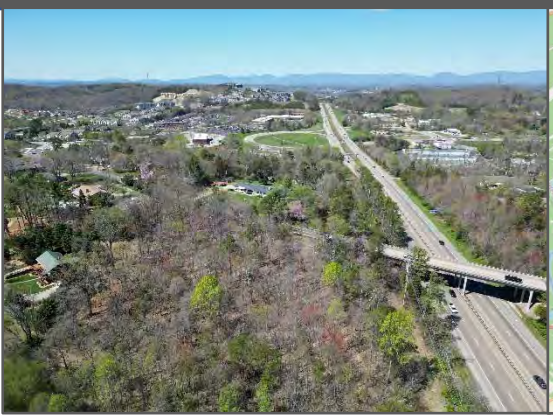
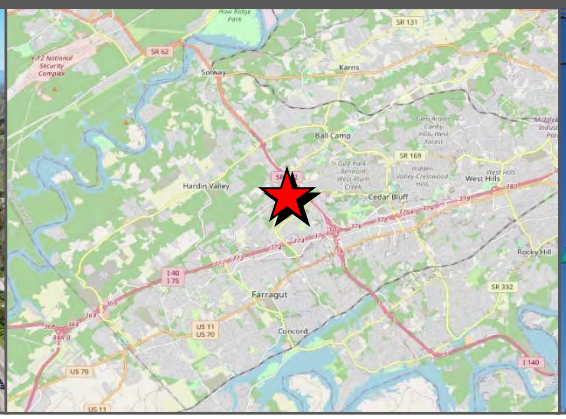
AJAX ENGINEERING

CIVIL ENGINEERING / TRAFFIC ENGINEERING

Transportation Impact Study
Bob Gray Road Subdivision
Knox County, Tennessee





Updated August 2024

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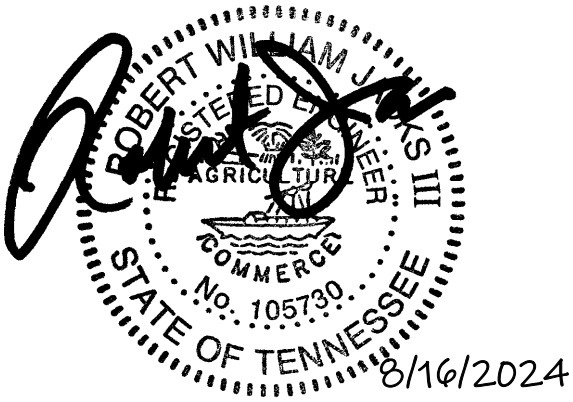

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8/19/2024

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EXECUTIVE SUMMARY

Note: This updated August 2024 report includes two important additions from the initial TIS. The first addition includes the final concept plan showing a single entrance to Bob Gray Road and a final count of 85 proposed townhouse units. The initial analysis included 94 townhouse units, and to provide a conservative analysis, the results provided in this updated report maintain the larger number of units. The second addition provided by the Tennessee Department of Transportation (TDOT) and suggested to be included in this updated report is a statement regarding a potential connection to Odin Street. Finally, this report includes the final concept plan in the provided figures and updates the final concept plan layout discussions.

Preface:

Bob Gray Developers, LLC proposes a residential development off Bob Gray Road in West Knox County adjacent to Pellissippi Parkway. The proposed development will include constructing 94 multi-family attached townhomes on 9.88 +/- acres. The development is named and referenced in this study as "Bob Gray Road Subdivision" since a formal name has not been chosen yet. The development proposes a single entrance on the south side of Bob Gray Road, approximately 1,500 feet east of the signalized intersection of Lovell Road at Bob Gray Road and Yarnell Road. The development is anticipated to be fully built and occupied by 2027.

The primary purpose of this study is to determine and evaluate the potential impacts of the development on the adjacent transportation system. The study includes a review of the primary access roads and intersections, and it is a Level 1 study established by Knoxville/Knox County Planning. This study also includes a review of the impacts of an existing adjacent residential development losing its road access to Pellissippi Parkway and its residents' trips diverted through the proposed Bob Gray Road Subdivision. Recommendations and mitigation measures are offered to accommodate the new residential subdivision if transportation operations are projected to be below recognized engineering standards. The measures also include recommendations if the adjacent subdivision loses its current road access and is routed to Bob Gray Road.

Study Results:

The significant findings of this study include the following:

- The Bob Gray Road Subdivision, with a maximum of 94 multi-family attached townhomes, is estimated to generate 903 trips at full build-out and occupancy on

an average weekday. Of these daily trips, 51 are estimated to occur during the AM peak hour and 73 in the PM peak hour in 2027.

- The Proposed Entrance for the Bob Gray Road Subdivision is expected to operate with acceptable vehicle delays in the projected AM and PM peak hours. The addition of the Proposed Entrance approach on Bob Gray Road will operate adequately in 2027 with respect to vehicle capacity.
- The projected 2027 traffic volumes for the Bob Gray Road Subdivision alone will not warrant the construction of turn lanes on Bob Gray Road at the Proposed Entrance. A single exiting lane for the Proposed Entrance at Bob Gray Road will be sufficient.
- If the adjacent residential development to the south, Parkway Heights, loses its only road access via Pellissippi Parkway, its traffic will need to be re-routed through the new Bob Gray Road Subdivision. If this were to occur, the projected 2027 volumes indicate that the warrant thresholds for a separate westbound left-turn lane and eastbound right-turn lane on Bob Gray Road would be met. These lanes would not be warranted based on the Bob Gray Road Subdivision alone.

Recommendations:

The following recommendations are based on the study analyses to minimize the impacts of the proposed development and potential diverted trips on the adjacent transportation system while attempting to achieve an acceptable traffic flow and improved safety. More details regarding all the recommendations are discussed at the end of the report.

Lovell Road at Bob Gray Road and Yarnell Road:

- Knox County Engineering is recommended to modify the traffic signal timing to reduce the considerable vehicle delays for the westbound and eastbound approaches on Bob Gray Road and Yarnell Road in the existing and projected conditions. This modification would include utilizing the optimized green times offered in the report, particularly for these approaches in the PM peak hour.

Bob Gray Road at the Proposed Entrance:

- An eastbound separate right-turn lane is recommended to be constructed on Bob Gray Road at the Proposed Entrance if Parkway Heights loses its access to Pellissippi Parkway. Due to the limited development property road frontage along Bob Gray Road, the eastbound right-turn lane would need to be designed and constructed with a minimal lane taper and maximum deceleration length possible within the confines of the property road frontage. The civil site designer

would need to coordinate the design of this turn lane with Knox County and include a white right-turn arrow and lane lines on the pavement for this exclusive lane. This lane would not be warranted based on the Bob Gray Road Subdivision alone.

- A separate westbound left-turn lane is shown to be warranted in this study in the projected 2027 conditions if Parkway Heights loses its road access to Pellissippi Parkway and is diverted through the new Bob Gray Road Subdivision for road access to Bob Gray Road. However, as discussed in the report, this lane is not likely feasible to be constructed.
- It is recommended that advance intersection warning signs be installed on Bob Gray Road to the east and west of the Proposed Entrance. These warning signs should be Side Road Intersection Signs (W2-2r and W2-2l). The signs should be installed in both directions on Bob Gray Road, preferably no less than 450 feet in advance of the Proposed Entrance.
- It is recommended that a Stop Sign (R1-1) be installed and a 24" white stop bar be applied to the Proposed Entrance approach at Bob Gray Road. The stop bar should be applied a minimum of 4 feet away from the edge of Bob Gray Road and placed at the desired stopping point that maximizes the sight distance.
- Based on a posted speed limit of 40-mph on Bob Gray Road, the required intersection sight distance is 400 feet for turning vehicles at the Proposed Entrance. The existing sight distances at the Proposed Entrance location were estimated visually to be adequate in both directions and certified by a land surveyor. Intersection sight distance at the Proposed Entrance at Bob Gray Road must not be impacted by future landscaping, signage, or existing or future vegetation.

Bob Gray Road Subdivision Internal Roads:

- A 25-mph Speed Limit Sign (R2-1) is recommended to be posted near the beginning of the development entrance off Bob Gray Road. It is recommended that a "No Outlet" Sign (W14-2a) be installed at the front of the development at Bob Gray Road. The "No Outlet" sign can be installed above or below the street name sign or separately posted on the entrance road.
- Dual end-of-roadway object markers (OM4-1) should be installed at the end of the internal roads in the subdivision that end in hammerhead turnarounds. These markers should also be installed at the end of Road "A" if the road is not immediately connected to Blinken Street to the south in the Parkway Heights development. Furthermore, if an immediate road connection is not made to Blinken Street, an additional sign should be posted at the end of Road "A" to follow

Knoxville-Knox County Subdivision regulations. This sign is for notification of a possible future street connection. It should state, "NOTICE – This road may be extended and connected to the south – for more info. contact Knox Co. Engineering & Public Works (865) 215-5800".

- Stop Signs (R1-1) with 24" white stop bars are recommended to be installed at the internal road locations, as shown in the study.
- Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping. With a speed limit of 25-mph in the development, the internal intersection sight distance is 250 feet. The required stopping sight distance is 155 feet for a level road grade. The site designer should ensure that internal sight distance lengths are met and account for different proposed road grades.
- It is recommended that a small strip of the development property be reserved as a potential common area for all Bob Gray Road Subdivision residents to walk or ride their bikes to the east. This strip would allow for a pathway to the future Knox to Oak Ridge Greenway if the greenway is constructed adjacent to the subdivision and on the west side of Pellissippi Parkway.
- If directed by the local post office, the site designer should include a parking area and a centralized mail delivery center within the development for the subdivision residents.
- All drainage grates and covers for the residential development must be pedestrian and bicycle-safe.
- Road "A" in the subdivision will have a long, straight road segment. Straight road segments encourage higher vehicle speeds. Additionally, if Parkway Heights loses its access to Pellissippi Parkway, residents from this other development will increase traffic volumes and may contribute to speeding in the Bob Gray Road Subdivision. It is recommended that the civil site designer consider including traffic calming measures on the internal Road "A", such as speed humps or tables. Specifics regarding this recommendation should be discussed in the design phase with Knox County Engineering.
- All road and intersection elements should be designed to AASHTO and Knox County specifications and guidelines to ensure proper operation.
- If a connection to Odin Street to the south (Parkway Heights Townhouses) is pursued as part of this project or in the future, then the connection of Odin Street to Pellissippi Parkway must be closed.

DESCRIPTION OF EXISTING CONDITIONS

- **STUDY AREA:**

The proposed location of this new residential development is shown on a map in Figure 1. This proposed development will be located off Bob Gray Road in West Knox County, TN. The development will be constructed on an existing single parcel, with a single entrance on the south side of Bob Gray Road. As requested, transportation impacts associated with the development were analyzed on Bob Gray Road, where the proposed development will have road access to and from external destinations.

The scope of work from Knoxville/Knox County Planning also requested that the study include a worst-case scenario if the existing adjacent townhouse development to the south, Parkway Heights, loses its current external road access. This worst-case scenario included routing the trips generated by the residents in Parkway Heights through the proposed new subdivision due to a road closure to Pellissippi Parkway. Parkway Heights only has external road access via its entrance at Pellissippi Parkway. Over the past few years, the Tennessee Department of Transportation has made a concerted effort to remove driveway access points and limit access to Pellissippi Parkway, forcing vehicular access to designated interchanges. Thus, this report includes two scenarios: an analysis of the proposed Bob Gray Road Subdivision alone and the other, the worst-case scenario, which includes the Bob Gray Road Subdivision plus the diverted trips from Parkway Heights Townhouses due to a potential entrance closure at Pellissippi Parkway.

View of Development Site along Bob Gray Road
(Looking Southeast from Bob Gray Road)

The proposed development property is in a suburban area of West Knox County, TN, with many surrounding residential developments and a few commercial properties nearby on Lovell Road

to the west. Several established neighborhoods are near the development site, including single-family detached houses, townhouses, and apartments. The site property is a remaining pocket of undeveloped land in an area that has experienced a lot of development over the past few decades. The property has remained undeveloped due to site challenges, including topography, drainage, and road access. However, it has become much more attractive for development due to the enormous residential activity in Knox County and its desirable location in West Knoxville.

The existing development site has steep topography near Bob Gray Road, sloped towards the south, and further to the south, the property slope becomes gentler. The existing property is covered with young forest and is adjacent to and west of Pellissippi Parkway. No existing structures are on the development property.

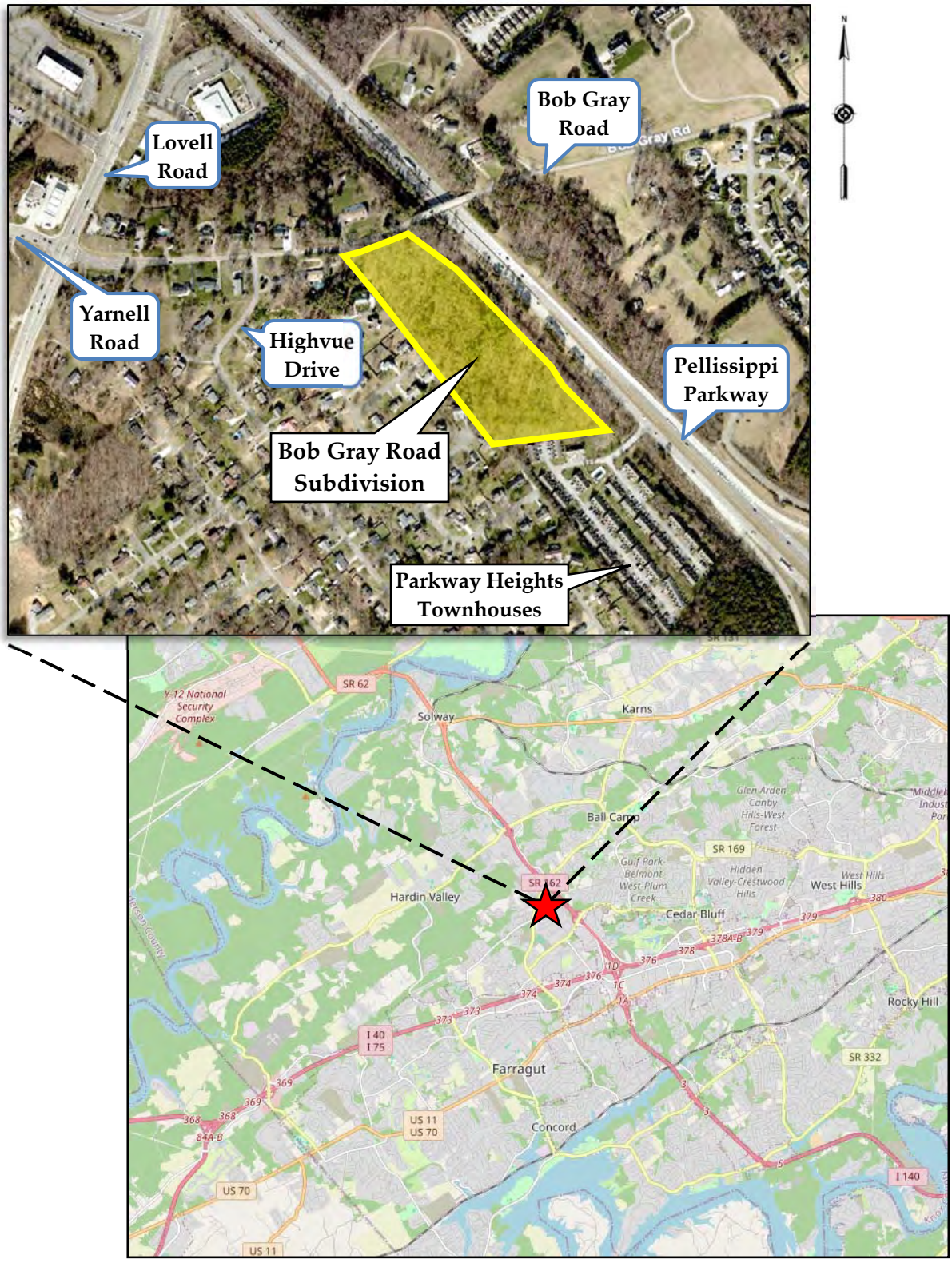


Figure 1
Location Map

- **EXISTING ROADWAYS:**

Table 1 lists the characteristics of the existing primary roadways near the development property and included in the study:

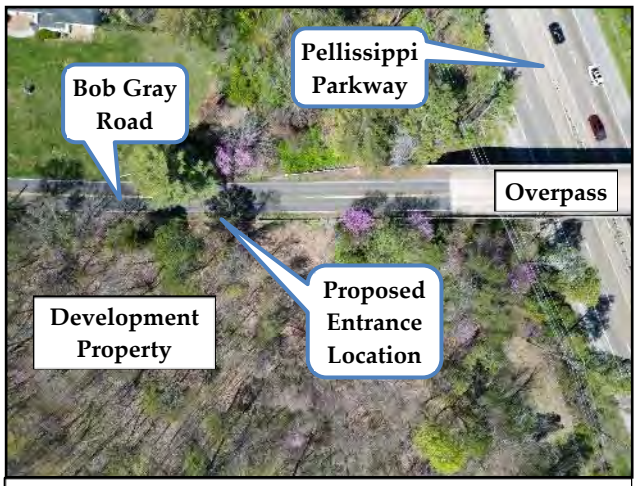
TABLE 1
STUDY CORRIDOR CHARACTERISTICS

NAME	CLASSIFICATION [1]	SPEED LIMIT	LANES	ROAD WIDTH [2]	TRANSIT [3]	PEDESTRIAN FACILITIES	BICYCLE FACILITIES
Bob Gray Road	Major Collector	40 mph	2 undivided	20 feet	None	No sidewalks along roadway	No bike lanes
Lovell Road (SR 131)	Minor Arterial	45 mph	4 undivided with TWLTL	70 feet	None	Sidewalks on both sides	Bike lanes on both sides
Yarnell Road	Major Collector	40 mph	2 undivided	25 feet	None	Sidewalk on north side of road for 500 feet at Lovell Road	No bike lanes

[1] 2018 Major Road Plan by Knoxville/Knox County Planning
[2] From edges of pavement and face of curbs near project site
[3] According to Knoxville Area Transit System Map

Bob Gray Road is classified as a Major Collector and traverses generally in a west-east direction with a total length of 3.1 miles. Bob Gray Road begins at the signalized intersection with Lovell Road (SR 131) and Yarnell Road on its west side. On its east side, the road name terminates at the signalized intersection with North Cedar Bluff Road and continues to the east as Old Cedar Bluff Road. Along its length, Bob Gray Road has two roundabout intersections and a few notable vertical curves, but for the most part, the vertical and horizontal elevation changes are gradual. Nearly all properties along Bob Gray Road are residential in nature.

Bob Gray Road has a 2-lane pavement section with white edge lines and a double yellow centerline at the subdivision's Proposed Entrance location. Roadway lighting is absent in the adjacent study area along Bob Gray Road. Other roadway features, including curbing, sidewalks, bike lanes, and greenway paths, are not provided along Bob Gray Road.



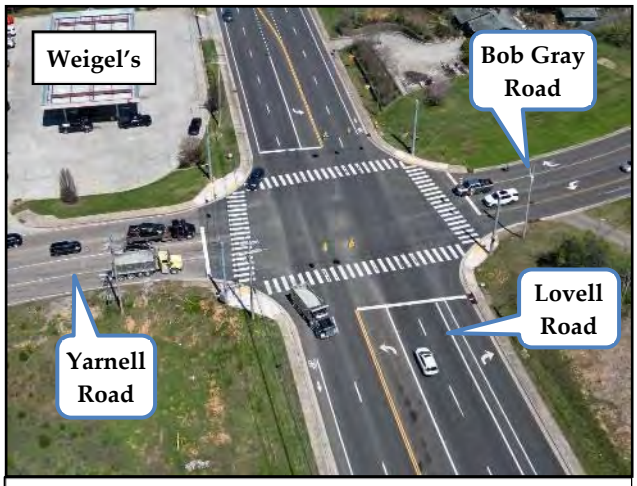
Bob Gray Road at the Proposed Entrance Location

Just east of the Proposed Entrance location, Bob Gray Road is delineated with guardrails on both sides before it transitions to an overpass bridge over Pellissippi Parkway. This overpass is designated and signed as a Memorial Bridge for Jackie Carroll Walker, a US Army 1st Lieutenant from Corryton, TN, who was killed in South Vietnam in November 1969.

Bob Gray Road has relatively good pavement conditions and will be the primary road for future subdivision residents. The asphalt pavement surface outside the white edge lines on Bob Gray Road near the development site ranges from a couple of inches to 6 inches. The pavement width at the Proposed Entrance is 20 feet. No paved shoulders are on Bob Gray Road, with most of the shoulders outside the pavement consisting of grass surfaces.

The Proposed Entrance for the subdivision will be located 1,500 feet east of the signalized intersection of Lovell Road at Bob Gray Road and Yarnell Road. The closest intersecting public street will be Highvue Drive, a local street for the adjacent Highvue Acres Subdivision, and will be 650 feet to the west of the Proposed Entrance.

Lovell Road (SR 131) is classified as a Minor Arterial and generally traverses north to south and is crossed by significant roadways along its route. Lovell Road is a Tennessee State Route and is maintained by TDOT. Lovell Road begins on the south side at the signalized intersection of Kingston Pike (SR 1) at Canton Hollow Road. Lovell Road formally ends on its north side at the signalized intersection with Middlebrook Pike, Ball Camp Byington Road, and Ball Camp Pike. Lovell Road has a total length of 6 miles. According to online sources at the Knoxville Civil War Roundtable website, Lovell was a "corrupted" village name that used to exist near the intersection of Kingston Pike and the current Lovell Road. This village was known as Loveville and was established in 1797 by Robert Loveville, a companion of General James White, recognized as the founder of Knoxville, TN.



Lovell Road at the Signalized Intersection with Bob Gray Road and Yarnell Road

Closer to the study area, Lovell Road provides convenient access to Pellissippi Parkway to the north for travel to the south towards Interstate 40/75/140 and, in particular, for travel to the north towards Oak Ridge, TN. To the south, Lovell Road provides access to Interstate 40/75, the Turkey

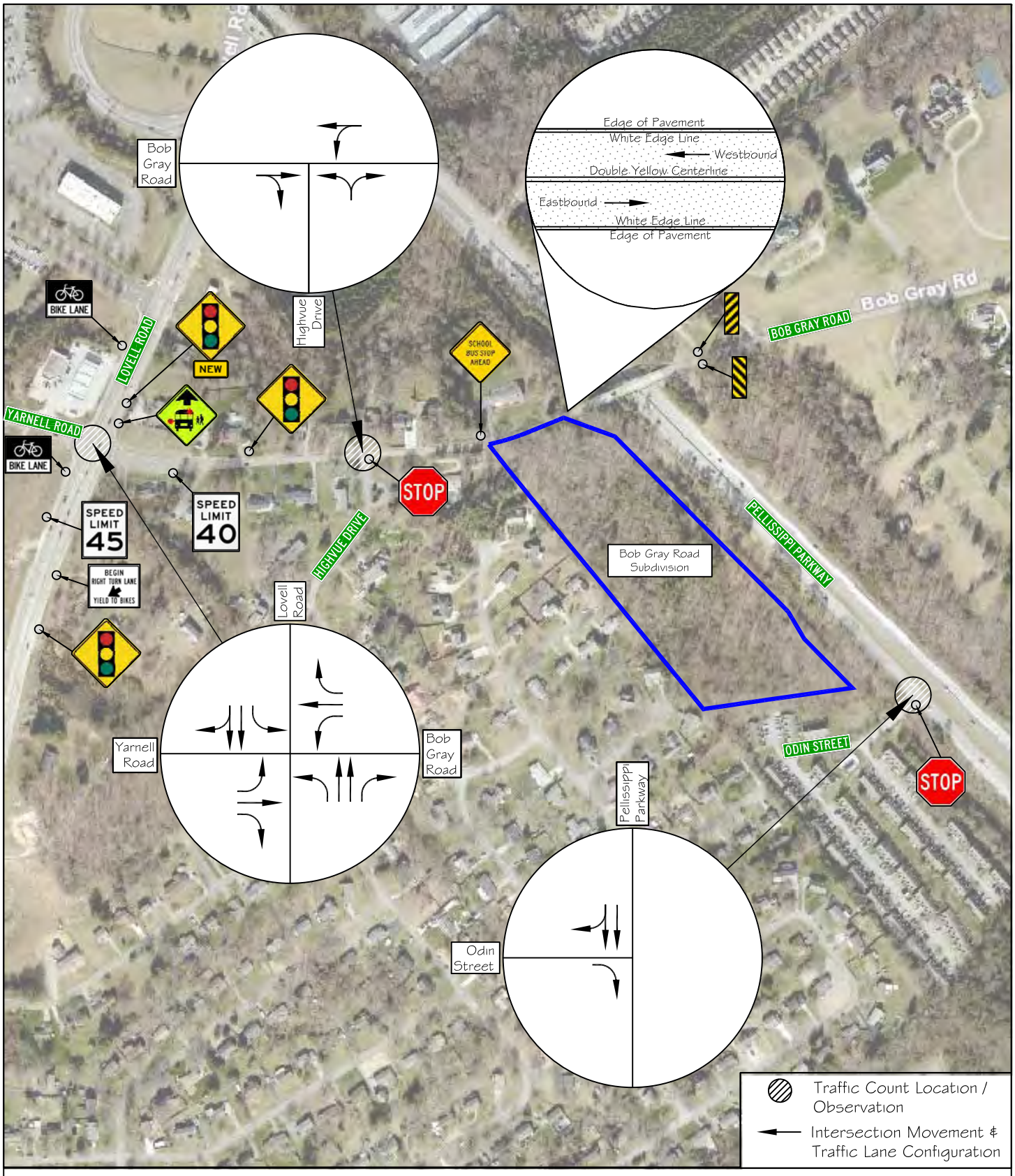
Creek Shopping area, and Kingston Pike. The posted speed limit on Lovell Road is 45 mph near the project site.

Lovell Road is a 4-lane undivided roadway near the proposed development site with a continuous center two-way left-turn lane (TWLTL). The TWLTL has a width of 12 feet with 11.5-foot wide dual-thru lanes in both directions. Each side of Lovell Road is flanked by 4.5-foot wide bike lanes, curb and gutter, and concrete sidewalks 4.5 feet wide. Road signage and pavement markings delineate the bike lanes on Lovell Road.

Recent improvements have been made along Lovell Road and at the signalized intersection of Lovell Road at Bob Gray Road and Yarnell Road. These improvements included repaving and restriping, new sidewalk ramps, pedestrian crossing buttons, and detectable surfaces to meet ADA (Americans with Disabilities Act) regulations. The traffic signal at the intersection of Lovell Road at Bob Gray Road and Yarnell Road is supported by strain poles, and the signal heads are hung on span wires. Pedestrian crosswalks are provided on all the approaches at the traffic signal.

Yarnell Road is classified as a Major Collector and traverses generally in a southwest-northeast direction. Yarnell Road begins at the unsignalized t-intersection with Everett Road on its southwest side and traverses 5.5 miles to its end to the northeast. Yarnell Road terminates at the signalized intersection with Lovell Road and Bob Gray Road on its northeast end. A driveway for a Weigel's Convenience Store is located just to the northwest of this signalized intersection. Yarnell Road has no bike lanes but has a short concrete sidewalk 500 feet in length on its north side between Lovell Road and the Lovell Crossing Apartments to the west. The sidewalk is 5 feet in width with a 6" curb.

Figure 2 shows the existing lane configurations of the roadways examined in the study, the traffic count locations, and the current traffic signage in the study area. The traffic signage shown in Figure 2 only includes warning and regulatory signage near the development site. The pages following Figure 2 give a further overview of the site study area with photographs.



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NOT TO SCALE

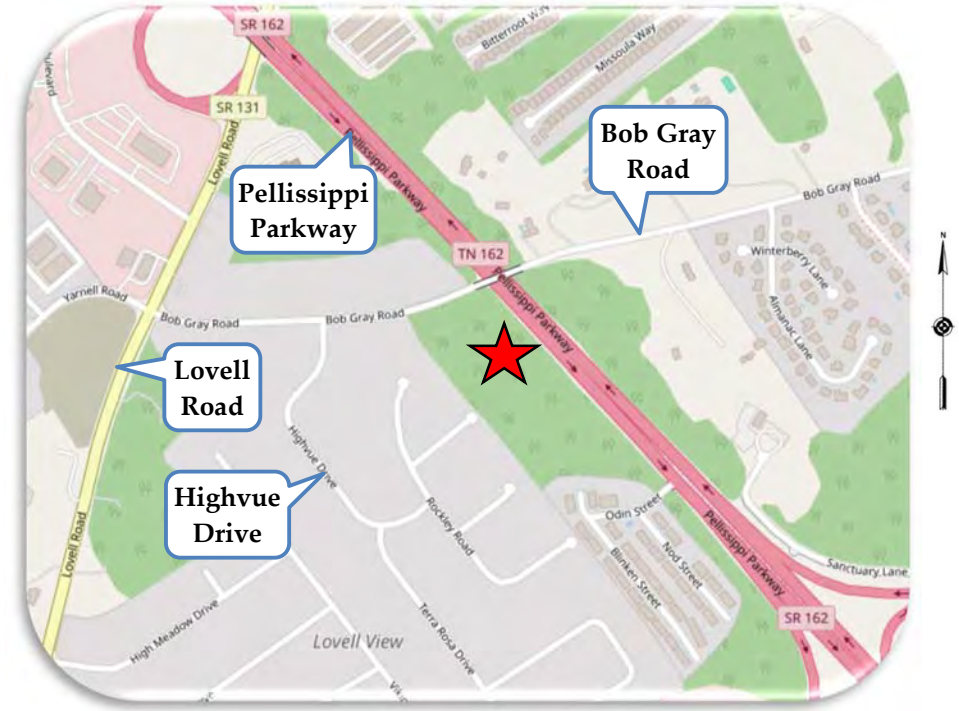
NORTH

FIGURE 2

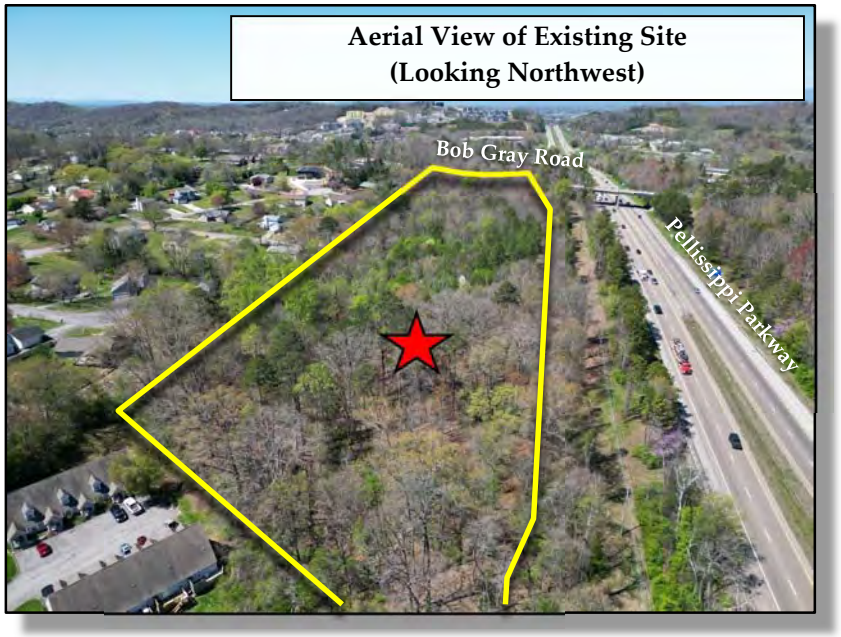
Bob Gray Road Subdivision

Traffic Count Locations, Traffic Signage & Existing Lane Configurations

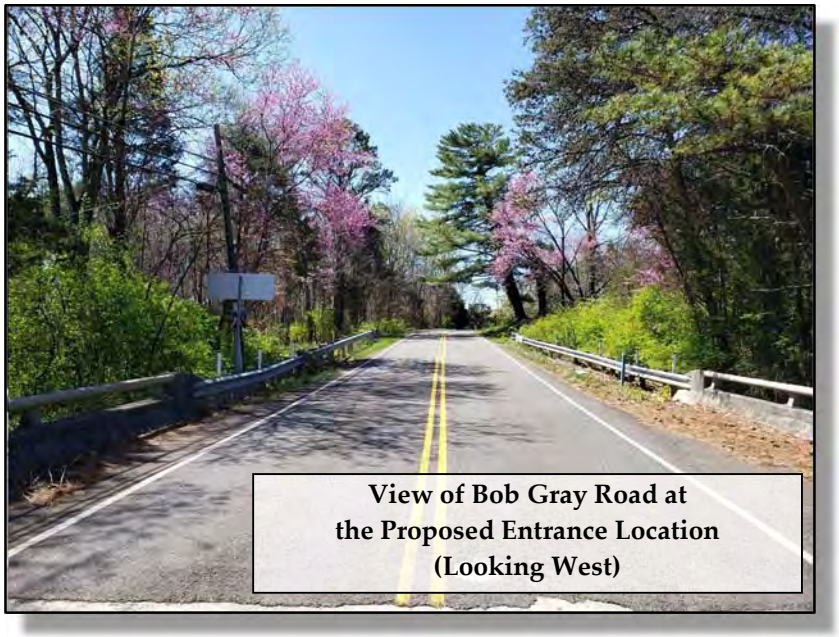
PHOTO EXHIBITS



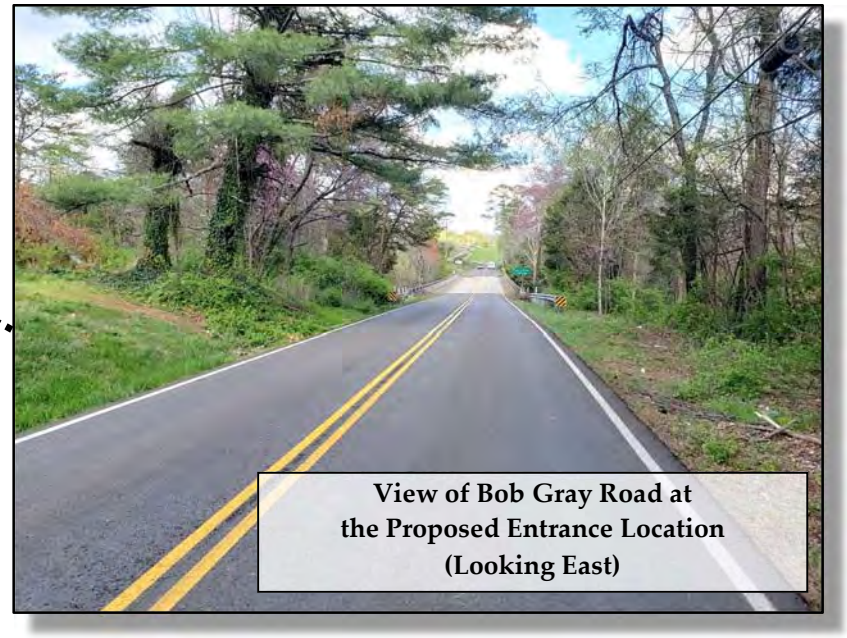
Proposed Development Area



Bob Gray Road at the Proposed Development Site



View of Bob Gray Road at the Proposed Entrance Location (Looking West)



View of Bob Gray Road at the Proposed Entrance Location (Looking East)

- **EXISTING TRANSPORTATION VOLUMES PER MODE**:

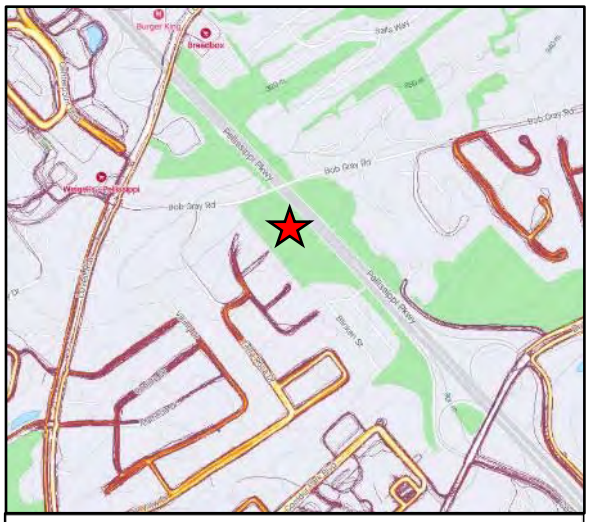
Three annual vehicular traffic count locations are in the study area, and the Tennessee Department of Transportation (TDOT) and the Knoxville Regional Transportation Planning Organization (TPO) conduct these counts. The count location data is the following and can be viewed with further details in Appendix A:

- Existing vehicular roadway traffic:
  - TDOT reported an Average Daily Traffic (ADT) on Bob Gray Road, east of Pellissippi Parkway and the proposed development site, at 3,401 vehicles per day in 2023. From 2016 to 2023, this count station has indicated a 2.5% average annual traffic growth rate.
  - TDOT reported an Average Daily Traffic (ADT) on Yarnell Road, west of Lovell Road and the proposed development site, at 3,636 vehicles per day in 2023. From 2013 to 2023, this count station has indicated a 1.7% average annual traffic growth rate.
  - TPO reported an Average Daily Traffic (ADT) on Lovell Road, north of Bob Gray Road and northwest of the proposed development site, at 22,090 vehicles per day in 2022. From 2012 to 2022, this count station has indicated a 1.5% average annual traffic growth rate.

