,161	0.33
1734	14,599	0.34
1735	11,258	0.26
1736	9,216	0.21
1737	9,534	0.22
1738	8,436	0.19
1739	9,027	0.21
1740	10,478	0.24
1741	9,041	0.21
1742	8,250	0.19
1743	8,250	0.19
1744	8,250	0.19
1745	8,250	0.19
1746	8,250	0.19
1747	8,250	0.19
1748	8,172	0.19
1749	8,541	0.20
1750	8,412	0.19
1751	7,866	0.18
1752	7,341	0.17
1753	7,458	0.17
1754	7,575	0.17
1755	8,429	0.19
1756	6,837	0.16
1757	6,678	0.15
1758	6,678	0.15
1759	6,678	0.15
1760	7,077	0.16
1761	7,013	0.16
1762	6,678	0.15
1763	6,678	0.15
1764	6,678	0.15
1765	6,624	0.15
1766	6,710	0.15
1767	7,220	0.17
1768	6,300	0.14
1769	6,300	0.14
1770	8,014	0.18
1771	7,013	0.16
1772	6,678	0.15
1773	6,678	0.15
1774	6,678	0.15
1775	6,678	0.15
1776	7,013	0.16

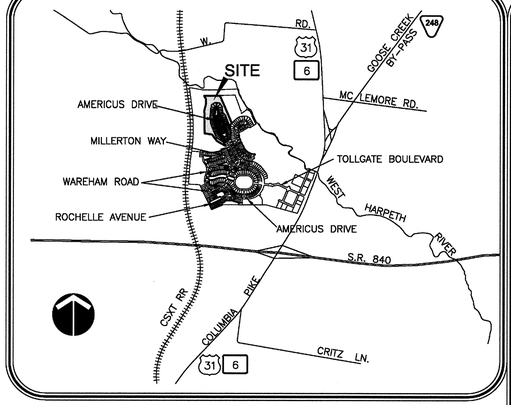
DEED REFERENCE

BEING A PORTION OF THE SAME PROPERTY CONVEYED TO MBSC TN HOMEBUILDER, LLC, FROM TGF 2010, LLC OF RECORD IN BOOK 5264, PAGE 242, REGISTER'S OFFICE FOR WILLIAMSON COUNTY, TENNESSEE.

PROPERTY MAP REFERENCE

BEING A PORTION OF PARCEL 1 AS SHOWN ON WILLIAMSON COUNTY PROPERTY MAP 132.

(SEE NOTE 2)
0 200 400 600



LOCATION MAP
NOT TO SCALE

OPEN SPACE AREA TABLE		
OPEN SPACE	SQ. FT.±	ACRES±
1789	28,924	0.66
1790	2,016	0.05
1791	2,016	0.05
1792	22,662	0.52
1793	676,406	15.53

INDEX OF SHEETS

TOTAL AREA = 1,493,683 SQUARE FEET OR 34.29 ACRES ±

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P.O. BOX 1988, 37202
(615) 244-8591
• www.ragansmith.com •

JOHN T. DARNALL REGISTERED LANDSCAPE ARCHITECT TENNESSEE NO. 1571

TOLLGATE VILLAGE - PHASE 17
FOR
MBSC TN HOMEBUILDER, LLC
TOWN OF THOMPSON'S STATION, WILLIAMSON COUNTY, TENNESSEE

JOB NO.	10-081
WK. ORDER	9260
APPROVED:	JTD
DRAWN:	SLN/AMR
SCALE:	1" = 200'
DATE:	AUGUST 23, 2016

REVISIONS
2 01-16-2017 (DRB) REV. PER STAFF COMMENTS
1 09-14-2016 (MAP) REV. PER STAFF COMMENTS

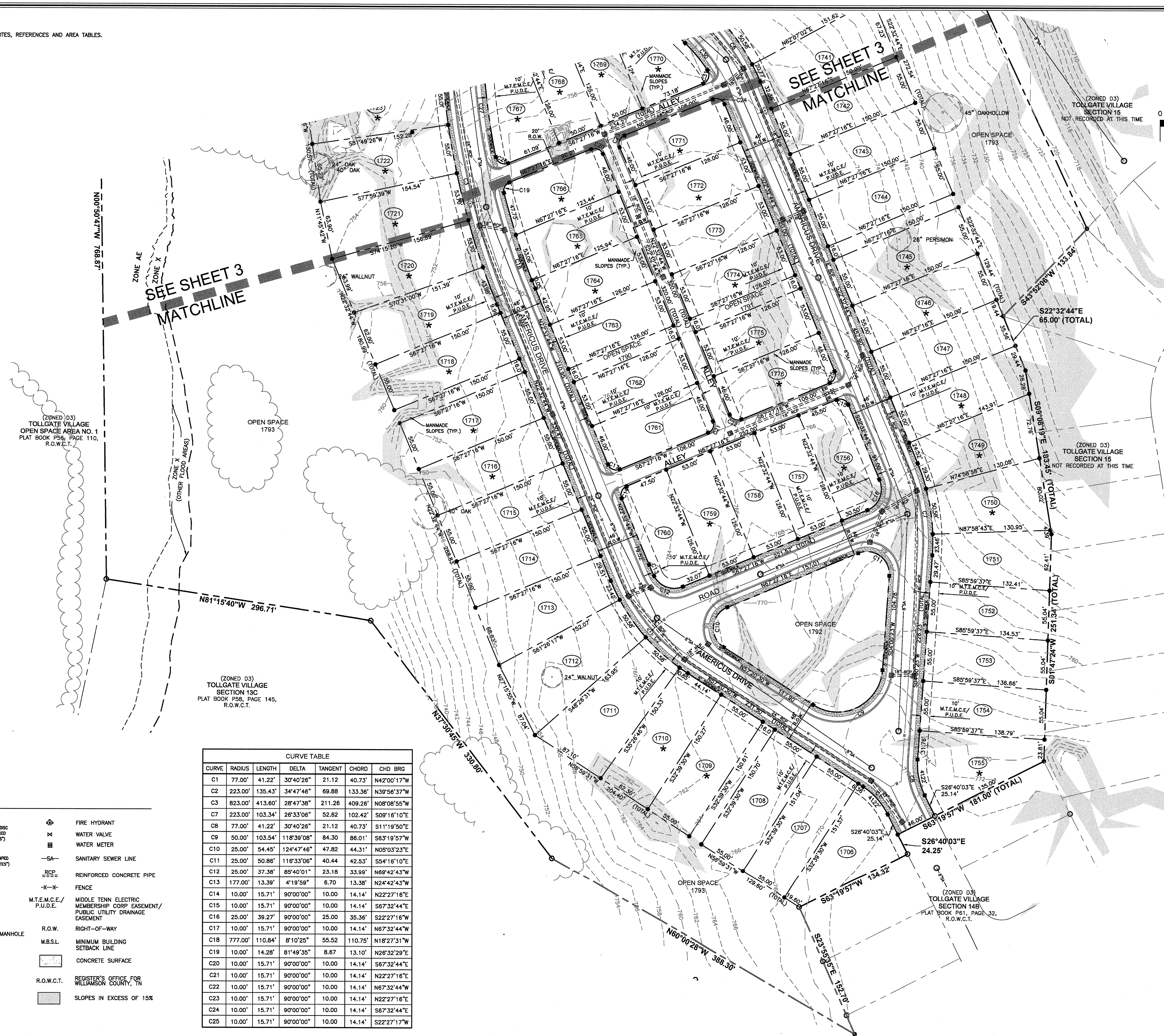
PRELIMINARY PLAT

1 OF 8

G:\10081-92501-SURVEY\PLATS\SECTION 17\PRELIMINARY PLATS\SEC 17 PRELIM PLAT.DWG
PLOTTED BY:DAVID D. BIRLEY ON: 1/16/2017 2:54 PM LAST UPDATED BY DDB ON: 1/16/2017 2:52 PM