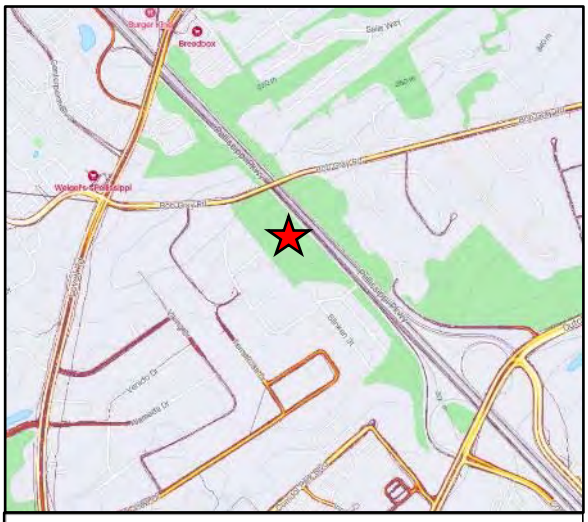
- Existing bicycle and pedestrian volumes:
  The average daily pedestrian and bicycle traffic along Bob Gray Road is unknown. However, with the lack of sidewalks and bike lanes, this roadway is assumed to have minimal pedestrian and bicyclist activity. During the traffic counts for this project, no bicyclists or pedestrians were observed along Bob Gray Road near the development site. However, a few pedestrians were observed on the sidewalk on the north side of Yarnell Road, the sidewalks on Lovell Road, and a few bicyclists were observed traveling on Lovell Road in the designated bike lanes.

  An online website, strava.com, provides "heat" maps detailing routes taken by pedestrians, joggers, and bicyclists. The provided heat maps show the last two years of data, are updated monthly, and are gathered from individuals allowing their smart devices to track and compile their routes (millions of users). The activities in the maps are shown on the roads with color intensities with lighter colors signifying higher activity. The Strava heat maps show some bicycle activity but no pedestrian activity

along Bob Gray Road adjacent to the development site. However, quite a bit of pedestrian and bicyclist activity is shown along Lovell Road and Yarnell Road to the west of the development site.



Strava Heat Map for Pedestrian and Joggers

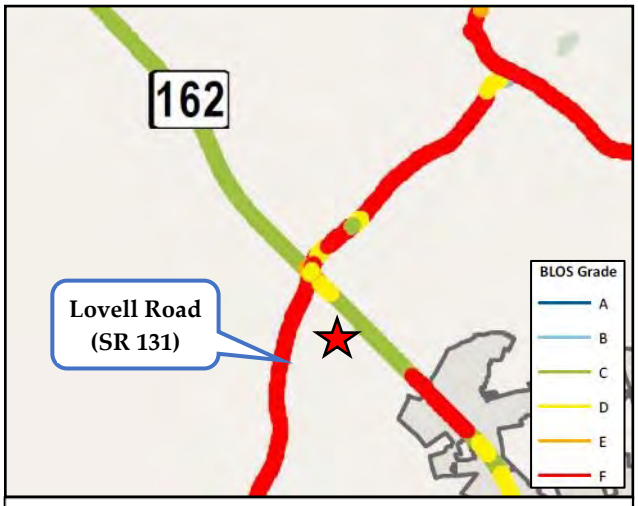


Strava Heat Map for Bicyclists

- **PEDESTRIAN AND BICYCLE FACILITIES**:

Sidewalks and bike lanes are not provided on Bob Gray Road. However, bike lanes are provided on Lovell Road. These bike lanes exist in both directions on Lovell Road between Cedardale Lane to the north and Gilbert Drive to the south, a total of 2.0 miles. Bike lanes will be extended further to the north on Lovell Road in 2030 when TDOT widens the roadway between Cedardale Lane and the intersection of Hardin Valley Road/Middlebrook Pike and Ball Camp Pike to a 5-lane section.

TDOT has published mapping illustrating the Bicycle Level of Service (BLOS) for State Routes. BLOS is a nationally used measure of bicyclist comfort based on a roadway's geometry and traffic conditions. BLOS A designates the route as most suitable for bicyclists and BLOS F as the least suitable. The BLOS for Lovell Road (SR 131) near Bob Gray Road and Yarnell Road has a poor grade of F, even though bicycle lanes are provided.

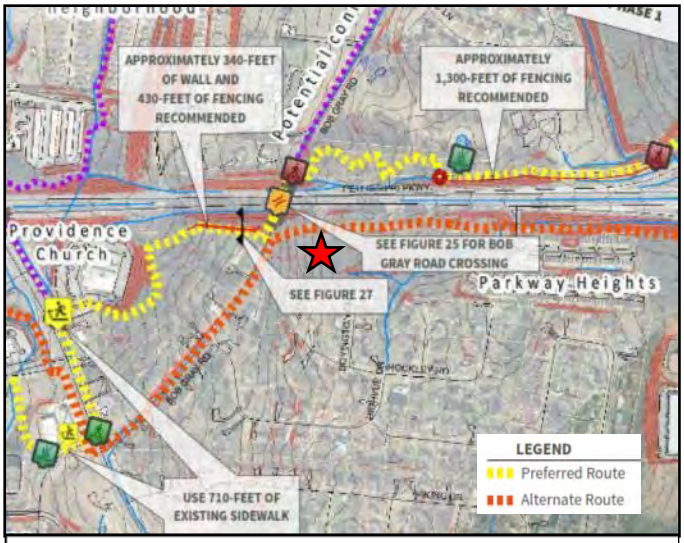


Mapping of Bicycle Level of Service (BLOS) - TDOT

Note: it is unknown when TDOT's BLOS data was determined and whether it was calculated for Lovell Road before the bike lanes were installed in 2012 during the reconstruction of the roadway.

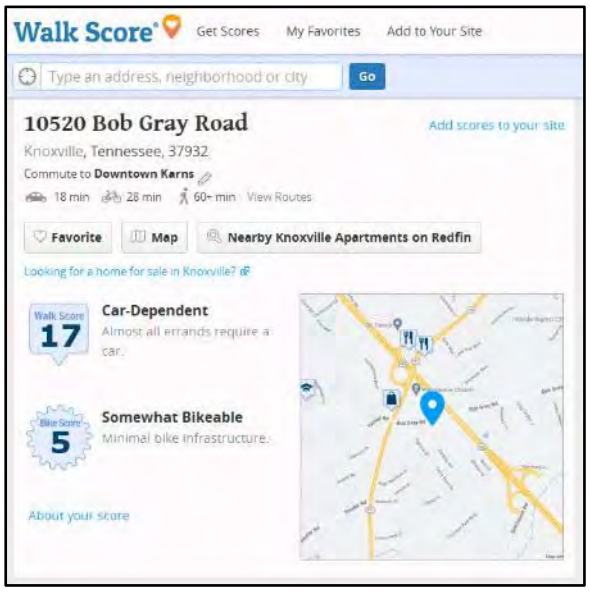
- **FUTURE GREENWAY**:

A Greenway Master Plan for Knox County to Oak Ridge was developed in 2015 by the Knoxville TPO. The plan developed potential routes to connect Knoxville, Knox County, and Oak Ridge communities via trails and greenways. Several maps in this report illustrated the preferred and alternate routes for a greenway between Knox County and Oak Ridge. Appendix B and the adjacent image show a detailed map of the potential greenway routes near the proposed Bob Gray Road Subdivision area. This map shows two distinct paths near the subdivision – the preferred route traversing across the Bob Gray Road overpass bridge to the other side of Pellissippi Parkway and an alternate route running adjacent to the proposed Bob Gray Road Subdivision and along the right-of-way for Pellissippi Parkway. The proposed Bob Gray Road Subdivision development is not expected to adversely impact the proposed greenway if the alternate route is selected.



Knox to Oak Ridge Greenway Study – Corridor Design

- **WALK SCORE**:



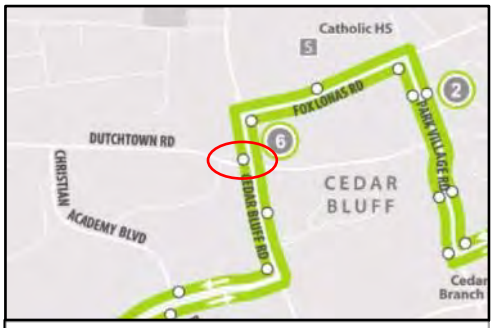
A private company offers a website at walkscore.com that grades and gives scores to locations within the United States based on "walkability", "bikeability", and transit availability based on a patented system. According to the website, the numerical values assigned for the Walk Score and the Bike Score are based on the distance to the closest amenity in various relevant categories (businesses, schools, parks, etc.) and are graded from 0 to 100.

Appendix C shows maps and other information for the Walk Score at the approximate development property address at 10520 Bob Gray Road. The project site location is graded with a Walk Score of 17. This Walk Score indicates that the site is car-dependent and that all errands currently require a vehicle for travel to and from the development property. The site is given a Bike Score of 5. The lack of pedestrian and bike facilities and the distance to amenities reduce the Walk and Bike Scores at the development site. The site is not given a Transit Score since public transportation is unavailable near the development site.

Due to the lack of sidewalks and bike facilities, it is not expected that any measurable bicycle or pedestrian trips will be generated to reduce vehicle trips to and from the proposed development on Bob Gray Road. Thus, these potential alternative transportation modes are not used for vehicle trip reductions.

- **TRANSIT SERVICES**:

The City of Knoxville has a network of public transit opportunities offered by Knoxville Area Transit (KAT). Bus service is not available near the development site. The overall KAT bus system map is provided in Appendix D.



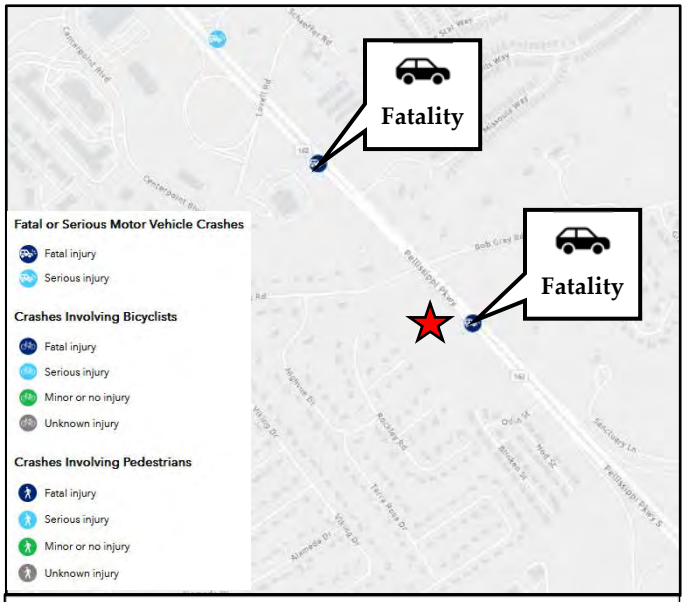
KAT Route 16

The closest public transit bus service is 3.0 miles to the

east at the corner of North Cedar Bluff Road and Dutchtown Road and is Route 16, "Cedar Bluff". It operates on weekdays and Saturdays, and this route map is included in Appendix D. Since the COVID-19 pandemic, KAT had to reduce its service schedule due to workforce shortages. These changes took place on August 29th, 2022, and the reduced schedule for this route is also included in Appendix D. However, KAT increased services on April 8th, 2024, for some routes on Sundays and evenings, but this did not include Route 16. Other transit services in the area include the East Tennessee Human Resource Agency (ETHRA) and the Community Action Committee (CAC), which provides transportation services when requested.

Since the distance to the nearest public bus service is several miles away, with no sidewalks or bike lanes available to access the bus stop without using a private vehicle, the proposed development is not expected to have any reduced vehicle trips due to public transit usage.

- **CRASH DATA**:



Bicycle, Pedestrian, and Vehicle Crash Data in Study Area

The Knoxville TPO provides a website that lists bicycle, pedestrian, and vehicle severe or fatal crashes from October 2016 to September 2021. The data shows none of these incidents occurred near the development site on Bob Gray Road, Lovell Road, or Yarnell Road during that time period. However, unfortunately, two fatalities are shown to have occurred on Pellissippi Parkway near the development site. These two fatalities occurred in two separate crashes on March 8, 2017, and December 11, 2017.

PROJECT DESCRIPTION

- **LOCATION AND SITE PLAN:**

The proposed plan layout with 94 multi-family attached townhomes on 9.88 +/- acres is designed by Batson, Himes, Norvell, and Poe and is shown in Figure 3. The design shows five new streets constructed for the residential development, Roads "A", "B", "D", "E", and "F". As shown in the figure, a single entrance will be constructed for the development on the south side of Bob Gray Road. The entrance road, Road "F", will be constructed just west of the existing guardrail and overpass bridge for Bob Gray Road over Pellissippi Parkway.

Internally, Road "A" will be the main road within the development and will provide access to four shorter feeder roads that include Roads "B", "D", and "E". These feeder roads and Road "A" will all end at hammerhead turnarounds.

Aerial View of Parkway Heights Townhouse Development (Looking South)

As shown in Figure 3, Road "A" will traverse from north to south, and on its south end, it will be terminated at the property line to allow for a potential future connection to the existing townhouse development to the south. This residential development to the south, Parkway Heights, has 123 townhouses and only has external road access to Pellissippi Parkway via Odin Street. At the Parkway Heights entrance, access to Pellissippi Parkway is restricted to right-turns in and right-turns out only (RIRO) since a median opening is not provided on Pellissippi Parkway. This arrangement only allows residents to exit to the south and enter from the north, which is beneficial for the residents if this is their intended travel direction but is detrimental for the residents wishing to travel in the opposite direction. As stated previously, TDOT desires to eliminate all entrances and driveways from Pellissippi Parkway due to the large vehicular volumes and speeds and restrict access to designated interchanges. No specific plans or timelines have been offered for when Odin Street in Parkway Heights may be closed to Pellissippi Parkway. However, this study was asked to include this possibility, which would

force all trips generated by the Parkway Heights Townhouses to be re-routed to and from the north through the proposed Bob Gray Road Subdivision. Due to other existing surrounding developments, other road access options to the west or south are not feasible for Parkway Heights.

Bob Gray Road Overpass Bridge at Pellissippi Parkway (Looking East)

The Bob Gray Road Subdivision will have a fair amount of open space on the north and south sides of the development, which will include common areas and areas for stormwater control. An existing power transmission line runs between the development property and Pellissippi Parkway, with cleared and maintained vegetation below the lines.

The typical lot dimensions for the multi-family attached townhouses in the development will be 80 feet deep and 20 feet wide, providing an area of 1,600 square feet. Each townhouse will have a garage and driveway. The developer is not proposing on-site amenities for the future subdivision residents other than providing open common areas. Internal sidewalks are not proposed either.

The schedule for the completion of this new residential development depends on economic factors and construction timelines. This project is also contingent on permitting, design, and other regulatory approvals. This study assumed that the total construction build-out of the development and full occupancy would occur within the next three years (2027).

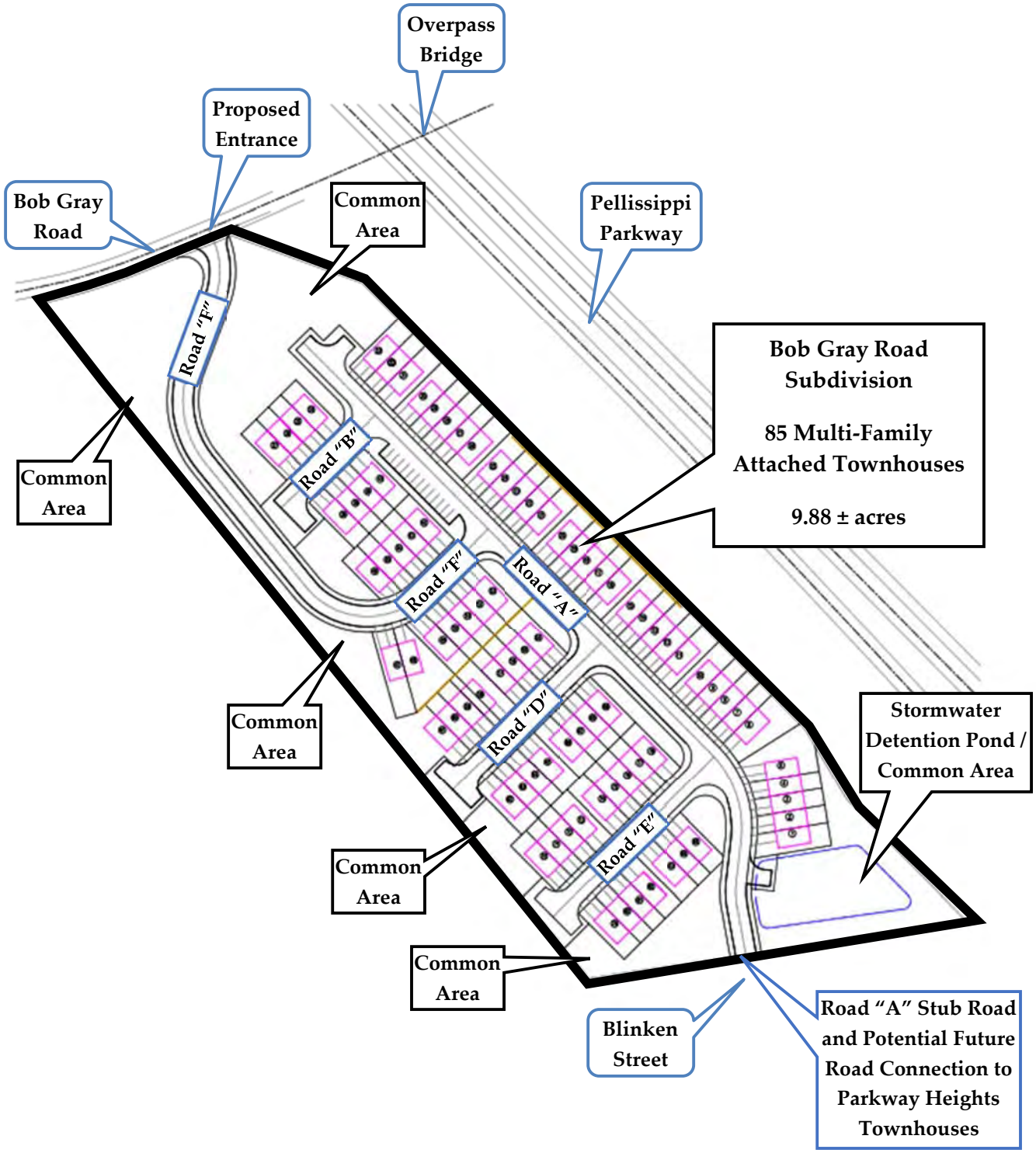


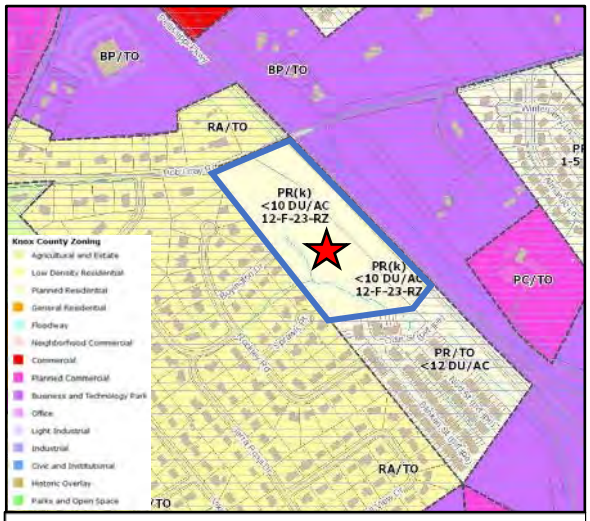
Figure 3
Proposed Plan Layout
Bob Gray Road Subivision

Not to Scale

- **PROPOSED USES AND ZONING REQUIREMENTS:**

The existing parcel comprising the Bob Gray Road Subdivision development property is in Knox County and was recently requested to be rezoned. Knox County Commission approved the rezoning on January 22, 2024. The property's existing zoning was Business and Technology Park (BP), and it was requested to be changed to Planned Residential (PR). Knoxville/Knox County Planning and Knox County Commission approved the property rezoning with a density of up to 10 units per acre. Uses permitted in the Planned Residential (PR) zone include single-family dwellings, duplexes, and multi-dwelling structures and developments. All the properties in this area along Pellissippi Parkway are overlaid with a Technology (TO) zone. According to the Knoxville/Knox County Planning website, the Technology (TO) overlay zone is described as a means to "encourage technology and related land uses while preserving forested ridges, rolling hills, and broad valleys. The zoning is fairly flexible and allows most types of office and light industry, with limits on retail development". This overlay designation was not changed. The most recently published online KGIS zoning map is provided in Appendix E. The existing adjacent surrounding zoning and land uses are the following:

- Bob Gray Road binds the development site to the north and northwest. Across Bob Gray Road, one parcel is zoned Low Density Residential (RA) and is occupied by a single-family detached house. The house at 10519 Bob Gray Road has a single driveway on its west side.
- Seven adjacent properties to the west are in the Highvue Acres Subdivision, are zoned as Low Density Residential (RA), and are occupied by single-family detached houses. These properties have road access to Rockley Road, Boyington Drive, and Sprawls Point inside the Highvue Acres Subdivision.
- Several small parcels to the south and southeast are zoned as Planned Residential (PR) and include attached townhouses in the Parkway Heights Townhouse development. These townhouses have access to Blinken Street and Odin Street, which are private roads with joint permanent easements. Odin Street provides the only road access to Pellissippi Parkway for this development.
- Pellissippi Parkway binds the development property to the east and is shown within the Business and Technology Park (BP) zone. This zone is also applied to the properties to the east and on the other side of Pellissippi Parkway.



KGIS Existing Zoning Map

KGIS Existing Land Use Map

- **ON-SITE CIRCULATION:**

The total length of the internal Bob Gray Road Subdivision roads will be 2,527 feet (0.48 miles), designed and constructed to Knox County specifications, and most will end at hammerhead turnarounds. The development will have asphalt-paved internal roadways with 8" extruded concrete curbs. The lane widths internally will be 13 feet each for a total 26-foot pavement width. Roads "F" and most of Road "A" will be public roads. Roads "B", "D", "E", and the northern portion of Road "A" to the north of Road "F" will be private roads. The public right-of-way width within the development will be 50 feet. No sidewalks are proposed on the internal roads in this development. Knox County will maintain the public streets in the development after construction, and these will be dedicated public roads. The developer will maintain the private streets.

- **SERVICE AND DELIVERY VEHICLE ACCESS AND CIRCULATION:**

Besides residential passenger vehicles, the internal roadways will provide access to service, delivery, maintenance, and fire protection/rescue vehicles. These vehicle types will not impact roadway operations except when they occasionally enter and exit the development. Curbside private garbage collection services are expected to be available for this residential subdivision if desired. The new public streets will be designed and constructed to Knox County specifications and are expected to be adequate for fire protection and rescue vehicles, trash collection trucks, and single-unit delivery trucks. The development's internal drives will accommodate the larger vehicle types and residents' standard passenger vehicles with hammerhead layouts at the road ends sufficiently sized to allow vehicles to turn around.

ANALYSIS OF EXISTING AND PROJECTED CONDITIONS

- **EXISTING TRAFFIC CONDITIONS:**

This study conducted traffic counts at three intersections near the proposed development site on Thursday, March 28th, 2024. An 8-hour traffic count was conducted at the signalized intersection of Lovell Road at Bob Gray Road and Yarnell Road, and a 6-hour traffic count was conducted at the unsignalized t-intersection of Bob Gray Road at Highvue Drive. A limited traffic count was also conducted at the intersection of Odin Street at Pellissippi Parkway. Manual traffic counts were conducted to identify and tabulate the morning and afternoon peak period volumes and the travel directions near the proposed development site. Local public schools were in session when the traffic counts were conducted. The signalized intersection of Lovell Road at Bob Gray Road and Yarnell Road was observed having an AM and PM peak hour at 7:30 – 8:30 a.m. and 4:45 – 5:45 p.m. The AM and PM peak hours at the t-intersection of Bob Gray Road at Highvue Drive were 7:30 – 8:30 a.m. and 4:30 – 5:30 p.m. At the intersection of Odin Street at Pellissippi Parkway, only the entering and exiting traffic was tabulated, and the AM and PM peak hours for these movements occurred at 7:30 – 8:30 a.m. and 3:45 – 4:45 p.m. The manual tabulated traffic counts can be reviewed in Figure 4 and Appendix F. Some observations of the vehicular traffic at the intersections include the following:

Lovell Road at Bob Gray Road and Yarnell Road

- No pedestrians or bicyclists were observed in the morning. In the afternoon, three bicyclists traveled on the bike lanes on Lovell Road, and two pedestrians were observed on the sidewalks on Lovell Road.
- Most vehicles at this intersection were passenger vehicles, but school buses, semi-tractor trailer trucks, single-unit trucks, and construction vehicles with trailers were observed.
- In the afternoon peak times, occasional, brief, and limited backups occurred for northbound traffic on Lovell Road from the adjacent signalized intersection to the north at Centerpoint Boulevard.
- Much higher eastbound volumes on Yarnell Road and some of the other turning movements at this intersection were observed compared to a previous traffic count in 2015.

Bob Gray Road at Highvue Drive

- Nearly all exiting vehicles from the Highvue Acres Subdivision were observed turning left (westbound). This observation shows a high attraction to Lovell Road to the west

versus toward the east from this residential subdivision, especially since only two subdivision entrances are provided. If there were much attraction to the east on Bob Gray Road by the Highvue Acres Subdivision residents, they would be expected to use this entrance intersection.

- Most vehicles at this intersection were passenger vehicles, but a fair amount of school buses were observed, along with some single-unit trucks. Two semi-tractor trailer trucks were observed traveling westbound on Bob Gray Road.
- No bicyclists or pedestrians were observed at this intersection.

Odin Street at Pellissippi Parkway

- Nearly all exiting vehicles from Parkway Heights suffered significant delays due to the high volumes on Pellissippi Parkway.
- The maximum vehicle queue with five passenger vehicles occurred during the morning peak.
- No bicyclists or pedestrians were observed at this intersection.

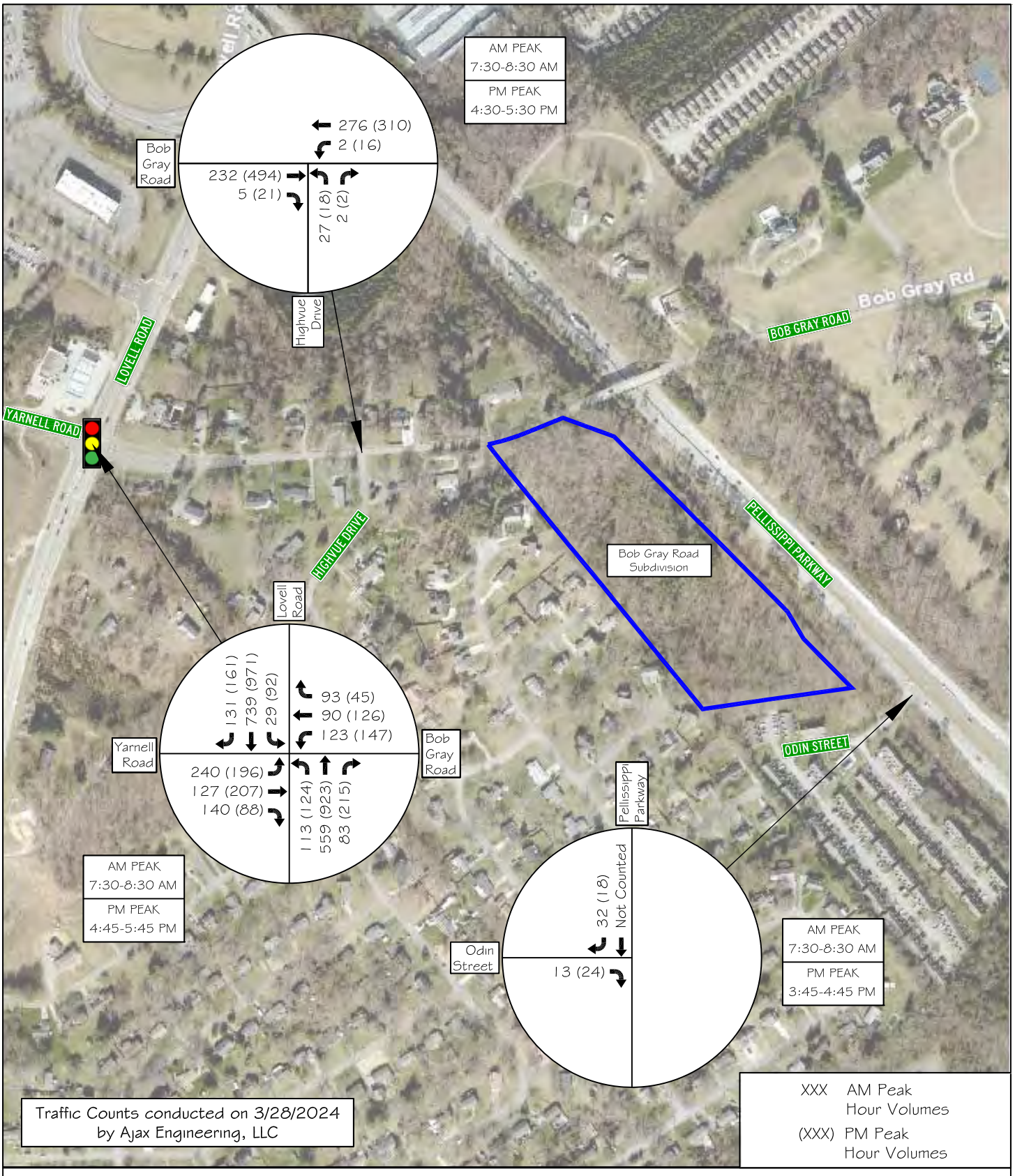


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FIGURE 4

Bob Gray Road Subdivision

2024 Peak Hour Traffic Volumes - EXISTING TRAFFIC CONDITIONS

Capacity analyses were undertaken to determine the Level of Service (LOS) for the existing 2024 intersection traffic volumes shown in Figure 4 (except for the intersection of Odin Street at Pellissippi Parkway). The capacity analyses were calculated following the Highway Capacity Manual (HCM) methods and utilizing Synchro Traffic Software (Version 12).

Methodology:

LOS is a qualitative measurement developed by the transportation profession to express how well an intersection or roadway performs based on a driver's perception. LOS designations include LOS A through LOS F. The designation of LOS A signifies a roadway or intersection operating at best, while LOS F signifies road operations at worst. This grading system provides a reliable, straightforward means to communicate road operations to the public. The HCM lists the level of service criteria for unsignalized intersections and signalized intersections.

LOS is defined by delay per vehicle (seconds), and roadway facilities are also characterized by the volume-to-capacity ratio (v/c). LOS designations, which are based on delay, are reported differently for unsignalized and signalized intersections. For example, a delay of 20 seconds at an unsignalized intersection would indicate LOS C, representing the additional delay a motorist would experience traveling through the intersection. Also, for example, a v/c ratio of 0.75 for an approach at an unsignalized intersection would indicate that it is operating at 75% of its available capacity. This difference is primarily due to motorists' different expectations between the two road facilities. Generally, for most instances, the LOS D / LOS E boundary is considered the upper limit of acceptable delay during peak periods in urban and suburban areas.

For unsignalized intersections, LOS is measured in terms of delay (in seconds). This measure attempts to quantify delay, including travel time, driver discomfort, and fuel consumption. For unsignalized intersections, the analysis assumes that the mainline thru and right-turn traffic does not stop and is not affected by the traffic on the minor side streets. Thus, the LOS for a two-way stop (or yield) controlled intersection is defined by

the delay for each minor approach and major street left-turn movements. Table 2 lists the level of service criteria for unsignalized intersections. The analysis results of unsignalized intersections using the HCM methodologies are conservative due to the more significant vehicle gap parameters used in the method. More often, in normal road conditions, drivers are more willing to accept smaller gaps in traffic than what is modeled using the HCM methodology. The unsignalized intersection methodology also does not account for more significant gaps sometimes produced by nearby upstream and downstream signalized intersections. For unsignalized intersections, in most instances, the upper limit of acceptable delay during peak hours is the LOS D/E boundary at 35 seconds.

For signalized intersections, LOS is based on delay (in seconds) for various movements within the intersection and the overall operation of all the traffic entering the intersection. This delay measures driver discomfort, frustration, fuel consumption, and lost travel time and depends on traffic signal cycle lengths, lengths of green phases, and the quality of traffic progression. This control delay includes deceleration/acceleration delay, queue move-up time, and stopped delay time. For signalized intersections, in most instances, the upper limit of acceptable delay during peak hours is the LOS D/E boundary at 55 seconds. Table 3 lists the level of service criteria for signalized intersections.

TABLE 2
LEVEL OF SERVICE AND DELAY FOR UNSIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	DESCRIPTION	CONTROL DELAY (seconds/vehicle)
A	Little or no delay	0 - 10
B	Short Traffic Delays	>10 -15
C	Average Traffic Delays	>15 - 25
D	Long Traffic Delays	>25 - 35
E	Very Long Traffic Delays	>35 - 50
F	Extreme Traffic Delays	>50

Source: Highway Capacity Manual, 7th Edition

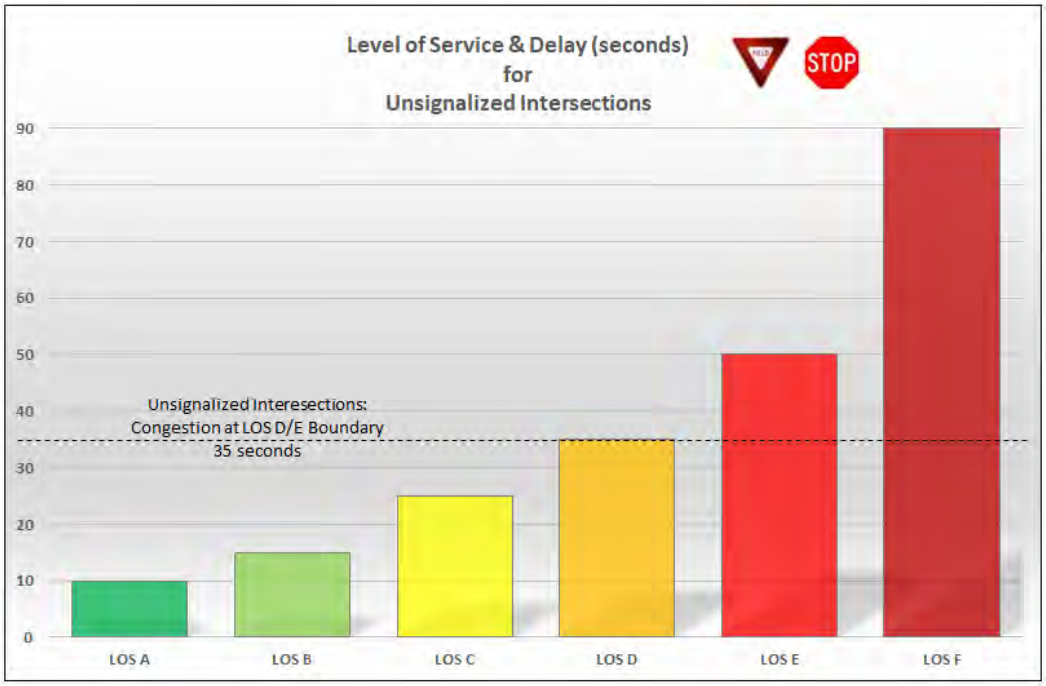
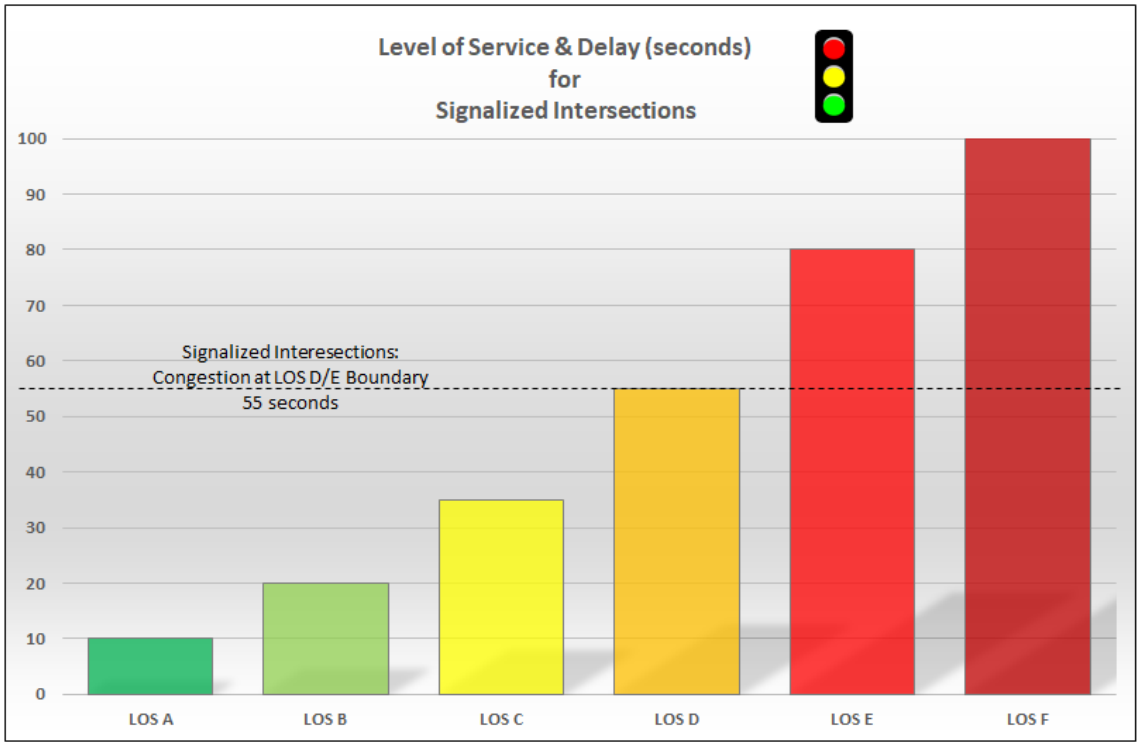


TABLE 3
LEVEL OF SERVICE AND DELAY FOR SIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	DESCRIPTION	CONTROL DELAY (seconds/vehicle)
A	Operation with very low control delay. Progression is extremely favorable and most vehicles do not stop at all.	≤10.0
B	Generally good level of progression. More vehicles stop than with LOS A, causing higher levels of average delay.	> 10 - 20
C	Higher delays with individual cycle failures may begin at this level. Many vehicles may still pass through without stopping.	> 20 - 35
D	Approaching unstable flow. The influence of congestion becomes more noticeable. Many vehicles stop.	> 35 - 55
E	Considered the limit of acceptable delay. High delays indicated by poor progression, long cycle lengths, and high v/c ratios.	> 55 - 80
F	Unacceptable delay occurs. Progression is extremely poor with long cycle lengths and high v/c ratios.	>80

Source: Highway Capacity Manual, 7th Edition



Intersection capacity results from the existing 2024 peak hour traffic are shown in Table 4. The intersections in the table are shown with a LOS designation, delay (in seconds), and v/c ratio (volume/capacity) for the AM and PM peak hours. The intersection of Bob Gray Road at Highvue Drive was not requested to be included in the scope of work provided by Knoxville/Knox County Planning but is included in the study as a courtesy since it was included in the traffic counts and adjacent to the development site. Appendix G includes the worksheets for the existing 2024 peak hour capacity analyses.

TABLE 4
2024 INTERSECTION CAPACITY ANALYSIS RESULTS -
EXISTING TRAFFIC CONDITIONS

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS [a]	DELAY [b] (seconds)	v/c [c]	LOS [a]	DELAY [b] (seconds)	v/c [c]
Lovell Road (SB & NB) at Bob Gray Road (WB) and Yarnell Road (EB)	Signalized	Eastbound	D	41.4		F	141.0	
		Westbound	D	47.1		E	58.0	
		Northbound	B	17.8		B	15.8	
		Southbound	C	26.6		C	20.5	
		Summary	C	29.5		D	40.3	
Bob Gray Road (WB & EB) at Highvue Drive (NB)	Unsignalized	Northbound Left/Right	B	12.6	0.071	C	15.7	0.087
		Westbound Left	A	8.6	0.004	A	8.7	0.036

Note: All analyses were calculated in Synchro 12 software and reported with HCM 7th Edition methodology
[a] Level of Service , [b] Average Delay (sec/vehicle) , [c] Volume-to-Capacity Ratio

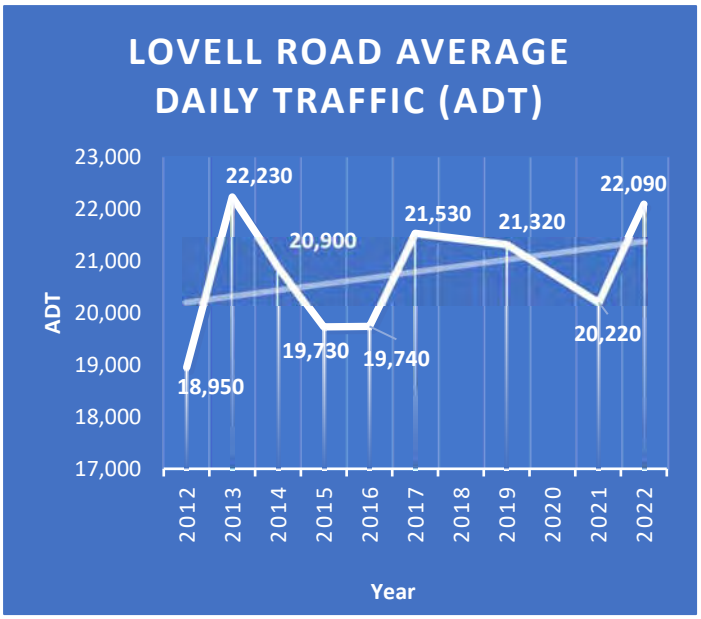
As shown in Table 4, the signalized intersection is calculated to operate with average LOS and reasonable vehicle delays in the existing 2024 conditions for the northbound and southbound approaches of Lovell Road. However, the westbound (Bob Gray Road) approach and especially the eastbound (Yarnell Road) approach have high vehicle delays calculated in the PM peak hour. The unsignalized intersection of Bob Gray Road at Highvue Drive is calculated with good to average LOS and short vehicle delays.

The signal timing used to analyze the Lovell Road at Bob Gray Road and Yarnell Road intersection was obtained from Knox County Engineering and is included in Appendix G. The traffic signal operates on a 100-second cycle length during the identified AM peak hour and a 120-second cycle length during the identified PM peak hour in an actuated-coordinated system. The signal timings were not changed or optimized for the existing analysis and were used as given.

- **PROJECTED TRAFFIC CONDITIONS WITHOUT THE PROJECT:**

Horizon year traffic conditions represent the projected traffic volumes in the study area without the proposed project being developed (no-build option). This proposed development's build-out and full occupancy are assumed to occur by 2027.

According to the nearby TDOT and TPO count stations, vehicular traffic on Lovell Road, Bob Gray Road, and Yarnell Road has grown moderately over the past ten years. The data in Appendix A shows that these roads have experienced annual growth between 1.5 - 2.5% over the past ten years.



For this study, an annual growth rate of +2.5% was used to calculate future growth on the studied intersections up to 2027 to account for potential traffic growth in the study area. The annual growth rate of 2.5% was applied to the existing 2024 volumes tabulated on Lovell Road, Bob Gray Road, and Yarnell Road to estimate the future volumes in the horizon year of 2027 without the potential development traffic. Volumes to and from Highvue Drive were not included. Figure 5 shows the projected 2027 horizon year traffic volumes at the studied intersections without the project during the AM and PM peak hours.

Capacity analyses were undertaken to determine the projected LOS in 2027 without the project. The signal timings were not changed or optimized for the capacity analyses in the projected conditions without the project. The results are shown in Table 5, and Appendix G includes the capacity analysis worksheets.

As expected, the results in Table 5 show moderately worse vehicle delays for all the intersection approaches in the 2027 projected conditions without the developments' generated trips versus the existing 2024 conditions.

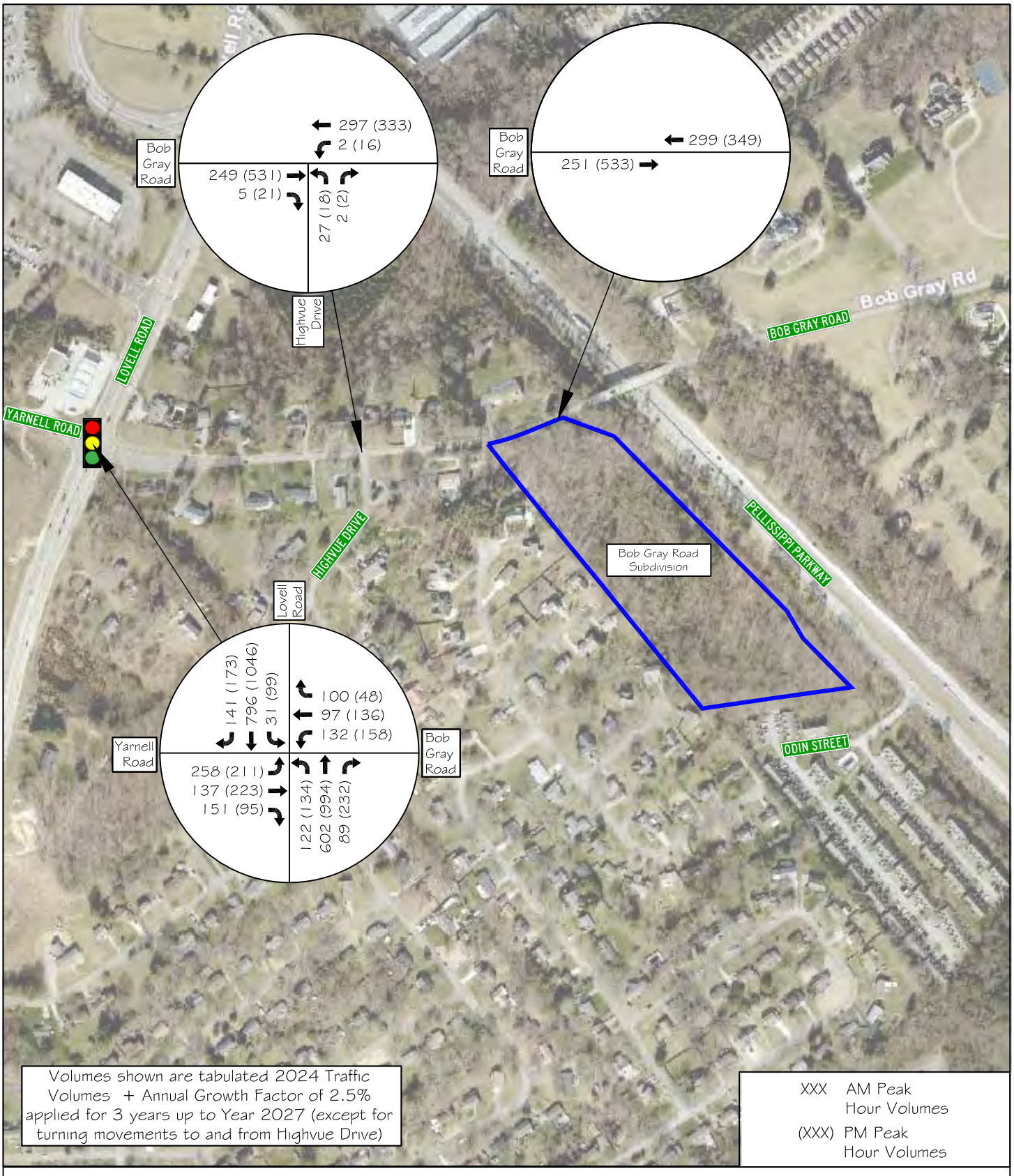


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FIGURE 5

Bob Gray Road Subdivision

2027 Peak Hour Traffic Volumes - PROJECTED TRAFFIC CONDITIONS WITHOUT THE PROJECT

TABLE 5
2027 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS WITHOUT THE PROJECT

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS [a]	DELAY [b] (seconds)	v/c [c]	LOS [a]	DELAY [b] (seconds)	v/c [c]
Lovell Road (SB & NB) at Bob Gray Road (WB) and Yarnell Road (EB)	Signalized	Eastbound	D	41.6		F	162.9	
		Westbound	D	47.3		E	59.1	
		Northbound	B	19.4		B	17.0	
		Southbound	C	30.9		C	22.5	
		Summary	C	31.6		D	44.8	
Bob Gray Road (WB & EB) at Highvue Drive (NB)	Unsignalized	Northbound Left/Right	B	13.1	0.075	C	16.6	0.094
		Westbound Left	A	8.7	0.004	A	8.8	0.037

Note: All analyses were calculated in Synchro 12 software and reported with HCM 7th Edition methodology
[a] Level of Service , [b] Average Delay (sec/vehicle) , [c] Volume-to-Capacity Ratio

- **TRIP GENERATION:**

A generated trip is a single or one-direction vehicle movement entering or exiting the study site. The estimated traffic the Bob Gray Road Subdivision will generate was based on the equations provided by Knoxville/Knox County Planning. These equations were developed from an extensive local study to estimate townhouse (and apartment) trip generation in the surrounding area and were published in December 1999. For Knox County, this is the preferred rate to use for townhouses and apartments. This local rate calculates slightly higher trip rates than the similar land use in the often-referenced Institute of Transportation (ITE) Trip Generation Manual.

The data and calculations from the local trip generation study for the proposed land use are shown in Appendix H. A summary of this information is presented in Table 6a:

TABLE 6a
TRIP GENERATION FOR BOB GRAY ROAD SUBDIVISION
94 Multi-Family Attached Townhouses

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Townhouses	94 Townhouses	903	22%	78%		55%	45%	
				11	40	51	40	33	73
Total New Volume Site Trips			**903**	**11**	**40**	**51**	**40**	**33**	**73**

Data from Local Trip Rates and calculated by using Fitted Curve Equations

For the proposed residential development, it is estimated that 11 vehicles will enter and 40 will exit, for a total of 51 generated trips during the AM peak hour in the year 2027. Similarly, it is estimated that 40 vehicles will enter and 33 will exit, for a total of 73 generated trips during the PM peak hour in the year 2027. The calculated trips generated for an average weekday are estimated to be 903 vehicles for the proposed development. No vehicle trip reductions were included in the calculations or analysis.

As part of the scope of work that requested a worst-case scenario analysis, where TDOT closes access to Pellissippi Parkway to the Parkway Heights Subdivision, the trip generation for this existing subdivision was also calculated by utilizing the local trip generation rates described above and is shown in Table 6b.

TABLE 6b
TRIP GENERATION FOR PARKWAY HEIGHTS TOWNHOUSES
123 Multi-Family Attached Townhouses

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Townhouses	123 Townhouses	1,150	22%	78%		55%	45%	
				14	51	65	51	42	93
Total New Volume Site Trips			**1,150**	**14**	**51**	**65**	**51**	**42**	**93**

Data from Local Trip Rates and calculated by using Fitted Curve Equations

Combining the results in Tables 6a and 6b results in the trip volumes shown in Table 6c.

TABLE 6c
TRIP GENERATION FOR COMBINED RESIDENTIAL DEVELOPMENTS

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Townhouses	217 Townhouses	2,053	22%	78%		55%	45%	
				25	91	116	91	75	166
Total New Volume Site Trips			**2,053**	**25**	**91**	**116**	**91**	**75**	**166**

Data from Local Trip Rates and calculated by using Fitted Curve Equations

The trips shown in Table 6c are the projected volumes that would be expected at the Proposed Entrance on Bob Gray Road once the Bob Gray Road Subdivision is constructed and fully occupied and if access to Pellissippi Parkway via Odin Street is closed at Parkway Heights and a road connection between the two subdivisions is provided.

As described earlier, the entering and exiting volumes at the intersection of Odin Street at Pellissippi Parkway were tabulated to determine the peak volumes generated by the townhouses in Parkway Heights. The peak results from this traffic count were the following:

AM Entering Trips = 13	AM Exiting Trips = 32	Total AM Trips = 45
PM Entering Trips = 24	PM Exiting Trips = 18	Total PM Trips = 42

As seen from the traffic count for the entering and exiting trips to and from Parkway Heights, the theoretical, calculated trip volumes shown in Table 6b are much higher. However, the calculated generated trips for Parkway Heights were used instead of the observed volumes to ensure a conservative analysis.

- **TRIP DISTRIBUTION AND ASSIGNMENT:**

The projected trip distribution and assignment for the Bob Gray Road Subdivision development are based on several sources and engineering judgment. The first source is based on the existing traffic count volumes and the observed travel directions collected on Bob Gray Road near the proposed development site.

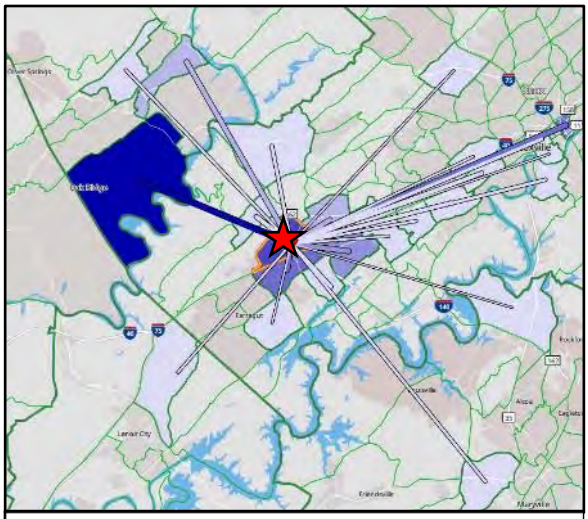
During the traffic count, directional splits were observed for the westbound and eastbound Bob Gray Road volumes during the morning and afternoon peak hours. In the AM peak hour, 54% of traffic on Bob Gray Road was observed traveling west towards Lovell Road and 46% east. In the PM peak hour, the directional flows were more pronounced, with 38% of the traffic on Bob Gray Road traveling westbound and 62% eastbound.

Bob Gray Road at Highvue Drive is an intersection that serves as an entrance to the Highvue Acres Subdivision. This intersection is approximately 650 feet west of the proposed Bob Gray Road Subdivision. This subdivision has dozens of single-family detached houses with two entrances, one at Bob Gray Road on the north side and the other at Lovell Road to the southwest. The observed entering and exiting splits on Highvue Drive are projected to be a good analog for the future residents of the Bob Gray Road Subdivision development since this road serves a similar residential land use as proposed for the development site. The entering and exiting percentages during the observed AM and PM peak hours to and from Highvue Drive at Bob Gray Road were the following:

Observed Entering and Exiting Vehicle Distribution at Highvue Drive on Bob Gray Road

AM PEAK HOUR		
ENTER FROM WEST	71%	
ENTER FROM EAST		29%
EXIT TO WEST	93%	
EXIT TO EAST		7%
PM PEAK HOUR		
ENTER FROM WEST	57%	
ENTER FROM EAST		43%
EXIT TO WEST	90%	
EXIT TO EAST		10%

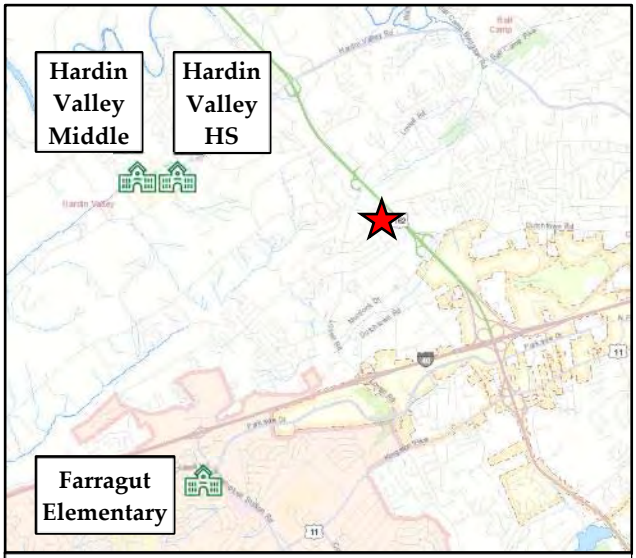
During the traffic count, as shown in the table, most vehicles entered and exited Highvue Drive to and from the west during the AM and PM peak hours.



**Top 25 Locations of
2021 Census Bureau Work-Based Trips to
& from Census Tract 59.11**

The second source for determining the projected trip distribution is based on work-related trips in the local area. Work-based trips will be a significant impetus for trips generated by residential development, and these trips are more likely to travel to and from the northwest and northeast. This assertion is based on data from the United States Bureau website for Census Tract 59.11, where the development property is located. Based on 2021 (latest available) census data shown in Appendix I, most work-based trips in the surrounding area correspond to nearby areas in West Knoxville, downtown Knoxville, the University of Tennessee area, and Oak Ridge. For future work-related travel to and from the development site, the proximity of the Lovell Road interchange on Pellissippi Parkway to the north and the Lovell Road interchange on Interstate 40/75 interchange to the south will draw a good portion of these trips. These trips will follow the pattern observed at the Highvue Acres Subdivision with predominate flows to and from the west on Bob Gray Road.

In addition to employment centers, some generated traffic will travel to and from public and private schools. Schools will be another impetus for external trip-making. The development property is currently zoned for Farragut Elementary, Hardin Valley Middle, and Hardin Valley Academy (High School). These zoned public schools are located northwest and southwest of the development site. For parents and children not utilizing public school bus transportation, the most direct route to these schools would be initially traveling on Bob Gray Road to Lovell Road and then utilizing other roads to the schools. Farragut Elementary is the closest to the development site at 4.1 miles, and Hardin Valley Middle School is the furthest at just under 5 miles. Hardin Valley Academy is 4.5 miles away, and both this school and the middle school



Zoned Public School Locations

will likely be best accessed during peak hours via Bob Gray Road, Yarnell Road, N Campbell Station Road, and then Hardin Valley Road. Farragut Elementary will require the residents to travel to and from the west on Bob Gray Road and then south on Lovell Road students by private vehicles.

The Knox County Schools Transportation Department has developed Parental Responsibility Zones (PRZ) to determine whether students are offered transportation services to and from school. The PRZ is defined as being 1.5 miles for grades 6 – 12 and 1.0 miles for grades K – 5 from where the students' parcel is accessed to the point where the buses unload at the school. This development will be outside the PRZ for all the zoned schools, and all school-age children attending public schools in the development will be able to utilize this service if desired.

Figure 6 shows the projected distribution of traffic entering and exiting the development at the Proposed Entrance at Bob Gray Road. The percentages shown in the figure only pertain to the trips generated by the proposed dwellings in the development calculated from the local trip rates. Ultimately, the projected, assumed trip distribution was heavily based on the observed traffic entering and exiting Highvue Drive at Bob Gray Road. The distributions shown in Figure 6 will also apply for the trips to and from the Parkway Heights Townhouses if their access to Pellissippi Parkway is eliminated and routed through the Bob Gray Road Subdivision. The percentages shown at the signalized intersection were based on the observed splits tabulated during the peak hours.

Figure 7a shows the traffic assignment of the computed trips generated by the Bob Gray Road Subdivision and is based on the assumed distribution of trips shown in Figure 6. Figure 7b shows the traffic assignment of the computed trips generated by the Bob Gray Road Subdivision plus the diverted trips from the Parkway Heights Townhouses if road access for this subdivision to Pellissippi Parkway is removed.

Additionally, Figure 7c includes a minor number of trips generated by a new nearby commercial development proposed on the southwest corner of Lovell Road at Bob Gray Road and Yarnell Road. This commercial development will include a 26,600 ft^2 building that will include retail and office space and is projected to also open by 2027. The assigned volumes shown in Figure 7c were obtained from the Transportation Impact Study for this other proposed development, Lovell Crossing.