GENERAL NOTES

1. SEE SHEET 1 OF 6 FOR NOTES, REFERENCES AND AREA TABLES.



CURVE TABLE						
CURVE	RADIUS	LENGTH	DELTA	TANGENT	CHORD	CHD BRG
C1	77.00'	41.22'	30°40'26"	21.12	40.73'	N42°00'17"W
C2	223.00'	135.43'	34°47'46"	69.88	133.36'	N39°56'37"W
C3	823.00'	413.60'	28°47'38"	211.26	409.26'	N08°08'55"W
C7	223.00'	103.34'	26°33'06"	52.62	102.42'	S09°16'10"E
C8	77.00'	41.22'	30°40'26"	21.12	40.73'	S11°19'50"E
C9	50.00'	103.54'	118°39'08"	84.30	86.01'	S63°19'57"W
C10	25.00'	54.45'	124°47'46"	47.82	44.31'	N05°03'23"E
C11	25.00'	50.86'	116°33'06"	40.44	42.53'	S54°16'10"E
C12	25.00'	37.38'	85°40'01"	23.18	33.99'	N69°42'43"W
C13	177.00'	13.39'	4°19'59"	6.70	13.38'	N24°42'43"W
C14	10.00'	15.71'	90°00'00"	10.00	14.14'	N22°27'16"E
C15	10.00'	15.71'	90°00'00"	10.00	14.14'	S67°32'44"E
C16	25.00'	39.27'	90°00'00"	25.00	35.36'	S22°27'16"W
C17	10.00'	15.71'	90°00'00"	10.00	14.14'	N67°32'44"W
C18	777.00'	110.84'	8°10'25"	55.52	110.75'	N18°27'31"W
C19	10.00'	14.28'	81°49'35"	8.67	13.10'	N26°32'29"E
C20	10.00'	15.71'	90°00'00"	10.00	14.14'	S67°32'44"E
C21	10.00'	15.71'	90°00'00"	10.00	14.14'	N22°27'16"E
C22	10.00'	15.71'	90°00'00"	10.00	14.14'	N67°32'44"W
C23	10.00'	15.71'	90°00'00"	10.00	14.14'	N22°27'16"E
C24	10.00'	15.71'	90°00'00"	10.00	14.14'	S67°32'44"E
C25	10.00'	15.71'	90°00'00"	10.00	14.14'	S22°27'17"W

LEGEND

Symbol	Description	Symbol	Description
■	MONUMENT (NEW) (4" DIAMETER ALUMINUM DISC W/ 5/8" IRON ROD MARKED "RAGAN-SMITH ASSOCIATES")		FIRE HYDRANT
●	IRON ROD (NEW) (5/8" X 18" W/CAP STAMPED "RAGAN SMITH & ASSOCIATES")	⋈	WATER VALVE
○	IRON ROD (OLD)	W	WATER METER
C	CABLE TV BOX	—SA—	SANITARY SEWER LINE
E	ELECTRIC BOX	RCP	REINFORCED CONCRETE PIPE
	CATCH BASIN	-X—X-	FENCE
	SANITARY SEWER MANHOLE	M.T.E.M.C.E./ P.U.D.E.	MIDDLE TENN ELECTRIC MEMBERSHIP CORP EASEMENT/ PUBLIC UTILITY DRAINAGE EASEMENT
	LIGHT STANDARD	R.O.W.	RIGHT-OF-WAY
XXX	LOT NUMBER	M.B.S.L.	MINIMUM BUILDING SETBACK LINE
R.O.W.	RIGHT-OF-WAY		CONCRETE SURFACE
	DECIDUOUS TREE	R.O.W.C.T.	REGISTER'S OFFICE FOR WILLIAMSON COUNTY, TN
*	CRITICAL LOT (SEE NOTE 12)		SLOPES IN EXCESS OF 15%

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JOHN T. DARNALL — TENNESSEE NO. 1571

TOLLGATE VILLAGE - PHASE 17

FOR

MBSC TN HOMEBUILDER, LLC

TOWN OF THOMPSON'S STATION, WILLIAMSON COUNTY, TENNESSEE

JOB NO. 10-081	WK. ORDER 9260
APPROVED:	JTD
DRAWN:	AMR/SLN
SCALE:	1" = 50'
DATE:	AUGUST 23, 2016

REVISIONS

1. 09-14-2016 (AMR) REV. PER STAFF COMMENTS
2. 01-16-2017 (DDB) REV. PER STAFF COMMENTS

PRELIMINARY PLAT

GENERAL NOTES

1. SEE SHEET 1 OF 6 FOR NOTES, REFERENCES AND AREA TABLES.

(SEE NOTE 2)

0 50 100 150

CURVE TABLE						
CURVE	RADIUS	LENGTH	DELTA	TANGENT	CHORD	CHD BRG
C3	823.00'	413.60'	28°47'38"	211.26	409.26'	N08°08'55"W
C4	73.00'	210.80'	165°26'54"	571.76	144.82'	N88°58'21"E
C5	77.00'	50.89'	37°51'59"	26.41	49.97'	S27°14'12"E
C6	223.00'	91.95'	23°37'27"	46.64	91.30'	S34°21'27"E
C26	10.00'	17.66'	101°12'19"	12.18	15.46'	S61°56'34"E
C28	25.00'	31.15'	71°23'05"	17.96	29.17'	N31°45'44"E
C29	25.00'	28.96'	66°22'33"	16.35	27.37'	S79°21'27"E
C30	177.00'	38.77'	12°33'06"	19.47	38.70'	S39°53'38"E
C31	10.00'	17.64'	101°04'22"	12.15	15.44'	S16°55'05"W
C32	25.00'	50.75'	116°19'01"	40.26	42.48'	N54°23'13"W
C33	783.00'	33.85'	2°28'37"	16.93	33.85'	N05°00'35"E
C34	33.00'	95.29'	165°26'54"	258.47	65.47'	N88°58'21"E
C35	117.00'	27.40'	13°25'10"	13.76	27.34'	S15°00'47"E
C36	25.00'	38.91'	89°10'39"	24.64	35.10'	S22°51'57"W

LEGEND

■	MONUMENT (NEW) (4" DIAMETER ALUMINUM DISC W/ 5/8" IRON ROD MARKED "RAGAN-SMITH ASSOCIATES")	FH	FIRE HYDRANT
●	IRON ROD (NEW) (5/8" x 18" W/CAP STAMPED "RAGAN SMITH & ASSOCIATES")	WV	WATER VALVE
○	IRON ROD (OLD)	WM	WATER METER
CATV	CABLE TV BOX	—SA—	SANITARY SEWER LINE
E	ELECTRIC BOX	RCP	REINFORCED CONCRETE PIPE
	CATCH BASIN	-x-x-	FENCE
	SANITARY SEWER MANHOLE	M.T.E.M.C.E./ P.U.D.E.	MIDDLE TENN ELECTRIC MEMBERSHIP CORP EASEMENT/ PUBLIC UTILITY DRAINAGE EASEMENT
*	LIGHT STANDARD	R.O.W.	RIGHT-OF-WAY
XXX	LOT NUMBER	M.B.S.L.	MINIMUM BUILDING SETBACK LINE
R.O.W.	RIGHT-OF-WAY		CONCRETE SURFACE
	DECIDUOUS TREE	R.O.W.C.T.	REGISTER'S OFFICE FOR WILLIAMSON COUNTY, TN
*	CRITICAL LOT (SEE NOTE 12)		SLOPES IN EXCESS OF 15%

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JOHN T. DARWIN — TENNESSEE NO. 1571

TOLLGATE VILLAGE - PHASE 17

FOR

MBSC TN HOMEBUILDER, LLC

TOWN OF THOMPSON'S STATION, WILLIAMSON COUNTY, TENNESSEE

JOB NO.	10-081
WK. ORDER	9260
APPROVED:	JTD
DRAWN:	AMR/SLN
SCALE:	1" = 50'
DATE:	AUGUST 23, 2016

NO.	REVISIONS
2	01-18-2017 (DSW) REV. PER STAFF COMMENTS
1	09-14-2016 (AMR) REV. PER STAFF COMMENTS

PRELIMINARY PLAT

3 OF 8

Tree Protection / Replacement Data Table

Tree Units Provided from Existing Trees		
Removed Tree Sizes	**Quantity**	**Units Per Tree**
24 "	1	24
26 "	1	26
30 "	1	30
34 "	1	34
36 "	1	36
42 "	1	42
72 "	1	72
Total Trees to be removed	**7**	
Total Units From Trees to be		264
Total Replacment Units		**264 x 1.5 = 396**
Total Replacment Units		**396***

* 290 CAL. IN. PROVIDED PER THIS LANDSCAPE PLAN. THE REMAINING REPLACEMENT TREES ARE PLANTED AS FOLLOWS:

SECTION 7: 61 CAL. IN.
SECTION 12: 36 CAL. IN.
SECTION 14: 9 CAL. IN.
SECTION 17: 290 CAL. IN.
TOTAL: 396 CAL. IN.

PLANT SCHEDULE

TREES	QTY	BOTANICAL NAME / COMMON NAME	TYPE	SIZE	HEIGHT	SPACING	REMARKS
CD	12	CEDRUS DEODARA / DEODAR CEDAR	EVERGREEN	3" CAL.		AS SHOWN	B&B
CC	25	CERCIS CANADENSIS / EASTERN REDBUD	DECIDUOUS	2" CAL.		AS SHOWN	B&B
MG	3	MAGNOLIA GRANDIFLORA / SOUTHERN MAGNOLIA	EVERGREEN	3" CAL.		AS SHOWN	B&B
PS	4	PINUS STROBUS / WHITE PINE	EVERGREEN	3" CAL.		AS SHOWN	B&B
PO	22	PLATANUS OCCIDENTALIS / AMERICAN SYCAMORE	DECIDUOUS	3" CAL.	14–16' HT	AS SHOWN	B&B
QP	23	QUERCUS PHELLOS / WILLOW OAK	DECIDUOUS	3" CAL.	14–16' HT	AS SHOWN	B&B
CL	16	X CUPRESSOCYPARIS LEYLANDII / LEYLANDI CYPRESS	DECIDUOUS	3" CAL.		AS SHOWN	B&B

NOTES: 1. SEED ALL DISTURBED AREAS NOT OTHERWISE PLANTED.

TOTAL PROVIDED: 290 CAL. INCHES

TREE PROTECTION FENCE (TYP.)
EXISTING TREE TO BE REMOVED (TYP.)

Know what's **below.** **Call** before you dig.

0 50 100 150

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BRENT ALAN SMITH — REGISTERED LANDSCAPE ARCHITECT — STATE OF TENNESSEE

SECTION 17
FOR
CONSTRUCTION PLANS

THOMPSON'S STATION, WILLIAMSON COUNTY, TN

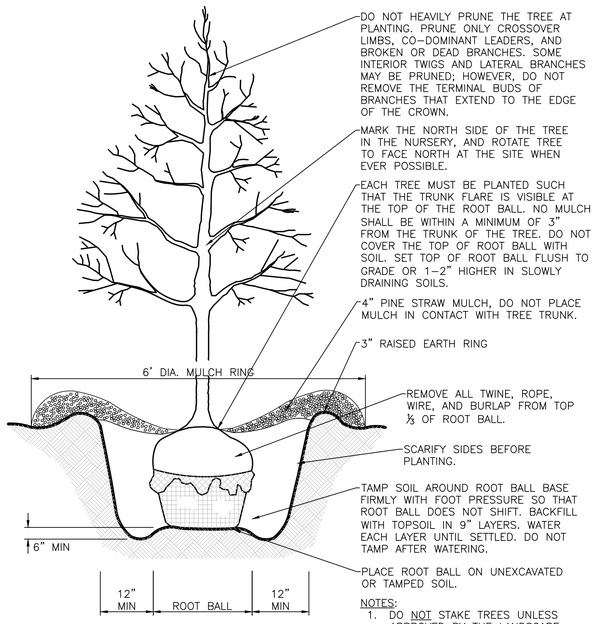
TOLLGATE Village

09-23-16 T. GARDNER
ADD TREE REMOVE/REPLACE
REVISIONS

JOB NO.	WK. ORDER 9260
10081	
DESIGNED:	B. SMITH
DRAWN:	T. GARDNER
SCALE:	1"=50'
DATE:	SEPTEMBER 1, 2016

TREE REMOVAL & LANDSCAPE PLAN

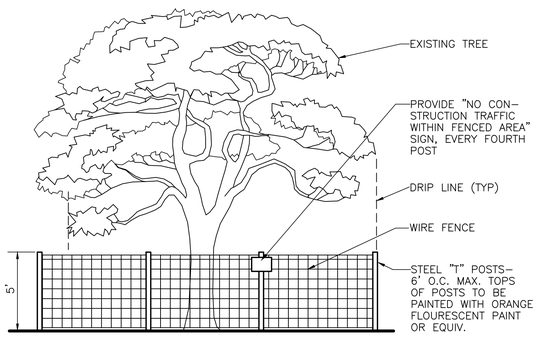
L1.1



NOTES:
1. DO NOT STAKE TREES UNLESS APPROVED BY THE LANDSCAPE ARCHITECT. IF STAKED, REMOVE AFTER ONE GROWING SEASON.
2. DO NOT WRAP TREE TRUNKS UNLESS APPROVED BY THE LANDSCAPE ARCHITECT. REMOVE WRAP AFTER PLANTING.
3. NON-BIODEGRADABLE BURLAP TO BE REMOVED OR ROLLED UNDER ROOT BALL AFTER PLANT IS PLACED IN HOLE.

TREE PLANTING

NOT TO SCALE



TREE PROTECTION DETAIL

NOT TO SCALE

NOTE:
POSTS TO BE PLACED AT 1.5 x DRIP LINE- SEE PLANS FOR FENCE LOCATION.

NOTE:

ALL TREE PROTECTION FENCING SHALL BE IN PLACE PRIOR TO THE ISSUANCE OF A GRADING PERMIT.