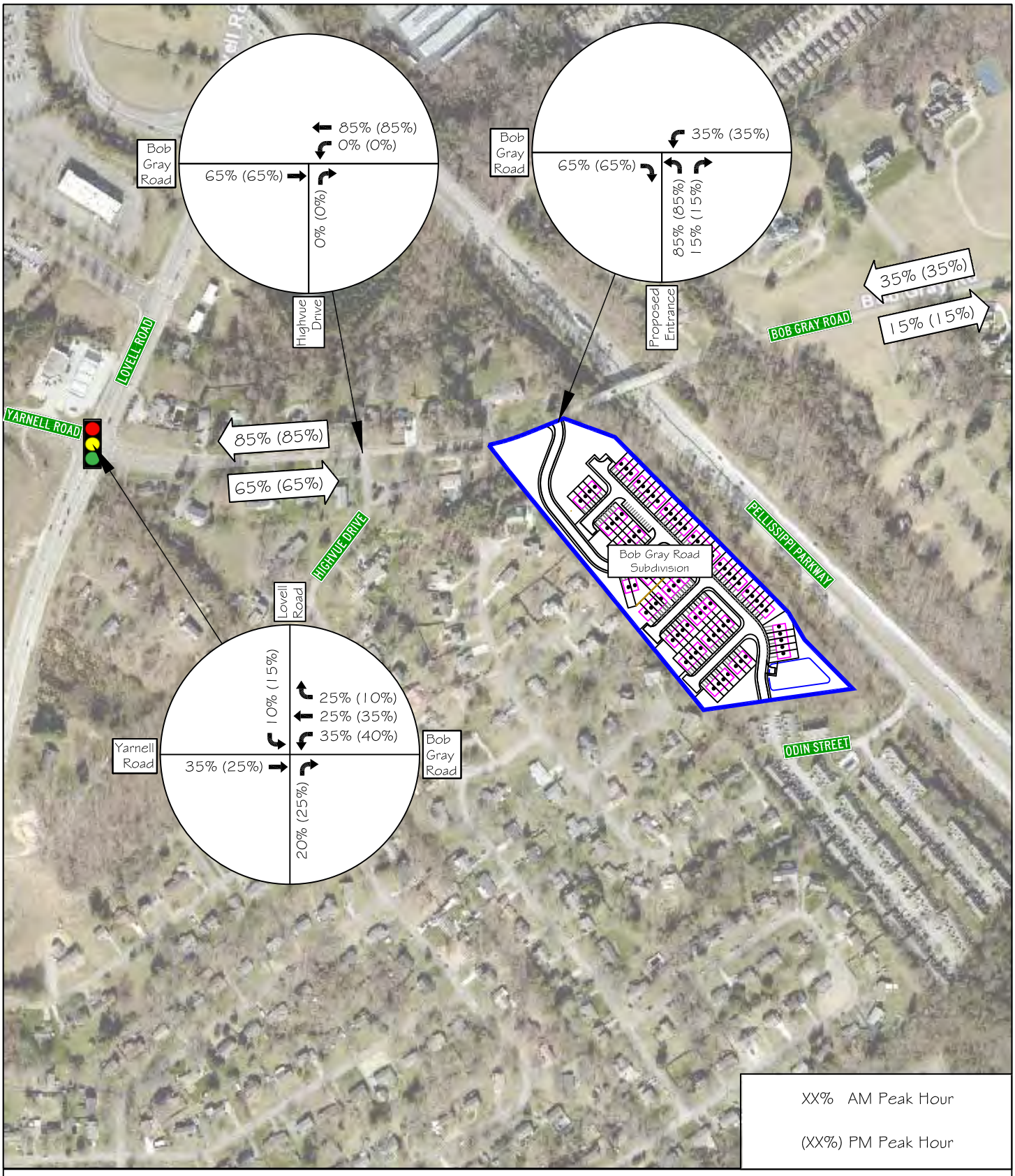


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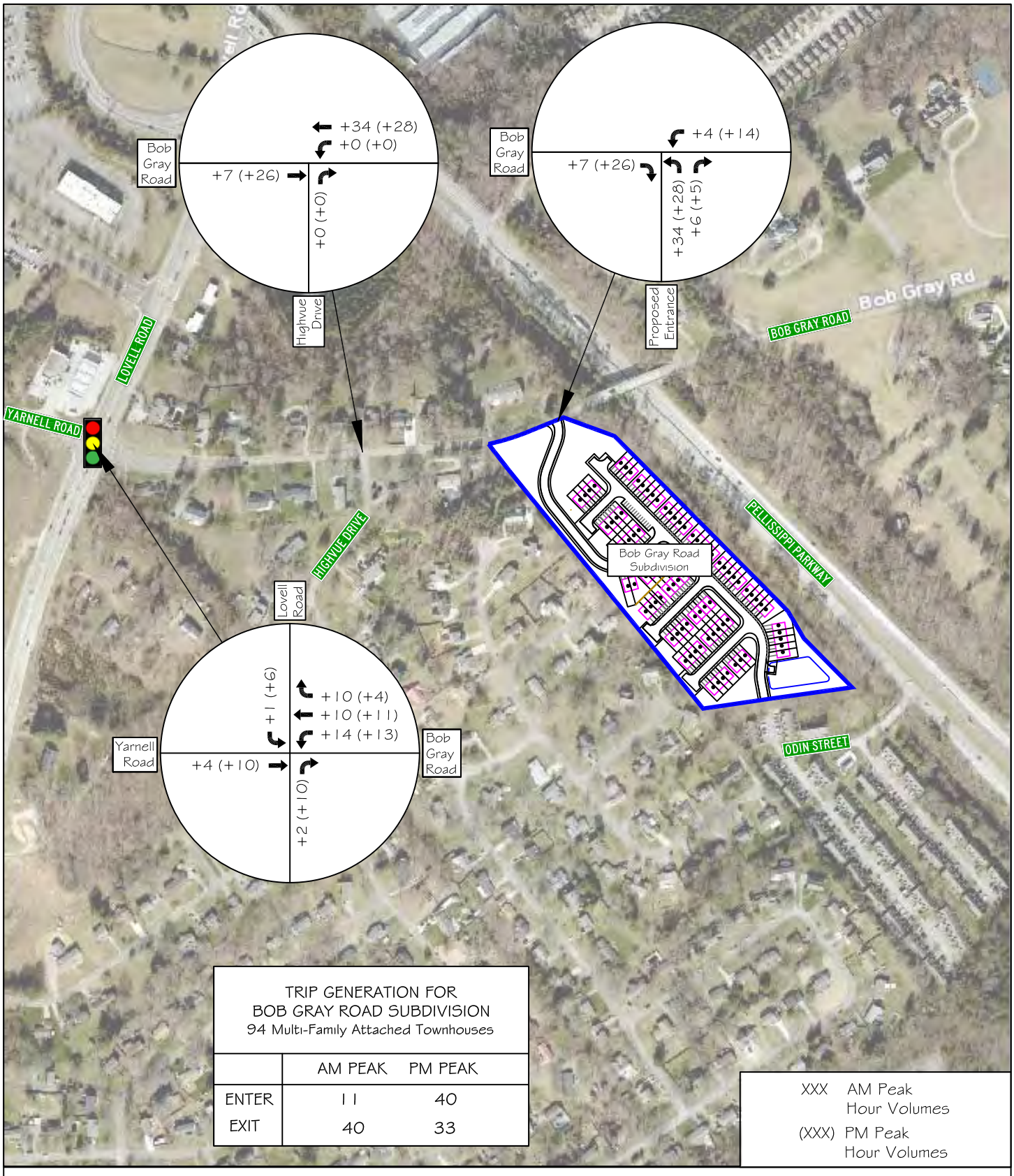
FIGURE 6

Bob Gray Road Subdivision

Directional Distribution of Generated Traffic during AM and PM Peak Hour



TRIP GENERATION FOR
BOB GRAY ROAD SUBDIVISION
94 Multi-Family Attached Townhouses

	AM PEAK	PM PEAK
ENTER	11	40
EXIT	40	33

XXX AM Peak Hour Volumes
(XXX) PM Peak Hour Volumes

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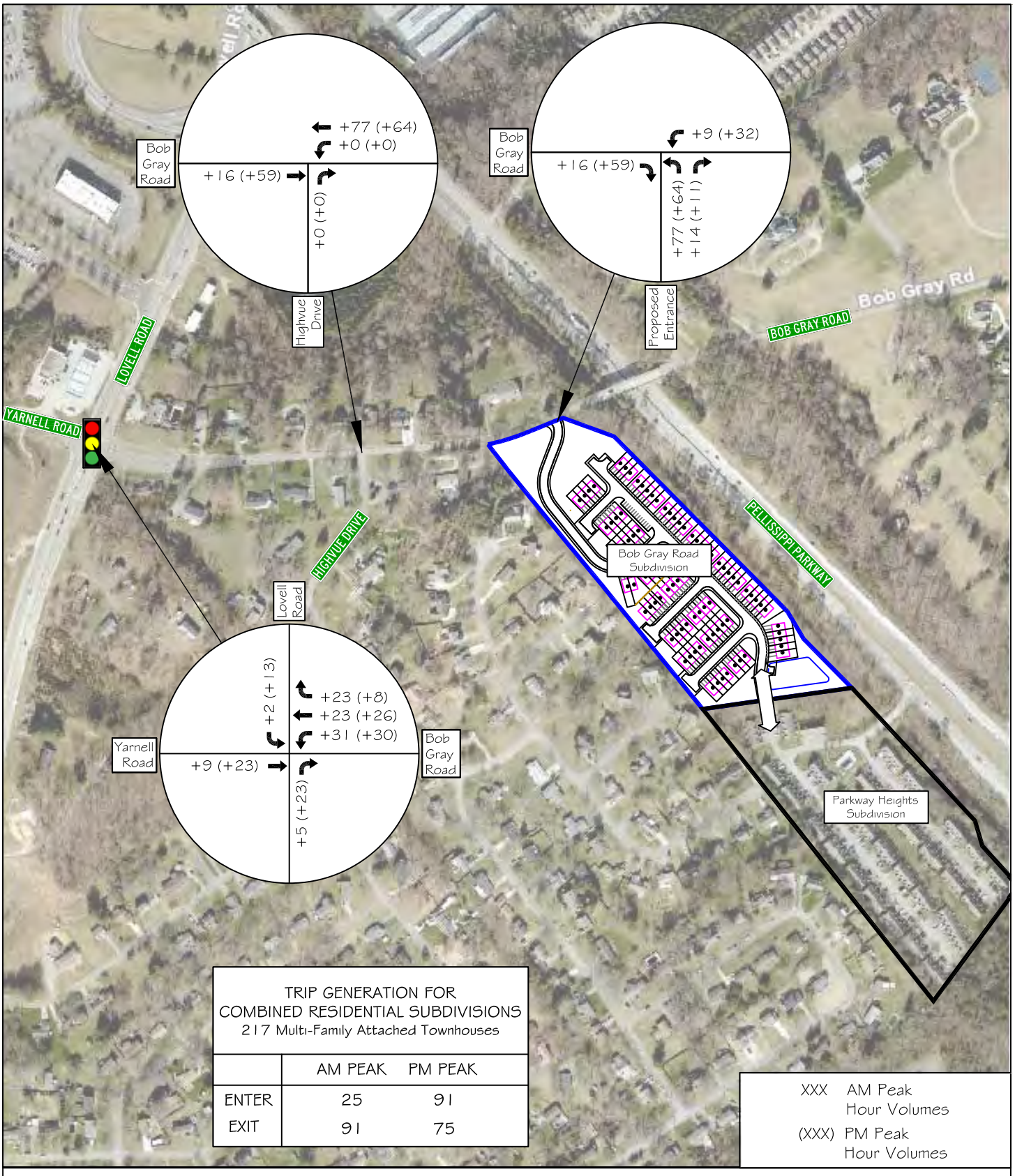
FIGURE 7a

Bob Gray Road Subdivision

Traffic Assignment of Generated Traffic during AM and PM Peak Hour - Bob Gray Road Subdivision Only



TRIP GENERATION FOR
COMBINED RESIDENTIAL SUBDIVISIONS
217 Multi-Family Attached Townhouses

	AM PEAK	PM PEAK
ENTER	25	91
EXIT	91	75

XXX AM Peak Hour Volumes
(XXX) PM Peak Hour Volumes

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FIGURE 7b

Bob Gray Road Subdivision

Traffic Assignment of Generated Traffic during AM and PM Peak Hour - Combined Residential Subdivisions

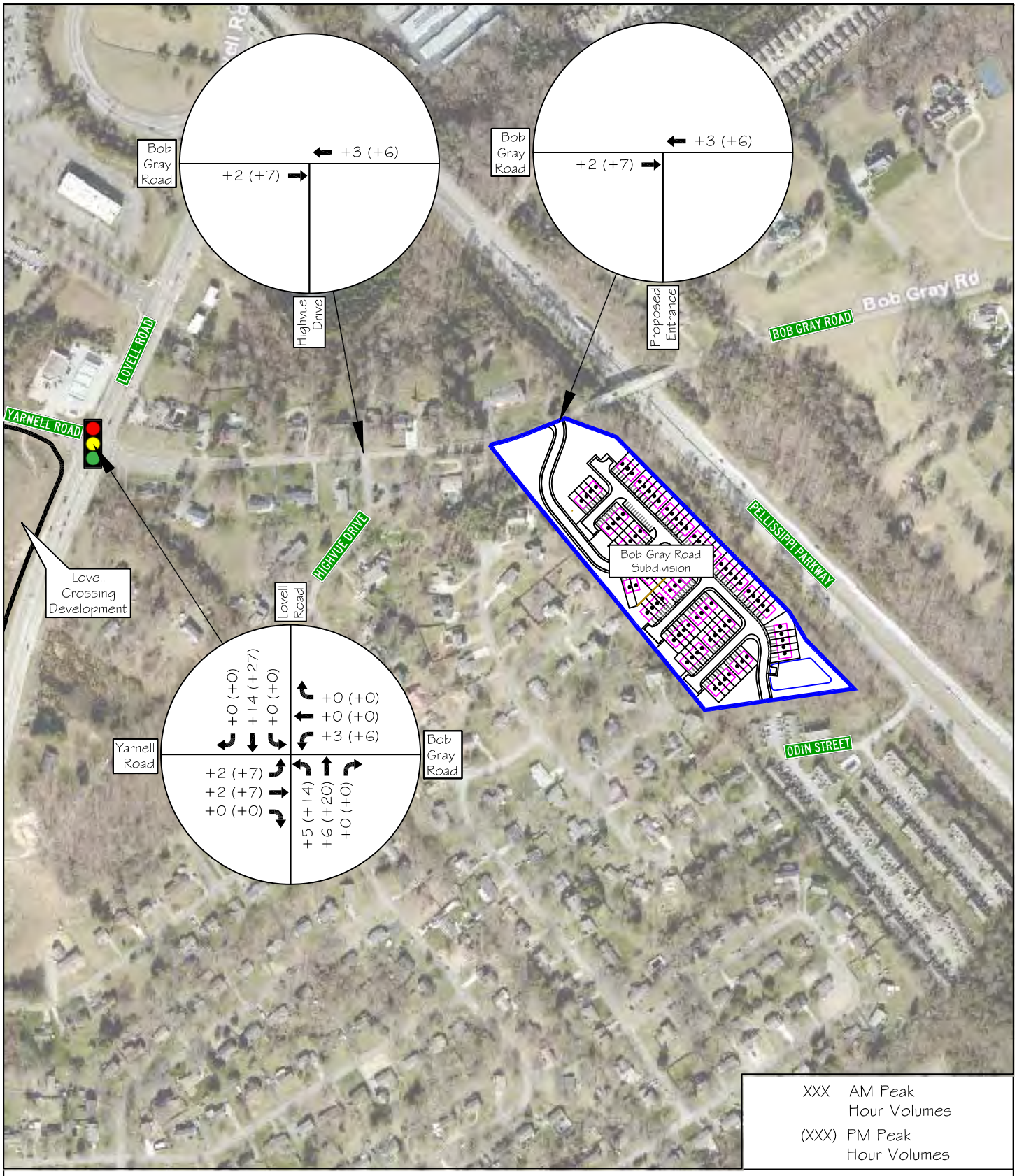

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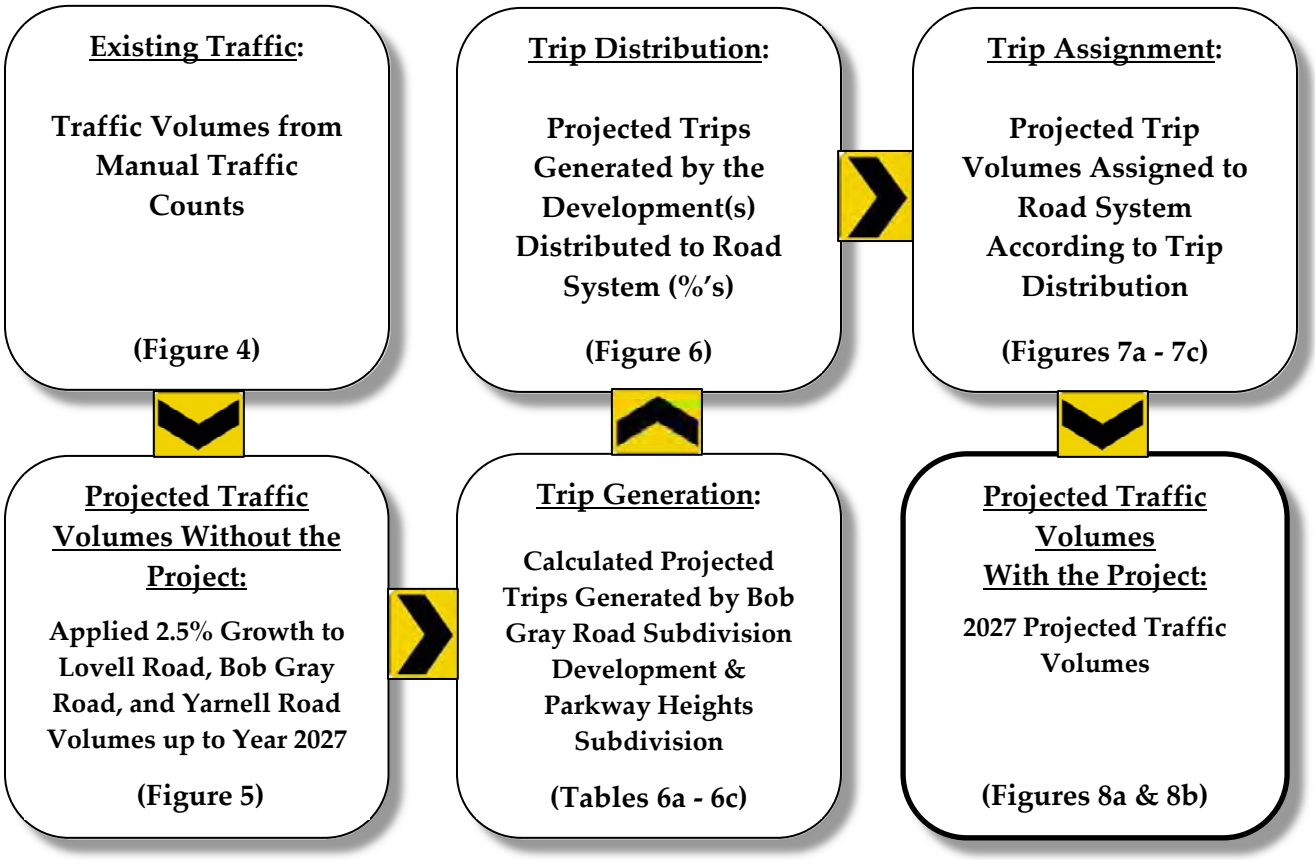
FIGURE 7c

Bob Gray Road Subdivision

Traffic Assignment of Generated Traffic during AM and PM Peak Hour - Lovell Crossing Development

- **PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT:**

Several additive steps were taken to estimate the total projected traffic volumes at the studied intersections on Bob Gray Road when the development is constructed and fully occupied in 2027. The steps are illustrated below for clarity and review:



The calculated peak hour traffic generated by the Bob Gray Road Subdivision development was added to the 2027 horizon year traffic by following the predicted trip distributions and assignments. This procedure was completed to obtain the total projected traffic volumes at the studied intersections when the Bob Gray Road Subdivision development is fully built and occupied in 2027. In addition to the Bob Gray Road Subdivision trips, projected 2027 volumes were also calculated to include the additional trips if Parkway Heights loses its access to Pellissippi Parkway, with residents diverted through the Bob Gray Road Subdivision for external road access. The calculations also included trips from the nearby proposed Lovell Crossing Development that will be opened in 2027.

Figure 8a shows the projected 2027 AM and PM peak hour volumes for the Bob Gray Road Subdivision trips only, plus the trips from the proposed Lovell Crossing Development. Figure

8b includes the worst-case scenario, which includes the projected 2027 AM and PM peak hour volumes for the Bob Gray Road Subdivision trips, the diverted trips from the Parkway Heights Townhouses, and the proposed Lovell Crossing Development trips.

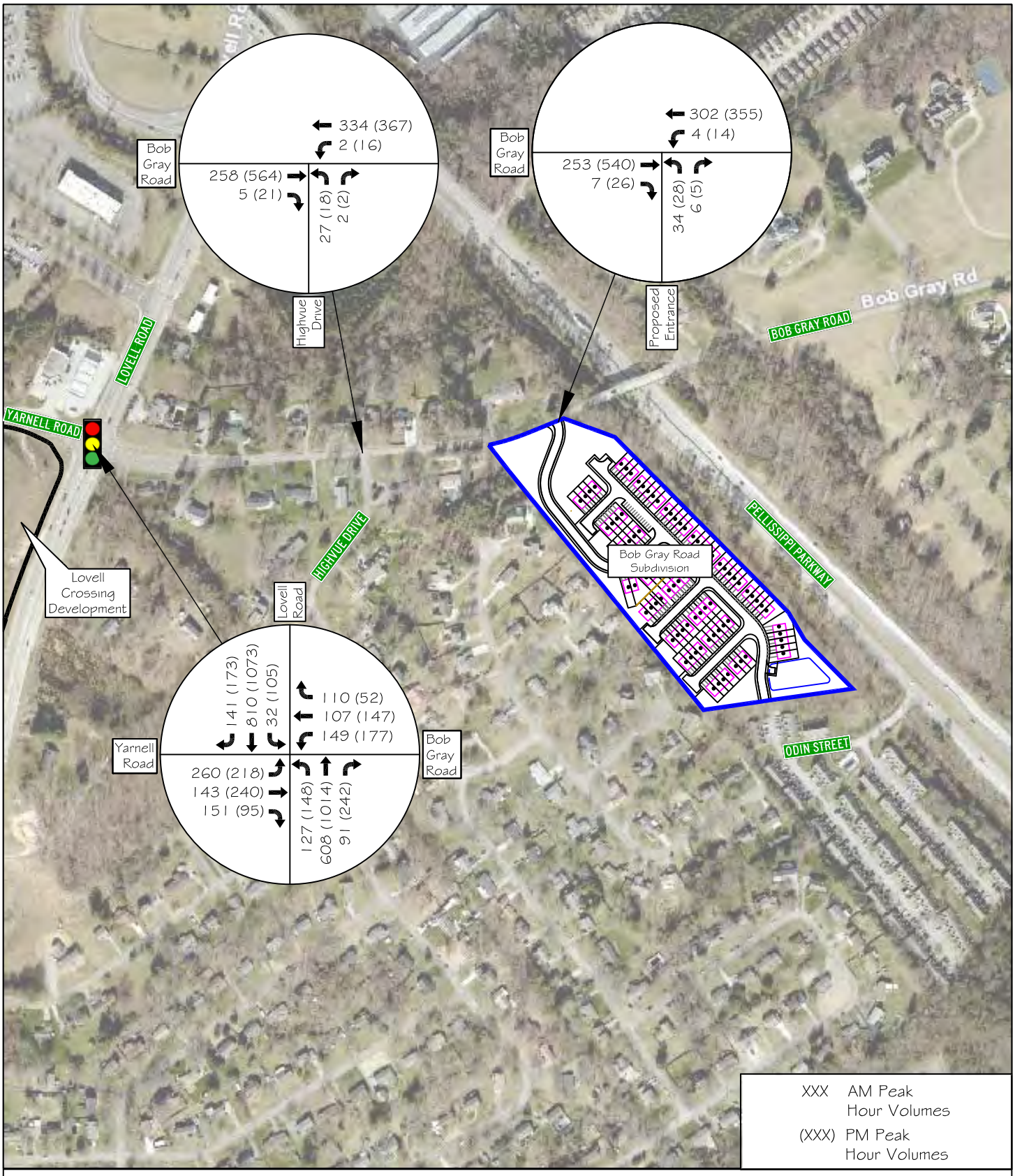


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FIGURE 8a

Bob Gray Road Subdivision

2027 Peak Hour Traffic Volumes - PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT - Bob Gray Road Subdivision Only + Lovell Crossing Development

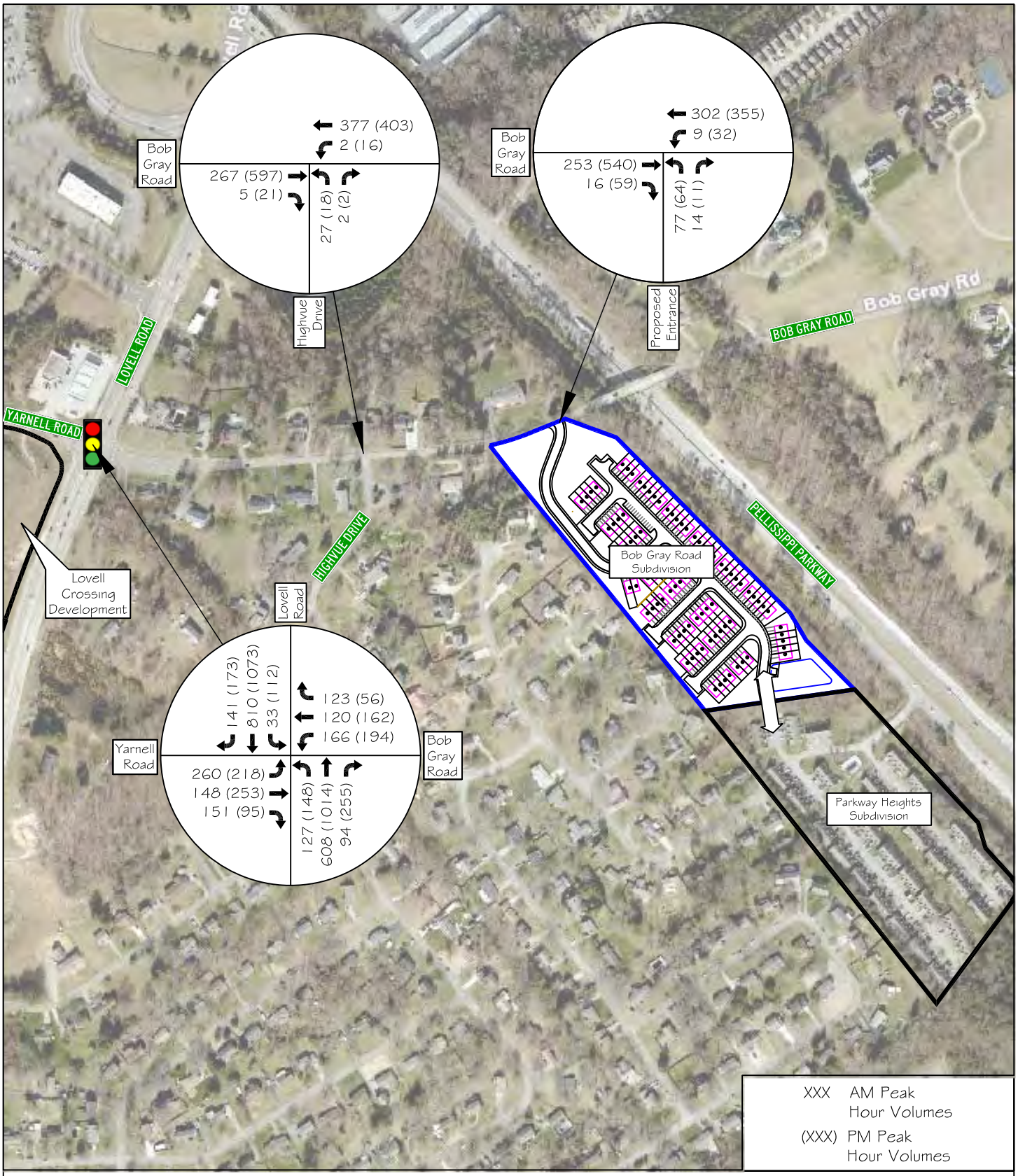

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FIGURE 8b

Bob Gray Road Subdivision

2027 Peak Hour Traffic Volumes - PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT - Combined Residential Subdivisions + Lovell Crossing Development

Capacity analyses were conducted to determine the projected LOS with the development traffic in 2027, shown in Figures 8a and 8b. Intersection capacity results from the projected 2027 peak hour traffic are shown in Tables 7a and 7b. Table 7a shows the projected 2027 AM and PM peak hour results for the Bob Gray Road Subdivision trips only, plus the trips from the Lovell Crossing Development. Table 7b shows the projected 2027 AM and PM peak hour worst-case results for the Bob Gray Road Subdivision trips, plus the diverted trips from the Parkway Heights Townhouses and the Lovell Crossing Development trips.

Appendix G includes the worksheets for the projected 2027 peak hour capacity analyses. The signal timings were not changed or optimized for the projected 2027 conditions results shown in the tables. As shown in Tables 7a and 7b, the unsignalized intersections are calculated to operate adequately with reasonable vehicle delays in the projected 2027 conditions. However, the signalized intersection of Lovell Road at Bob Gray Road and Yarnell Road is calculated to have very high vehicle delays, especially for the eastbound and westbound approaches of Yarnell Road and Bob Gray Road in the PM peak hour.

TABLE 7a
2027 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT
Bob Gray Road Subdivision Only + Lovell Crossing Development

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS [a]	DELAY [b] (seconds)	v/c [c]	LOS [a]	DELAY [b] (seconds)	v/c [c]
Lovell Road (SB & NB) at Bob Gray Road (WB) and Yarnell Road (EB)	Signalized	Eastbound	D	42.1		F	189.8	
		Westbound	D	47.8		E	63.5	
		Northbound	B	20.0		B	17.5	
		Southbound	C	32.7		C	23.5	
		Summary	C	32.8		D	50.3	
Bob Gray Road (WB & EB) at Highvue Drive (NB)	Unsignalized	Northbound Left/Right	B	13.6	0.080	C	17.7	0.102
		Westbound Left	A	8.7	0.004	A	9.0	0.038
Bob Gray Road (WB & EB) at Proposed Entrance (NB)	Unsignalized	Northbound Left/Right	B	13.4	0.094	D	27.7	0.188
		Westbound Left	A	7.8	0.003	A	9.4	0.019

Note: All analyses were calculated in Synchro 12 software and reported with HCM 7th Edition methodology
[a] Level of Service , [b] Average Delay (sec/vehicle) , [c] Volume-to-Capacity Ratio

TABLE 7b
2027 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT
Combined Residential Subdivisions + Lovell Crossing Development

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS [a]	DELAY [b] (seconds)	v/c [c]	LOS [a]	DELAY [b] (seconds)	v/c [c]
Lovell Road (SB & NB) at Bob Gray Road (WB) and Yarnell Road (EB)	Signalized	Eastbound	D	42.6		F	213.5	
		Westbound	D	48.9		E	73.2	
		Northbound	C	20.5		B	17.7	
		Southbound	C	33.9		C	23.5	
		Summary	C	33.9		E	55.4	
Bob Gray Road (WB & EB) at Highvue Drive (NB)	Unsignalized	Northbound Left/Right	B	14.3	0.086	C	19.0	0.111
		Westbound Left	A	8.8	0.004	A	9.1	0.040
Bob Gray Road (WB & EB) at Proposed Entrance (NB)	Unsignalized	Northbound Left/Right	B	15.0	0.219	E	43.5	0.480
		Westbound Left	A	7.8	0.008	A	9.6	0.044

Note: All analyses were calculated in Synchro 12 software and reported with HCM 7th Edition methodology
[a] Level of Service , [b] Average Delay (sec/vehicle) , [c] Volume-to-Capacity Ratio

- **POTENTIAL TRANSPORTATION SAFETY ISSUES:**

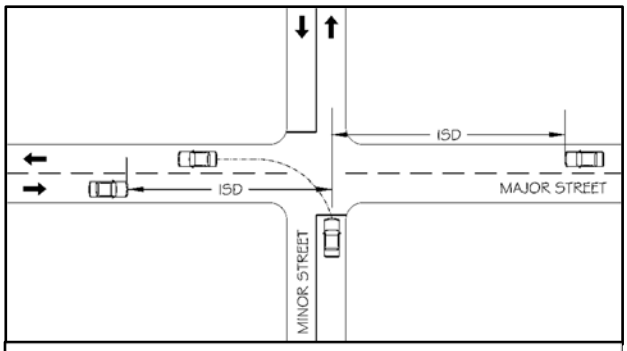
The study area was investigated for potential existing and future safety issues when the development is constructed. These transportation features are discussed in the following pages.

- **EVALUATION OF SIGHT DISTANCE**

For intersections, sight distance evaluations have two categories: Stopping Sight Distance (SSD) and Intersection Sight Distance (ISD).

Methodology:
SSD is the distance required for a motorist on a major street to perceive, react, and the vehicle to come to a complete stop before colliding with an object on the road. For evaluating intersections, this object would be another vehicle entering the intersection from a minor street. SSD can be considered the minimum visibility distance standard for evaluating the safety of an intersection.

ISD is the required visibility distance standard for evaluating the safety of an intersection per section 3.04.J.5 in the Knoxville-Knox County Subdivision Regulations. ISD is based on the time required to perceive, react, and complete the desired traffic maneuver once a motorist on a minor street decides to perform a traffic maneuver.



Intersection Sight Distance Diagram

Three traffic maneuvers are available for vehicles stopped on a minor street at a 4-way intersection: (1) left-turn, (2) right-turn, (3) or a crossing maneuver across the major street. For turns from the minor street, ISD is needed to allow a stopped motorist to turn onto a major street without being overtaken by an approaching vehicle. The most critical ISD is for left turns from the minor street. The ISD for this maneuver includes the time to turn left and clear half of the intersection without conflicting with the oncoming traffic from the left and accelerating to the road's operating speed without causing the approaching vehicles from the right to reduce their speed substantially.

Bob Gray Road has a posted speed limit of 40-mph. Based on Knox County's policy of requiring 10 feet of sight distance per 1-mph of speed, the required intersection sight distance is 400 feet. Batson, Himes, Norvell, and Poe measured the sight distance from the Proposed Entrance location and determined that the available sight distance is adequate. The sight distance was measured to be 415 feet to the west and over 500 feet to the east from the Proposed Entrance location. A vertical curve on Bob Gray Road west of the Proposed Entrance limits the visual distance beyond 415 feet.

Images of the existing sight distances at the Proposed Entrance location are labeled below with the ISD and land surveyor-measured sight distances.

View of Sight Distance on Bob Gray Road at the Proposed Entrance Location (Looking West)

View of Sight Distance on Bob Gray Road at the Proposed Entrance Location (Looking East)

- **EVALUATION OF TURN LANE THRESHOLDS**

The need for separate entering turn lanes was evaluated in the projected 2027 conditions for the Proposed Entrance at Bob Gray Road.

The criteria used for these turn lane evaluations were based on Knox County's "Access Control and Driveway Design Policy". This design policy relates vehicle volume thresholds based on prevailing speeds for two-lane and four-lane roadways. The location of the Proposed Entrance on Bob Gray Road is within a 40-mph speed zone; thus, it was evaluated based on this speed.

For the scenario that only includes the Bob Gray Road Subdivision, separate turn lanes on Bob Gray Road at the Proposed Entrance will not be warranted based on the projected peak hour 2027 traffic volumes. For the scenario which includes the Bob Gray Road Subdivision and the diverted trips from Parkway Heights, a separate eastbound right-turn lane and a separate westbound left-turn lane on Bob Gray Road at the Proposed Entrance will be warranted based on the projected PM peak hour 2027 traffic volumes. The worksheets for these evaluations are provided in Appendix J.

- **PROJECTED VEHICLE QUEUES**

An additional software program calculated the 2027 AM and PM peak hour projected vehicle queues at the studied intersections. The previously mentioned Synchro Traffic Software includes SimTraffic. The Synchro portion of the software performs the macroscopic calculations for intersections, and SimTraffic performs micro-simulation and animation of vehicular traffic. SimTraffic software was utilized to estimate the projected vehicle queues.

The 95th percentile vehicle queue is the recognized measurement in the traffic engineering profession as the design standard used when considering vehicle queue lengths. A 95th percentile vehicle queue length means 95% certainty that the vehicle queue will not extend beyond that point. The calculated vehicle queue results were based on averaging the outcome obtained during ten traffic simulations in the software. The 95th percentile vehicle queue lengths at the intersections are shown in Table 8a for the projected 2027 conditions with the Bob Gray Road Subdivision only. Table 8b shows the 95th percentile vehicle queue lengths for the projected 2027 conditions with the combined residential subdivisions. The vehicle queue worksheet results from the SimTraffic software are in Appendix K.

TABLE 8a
TURN LANE STORAGE & VEHICLE QUEUE SUMMARY -
2027 PROJECTED PEAK HOUR TRAFFIC WITH THE PROJECT
Bob Gray Road Subdivision Only + Lovell Crossing Development

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	STORAGE LENGTH (ft)	SIMTRAFFIC 95th PERCENTILE QUEUE LENGTH (ft)		ADEQUATE LENGTH?
				AM PEAK HOUR	PM PEAK HOUR	
Lovell Road (SB & NB) at Bob Gray Road (WB) and Yarnell Road (EB)	Signalized	Eastbound Left	180	216	317	NO
		Eastbound Thru	n/a	174	557	n/a
		Eastbound Right	300	80	600	NO
		Westbound Left	175	131	208	NO
		Westbound Thru	n/a	126	228	n/a
		Westbound Right	215	58	44	✓
		Northbound Left	TWLTL	116	193	✓
		Northbound Thru *	n/a	197	325	n/a
		Northbound Right	245	45	89	✓
		Southbound Left	220	117	200	✓
		Southbound Thru	n/a	328	396	n/a
		Southbound Thru/Right	n/a	279	361	n/a
Bob Gray Road (WB & EB) at Highvue Drive (NB)	Unsignalized	Westbound Left/Thru	n/a	10	35	n/a
		Northbound Left/Right	n/a	44	39	n/a
Bob Gray Road (WB & EB) at Proposed Entrance (NB)	Unsignalized	Westbound Left/Thru	n/a	14	40	n/a
		Northbound Left/Right	n/a	49	48	n/a

Note: 95th percentile queues were calculated in SimTraffic 11 software
* Longest queue in dual thru lanes

TABLE 8b
TURN LANE STORAGE & VEHICLE QUEUE SUMMARY -
2027 PROJECTED PEAK HOUR TRAFFIC WITH THE PROJECT
Combined Residential Subdivisions + Lovell Crossing Development

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	STORAGE LENGTH (ft)	SIMTRAFFIC 95th PERCENTILE QUEUE LENGTH (ft)		ADEQUATE LENGTH?
				AM PEAK HOUR	PM PEAK HOUR	
Lovell Road (SB & NB) at Bob Gray Road (WB) and Yarnell Road (EB)	Signalized	Eastbound Left	180	220	330	NO
		Eastbound Thru	n/a	194	596	n/a
		Eastbound Right	300	100	602	NO
		Westbound Left	175	150	244	NO
		Westbound Thru	n/a	144	346	n/a
		Westbound Right	215	60	174	✓
		Northbound Left	TWLTL	119	186	✓
		Northbound Thru *	n/a	208	313	n/a
		Northbound Right	245	45	93	✓
		Southbound Left	220	119	211	✓
		Southbound Thru	n/a	328	392	n/a
		Southbound Thru/Right	n/a	282	349	n/a
Bob Gray Road (WB & EB) at Highvue Drive (NB)	Unsignalized	Westbound Left/Thru	n/a	9	38	n/a
		Northbound Left/Right	n/a	43	42	n/a
Bob Gray Road (WB & EB) at Proposed Entrance (NB)	Unsignalized	Westbound Left/Thru	n/a	19	52	n/a
		Northbound Left/Right	n/a	63	61	n/a

Note: 95th percentile queues were calculated in SimTraffic 11 software
* Longest queue in dual thru lanes

Tables 8a and 8b show considerable projected vehicle queue lengths at the signalized intersection of Lovell Road at Bob Gray Road and Yarnell Road in the 2027 peak hour conditions in both scenarios, with many extending beyond the available vehicle storage.

However, the projected vehicle queues for the exiting traffic in the 2027 AM and PM peak hours at the Proposed Entrance are calculated to be very reasonable for either scenario. The longest queue on the northbound (exiting) approach of the Proposed Entrance at Bob Gray Road is calculated to occur for the scenario with combined residential subdivisions (Table 8b). In this scenario, the longest queue on the northbound (exiting) approach of the Proposed Entrance at Bob Gray Road with a shared left/right lane was calculated to be nearly three vehicles, assuming a length of 25 feet per vehicle.

CONCLUSIONS & RECOMMENDATIONS

The following is an overview of recommendations to minimize the transportation impacts of the Bob Gray Road Subdivision development on the adjacent transportation system while attempting to achieve an acceptable traffic flow and safety level. The recommendations also take into account if Parkway Heights loses its access to Pellissippi Parkway and its trips are routed through the Bob Gray Road Subdivision.

Lovell Road at Bob Gray Road and Yarnell Road: The 2027 projected level of service calculations for this intersection resulted in high vehicle delays and poor LOS for the westbound and eastbound approaches of Bob Gray Road and Yarnell Road, particularly in the PM peak hour. The Synchro software was used to optimize the traffic signal phases to combat these poor results.

The signal timing for the projected 2027 PM peak hour volumes was optimized in the Synchro software while keeping the same cycle lengths in the AM and PM peak periods since the intersection is in a coordinated system. This optimization substantially reduced vehicle delays for the westbound and eastbound approaches and reduced the vehicle queue lengths. However, the optimization results in the mainline traffic on Lovell Road having slightly increased vehicle delays and queue lengths in the PM peak hour.

The capacity analysis results of this modified AM and PM signal timing are shown below in Tables 9a and 9b. The capacity analysis results are included in Appendix G. The optimization results are presented for the two scenarios included in the report, one for the Bob Gray Road Subdivision only (plus the Lovell Crossing Development) and the other for the combined residential subdivisions (plus the Lovell Crossing Development).

The results in Tables 9a and 9b show the potential reduction in vehicle delays and queues in the AM and PM peak hours due to software optimization compared to the AM and PM peak hour results (Tables 7a and 8a), leaving the traffic signal timing as-is. The results shown in Tables 9a and 9b are for the Bob Gray Road Subdivision only scenario (plus the Lovell Crossing Development). Green and red in the table denote the changes, showing the decreases and increases, respectively.

TABLE 9a
2027 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT - MODIFIED SIGNAL TIMING
Bob Gray Road Subdivision Only + Lovell Crossing Development

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS [a]	DELAY [b] (seconds)	CHANGE [c] (seconds)	LOS [a]	DELAY [b] (seconds)	CHANGE [c] (seconds)
Lovell Road (SB & NB) at Bob Gray Road (WB) and Yarnell Road (EB)	Signalized	Eastbound	D	37.3	-4.8	D	51.2	-138.6
		Westbound	D	38.7	-9.1	D	48.5	-15.0
		Northbound	B	15.9	-4.1	C	23.2	5.7
		Southbound	C	27.9	-4.8	C	32.4	8.9
		Summary	C	27.6	-5.2	C	33.4	-16.9

Note: All analyses were calculated in Synchro 12 software and reported with HCM 7th Edition methodology
[a] Level of Service , [b] Average Delay (sec/vehicle)
[c] Difference between 2027 Projected Vehicle Delay (Table 7a) versus 2027 Projected Vehicle Delay with Revised Signal Timing (Table 9a, this table)

TABLE 9b
TURN LANE STORAGE & VEHICLE QUEUE SUMMARY -
2027 PROJECTED PEAK HOUR TRAFFIC WITH THE PROJECT - MODIFIED SIGNAL TIMING
Bob Gray Road Subdivision Only + Lovell Crossing Development

INTERSECTION	APPROACH/ MOVEMENT	SIMTRAFFIC 95th PERCENTILE QUEUE LENGTH (ft)			
		AM PEAK HOUR	CHANGE [a] (feet)	PM PEAK HOUR	CHANGE [a] (feet)
Lovell Road (SB & NB) at Bob Gray Road (WB) and Yarnell Road (EB)	Eastbound Left	214	-2	270	-47
	Eastbound Thru	183	9	389	-168
	Eastbound Right	77	-3	171	-429
	Westbound Left	148	17	233	25
	Westbound Thru	139	13	321	93
	Westbound Right	58	0	135	91
	Northbound Left	111	-5	220	27
	Northbound Thru	180	-17	359	34
	Northbound Right	42	-3	117	28
	Southbound Left	102	-15	233	33
	Southbound Thru	302	-26	432	36
	Southbound Thru/Right	257	-22	397	36

Note: 95th percentile queues were calculated in SimTraffic 11 software
[a] Difference between 2027 Projected Vehicle Queue (Table 8a) versus 2027 Projected Vehicle Queue with Modified Signal Timing (Table 9b, this table)

The results in Tables 10a and 10b below show the potential reduction in vehicle delays and queues in the AM and PM peak hours due to software optimization compared to the AM and PM peak hour results (Tables 7b and 8b), leaving the traffic signal timing as-is. These results are for the combined residential subdivisions plus the Lovell Crossing Development scenario. Green and red in the table denote the changes, showing the decreases and increases, respectively.

TABLE 10a
2027 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT - MODIFIED SIGNAL TIMING
Combined Residential Subdivisions + Lovell Crossing Development

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS [a]	DELAY [b] (seconds)	CHANGE [c] (seconds)	LOS [a]	DELAY [b] (seconds)	CHANGE [c] (seconds)
Lovell Road (SB & NB) at Bob Gray Road (WB) and Yarnell Road (EB)	Signalized	Eastbound	D	36.1	-6.5	D	49.6	-163.9
		Westbound	D	39.6	-9.3	D	50.3	-22.9
		Northbound	B	16.7	-3.8	C	24.5	6.8
		Southbound	C	28.6	-5.3	C	34.9	11.4
		Summary	C	28.2	-5.7	C	34.9	-20.5

Note: All analyses were calculated in Synchro 12 software and reported with HCM 7th Edition methodology
[a] Level of Service , [b] Average Delay (sec/vehicle)
[c] Difference between 2027 Projected Vehicle Delay (Table 7b) versus 2027 Projected Vehicle Delay with Revised Signal Timing (Table 10a, this table)

TABLE 10b
TURN LANE STORAGE & VEHICLE QUEUE SUMMARY -
2027 PROJECTED PEAK HOUR TRAFFIC WITH THE PROJECT - MODIFIED SIGNAL TIMING
Combined Residential Subdivisions + Lovell Crossing Development

INTERSECTION	APPROACH/ MOVEMENT	SIMTRAFFIC 95th PERCENTILE QUEUE LENGTH (ft)			
		AM PEAK HOUR	CHANGE [a] (feet)	PM PEAK HOUR	CHANGE [a] (feet)
Lovell Road (SB & NB) at Bob Gray Road (WB) and Yarnell Road (EB)	Eastbound Left	225	5	275	-55
	Eastbound Thru	187	-7	407	-189
	Eastbound Right	80	-20	181	-421
	Westbound Left	163	13	235	-9
	Westbound Thru	151	7	280	-66
	Westbound Right	60	0	80	-94
	Northbound Left	110	-9	235	49
	Northbound Thru	181	-27	368	55
	Northbound Right	42	-3	114	21
	Southbound Left	81	-38	245	34
	Southbound Thru	298	-30	439	47
	Southbound Thru/Right	254	-28	406	57

Note: 95th percentile queues were calculated in SimTraffic 11 software
[a] Difference between 2027 Projected Vehicle Queue (Table 8b) versus 2027 Projected Vehicle Queue with Modified Signal Timing (Table 10b, this table)

Based on these results, Knox County Engineering is recommended to modify the traffic signal timing to reduce the considerable vehicle delays for the westbound and eastbound approaches on Bob Gray Road and Yarnell Road in the existing and projected conditions. The recommended optimization signal timing changes for the green times are shown in Table 11.

TABLE 11
TRAFFIC SIGNAL GREEN TIME MODIFICATIONS
LOVELL ROAD AT BOB GRAY ROAD AND YARNELL ROAD

AM PEAK HOUR				
PHASE #	MOVEMENT	EXISTING GREEN TIME (seconds)	OPTIMIZED GREEN TIME * (seconds)	CHANGE (seconds)
1	Southbound Left	15	11	-4
2	Northbound Thru/Right	42	51	9
3	Eastbound Left	25	21	-4
4	Westbound Thru/Right	18	17	-1
5	Northbound Left	15	15.4	0.4
6	Southbound Thru/Right	42	46.6	4.6
7	Westbound Left	20	15	-5
8	Eastbound Thru/Right	23	23	0
PM PEAK HOUR				
PHASE #	MOVEMENT	EXISTING GREEN TIME (seconds)	OPTIMIZED GREEN TIME * (seconds)	CHANGE (seconds)
1	Southbound Left	22	14	-8
2	Northbound Thru/Right	62	61	-1
3	Eastbound Left	18	20	2
4	Westbound Thru/Right	18	25	7
5	Northbound Left	19	17.5	-1.5
6	Southbound Thru/Right	65	57.5	-7.5
7	Westbound Left	18	17	-1
8	Eastbound Thru/Right	18	28	10

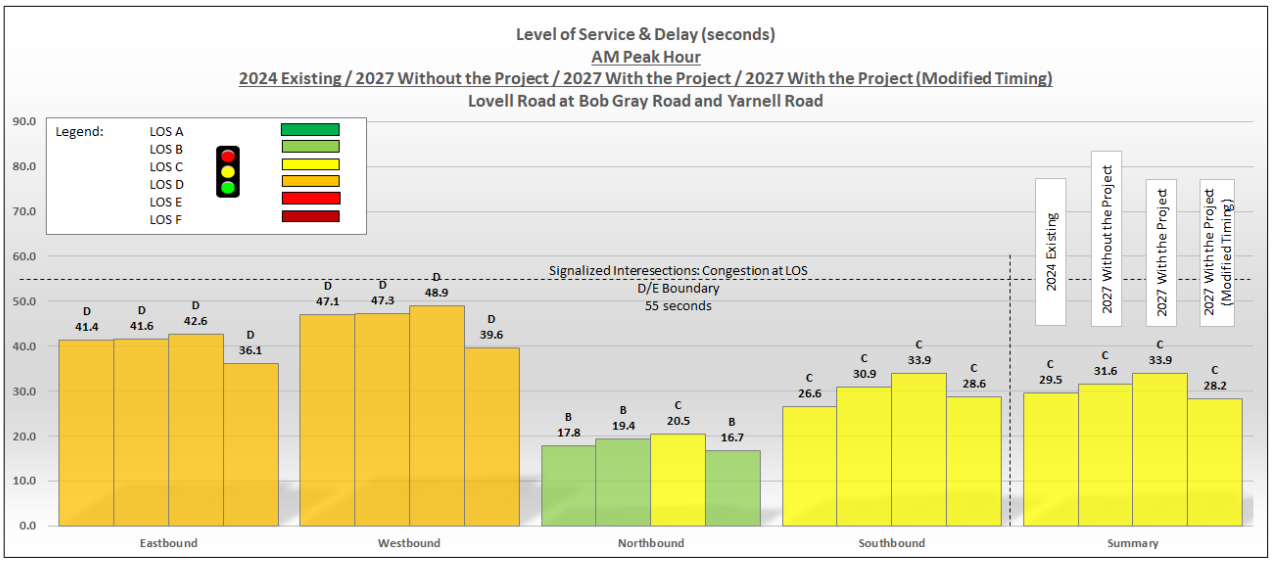
* Optimized output from Synchro 12

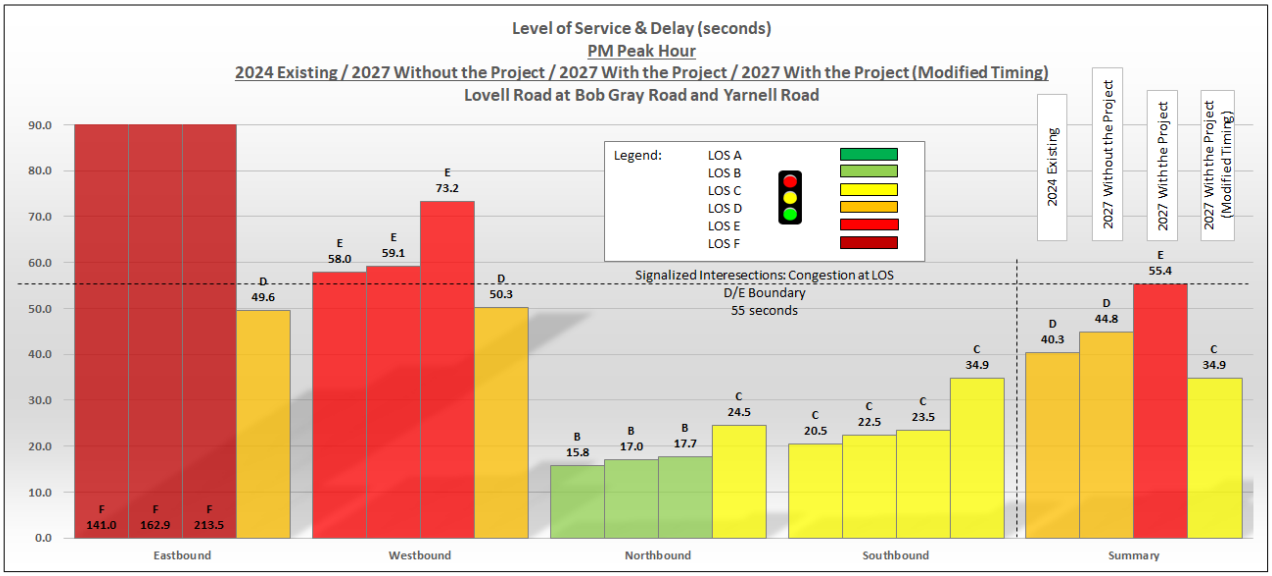
A summary of the Lovell Road at Bob Gray Road and Yarnell Road intersection capacity analyses are presented in Table 12. This table provides a side-by-side summary and comparison of the intersection for the 2024 existing conditions, projected conditions in 2027 without the project, the projected conditions in 2027 with the project (with the Bob Gray Road Subdivision, Parkway Heights Townhouses, and Lovell Crossing Development), and the projected conditions in 2027 (with all the developments) with the modified signal timing. As can be seen in Table 12, the optimization provided significant benefits in reducing vehicle delays in the projected 2027 conditions.

TABLE 12
INTERSECTION CAPACITY ANALYSIS SUMMARY
LOVELL ROAD AT BOB GRAY ROAD AND YARNELL ROAD

APPROACH / PEAK HOUR MOVEMENT	2024 EXISTING		2027 WITHOUT THE PROJECT		2027 WITH THE PROJECT *		2027 WITH THE PROJECT * (MODIFIED TIMING)	
	LOS[a]	Delay[b]	LOS[a]	Delay[b]	LOS[a]	Delay[b]	LOS[a]	Delay[b]
AM Peak								
Eastbound	D	41.4	D	41.6	D	42.6	D	36.1
Westbound	D	47.1	D	47.3	D	48.9	D	39.6
Northbound	B	17.8	B	19.4	C	20.5	B	16.7
Southbound	C	26.6	C	30.9	C	33.9	C	28.6
Summary	C	29.5	C	31.6	C	33.9	C	28.2
PM Peak								
Eastbound	F	141.0	F	162.9	F	213.5	D	49.6
Westbound	E	58.0	E	59.1	E	73.2	D	50.3
Northbound	B	15.8	B	17.0	B	17.7	C	24.5
Southbound	C	20.5	C	22.5	C	23.5	C	34.9
Summary	D	40.3	D	44.8	E	55.4	C	34.9

Note: All analyses were calculated in Synchro 12 software and reported with HCM 7th Edition methodology
[a] Level of Service , [b] Average Delay (sec/vehicle)
* Includes Bob Gray Road Subdivision, Parkway Heights Townhouses, and Lovell Crossing Development





Bob Gray Road at the Proposed Entrance: The 2027 projected level of service calculations for this intersection resulted in average vehicle delays and LOS. Poorer LOS results were calculated for the northbound exiting approach in the PM peak hour.

2a) For the scenario that only includes the Bob Gray Road Subdivision, separate turn lanes on Bob Gray Road at the Proposed Entrance will not be warranted based on the projected peak hour 2027 traffic volumes. For the scenario which includes the Bob Gray Road Subdivision and the diverted trips from the Parkway Heights Townhouses, a separate eastbound right-turn lane and a separate westbound left-turn lane on Bob Gray Road at the Proposed Entrance will be warranted based on the projected PM peak hour 2027 traffic volumes.

Due to the limited development property road frontage along Bob Gray Road, the eastbound right-turn lane would need to be designed and constructed with a minimal lane taper and maximum deceleration length possible within the confines of the property road frontage. Based on the site plan, the horizontal distance between the centerline of the Proposed Entrance and the western property line at Bob Gray Road is 230 feet. The civil site designer would need to coordinate the design of this turn lane with Knox County and include a white right-turn arrow and lane lines on the pavement for this exclusive lane.

A separate westbound left-turn lane is shown to be warranted in this study in the projected 2027 conditions if Parkway Heights loses its road access to Pellissippi Parkway and is diverted through the new Bob Gray Road Subdivision for road access to Bob Gray Road. The Proposed Entrance location on Bob Gray Road will be just west of the overpass bridge on Bob Gray Road over Pellissippi Parkway. Providing a westbound left-turn lane at the Proposed Entrance on Bob Gray Road would necessitate substantial construction costs due to the limited width of the overpass bridge on Bob Gray Road over Pellissippi Parkway. This overpass bridge has a width of approximately 30 feet between barrier faces. This width would not be conducive for three lanes of traffic while providing an adequate safe buffer from the barrier walls. Furthermore, the future greenway referenced earlier stated that this overpass bridge would be the preferred route, which would not be achievable if three lanes for automobile traffic were proposed without widening the overpass bridge.

Furthermore, according to the local trip generation calculations, the entering volumes for the 123 townhouses in the Parkway Heights Townhouses are calculated to be 51 trips in the PM peak hour, which, in combination with the trips from the Bob Gray Road Subdivision, meets the threshold for a westbound left-turn lane. However, the traffic counts determined that 18 vehicles entered the Parkway Heights Townhouses during the PM peak hour, which is substantially less (nearly three times less) than the calculated theoretical value. Thus, due to these realities, a separate westbound left-turn lane on Bob Gray Road is not likely feasible and recommended even if the Parkway Heights Townhouses traffic is diverted. Likewise, due to the probability of over-estimating generated tips, the projected LOS E conditions for the exiting lane at Bob Gray Road are not expected, as shown in Table 7b, and will have much shorter vehicle delays.

2b) Due to the vertical curve on Bob Gray Road to the west and the overpass bridge to the east, it is recommended that advance intersection warning signs be installed on Bob Gray Road to the east and west of the Proposed Entrance. These warning signs should be Side Road Intersection Signs (W2-2r and W2-2l). The signs should be installed in both directions on Bob Gray Road, preferably no less than 450 feet in advance of the Proposed Entrance.

2c) It is recommended that a Stop Sign (R1-1) be installed and a 24" white stop bar be applied to the Proposed Entrance approach at Bob Gray Road. The stop bar should be applied a minimum of 4 feet away from the edge of Bob Gray Road and placed at the desired stopping point that maximizes the sight distance.

2d) A single exit lane for the Bob Gray Road development entrance will be sufficient. The northbound exiting lane at Bob Gray Road is proposed as a shared left/right turn lane.

The longest vehicle queue in the projected 2027 conditions on this exiting approach is calculated to be 49 feet in the AM peak hour and 48 feet in the PM peak hour for the scenario that only includes the Bob Gray Road Subdivision. These queue lengths are reasonable and translate to just two passenger cars, assuming a length of 25 feet per vehicle. The longest vehicle queue in the projected 2027 conditions on this exiting approach is calculated to be 63 feet in the AM peak hour and 61 feet in the PM peak hour for the worst-case scenario that includes the Bob Gray Road Subdivision and the

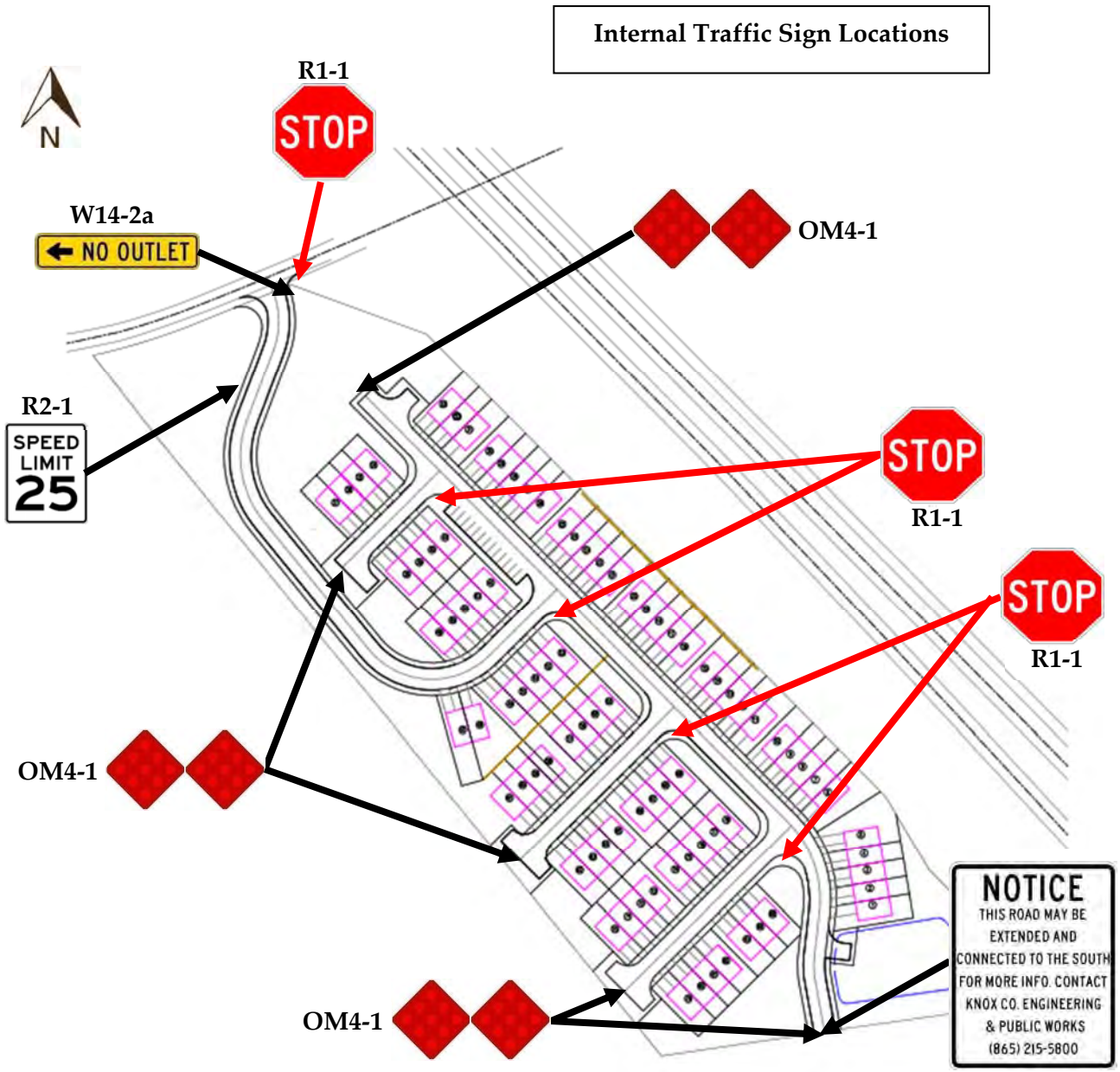
diverted trips from the Parkway Heights Townhouses. These queue lengths are reasonable and translate to nearly three passenger cars.

2e) Intersection sight distance at the Proposed Entrance at Bob Gray Road must not be impacted by future landscaping, signage, or existing or future vegetation. Based on a posted speed limit of 40-mph on Bob Gray Road, the required intersection sight distance is 400 feet for exiting left and right-turning vehicles. The existing sight distances at the Proposed Entrance location were estimated visually to be adequate in both directions and were also certified by a land surveyor.

3 **Bob Gray Road Subdivision Internal Roads:** The layout plan shows a single entrance at Bob Gray Road constructed for the development, as shown in Figure 3.

3a) A 25-mph Speed Limit (R2-1) sign is recommended to be posted near the beginning of the development entrance off Bob Gray Road. It is also recommended that a "No Outlet" Sign (W14-2a) be posted at the front of the subdivision. This sign can be posted above or below the street name sign.

3b) The image below shows the recommended internal road signage for the proposed subdivision.



Dual end-of-roadway object markers (OM4-1) should be installed at the end of the internal roads in the subdivision that end in hammerhead turnarounds. These markers should also be installed at the end of Road "A" if the road is not immediately connected to Blinken Street to the south in the Parkway Heights development. Furthermore, if an immediate road connection is not made to Blinken Street, an additional sign should be posted at the end of Road "A" to follow Knoxville-Knox County Subdivision regulations. This sign is for notification of a possible future street connection. It should state, "NOTICE – This road may be extended and connected to the south – for more info. contact Knox Co. Engineering & Public Works (865) 215-5800".

Stop Signs (R1-1) with 24" white stop bars are recommended to be installed at the internal road locations, as shown in the above image.

3c) Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping. With a speed limit of 25-mph in the development, the internal intersection sight distance is 250 feet. The required stopping sight distance is 155 feet for a level road grade. The site designer should ensure that internal sight distance lengths are met and account for different proposed road grades.

3d) It is recommended that a small strip of the development property be reserved as a potential common area for all Bob Gray Road Subdivision residents to walk or ride their bikes to the east. This strip would allow for a pathway to the future Knox to Oak Ridge Greenway if the greenway is constructed adjacent to the subdivision and on the west side of Pellissippi Parkway.

3e) If directed by the local post office, the site designer should include a parking area and a centralized mail delivery center within the development for the subdivision residents.