PLANTING NOTES

1. ANY SERIES OF TREES TO BE PLACED IN A PARTICULAR ARRANGEMENT WILL BE FIELD CHECKED FOR ACCURACY. ANY PLANTS MISARRANGED WILL BE RELOCATED.
2. SOIL USED IN BACKFILLING PLANTING PITS SHALL BE TOPSOIL AND MIXED WITH 25% PEAT BY VOLUME. EXCEPT FOR ERICACEOUS PLANTS, VERY ACID OR SOUR SOIL (SOIL HAVING A pH less than 6) SHALL BE MIXED WITH SUFFICIENT LIME TO PRODUCE A SLIGHTLY ACID REACTION (A pH of 6.0 to 6.5). ADD 10-10-10 COMMERCIAL FERTILIZER AT THE RATE OF 2 POUNDS PER CUBIC YARD. MIX BOTH FERTILIZER AND PEAT THOROUGHLY BY HAND OR ROTARY TILLER.
3. SOIL USED IN BACKFILLING ERICACEOUS PLANTS SHALL BE TOPSOIL MIXED WITH 50% PEAT BY VOLUME. ADD 5-10-5 COMMERCIAL FERTILIZER AT THE RATE OF 5 POUNDS PER CUBIC YARD. MIX BOTH FERTILIZER AND PEAT THOROUGHLY BY HAND OR ROTARY TILLER.
4. UPON SECURING PLANT MATERIAL AND BEFORE INSTALLATION, THE CONTRACTOR SHALL NOTIFY THE LANDSCAPE ARCHITECT OR OWNER'S REPRESENTATIVE FOR A PRE-INSTALLATION INSPECTION TO VERIFY ALL PLANT MATERIAL MEETS SPECIFICATION. MATCH TREES OF SAME SPECIES IN GROWTH CHARACTER AND UNIFORMITY.
5. APPLY HERBICIDE (TREFLAN OR EQUIVALENT) TO ALL PLANT BEDS PRIOR TO PLANTING FOR NOXIOUS WEED CONTROL AT A RATE OF 2 POUNDS PER 1,000 SQUARE FEET.
6. CONTRACTOR SHALL SUBMIT A 10 OUNCE SAMPLE OF THE TOPSOIL PROPOSED TO A TESTING LABORATORY FOR ANALYSIS. SUBMIT TEST RESULTS WITH RECOMMENDATIONS FOR SUITABILITY TO THE OWNER'S REPRESENTATIVE FOR APPROVAL.
7. PLANTS SHALL BE ORIENTED FOR BEST APPEARANCE AND VERTICAL. ALL NON-BIODEGRADABLE ROOT CONTAINERS SHALL BE REMOVED.
8. SELECTIVELY TRIM TREE BRANCHES BY 25%, MAINTAINING NATURAL SHAPE. PRUNE ALL DEAD AND BROKEN BRANCHES IN TREES AND SHRUBS. REMOVE TAGS, TWINE OR OTHER NON-BIODEGRADABLE MATERIAL.
9. SCARIFY SUBSOIL IN PLANTING BEDS TO A DEPTH OF 3 INCHES. ALL PLANTING BEDS SHALL RECEIVE A MINIMUM OF 6 INCHES OF TOPSOIL.
10. CONTRACTOR SHALL PROVIDE SMOOTH, NEATLY TRENCHED (3 INCH DEEP) BED EDGES.
11. ALL PLANTING BEDS TO HAVE A MINIMUM 4 INCH DEEP PINE BARK MULCH, PINE STRAW MULCH OR OTHER MULCH AS SPECIFIED.
12. DIMENSIONS FOR TRUNK CALIPER, HEIGHTS, AND SPREAD SPECIFIED ON THE MATERIAL SCHEDULE ARE A GENERAL GUIDE FOR THE MINIMUM REQUIRED SIZE OF EACH PLANT. QUALITY AND SIZE OF PLANTS, SPREAD OF ROOTS AND SIZE OF BALLS SHALL BE IN ACCORDANCE WITH A.N.S.I. Z80 "AMERICAN STANDARD FOR NURSERY STOCK" (CURRENT EDITION) AS PUBLISHED BY THE AMERICAN ASSOCIATION OF NURSERYMEN, INC.
13. THE QUANTITIES INDICATED ON THE MATERIAL SCHEDULE ARE PROVIDED FOR THE BENEFIT OF THE CONTRACTOR, BUT SHOULD NOT BE ASSUMED TO ALWAYS BE CORRECT. IN THE EVENT OF A DISCREPANCY, THE PLANTING PLAN (PLANT SYMBOLS) WILL TAKE PRECEDENCE OVER THE MATERIAL SCHEDULE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR HIS/HER OWN QUANTITY CALCULATIONS AND THE LIABILITY PERTAINING TO THOSE QUANTITIES AND ANY RELATED CONTRACT DOCUMENTS AND/OR PRICE QUOTATIONS.
14. CONTRACTOR TO WARRANTY ALL MATERIAL FOR ONE YEAR AFTER DATE OF FINAL ACCEPTANCE.

SEEDING NOTES

1. SEED ALL DISTURBED AREAS WITH KY-31 AT THE RATE OF 5 POUNDS PER 1,000 S.F. ALL SEED TO BE 98% PURE WITH 85% GERMINATION AND CONFORM TO ALL STATE REQUIREMENTS FOR GRASS SEED. THE FERTILIZER TO BE 6-12-12 COMMERCIAL TYPE WITH 50% OF ITS ELEMENTS DERIVED FROM ORGANIC SOURCES.
2. PLACE STRAW MULCH ON SEEDED AREAS. STRAW TO BE OATS OR WHEAT STRAW, FREE FROM WEEDS, FOREIGN MATTER DETRIMENTAL TO PLANT LIFE, AND DRY. HAY OR CHOPPED CORNSTALKS ARE NOT ACCEPTABLE.
3. THE CONTRACTOR SHALL VERIFY THAT THE PREPARED SOIL BASE IS READY TO RECEIVE WORK. CULTIVATE THE TOPSOIL TO A DEPTH OF 4 INCHES WITH A MECHANICAL TILLER AND SUBSEQUENTLY RAKE UNTIL SMOOTH. REMOVE FOREIGN MATERIALS COLLECTED DURING CULTIVATION AND RAKING OPERATIONS.
4. APPLY FERTILIZER ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS. LIMESTONE MAY BE APPLIED WITH THE FERTILIZER. APPLY FERTILIZER AFTER SMOOTH RAKING AND PRIOR TO ROLLER COMPACTION AND MIX THOROUGHLY IN THE UPPER 2 INCHES OF TOPSOIL.
5. APPLY SEED EVENLY IN TWO INTERSECTING DIRECTIONS AND RAKE IN LIGHTLY. WATER TOPSOIL LIGHTLY PRIOR TO APPLYING SEED. DO NOT SEED AREA IN EXCESS OF THAT WHICH CAN BE MULCHED ON THE SAME DAY.
6. ROLL SEEDED AREA WITH ROLLER NOT EXCEEDING 112 POUNDS.
7. IMMEDIATELY FOLLOWING SEEDING AND COMPACTING, APPLY STRAW MULCH AT THE RATE OF ONE AND ONE HALF BALES PER 1,000 SQUARE FEET. IMMEDIATELY AFTER MULCHING, APPLY WATER WITH A FINE SPRAY AND SATURATE THE GROUND TO A DEPTH OF 4 INCHES.
8. CONTRACTOR IS RESPONSIBLE FOR WATERING SEEDED AREAS TO PREVENT GRASS AND SOIL FROM DRYING OUT UNTIL THE INSTALLATION IS INSPECTED AND ACCEPTED BY THE OWNER'S REPRESENTATIVE.
9. CONTRACTOR IS RESPONSIBLE FOR RESEEDING BARE SPOTS FOR A PERIOD OF ONE YEAR AFTER ACCEPTANCE OF INSTALLATION.