3f) All drainage grates and covers for the residential development must be pedestrian and bicycle-safe.

3g) Road "A" will have a long, straight road segment. Straight road segments encourage higher vehicle speeds. Additionally, if Parkway Heights loses its access to Pellissippi Parkway, residents from this other development will increase traffic volumes and may contribute to speeding in the Bob Gray Road Subdivision. It is recommended that the civil site designer consider including traffic calming measures on the internal Road "A",

such as speed humps or tables. Specifics regarding this recommendation should be discussed in the design phase with Knox County Engineering.

3h) All road and intersection elements should be designed to AASHTO, TDOT, and Knox County specifications and guidelines to ensure proper transportation operations.

3i) If a connection to Odin Street to the south (Parkway Heights Subdivision) is pursued as part of this project or in the future, then the connection of Odin Street to Pellissippi Parkway must be closed.

APPENDIX A

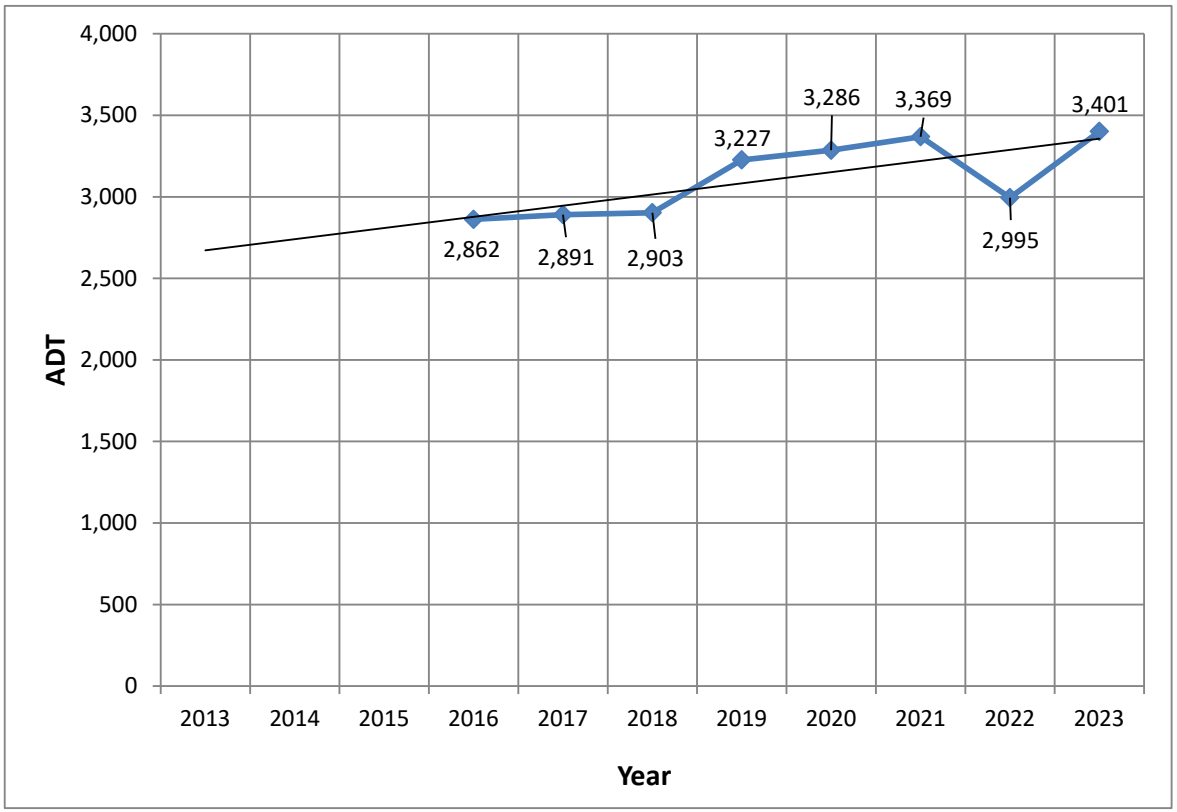
HISTORICAL TRAFFIC COUNT DATA

Historical Traffic Counts

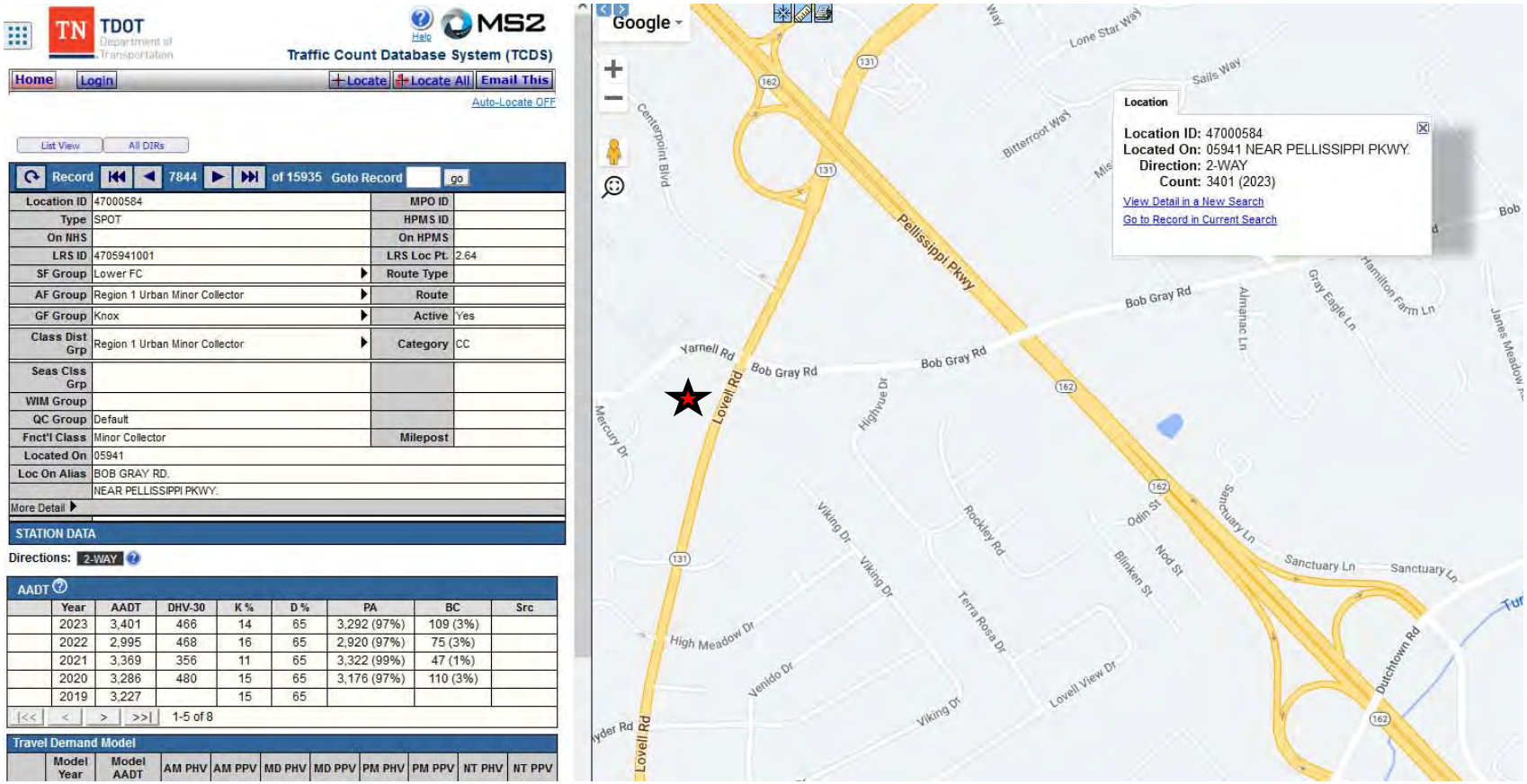
Organization: TDOT
Station ID #: 47000584
Location: Bob Gray Road, east of Pellissippi Parkway

YEAR	ADT
2013	
2014	
2015	
2016	2,862
2017	2,891
2018	2,903
2019	3,227
2020	3,286
2021	3,369
2022	2,995
2023	3,401

Trendline



2016 - 2023 Growth Rate = 18.8%
Average Annual Growth Rate = 2.5%

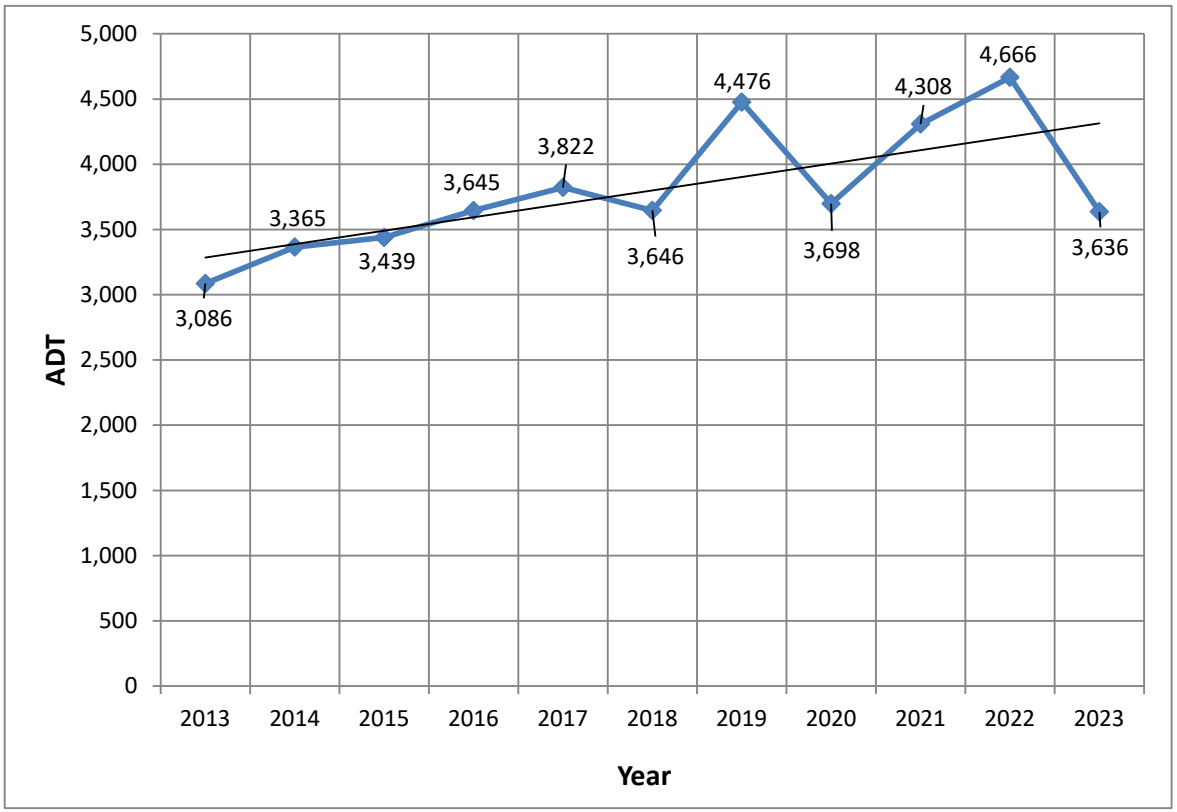

TN TDOT Department of Transportation
Help MS2
Traffic Count Database System (TCDS)
Home
Login
Locate
Locate All
Email This
Auto-Locate OFF
List View
All DIRs
Record 7844 of 15935 Goto Record go
Location ID 47000584
Type SPOT
On NHS
LRS ID 4705941001
SF Group Lower FC
AF Group Region 1 Urban Minor Collector
GF Group Knox
Class Dist Grp Region 1 Urban Minor Collector
Seas Clss Grp
WIM Group
QC Group Default
Fnct'l Class Minor Collector
Located On 05941
Loc On Alias BOB GRAY RD.
NEAR PELLISSIPPI PKWY.
More Detail
MPO ID
HPMS ID
On HPMS
LRS Loc Pt. 2.64
Route Type
Route
Active Yes
Category CC
Milepost
STATION DATA
Directions: 2-WAY
AADT
Year AADT DHV-30 K % D % PA BC Src
2023 3,401 466 14 65 3,292 (97%) 109 (3%)
2022 2,995 468 16 65 2,920 (97%) 75 (3%)
2021 3,369 356 11 65 3,322 (99%) 47 (1%)
2020 3,286 480 15 65 3,176 (97%) 110 (3%)
2019 3,227 15 65
1-5 of 8
Travel Demand Model
Model Year Model AADT AM PHV AM PPV MD PHV MD PPV PM PHV PM PPV NT PHV NT PPV
Google
Location
Location ID: 47000584
Located On: 05941 NEAR PELLISSIPPI PKWY.
Direction: 2-WAY
Count: 3401 (2023)
View Detail in a New Search
Go to Record in Current Search
Pellissippi Pkwy
Bob Gray Rd
Yarnell Rd
Lovell Rd
Centerpoint Blvd
Bitterroot Way
Lone Star Way
Sails Way
Almanac Ln
Gray Eagle Ln
Hamilton Farm Ln
Highvue Dr
Mercury Dr
Viking Dr
Rockley Rd
Odin St
Nod St
Blinken St
Sanctuary Ln
Terra Rosa Dr
High Meadow Dr
Venido Dr
Lovell View Dr
Dutchtown Rd
131
162

Historical Traffic Counts

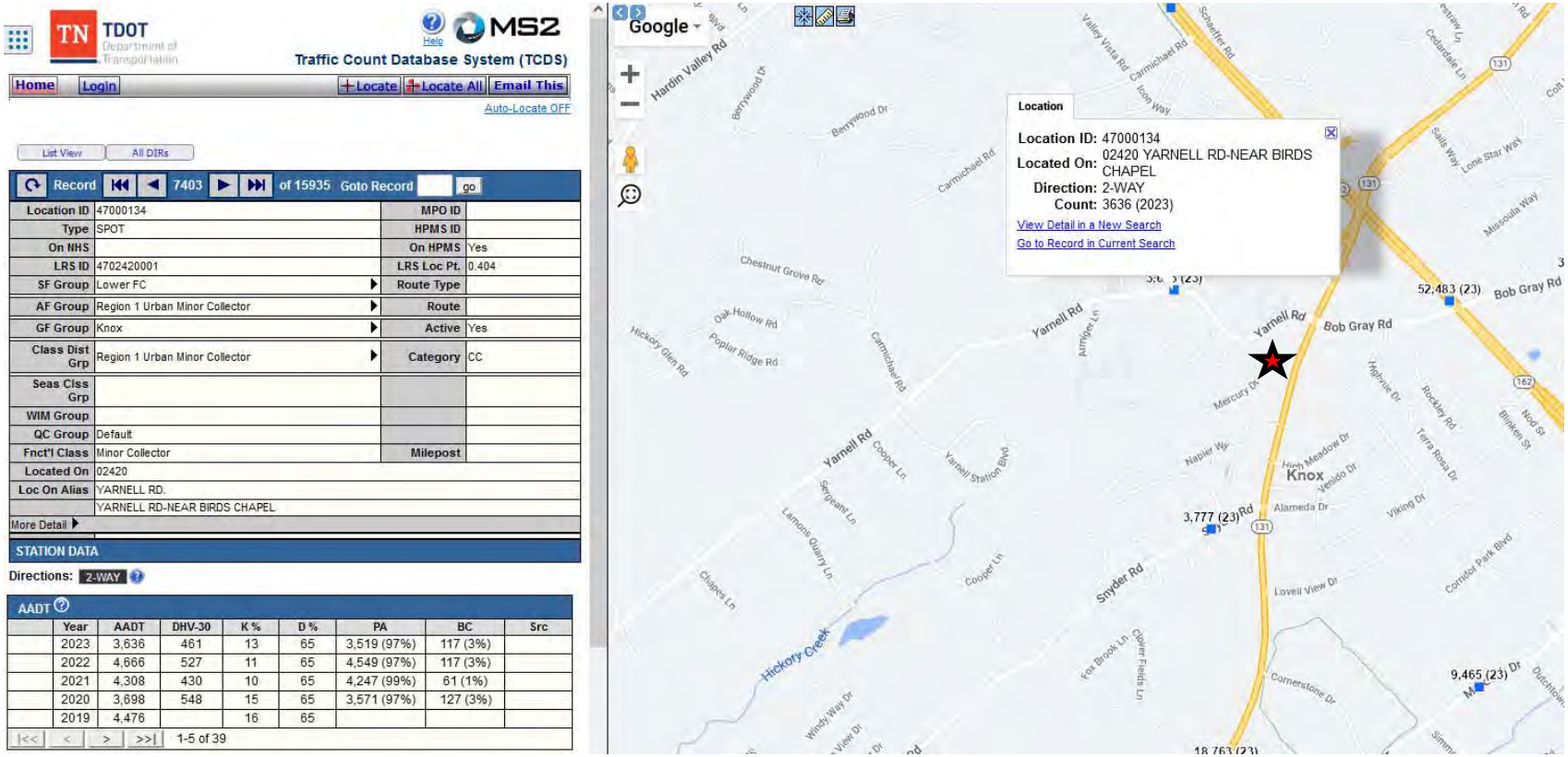
Organization: TDOT
Station ID #: 47000134
Location: Yarnell Road, west of Lovell Road

YEAR	ADT
2013	3,086
2014	3,365
2015	3,439
2016	3,645
2017	3,822
2018	3,646
2019	4,476
2020	3,698
2021	4,308
2022	4,666
2023	3,636

Trendline



2013 - 2023 Growth Rate = 17.8%
Average Annual Growth Rate = 1.7%

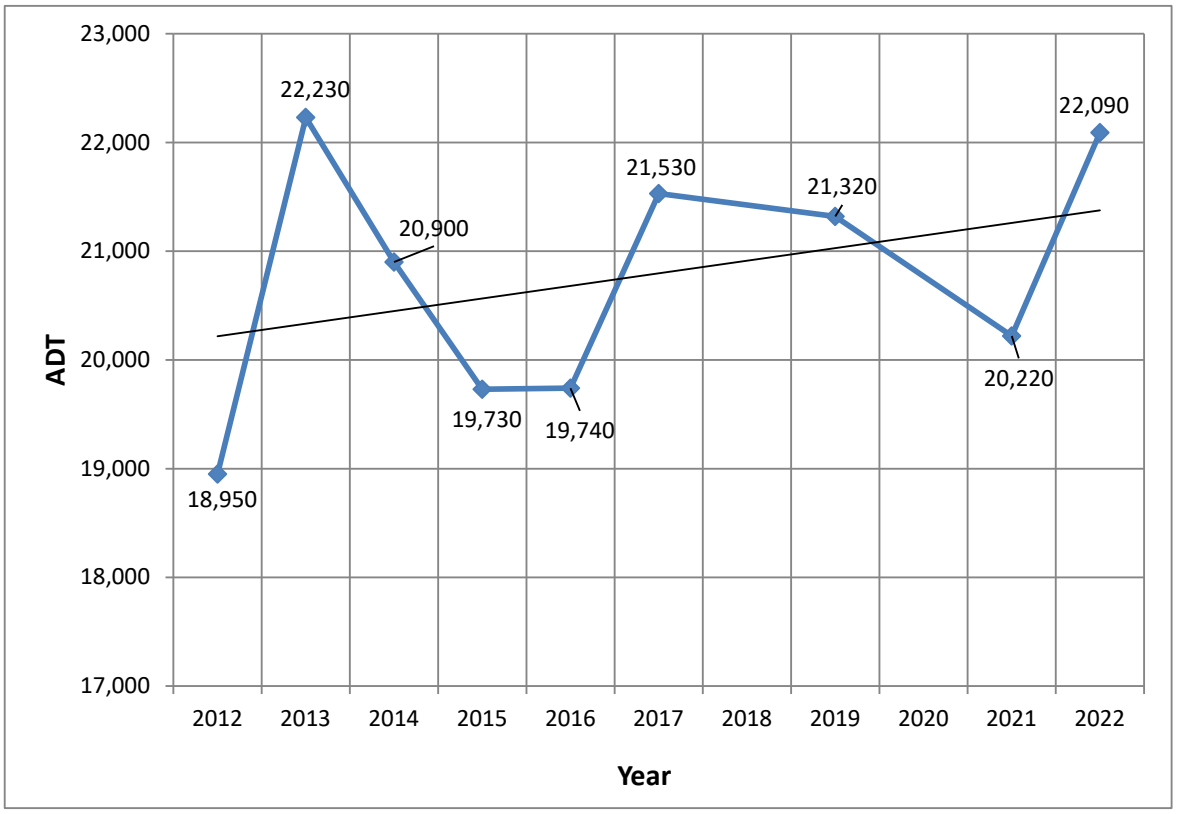

TN TDOT Department of Transportation
MS2
Traffic Count Database System (TCDS)
Home
Login
Locate
Locate All
Email This
Auto-Locate OFF
List View
All DIRs
Record 7403 of 15935 Goto Record go
Location ID 47000134
Type SPOT
On NHS
LRS ID 4702420001
SF Group Lower FC
AF Group Region 1 Urban Minor Collector
GF Group Knox
Class Dist Grp Region 1 Urban Minor Collector
Seas Clss Grp
WIM Group
QC Group Default
Fnct'l Class Minor Collector
Located On 02420
Loc On Alias YARNELL RD.
YARNELL RD-NEAR BIRDS CHAPEL
More Detail
MPO ID
HPMS ID
On HPMS Yes
LRS Loc Pt. 0.404
Route Type
Route
Active Yes
Category CC
Milepost
STATION DATA
Directions: 2-WAY
AADT
Year AADT DHV-30 K % D % PA BC Src
2023 3,636 461 13 65 3,519 (97%) 117 (3%)
2022 4,666 527 11 65 4,549 (97%) 117 (3%)
2021 4,308 430 10 65 4,247 (99%) 61 (1%)
2020 3,698 548 15 65 3,571 (97%) 127 (3%)
2019 4,476 16 65
1-5 of 39
Google
Location
Location ID: 47000134
Located On: 02420 YARNELL RD-NEAR BIRDS CHAPEL
Direction: 2-WAY
Count: 3636 (2023)
View Detail in a New Search
Go to Record in Current Search
Hardin Valley Rd
Yarnell Rd
Bob Gray Rd
Snyder Rd
Knox
Hickory Creek
52,483 (23)
3,777 (23)
9,465 (23)
18,763 (23)

Historical Traffic Counts

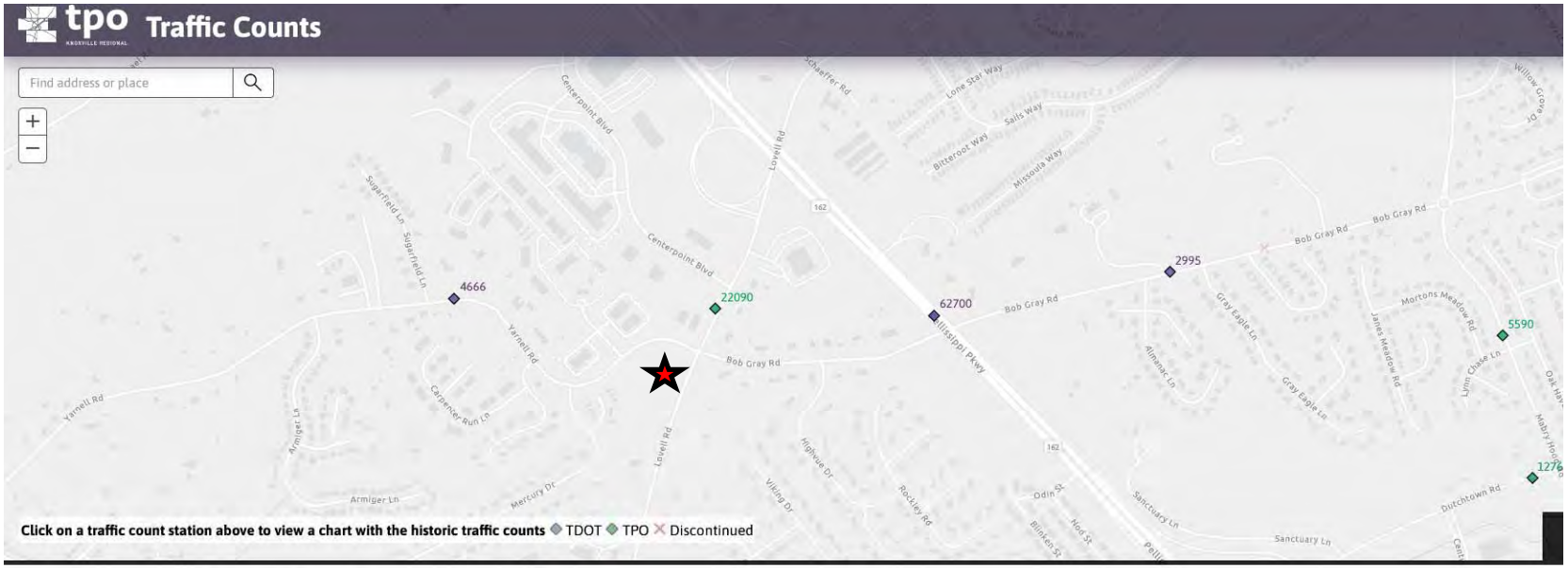
Organization: TPO
Station ID #: 093M358
Location: Lovell Road, north of Bob Gray Road

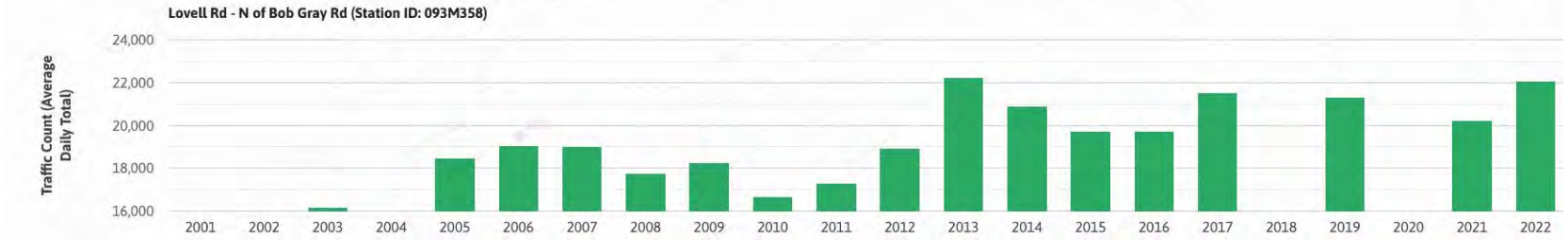
YEAR	ADT
2012	18,950
2013	22,230
2014	20,900
2015	19,730
2016	19,740
2017	21,530
2018	-
2019	21,320
2020	-
2021	20,220
2022	22,090

Trendline



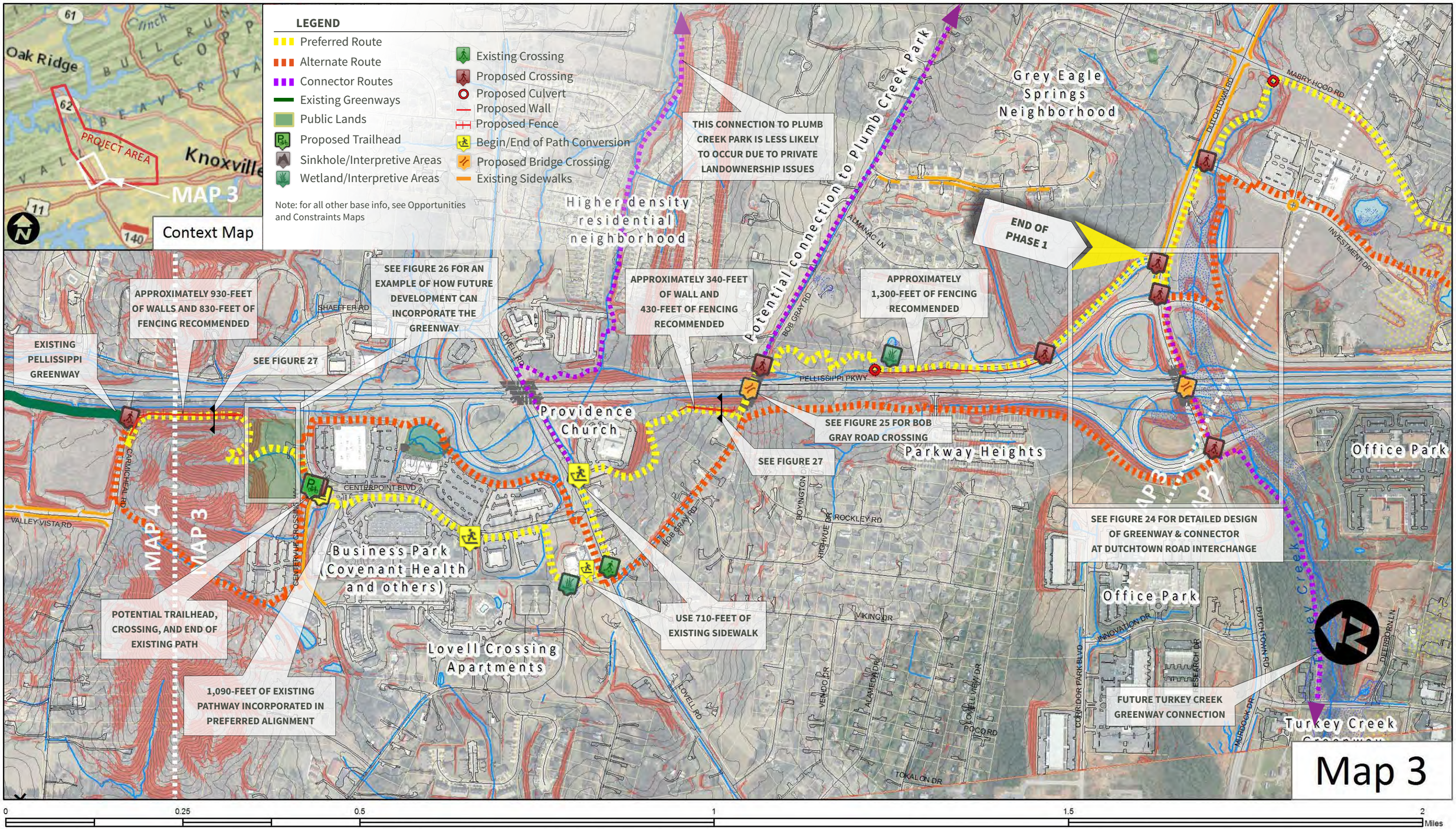
2012 - 2022 Growth Rate = 16.6%
Average Annual Growth Rate = 1.5%


tpo
KNOXVILLE REGIONAL
Traffic Counts
Find address or place
Centerpoint Blvd
Schaeffer Rd
Lone Star Way
Sails Way
Bitterroot Way
Missoula Way
Lovell Rd
162
Willow Creek Dr
Sugarfield Ln
Centerpoint Blvd
4666
22090
62700
2995
Bob Gray Rd
Bob Gray Rd
Bob Gray Rd
Gray Eagle Ln
Mortons Meadow Rd
Jones Meadow Rd
5590
Lynn Chase Ln
Oak Hav
Yarnell Rd
Yarnell Rd
Carpenter Run Ln
Armiger Ln
Armiger Ln
Mercury Dr
Lovell Rd
Highvue Dr
Viking Dr
Rockley Rd
Odin St
Noel St
Blinken St
Sanctuary Ln
Sanctuary Ln
Dutchtown Rd
1276
Click on a traffic count station above to view a chart with the historic traffic counts
TDOT
TPO
Discontinued


Lovell Rd - N of Bob Gray Rd (Station ID: 093M358)
Traffic Count (Average Daily Total)
24,000
22,000
20,000
18,000
16,000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022

APPENDIX B

FUTURE KNOX TO OAK RIDGE GREENWAY STUDY MAP


Context Map
MAP 3
PROJECT AREA
Oak Ridge
Knoxville
LEGEND
Preferred Route
Alternate Route
Connector Routes
Existing Greenways
Public Lands
Proposed Trailhead
Sinkhole/Interpretive Areas
Wetland/Interpretive Areas
Existing Crossing
Proposed Crossing
Proposed Culvert
Proposed Wall
Proposed Fence
Begin/End of Path Conversion
Proposed Bridge Crossing
Existing Sidewalks
Note: for all other base info, see Opportunities and Constraints Maps
THIS CONNECTION TO PLUMB CREEK PARK IS LESS LIKELY TO OCCUR DUE TO PRIVATE LANDOWNERSHIP ISSUES
Potential Connection to Plumb Creek Park
Higher density residential neighborhood
Grey Eagle Springs Neighborhood
END OF PHASE 1
APPROXIMATELY 930-FEET OF WALLS AND 830-FEET OF FENCING RECOMMENDED
SEE FIGURE 26 FOR AN EXAMPLE OF HOW FUTURE DEVELOPMENT CAN INCORPORATE THE GREENWAY
APPROXIMATELY 340-FEET OF WALL AND 430-FEET OF FENCING RECOMMENDED
APPROXIMATELY 1,300-FEET OF FENCING RECOMMENDED
EXISTING PELLISSIPPI GREENWAY
SEE FIGURE 27
SEE FIGURE 25 FOR BOB GRAY ROAD CROSSING
SEE FIGURE 27
Providence Church
Parkway Heights
Office Park
SEE FIGURE 24 FOR DETAILED DESIGN OF GREENWAY & CONNECTOR AT DUTCHTOWN ROAD INTERCHANGE
Business Park (Covenant Health and others)
Lovell Crossing Apartments
POTENTIAL TRAILHEAD, CROSSING, AND END OF EXISTING PATH
USE 710-FEET OF EXISTING SIDEWALK
1,090-FEET OF EXISTING PATHWAY INCORPORATED IN PREFERRED ALIGNMENT
FUTURE TURKEY CREEK GREENWAY CONNECTION
Turkey Creek
MAP 4
MAP 3
MAP 2
SHAEFFER RD
LOVELL RD
BOB GRAY RD
ALMANAC LN
PELLISSIPPI PKWY
MABRY HOOD RD
DUTCHTOWN RD
INVESTMENT DR
CARMICHEAL RD
CENTERPOINT BLVD
VALLEY VISTA RD
CENTERVIEW CROSSING
BOYINGTON
ROCKLEY RD
VIKING DR
VENDO DR
ALAMEDA DR
LOVELL VIEW DR
TOKALON DR
INNOVATION DR
RESEARCH DR
CORRIDOR PARK BLVD
MURDOCK DR
DEERBORN LN
0
0.25
0.5
1
1.5
2
Miles

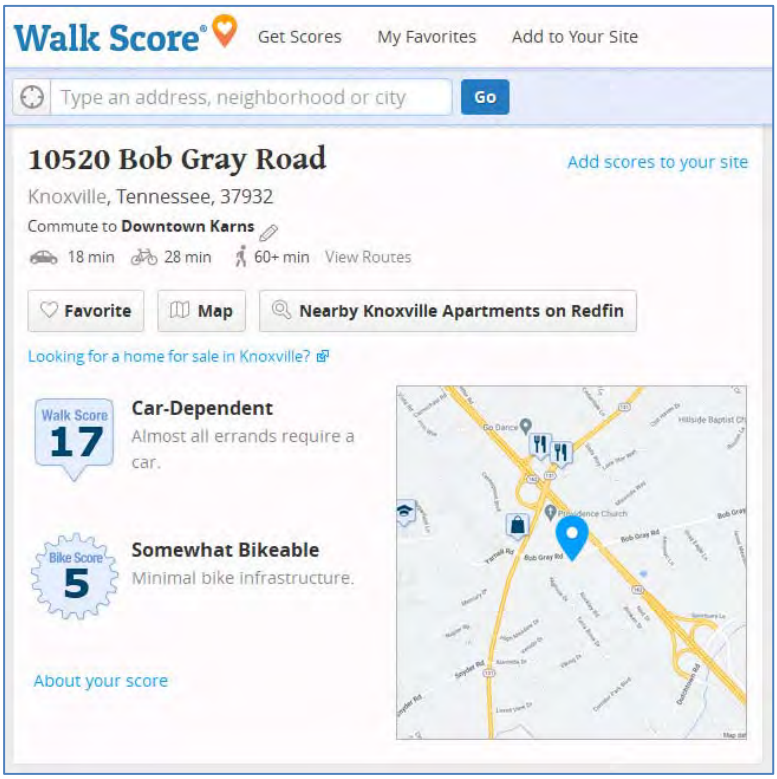
Map 3

APPENDIX C

WALK SCORE

WALKSCORE

(from walkscore.com)



Scores for 10520 Bob Gray Road

Walk Score	Transit Score	Bike Score

Transit Score measures how well a location is served by public transit based on the distance and type of nearby transit lines.