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• www.ragansmith.com •

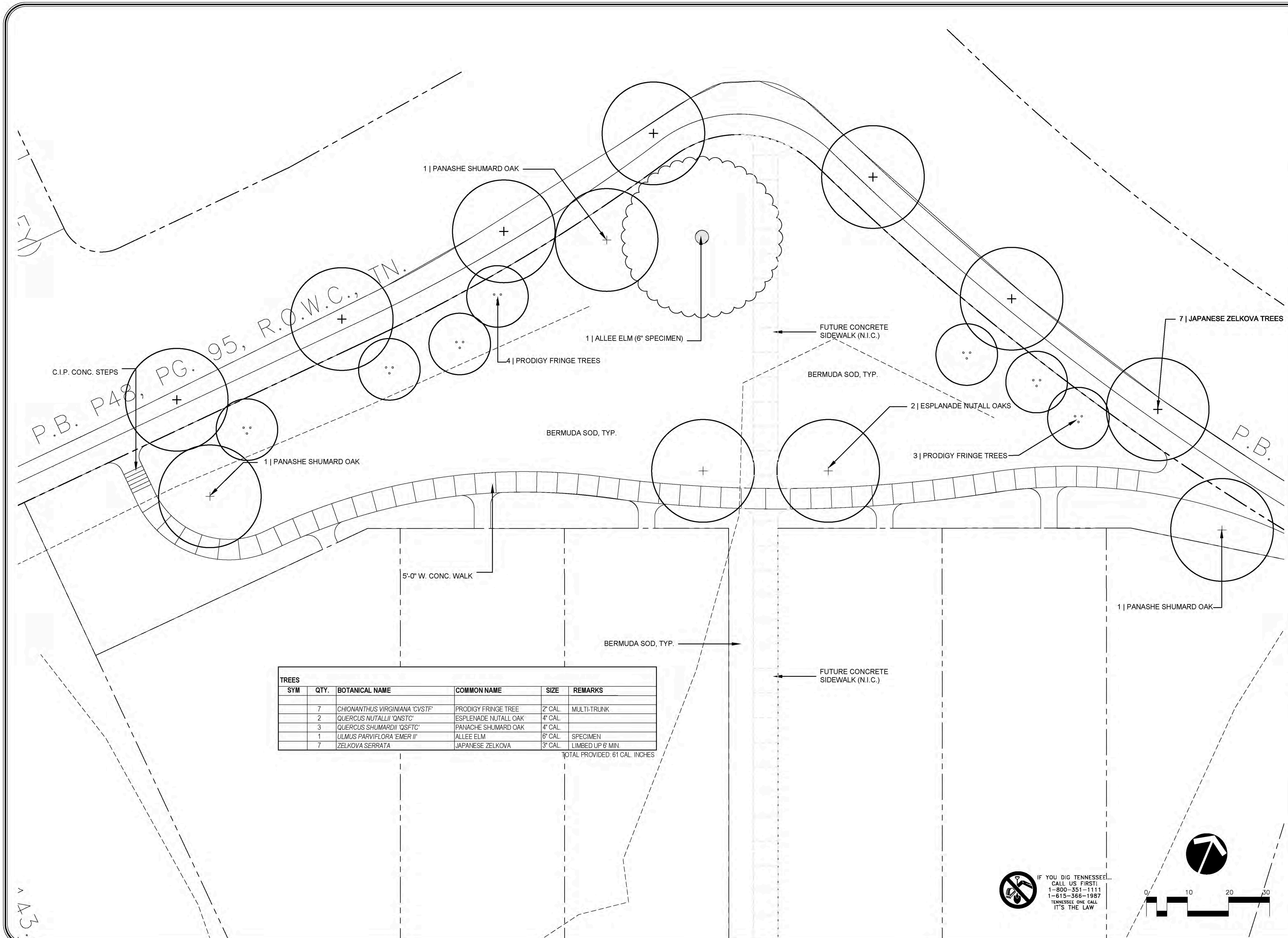
SECTION 17
FOR
CONSTRUCTION PLANS
THOMPSON'S STATION, WILLIAMSON COUNTY, TN

TOLLGATE Village

JOB NO.	WK. ORDER	DESIGNED:	DRAWN:	SCALE:	DATE:	REVISIONS
10081	9260	B. SMITH	T. GARDNER	N.T.S.	SEPTEMBER 1, 2016	

LANDSCAPE NOTES AND DETAILS

L1.2



TREES

SYM	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	REMARKS
	7	*CHIONANTHUS VIRGINIANA 'CVSTF'*	PRODIGY FRINGE TREE	2" CAL.	MULTI-TRUNK
	2	*QUERCUS NUTALLII 'QNSTC'*	ESPLENADE NUTALL OAK	4" CAL.	
	3	*QUERCUS SHUMARDII 'QSFTC'*	PANACHE SHUMARD OAK	4" CAL.	
	1	*ULMUS PARVIFLORA 'EMER II'*	ALLEE ELM	6" CAL.	SPECIMEN
	7	*ZELKOVA SERRATA*	JAPANESE ZELKOVA	3" CAL.	LIMBED UP 6' MIN.

TOTAL PROVIDED: 61 CAL. INCHES

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CHATTANOOGA, TN 37408
(423) 490-9400
• www.ragansmith.com •

SECTION 7 FOR CONSTRUCTION PLANS

THOMPSON'S STATION, WILLIAMSON COUNTY, TN

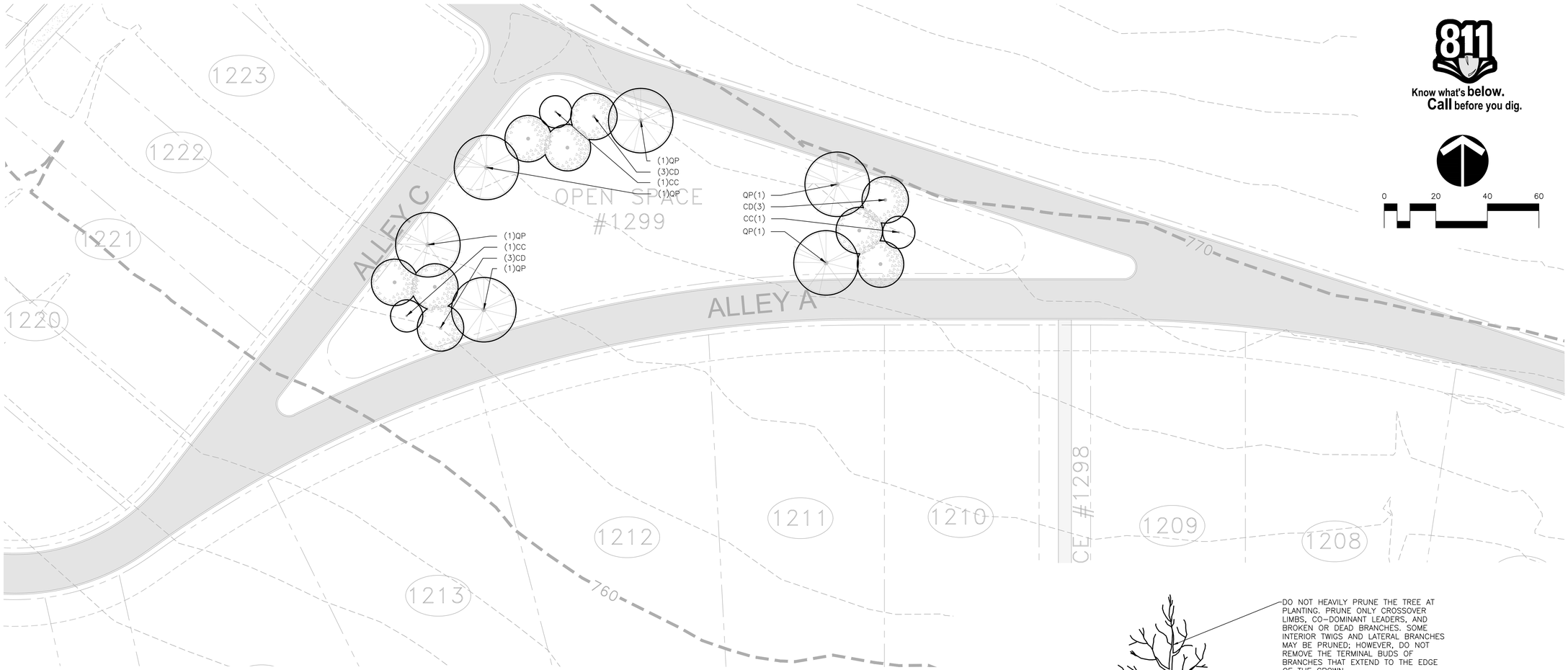
TOLLGATE Village

JOB NO.	WK. ORDER
DESIGNED:	B. SMITH
DRAWN:	T. GARDNER
SCALE:	1"=10'
DATE:	SEPTEMBER 2, 2016

REVISIONS

LANDSCAPE PLAN

L1.1



Know what's **below.**
Call before you dig.

0 20 40 60

PLANT SCHEDULE							
TREES	QTY	BOTANICAL NAME / COMMON NAME	TYPE	SIZE	HEIGHT	SPACING	REMARKS
CD	9	CEDRUS DEODARA / DEODAR CEDAR	EVERGREEN	2" CAL.		AS SHOWN	B&B
CC	3	CERCIS CANADENSIS / EASTERN REDBUD	DECIDUOUS	2" CAL.		AS SHOWN	B&B
QP	6	QUERCUS SHUMARDII 'PANACHE' / PANACHE SHUMARD OAK	DECIDUOUS	2" CAL.	12-14' HT	AS SHOWN	B&B

NOTES: 1. SEED ALL DISTURBED AREAS NOT OTHERWISE PLANTED. TOTAL PROVIDED: 36 CAL. INCHES

SEEDING NOTES

1. SEED ALL DISTURBED AREAS WITH KY-31 AT THE RATE OF 5 POUNDS PER 1,000 S.F. ALL SEED TO BE 98% PURE WITH 85% GERMINATION AND CONFORM TO ALL STATE REQUIREMENTS FOR GRASS SEED. THE FERTILIZER TO BE 6-12-12 COMMERCIAL TYPE WITH 50% OF ITS ELEMENTS DERIVED FROM ORGANIC SOURCES.
2. PLACE STRAW MULCH ON SEEDED AREAS. STRAW TO BE OATS OR WHEAT STRAW, FREE FROM WEEDS, FOREIGN MATTER DETRIMENTAL TO PLANT LIFE, AND DRY. HAY OR CHOPPED CORNSTALKS ARE NOT ACCEPTABLE.
3. THE CONTRACTOR SHALL VERIFY THAT THE PREPARED SOIL BASE IS READY TO RECEIVE WORK. CULTIVATE THE TOPSOIL TO A DEPTH OF 4 INCHES WITH A MECHANICAL TILLER AND SUBSEQUENTLY RAKE UNTIL SMOOTH. REMOVE FOREIGN MATERIALS COLLECTED DURING CULTIVATION AND RAKING OPERATIONS.
4. APPLY FERTILIZER ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS. LIMESTONE MAY BE APPLIED WITH THE FERTILIZER. APPLY FERTILIZER AFTER SMOOTH RAKING AND PRIOR TO ROLLER COMPACTION AND MIX THOROUGHLY IN THE UPPER 2 INCHES OF TOPSOIL.
5. APPLY SEED EVENLY IN TWO INTERSECTING DIRECTIONS AND RAKE IN LIGHTLY. WATER TOPSOIL LIGHTLY PRIOR TO APPLYING SEED. DO NOT SEED AREA IN EXCESS OF THAT WHICH CAN BE MULCHED ON THE SAME DAY.
6. ROLL SEEDED AREA WITH ROLLER NOT EXCEEDING 112 POUNDS.
7. IMMEDIATELY FOLLOWING SEEDING AND COMPACTING, APPLY STRAW MULCH AT THE RATE OF ONE AND ONE HALF BALES PER 1,000 SQUARE FEET. IMMEDIATELY AFTER MULCHING, APPLY WATER WITH A FINE SPRAY AND SATURATE THE GROUND TO A DEPTH OF 4 INCHES.
8. CONTRACTOR IS RESPONSIBLE FOR WATERING SEEDED AREAS TO PREVENT GRASS AND SOIL FROM DRYING OUT UNTIL THE INSTALLATION IS INSPECTED AND ACCEPTED BY THE OWNER'S REPRESENTATIVE.
9. CONTRACTOR IS RESPONSIBLE FOR RESEEDING BARE SPOTS FOR A PERIOD OF ONE YEAR AFTER ACCEPTANCE OF INSTALLATION.