90–100	**Rider's Paradise** World-class public transportation
70–89	**Excellent Transit** Transit is convenient for most trips
50–69	**Good Transit** Many nearby public transportation options
25–49	**Some Transit** A few nearby public transportation options
0–24	**Minimal Transit** It is possible to get on a bus

Scores for 10520 Bob Gray Road

Walk Score	Transit Score	Bike Score

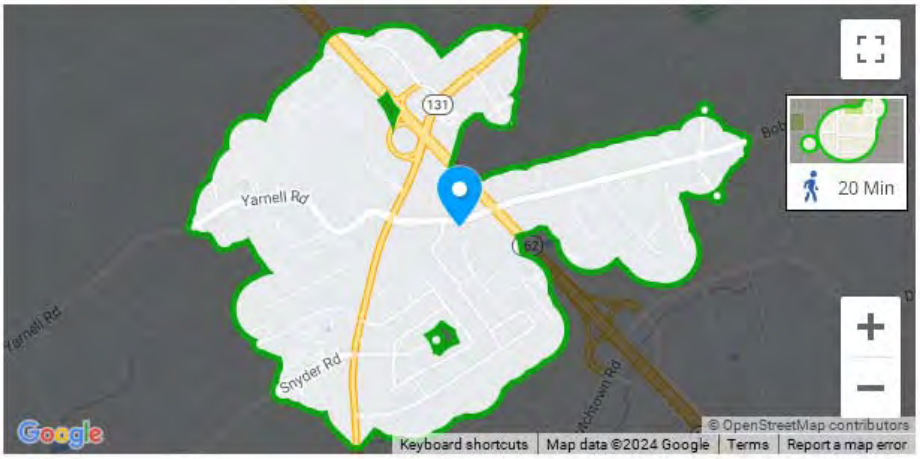
Bike Score measures whether an area is good for biking based on bike lanes and trails, hills, road connectivity, and destinations.

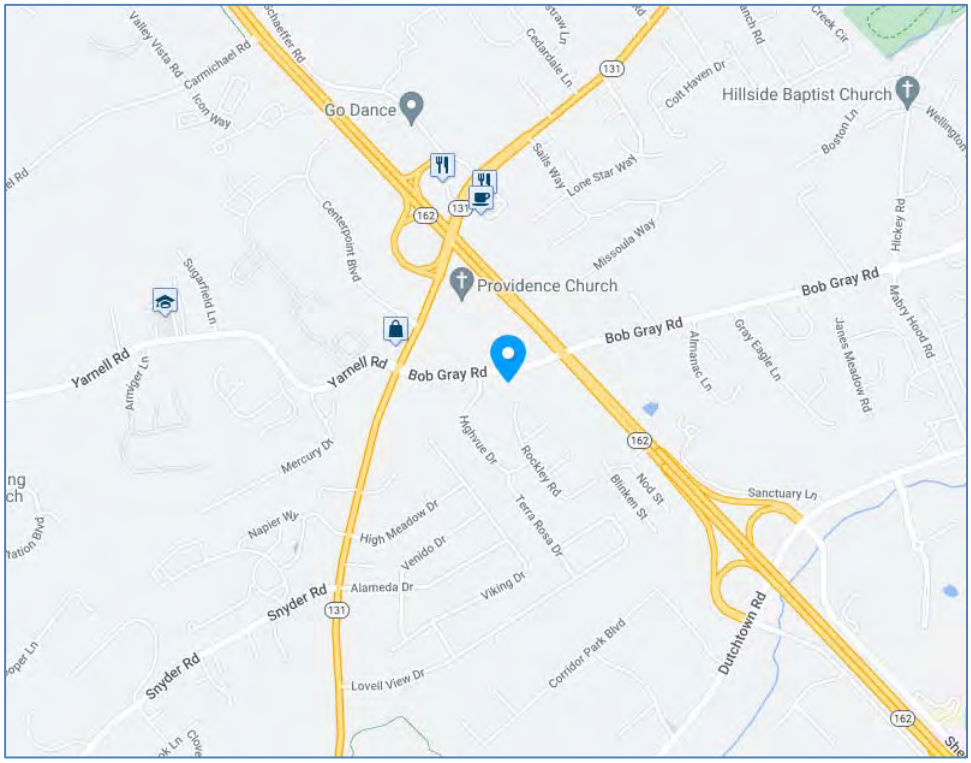
90–100	**Biker's Paradise** Daily errands can be accomplished on a bike
70–89	**Very Bikeable** Biking is convenient for most trips
50–69	**Bikeable** Some bike infrastructure
0–49	**Somewhat Bikeable** Minimal bike infrastructure

Travel Time Map

Add to your site

Explore how far you can travel by car, bus, bike and foot from 10520 Bob Gray Road.

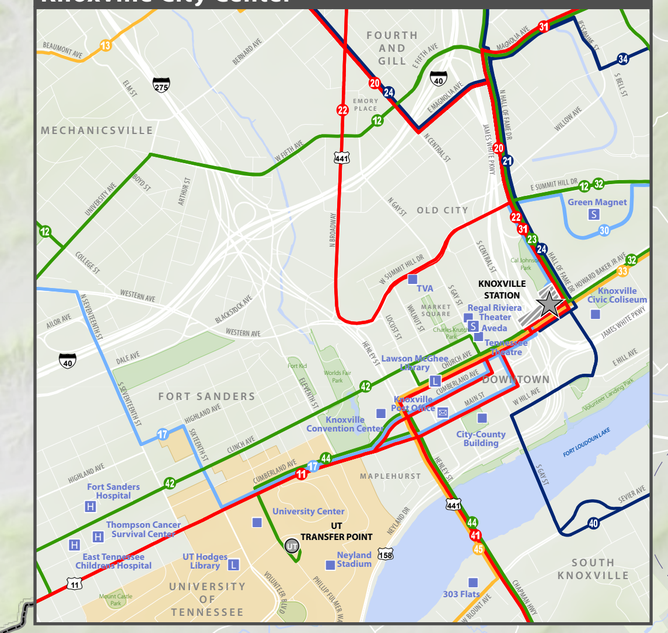




APPENDIX D

KNOXVILLE AREA TRANSIT MAP AND INFORMATION

Knoxville City Center



Legend

- Transfer Point
- Lift Service Area Boundary

Points of Interest

- Hospital
- Library
- Post Office
- School
- Point of Interest

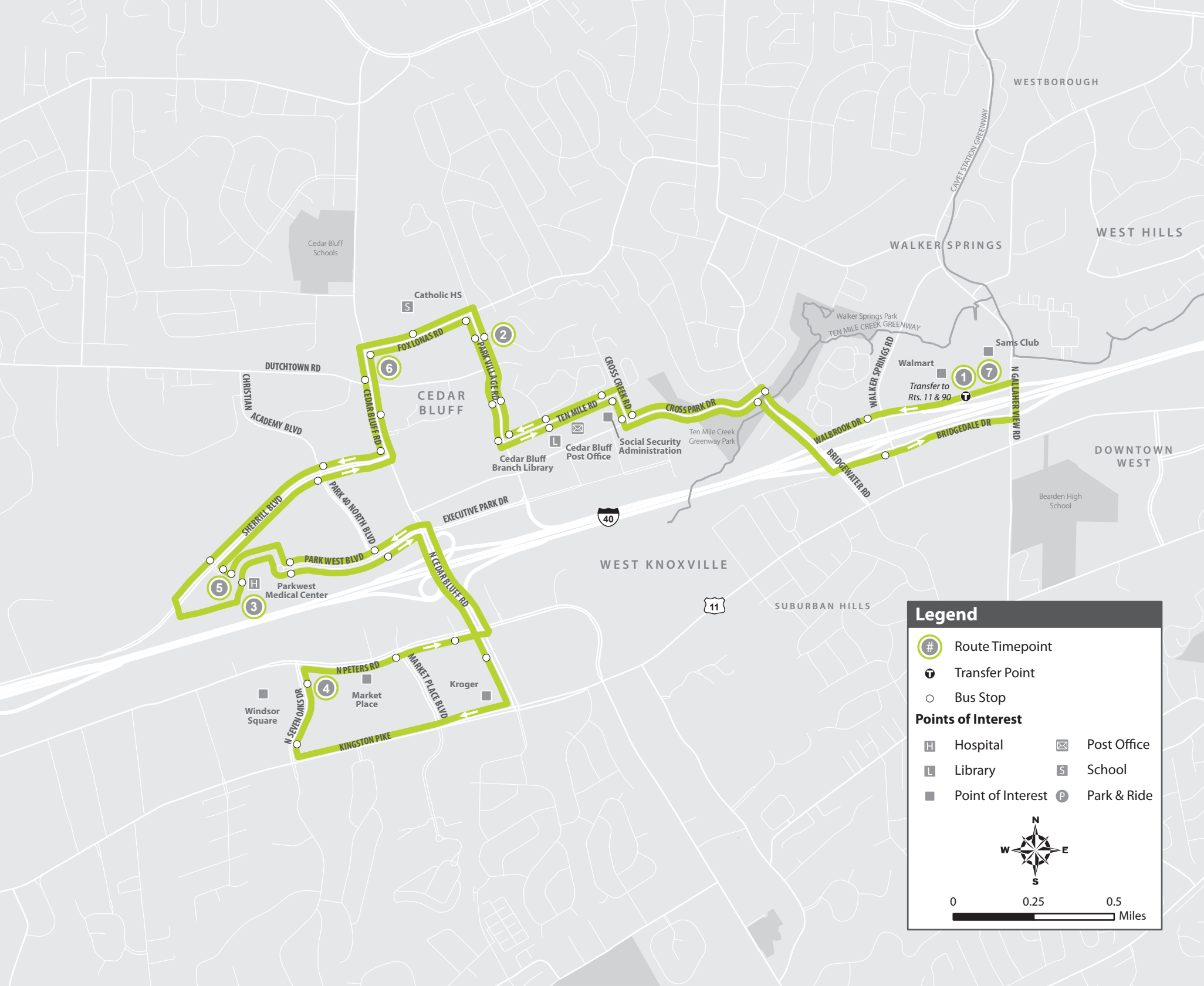
Distances

0 5 10 Minutes Walking

0 5 10 Minutes Biking

0 0.5 1 Map Scale in Miles

NORTH


WESTBOROUGH
CAVET STATION GREENWAY
WEST HILLS
WALKER SPRINGS
Cedar Bluff Schools
Catholic HS
FOX LONAS RD
PARK VILLAGE RD
DUTCHTOWN RD
CHRISTIAN ACADEMY BLVD
CEDAR BLUFF RD
CEDAR BLUFF
TEN MILE RD
CROSS CREEK RD
CROSS PARK DR
Cedar Bluff Branch Library
Cedar Bluff Post Office
Social Security Administration
Ten Mile Creek Greenway Park
Walker Springs Park
TEN MILE CREEK GREENWAY
Sams Club
Walmart
Transfer to Rts. 11 & 90
WALKER SPRINGS RD
N GALLAHER VIEW RD
WALBROOK DR
BRIDGEDALE DR
BRIDGEWATER RD
DOWNTOWN WEST
Bearden High School
SHERRILL BLVD
PARK 40 NORTH BLVD
EXECUTIVE PARK DR
40
PARK WEST BLVD
Parkwest Medical Center
N CEDAR BLUFF RD
WEST KNOXVILLE
11
SUBURBAN HILLS
N PETERS RD
MARKET PLACE BLVD
Kroger
Market Place
Windsor Square
N SEVEN OAKS DR
KINGSTON PIKE
Legend
Route Timepoint
Transfer Point
Bus Stop
Points of Interest
Hospital
Post Office
Library
School
Point of Interest
Park & Ride
N
W
E
S
0
0.25
0.5
Miles

Route 16 - Cedar Bluff: Weekdays

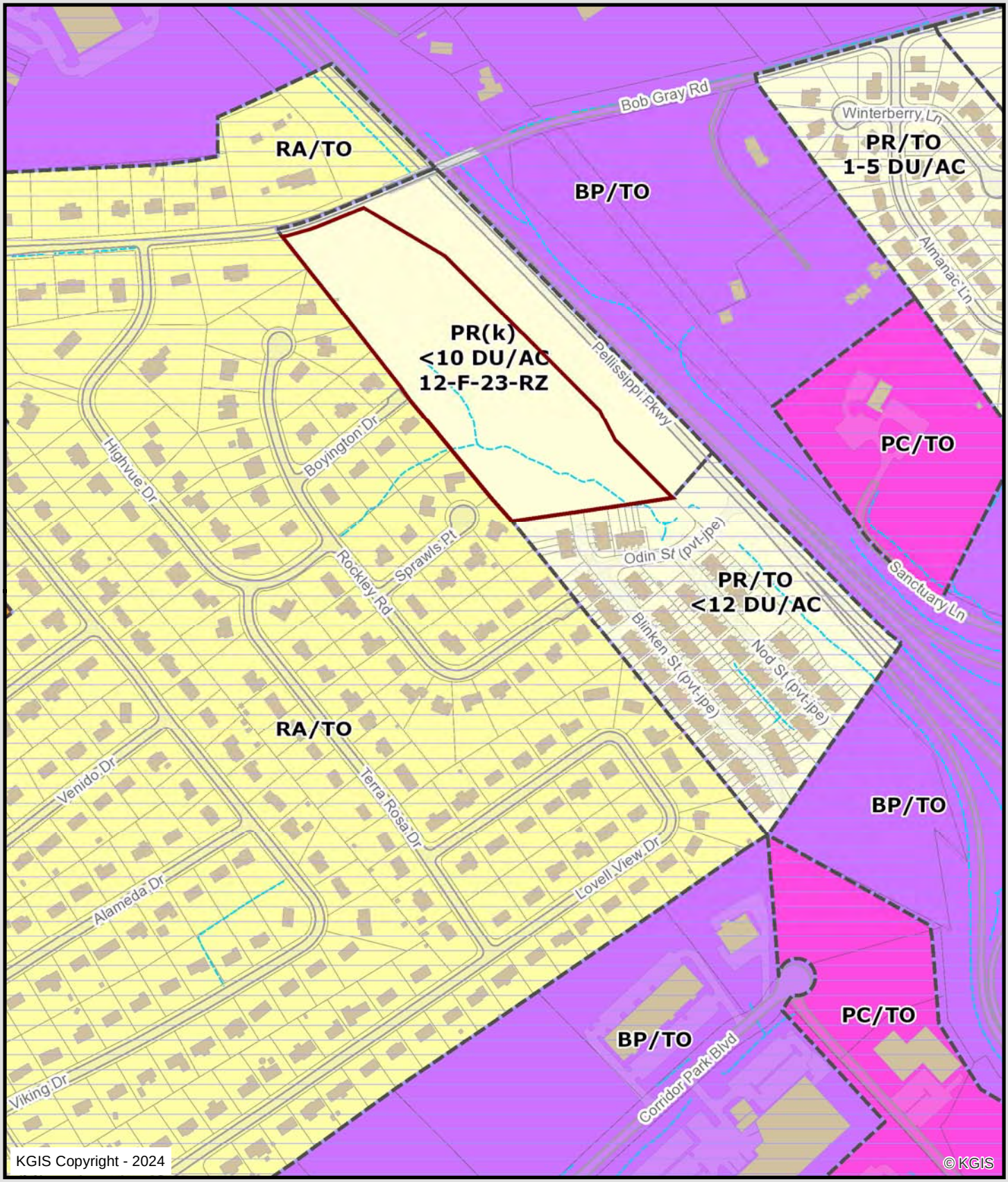
Going away from Walmart				*Going to Walmart*		
Walmart	**Park Village @ Woodpark**	**Parkwest Hospital**	**Windsor Square**	**Parkwest Hospital**	**Cedar Bluff @ Fox Lonas**	**Walmart**
1	**2**	**3**	**4**	**5**	**6**	**7**
6:15 AM	6:27 AM	6:32 AM	6:42 AM	6:50 AM	6:54 AM	7:10 AM
7:15 AM	7:27 AM	7:32 AM	7:42 AM	7:50 AM	7:54 AM	8:10 AM
8:15 AM	8:27 AM	8:32 AM	8:42 AM	8:50 AM	8:54 AM	9:10 AM
9:15 AM	9:27 AM	9:32 AM	9:42 AM	9:50 AM	9:54 AM	10:10 AM
10:15 AM	10:27 AM	10:32 AM	10:42 AM	10:50 AM	10:54 AM	11:10 AM
11:15 AM	11:27 AM	11:32 AM	11:42 AM	11:50 AM	11:54 AM	12:10 PM
12:15 PM	12:27 PM	12:32 PM	12:42 PM	12:50 PM	12:54 PM	1:10 PM
1:15 PM	1:27 PM	1:32 PM	1:42 PM	1:50 PM	1:54 PM	2:10 PM
2:15 PM	2:27 PM	2:32 PM	2:42 PM	2:50 PM	2:54 PM	3:10 PM
3:15 PM	3:27 PM	3:32 PM	3:42 PM	3:50 PM	3:54 PM	4:10 PM
4:15 PM	4:27 PM	4:32 PM	4:42 PM	4:50 PM	4:54 PM	5:10 PM
5:15 PM	5:27 PM	5:32 PM	5:42 PM	5:50 PM	5:54 PM	6:10 PM
6:15 PM	6:27 PM	6:32 PM	6:42 PM	6:50 PM	6:54 PM	7:10 PM
7:15 PM	7:27 PM	7:32 PM	7:42 PM	7:50 PM	7:54 PM	8:10 PM
8:15 PM	8:27 PM	8:32 PM	8:42 PM	8:50 PM	8:54 PM	9:10 PM
9:15 PM	9:27 PM	9:32 PM	9:42 PM	9:50 PM	9:54 PM	10:10 PM

Route 16 - Cedar Bluff: SATURDAYS

Going away from Walmart				*Going to Walmart*		
Walmart	**Park Village @ Woodpark**	**Parkwest Hospital**	**Windsor Square**	**Parkwest Hospital**	**Cedar Bluff @ Fox Lonas**	**Walmart**
1	**2**	**3**	**4**	**5**	**6**	**7**
7:15 AM	7:27 AM	7:32 AM	7:42 AM	7:50 AM	7:54 AM	8:10 AM
8:15 AM	8:27 AM	8:32 AM	8:42 AM	8:50 AM	8:54 AM	9:10 AM
9:15 AM	9:27 AM	9:32 AM	9:42 AM	9:50 AM	9:54 AM	10:10 AM
10:15 AM	10:27 AM	10:32 AM	10:42 AM	10:50 AM	10:54 AM	11:10 AM
11:15 AM	11:27 AM	11:32 AM	11:42 AM	11:50 AM	11:54 AM	12:10 PM
12:15 PM	12:27 PM	12:32 PM	12:42 PM	12:50 PM	12:54 PM	1:10 PM
1:15 PM	1:27 PM	1:32 PM	1:42 PM	1:50 PM	1:54 PM	2:10 PM
2:15 PM	2:27 PM	2:32 PM	2:42 PM	2:50 PM	2:54 PM	3:10 PM
3:15 PM	3:27 PM	3:32 PM	3:42 PM	3:50 PM	3:54 PM	4:10 PM
4:15 PM	4:27 PM	4:32 PM	4:42 PM	4:50 PM	4:54 PM	5:10 PM
5:15 PM	5:27 PM	5:32 PM	5:42 PM	5:50 PM	5:54 PM	6:10 PM
6:15 PM	6:27 PM	6:32 PM	6:42 PM	6:50 PM	6:54 PM	7:10 PM
7:15 PM	7:27 PM	7:32 PM	7:42 PM	7:50 PM	7:54 PM	8:10 PM
8:15 PM	8:27 PM	8:32 PM	8:42 PM	8:50 PM	8:54 PM	9:10 PM
9:15 PM	9:27 PM	9:32 PM	9:42 PM	9:50 PM	9:54 PM	10:10 PM

APPENDIX E

ZONING MAP



Zoning Map

3.22.24

Knoxville - Knox County - KUB Geographic Information System

Printed: 3/22/2024 at 5:02:16 PM

0 200 400 800

ft

APPENDIX F

MANUAL TRAFFIC COUNT DATA

TRAFFIC COUNT DATA

Major Street: Lovell Road (SB and NB)
Minor Street: Bob Gray Road (WB) and Yarnell Road (EB)
Traffic Control: Traffic Signal

3/28/2024 (Thursday)
Mostly Sunny and Mild
Conducted by: Ajax Engineering

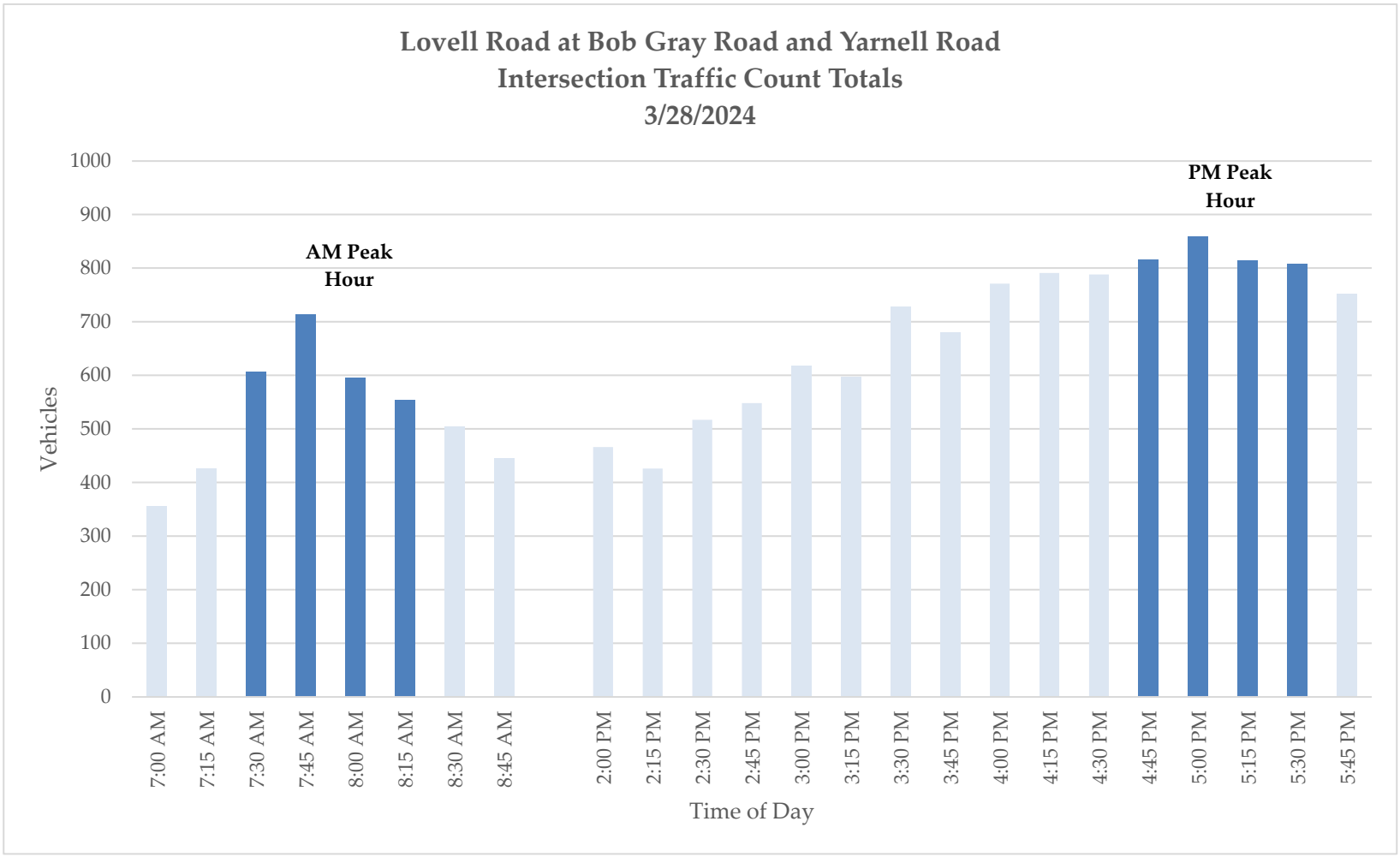
	Lovell Road			Bob Gray Road			Lovell Road			Yarnell Road				
TIME	SOUTHBOUND			WESTBOUND			NORTHBOUND			EASTBOUND			VEHICLE	PEAK
BEGIN	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	TOTAL	HOUR
7:00 AM	7	128	17	8	5	14	14	105	6	30	4	17	355	
7:15 AM	4	146	20	22	8	24	10	106	5	46	14	21	426	
7:30 AM	7	186	47	38	13	17	22	135	17	61	28	35	606	**7:30 AM - 8:30 AM**
7:45 AM	9	211	42	40	29	29	37	123	30	65	49	49	713	
8:00 AM	6	166	19	25	30	17	26	161	21	62	33	29	595	
8:15 AM	7	176	23	20	18	30	28	140	15	52	17	27	553	
8:30 AM	6	174	18	10	7	16	22	134	12	58	19	28	504	
8:45 AM	11	157	25	10	4	9	23	123	11	42	10	20	445	
TOTAL	57	1344	211	173	114	156	182	1027	117	416	174	226	4197	
2:00 PM	15	144	26	13	8	5	18	158	21	27	12	19	466	
2:15 PM	11	127	26	12	9	8	19	132	20	33	13	16	426	
2:30 PM	9	161	31	27	8	8	14	176	14	39	10	20	517	
2:45 PM	15	174	33	21	12	6	19	167	19	37	20	25	548	
3:00 PM	10	181	42	24	16	8	32	194	31	35	20	25	618	
3:15 PM	15	178	35	26	22	7	24	164	30	45	30	21	597	
3:30 PM	21	210	39	36	28	10	21	229	27	50	29	28	728	
3:45 PM	18	222	48	36	24	11	20	177	26	50	20	27	679	
4:00 PM	22	275	32	29	12	10	25	219	41	44	36	26	771	
4:15 PM	24	236	37	21	23	11	36	224	42	66	54	17	791	
4:30 PM	38	226	38	31	20	20	28	207	54	58	47	21	788	
4:45 PM	24	237	45	44	32	11	29	221	45	58	40	29	815	**4:45 PM - 5:45 PM**
5:00 PM	33	252	41	32	37	6	34	248	67	40	46	23	859	
5:15 PM	24	228	39	41	31	16	34	231	48	47	57	18	814	
5:30 PM	11	254	36	30	26	12	27	223	55	51	64	18	807	
5:45 PM	21	257	38	49	20	15	29	176	40	42	41	24	752	
TOTAL	311	3362	586	472	328	164	409	3146	580	722	539	357	10976	

2024 AM Peak Hour **7:30 AM - 8:30 AM**

	Lovell Road			Bob Gray Road			Lovell Road			Yarnell Road		
TIME	SOUTHBOUND			WESTBOUND			NORTHBOUND			EASTBOUND		
BEGIN	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT
7:30 AM	7	186	47	38	13	17	22	135	17	61	28	35
7:45 AM	9	211	42	40	29	29	37	123	30	65	49	49
8:00 AM	6	166	19	25	30	17	26	161	21	62	33	29
8:15 AM	7	176	23	20	18	30	28	140	15	52	17	27
TOTAL	**29**	**739**	**131**	**123**	**90**	**93**	**113**	**559**	**83**	**240**	**127**	**140**
TRUCK %	**0.0%**	**1.4%**	**1.5%**	**0.0%**	**0.0%**	**2.1%**	**1.8%**	**2.9%**	**0.0%**	**0.8%**	**0.0%**	**1.4%**
PHF $_{mvmt}$	**0.81**	**0.88**	**0.70**	**0.77**	**0.75**	**0.78**	**0.76**	**0.87**	**0.69**	**0.92**	**0.65**	**0.71**
PHF $_{app}$		**0.86**			**0.78**			**0.91**			**0.78**	
PHF $_{int}$						**0.87**						