PLANTING NOTES

1. ANY SERIES OF TREES TO BE PLACED IN A PARTICULAR ARRANGEMENT WILL BE FIELD CHECKED FOR ACCURACY. ANY PLANTS MISARRANGED WILL BE RELOCATED.
2. SOIL USED IN BACKFILLING PLANTING PITS SHALL BE TOPSOIL AND MIXED WITH 25% PEAT BY VOLUME. EXCEPT FOR ERICACEOUS PLANTS, VERY ACID OR SOUR SOIL (SOIL HAVING A pH less than 6) SHALL BE MIXED WITH SUFFICIENT LIME TO PRODUCE A SLIGHTLY ACID REACTION (A pH of 6.0 to 6.5). ADD 10-10-10 COMMERCIAL FERTILIZER AT THE RATE OF 2 POUNDS PER CUBIC YARD. MIX BOTH FERTILIZER AND PEAT THOROUGHLY BY HAND OR ROTARY TILLER.
3. SOIL USED IN BACKFILLING ERICACEOUS PLANTS SHALL BE TOPSOIL MIXED WITH 50% PEAT BY VOLUME. ADD 5-10-5 COMMERCIAL FERTILIZER AT THE RATE OF 5 POUNDS PER CUBIC YARD. MIX BOTH FERTILIZER AND PEAT THOROUGHLY BY HAND OR ROTARY TILLER.
4. UPON SECURING PLANT MATERIAL AND BEFORE INSTALLATION, THE CONTRACTOR SHALL NOTIFY THE LANDSCAPE ARCHITECT OR OWNER'S REPRESENTATIVE FOR A PRE-INSTALLATION INSPECTION TO VERIFY ALL PLANT MATERIAL MEETS SPECIFICATION. MATCH TREES OF SAME SPECIES IN GROWTH CHARACTER AND UNIFORMITY.
5. APPLY HERBICIDE (TREFLAN OR EQUIVALENT) TO ALL PLANT BEDS PRIOR TO PLANTING FOR NOXIOUS WEED CONTROL AT A RATE OF 2 POUNDS PER 1,000 SQUARE FEET.
6. CONTRACTOR SHALL SUBMIT A 10 OUNCE SAMPLE OF THE TOPSOIL PROPOSED TO A TESTING LABORATORY FOR ANALYSIS. SUBMIT TEST RESULTS WITH RECOMMENDATIONS FOR SUITABILITY TO THE OWNER'S REPRESENTATIVE FOR APPROVAL.
7. PLANTS SHALL BE ORIENTED FOR BEST APPEARANCE AND VERTICAL. ALL NON-BIODEGRADABLE ROOT CONTAINERS SHALL BE REMOVED.
8. SELECTIVELY TRIM TREE BRANCHES BY 25%, MAINTAINING NATURAL SHAPE. PRUNE ALL DEAD AND BROKEN BRANCHES IN TREES AND SHRUBS. REMOVE TAGS, TWINE OR OTHER NON-BIODEGRADABLE MATERIAL.
9. SCARIFY SUBSOIL IN PLANTING BEDS TO A DEPTH OF 3 INCHES. ALL PLANTING BEDS SHALL RECEIVE A MINIMUM OF 6 INCHES OF TOPSOIL.
10. CONTRACTOR SHALL PROVIDE SMOOTH, NEATLY TRENCHED (3 INCH DEEP) BED EDGES.
11. ALL PLANTING BEDS TO HAVE A MINIMUM 4 INCH DEEP PINE BARK MULCH, PINE STRAW MULCH OR OTHER MULCH AS SPECIFIED.
12. DIMENSIONS FOR TRUNK CALIPER, HEIGHTS, AND SPREAD SPECIFIED ON THE MATERIAL SCHEDULE ARE A GENERAL GUIDE FOR THE MINIMUM REQUIRED SIZE OF EACH PLANT. QUALITY AND SIZE OF PLANTS, SPREAD OF ROOTS AND SIZE OF BALLS SHALL BE IN ACCORDANCE WITH A.N.S.I. Z80 "AMERICAN STANDARD FOR NURSERY STOCK" (CURRENT EDITION) AS PUBLISHED BY THE AMERICAN ASSOCIATION OF NURSERYMEN, INC.
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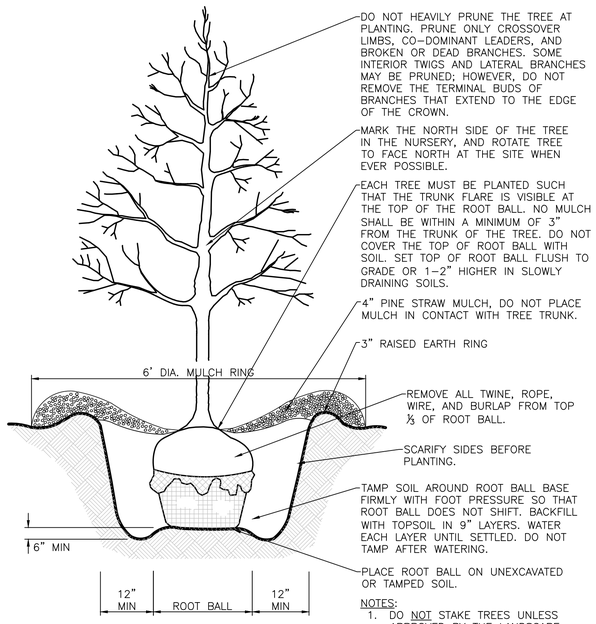
14. CONTRACTOR TO WARRANTY ALL MATERIAL FOR ONE YEAR AFTER DATE OF FINAL ACCEPTANCE.



TREE PLANTING
NOT TO SCALE

NOTES:
1. DO NOT STAKE TREES UNLESS APPROVED BY THE LANDSCAPE ARCHITECT. IF STAKED, REMOVE AFTER ONE GROWING SEASON.
2. DO NOT WRAP TREE TRUNKS UNLESS APPROVED BY THE LANDSCAPE ARCHITECT. REMOVE WRAP AFTER PLANTING.
3. NON-BIODEGRADABLE BURLAP TO BE REMOVED OR ROLLED UNDER ROOT BALL AFTER PLANT IS PLACED IN HOLE.

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BRETT ALAN SMITH REGISTERED LANDSCAPE ARCHITECT TENNESSEE

SECTION 12
FOR
CONSTRUCTION PLANS
THOMPSON'S STATION, WILLIAMSON COUNTY, TN

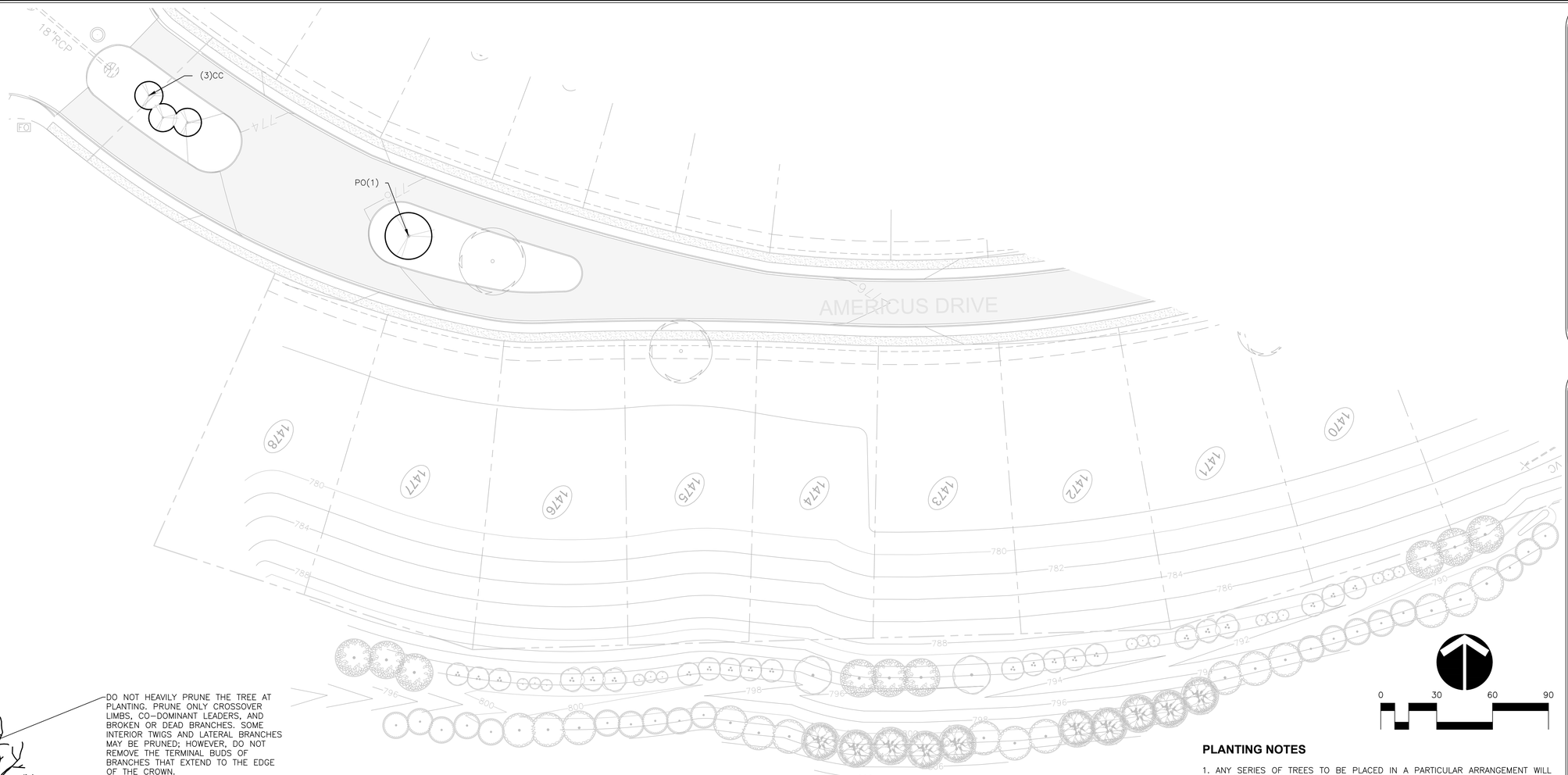
TOLLGATE Village

JOB NO.	WK. ORDER
10081	9260
DESIGNED:	B. SMITH
DRAWN:	T. GARDNER
SCALE:	1"=20'
DATE:	SEPTEMBER 23, 2016

REVISIONS

LANDSCAPE PLAN

L1.1

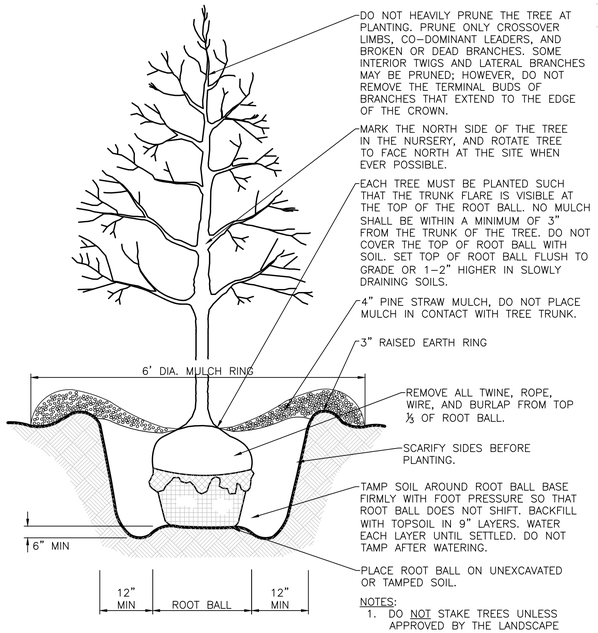


0 30 60 90

PLANT SCHEDULE

TREES	QTY	BOTANICAL NAME / COMMON NAME	TYPE	SIZE	HEIGHT	SPACING	REMARKS
CC	3	CERCIS CANADENSIS / EASTERN REDBUD	DECIDUOUS	2" CAL.		AS SHOWN	
PO	1	PLATANUS OCCIDENTALIS / AMERICAN SYCAMORE	DECIDUOUS	3" CAL.	14–16' HT	AS SHOWN	B&B

NOTES: 1. SEED ALL DISTURBED AREAS NOT OTHERWISE PLANTED. TOTAL PROVIDED: 9 CAL. INCHES



DO NOT HEAVILY PRUNE THE TREE AT PLANTING. PRUNE ONLY CROSSOVER LIMBS, CO–DOMINANT LEADERS, AND BROKEN OR DEAD BRANCHES. SOME INTERIOR TWIGS AND LATERAL BRANCHES MAY BE PRUNED; HOWEVER, DO NOT REMOVE THE TERMINAL BUDS OF BRANCHES THAT EXTEND TO THE EDGE OF THE CROWN.

MARK THE NORTH SIDE OF THE TREE IN THE NURSERY, AND ROTATE TREE TO FACE NORTH AT THE SITE WHEN EVER POSSIBLE.

EACH TREE MUST BE PLANTED SUCH THAT THE TRUNK FLARE IS VISIBLE AT THE TOP OF THE ROOT BALL. NO MULCH SHALL BE WITHIN A MINIMUM OF 3" FROM THE TRUNK OF THE TREE. DO NOT COVER THE TOP OF ROOT BALL WITH SOIL. SET TOP OF ROOT BALL FLUSH TO GRADE OR 1–2" HIGHER IN SLOWLY DRAINING SOILS.

4" PINE STRAW MULCH, DO NOT PLACE MULCH IN CONTACT WITH TREE TRUNK.

3" RAISED EARTH RING

REMOVE ALL TWINE, ROPE, WIRE, AND BURLAP FROM TOP ⅓ OF ROOT BALL.

SCARIFY SIDES BEFORE PLANTING.

TAMP SOIL AROUND ROOT BALL BASE FIRMLY WITH FOOT PRESSURE SO THAT ROOT BALL DOES NOT SHIFT. BACKFILL WITH TOPSOIL IN 9" LAYERS. WATER EACH LAYER UNTIL SETTLED. DO NOT TAMP AFTER WATERING.

PLACE ROOT BALL ON UNEXCAVATED OR TAMPED SOIL.

NOTES:
1. DO NOT STAKE TREES UNLESS APPROVED BY THE LANDSCAPE ARCHITECT. IF STAKED, REMOVE AFTER ONE GROWING SEASON.
2. DO NOT WRAP TREE TRUNKS UNLESS APPROVED BY THE LANDSCAPE ARCHITECT. REMOVE WRAP AFTER PLANTING.
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TREE PLANTING
NOT TO SCALE

Know what's **below.**
Call before you dig.

SEEDING NOTES

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PLANTING NOTES

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3. SOIL USED IN BACKFILLING ERICACEOUS PLANTS SHALL BE TOPSOIL MIXED WITH 50% PEAT BY VOLUME. ADD 5–10–5 COMMERCIAL FERTILIZER AT THE RATE OF 5 POUNDS PER CUBIC YARD. MIX BOTH FERTILIZER AND PEAT THOROUGHLY BY HAND OR ROTARY TILLER.
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7. PLANTS SHALL BE ORIENTED FOR BEST APPEARANCE AND VERTICAL. ALL NON–BIODEGRADABLE ROOT CONTAINERS SHALL BE REMOVED.
8. SELECTIVELY TRIM TREE BRANCHES BY 25%, MAINTAINING NATURAL SHAPE. PRUNE ALL DEAD AND BROKEN BRANCHES IN TREES AND SHRUBS. REMOVE TAGS, TWINE OR OTHER NON–BIODEGRADABLE MATERIAL.
9. SCARIFY SUBSOIL IN PLANTING BEDS TO A DEPTH OF 3 INCHES. ALL PLANTING BEDS SHALL RECEIVE A MINIMUM OF 6 INCHES OF TOPSOIL.
10. CONTRACTOR SHALL PROVIDE SMOOTH, NEATLY TRENCHED (3 INCH DEEP) BED EDGES.
11. ALL PLANTING BEDS TO HAVE A MINIMUM 4 INCH DEEP PINE BARK MULCH, PINE STRAW MULCH OR OTHER MULCH AS SPECIFIED.
12. DIMENSIONS FOR TRUNK CALIPER, HEIGHTS, AND SPREAD SPECIFIED ON THE MATERIAL SCHEDULE ARE A GENERAL GUIDE FOR THE MINIMUM REQUIRED SIZE OF EACH PLANT. QUALITY AND SIZE OF PLANTS, SPREAD OF ROOTS AND SIZE OF BALLS SHALL BE IN ACCORDANCE WITH A.N.S.I. Z80 "AMERICAN STANDARD FOR NURSERY STOCK" (CURRENT EDITION) AS PUBLISHED BY THE AMERICAN ASSOCIATION OF NURSERYMEN, INC.
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• www.ragansmith.com •

SECTION 14
FOR
CONSTRUCTION PLANS

TAILGATE Village

JOB NO.	WK. ORDER
10081	9260
DESIGNED:	B. SMITH
DRAWN:	T. GARDNER
SCALE:	1"=30'
DATE:	SEPTEMBER 23, 2016

REVISIONS

LANDSCAPE PLAN

L1.2