2024 PM Peak Hour **4:45 PM - 5:45 PM**

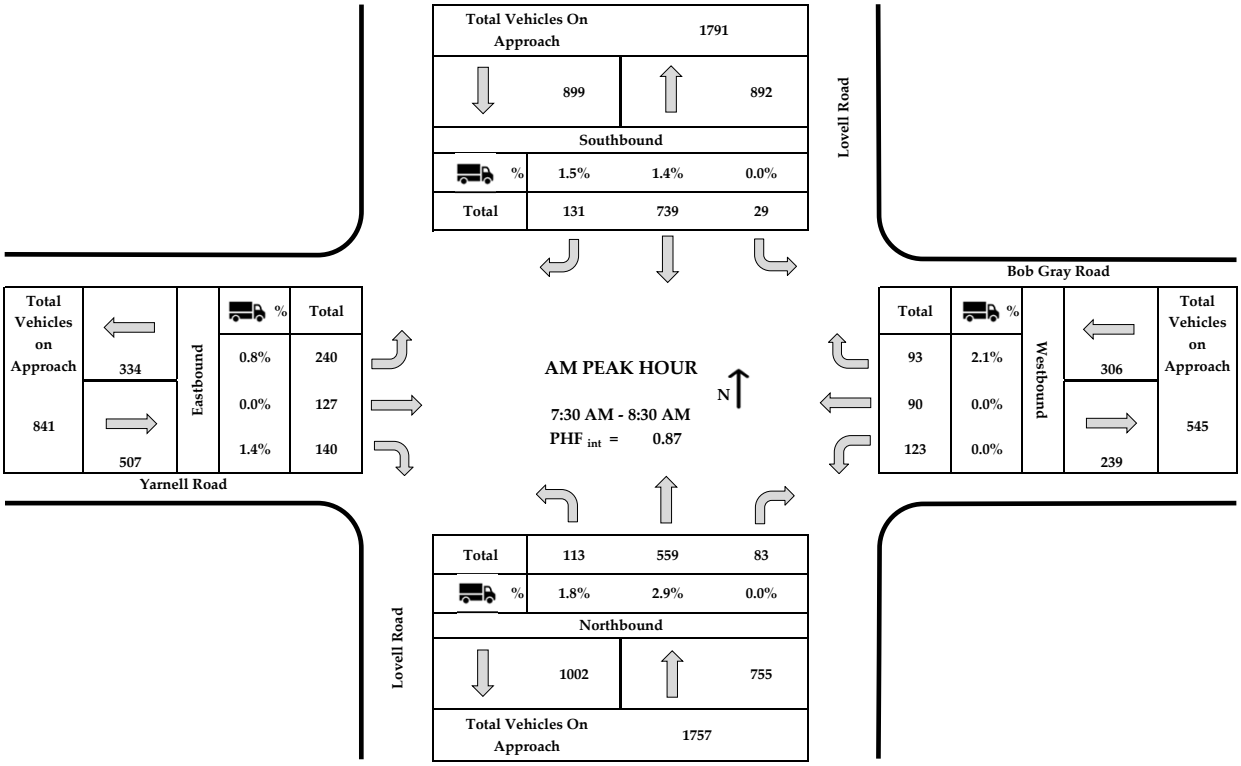
	Lovell Road			Bob Gray Road			Lovell Road			Yarnell Road		
TIME	SOUTHBOUND			WESTBOUND			NORTHBOUND			EASTBOUND		
BEGIN	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT
4:45 PM	24	237	45	44	32	11	29	221	45	58	40	29
5:00 PM	33	252	41	32	37	6	34	248	67	40	46	23
5:15 PM	24	228	39	41	31	16	34	231	48	47	57	18
5:30 PM	11	254	36	30	26	12	27	223	55	51	64	18
TOTAL	**92**	**971**	**161**	**147**	**126**	**45**	**124**	**923**	**215**	**196**	**207**	**88**
TRUCK %	**0.0%**	**1.4%**	**1.5%**	**0.0%**	**0.0%**	**2.1%**	**1.8%**	**2.9%**	**0.0%**	**0.8%**	**0.0%**	**1.4%**
PHF $_{mvmt}$	**0.70**	**0.96**	**0.89**	**0.84**	**0.85**	**0.70**	**0.91**	**0.93**	**0.80**	**0.84**	**0.81**	**0.76**
PHF $_{app}$		**0.94**			**0.90**			**0.90**			**0.92**	
PHF $_{int}$						**0.96**						

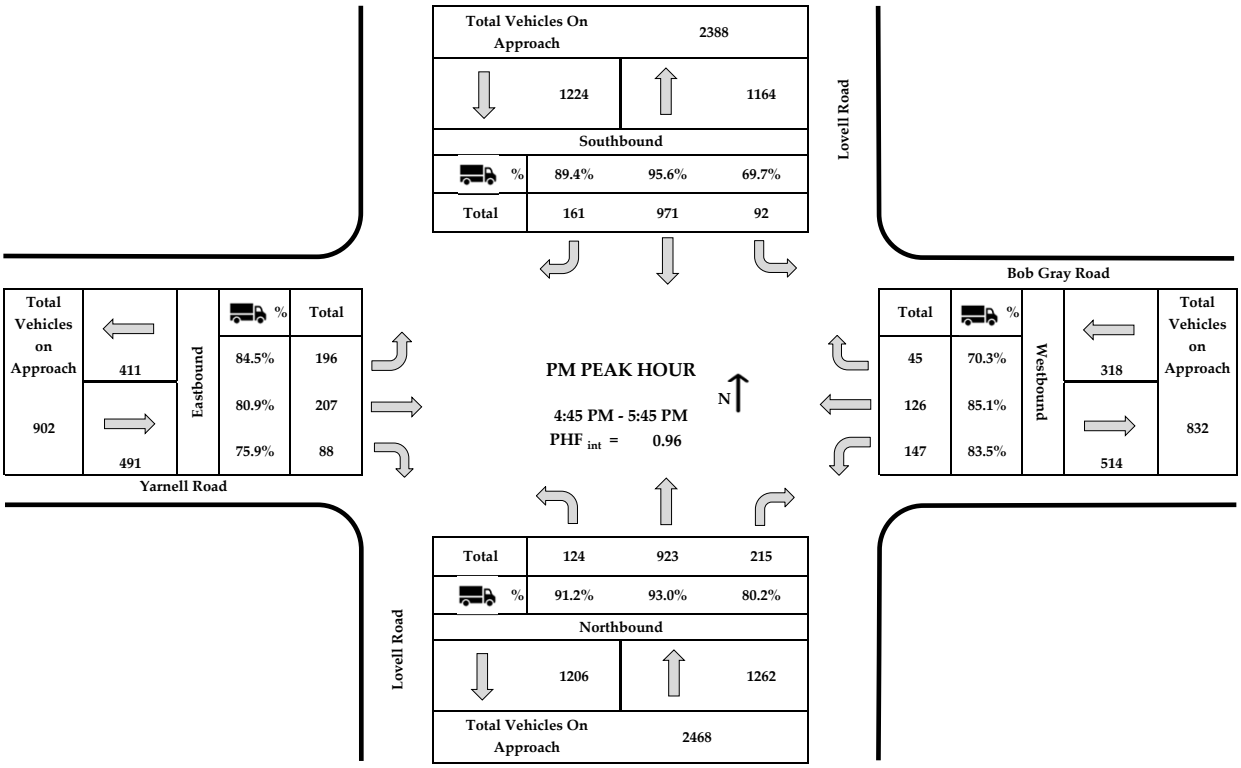

Lovell Road at Bob Gray Road and Yarnell Road
Intersection Traffic Count Totals
3/28/2024
1000
900
800
700
600
500
400
300
200
100
0
Vehicles
AM Peak Hour
PM Peak Hour
7:00 AM
7:15 AM
7:30 AM
7:45 AM
8:00 AM
8:15 AM
8:30 AM
8:45 AM
2:00 PM
2:15 PM
2:30 PM
2:45 PM
3:00 PM
3:15 PM
3:30 PM
3:45 PM
4:00 PM
4:15 PM
4:30 PM
4:45 PM
5:00 PM
5:15 PM
5:30 PM
5:45 PM
Time of Day

PEAK HOUR DATA

Major Street: Lovell Road (SB and NB)
Minor Street: Bob Gray Road (WB) and Yarnell Road (EB)
Traffic Control: Traffic Signal

3/28/2024 (Thursday)
Mostly Sunny and Mild
Conducted by: Ajax Engineering





TRAFFIC COUNT DATA

Major Street: Bob Gray Road (EB and WB)
Minor Street: Highvue Drive (NB)
Traffic Control: Stop Sign on Minor Street

3/28/2024 (Thursday)
Mostly Sunny and Mild
Conducted by: Ajax Engineering

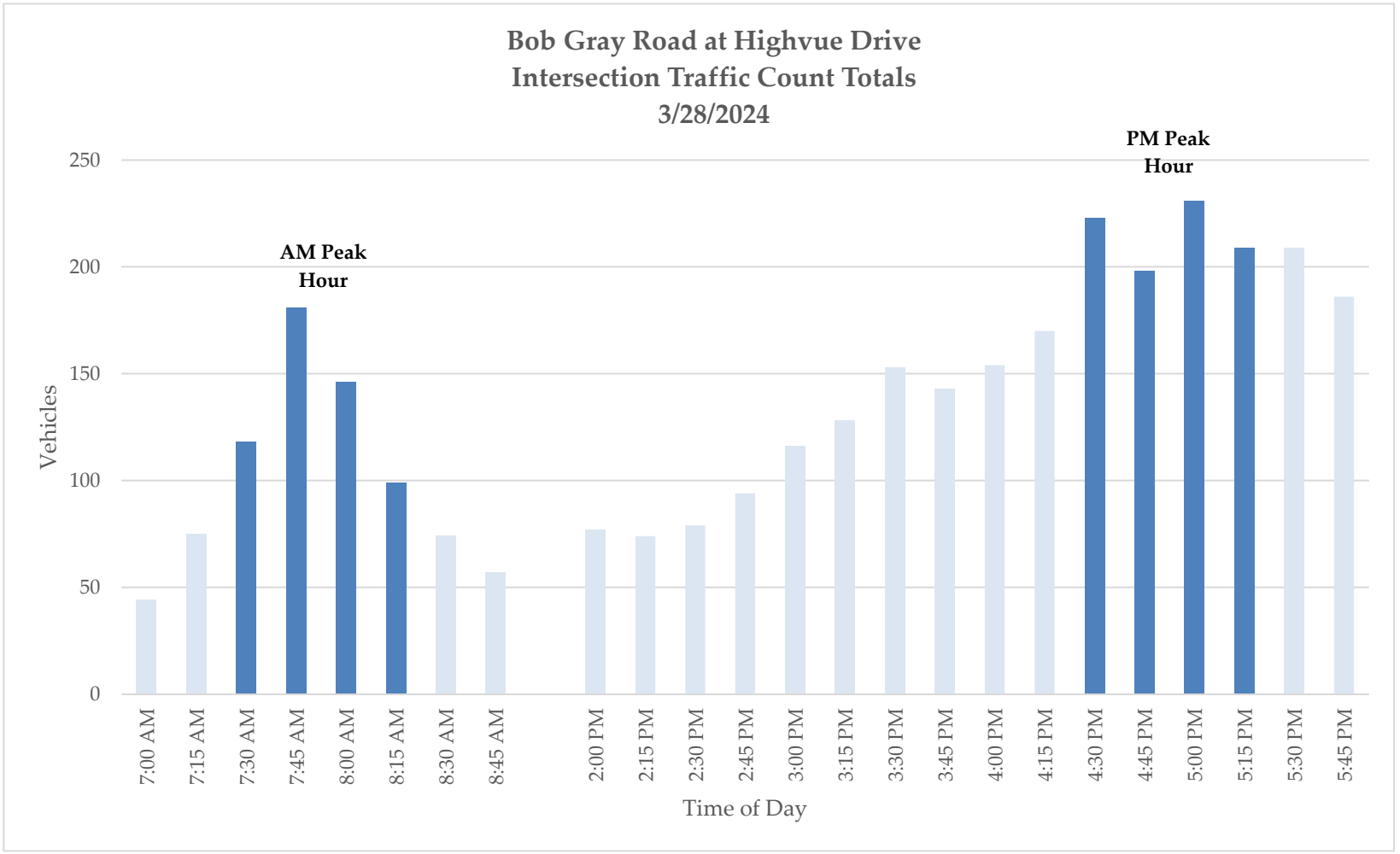
	Bob Gray Road		Highvue Drive		Bob Gray Road			
TIME	WESTBOUND		NORTHBOUND		EASTBOUND		VEHICLE	PEAK
BEGIN	LT	THRU	LT	RT	THRU	RT	TOTAL	HOUR
7:00 AM	0	21	6	1	14	2	44	
7:15 AM	0	48	7	0	20	0	75	
7:30 AM	1	60	8	0	47	2	118	**7:30 AM - 8:30 AM**
7:45 AM	0	92	5	1	82	1	181	
8:00 AM	0	72	6	0	66	2	146	
8:15 AM	1	52	8	1	37	0	99	
8:30 AM	0	30	5	1	38	0	74	
8:45 AM	2	19	2	2	32	0	57	
TOTAL	4	394	47	6	336	7	794	
2:00 PM	0	27	1	1	45	3	77	
2:15 PM	2	27	1	1	40	3	74	
2:30 PM	1	45	0	0	29	4	79	
2:45 PM	2	32	4	0	55	1	94	
3:00 PM	0	51	1	1	58	5	116	
3:15 PM	2	52	2	0	65	7	128	
3:30 PM	2	72	2	2	65	10	153	
3:45 PM	3	68	4	1	59	8	143	
4:00 PM	0	42	7	1	97	7	154	
4:15 PM	3	51	0	0	109	7	170	
4:30 PM	9	70	5	0	136	3	223	**4:30 PM - 5:30 PM**
4:45 PM	2	81	5	0	103	7	198	
5:00 PM	3	88	1	1	132	6	231	
5:15 PM	2	71	7	1	123	5	209	
5:30 PM	1	71	2	2	129	4	209	
5:45 PM	2	75	5	3	92	9	186	
TOTAL	34	923	47	14	1337	89	2444	

2024 AM Peak Hour **7:30 AM - 8:30 AM**

	Bob Gray Road		Highvue Drive		Bob Gray Road	
TIME	WESTBOUND		NORTHBOUND		EASTBOUND	
BEGIN	LT	THRU	LT	RT	THRU	RT
7:30 AM	1	60	8	0	47	2
7:45 AM	0	92	5	1	82	1
8:00 AM	0	72	6	0	66	2
8:15 AM	1	52	8	1	37	0
TOTAL	**2**	**276**	**27**	**2**	**232**	**5**
PHF	**0.50**	**0.75**	**0.84**	**0.50**	**0.71**	**0.63**
Truck %	**50.0%**	**0.4%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**

2024 PM Peak Hour **4:30 PM - 5:30 PM**

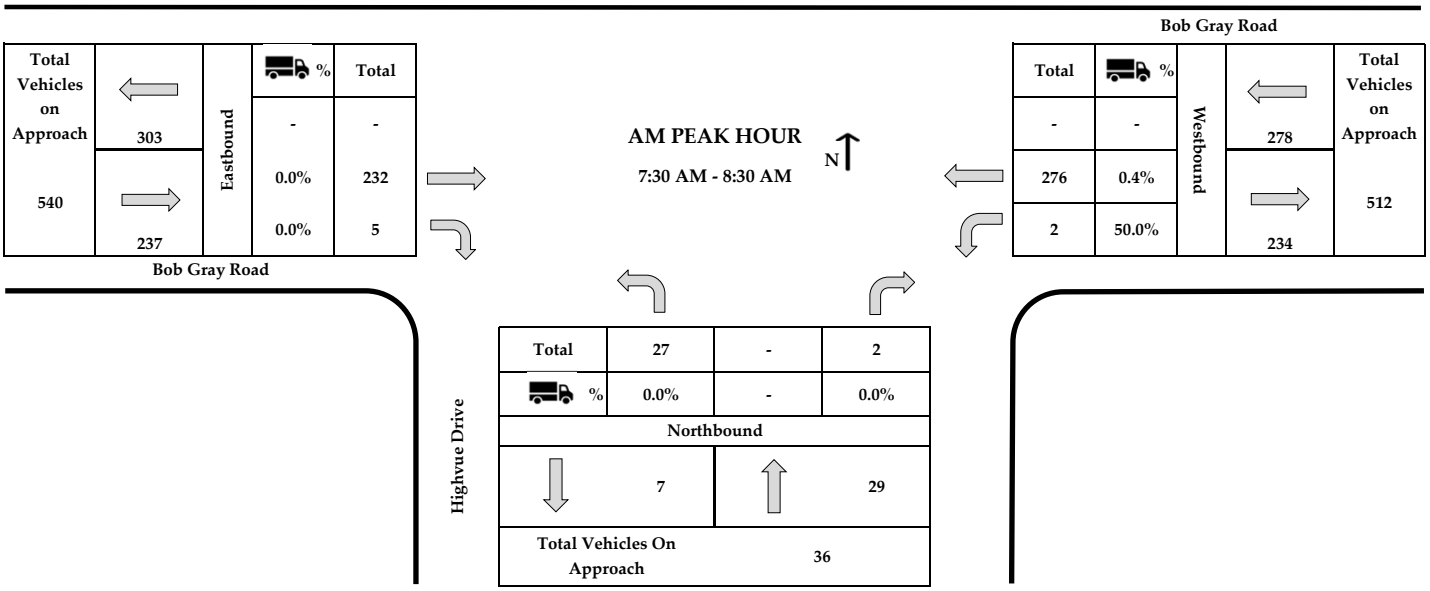
	Bob Gray Road		Highvue Drive		Bob Gray Road	
TIME	WESTBOUND		NORTHBOUND		EASTBOUND	
BEGIN	LT	THRU	LT	RT	THRU	RT
4:30 PM	9	70	5	0	136	3
4:45 PM	2	81	5	0	103	7
5:00 PM	3	88	1	1	132	6
5:15 PM	2	71	7	1	123	5
TOTAL	**16**	**310**	**18**	**2**	**494**	**21**
PHF	**0.44**	**0.88**	**0.64**	**0.50**	**0.91**	**0.75**
Truck %	**0.0%**	**0.3%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**

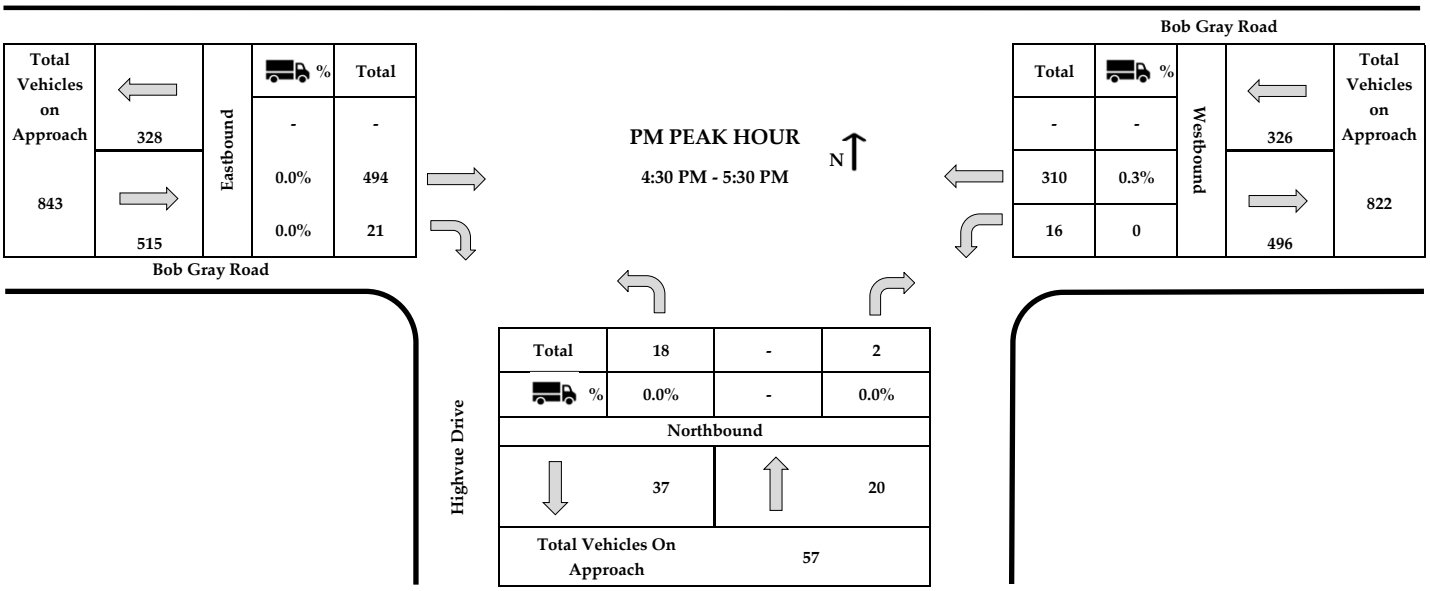

Bob Gray Road at Highvue Drive
Intersection Traffic Count Totals
3/28/2024
PM Peak Hour
AM Peak Hour
250
200
150
100
50
0
Vehicles
7:00 AM
7:15 AM
7:30 AM
7:45 AM
8:00 AM
8:15 AM
8:30 AM
8:45 AM
2:00 PM
2:15 PM
2:30 PM
2:45 PM
3:00 PM
3:15 PM
3:30 PM
3:45 PM
4:00 PM
4:15 PM
4:30 PM
4:45 PM
5:00 PM
5:15 PM
5:30 PM
5:45 PM
Time of Day

PEAK HOUR DATA

Major Street: Bob Gray Road (EB and WB)
Minor Street: Highvue Drive (NB)
Traffic Control: Stop Sign on Minor Street

3/28/2024 (Thursday)
Mostly Sunny and Mild
Conducted by: Ajax Engineering





TRAFFIC COUNT DATA

Major Street: Pellissippi Parkway (SB and NB)
Minor Street: Odin Street (EB)
Traffic Control: Stop Sign on Odin Street

3/28/2024 (Thursday)
Mostly Sunny and Mild
Conducted by: Ajax Engineering

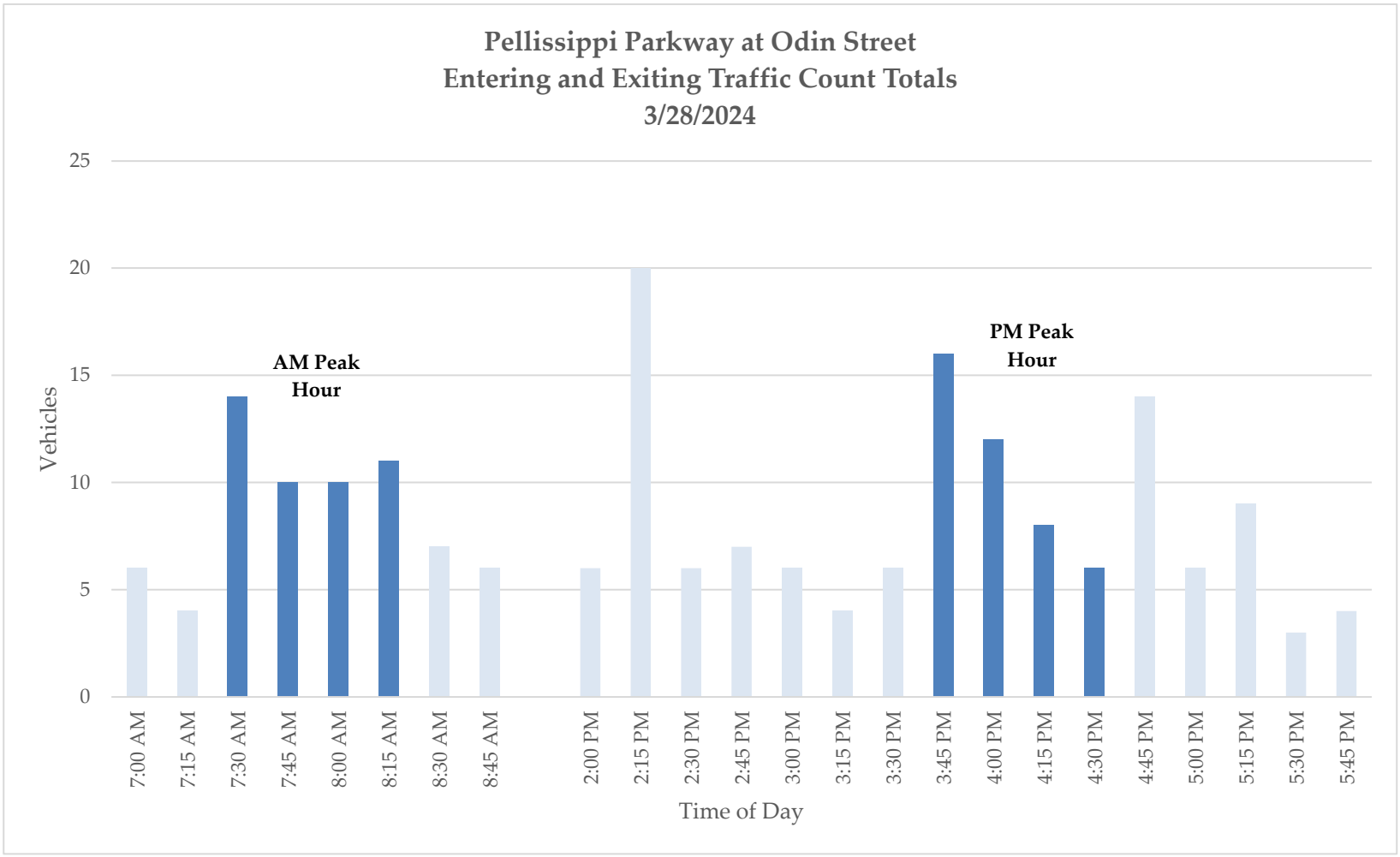
	Pellissippi Parkway		Pellissippi Parkway		Odin Street			
TIME	SOUTHBOUND		NORTHBOUND		EASTBOUND		VEHICLE	PEAK
BEGIN	THRU	RT	LT	THRU	LT	RT	TOTAL	HOUR
7:00 AM	-	0	-	-	-	6	6	
7:15 AM	-	0	-	-	-	4	4	
7:30 AM	-	6	-	-	-	8	14	**7:30 AM - 8:30 AM**
7:45 AM	-	1	-	-	-	9	10	
8:00 AM	-	3	-	-	-	7	10	
8:15 AM	-	3	-	-	-	8	11	
8:30 AM	-	2	-	-	-	5	7	
8:45 AM	-	1	-	-	-	5	6	
TOTAL	-	16	-	-	-	52	68	
2:00 PM	-	4	-	-	-	2	6	
2:15 PM	-	10	-	-	-	10	20	
2:30 PM	-	2	-	-	-	4	6	
2:45 PM	-	2	-	-	-	5	7	
3:00 PM	-	3	-	-	-	3	6	
3:15 PM	-	3	-	-	-	1	4	
3:30 PM	-	5	-	-	-	1	6	
3:45 PM	-	9	-	-	-	7	16	**3:45 PM - 4:45 PM**
4:00 PM	-	6	-	-	-	6	12	
4:15 PM	-	5	-	-	-	3	8	
4:30 PM	-	4	-	-	-	2	6	
4:45 PM	-	9	-	-	-	5	14	
5:00 PM	-	4	-	-	-	2	6	
5:15 PM	-	7	-	-	-	2	9	
5:30 PM	-	1	-	-	-	2	3	
5:45 PM	-	3	-	-	-	1	4	
TOTAL	-	77	-	-	-	56	133	

2024 AM Peak Hour **7:30 AM - 8:30 AM**

	Pellissippi Parkway		Pellissippi Parkway		Odin Street	
TIME	SOUTHBOUND		NORTHBOUND		EASTBOUND	
BEGIN	THRU	RT	LT	THRU	LT	RT
7:30 AM	-	6	-	-	-	8
7:45 AM	-	1	-	-	-	9
8:00 AM	-	3	-	-	-	7
8:15 AM	-	3	-	-	-	8
TOTAL	**-**	**13**	**-**	**-**	**-**	**32**
PHF	**-**	**0.54**	**-**	**-**	**-**	**0.89**
TRUCK %	**-**	**0.0%**	**-**	**-**	**-**	**0.0%**

2024 PM Peak Hour **3:45 PM - 4:45 PM**

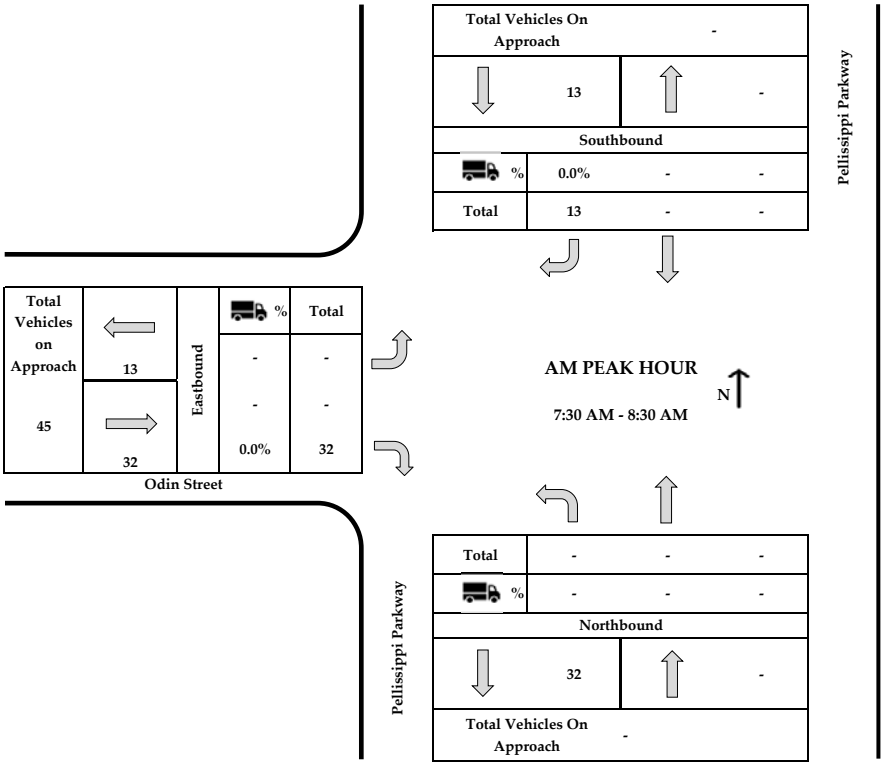
	Pellissippi Parkway		Pellissippi Parkway		Odin Street	
TIME	SOUTHBOUND		NORTHBOUND		EASTBOUND	
BEGIN	THRU	RT	LT	THRU	LT	RT
3:45 PM	-	9	-	-	-	7
4:00 PM	-	6	-	-	-	6
4:15 PM	-	5	-	-	-	3
4:30 PM	-	4	-	-	-	2
TOTAL	**-**	**24**	**-**	**-**	**-**	**18**
PHF	**-**	**0.67**	**-**	**-**	**-**	**0.64**
TRUCK %	**-**	**0.0%**	**-**	**-**	**-**	**0.0%**

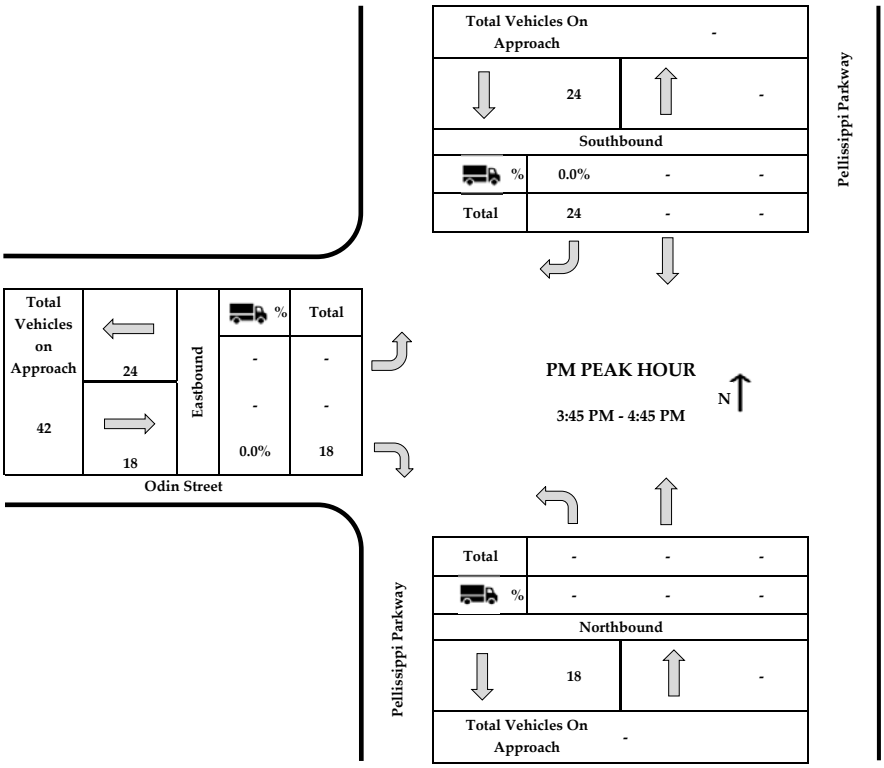

Pellissippi Parkway at Odin Street
Entering and Exiting Traffic Count Totals
3/28/2024
25
20
15
10
5
0
Vehicles
AM Peak Hour
PM Peak Hour
7:00 AM
7:15 AM
7:30 AM
7:45 AM
8:00 AM
8:15 AM
8:30 AM
8:45 AM
2:00 PM
2:15 PM
2:30 PM
2:45 PM
3:00 PM
3:15 PM
3:30 PM
3:45 PM
4:00 PM
4:15 PM
4:30 PM
4:45 PM
5:00 PM
5:15 PM
5:30 PM
5:45 PM
Time of Day

PEAK HOUR DATA

Major Street: Pellissippi Parkway (SB and NB)
Minor Street: Odin Street (EB)
Traffic Control: Stop Sign on Odin Street

3/28/2024 (Thursday)
Mostly Sunny and Mild
Conducted by: Ajax Engineering





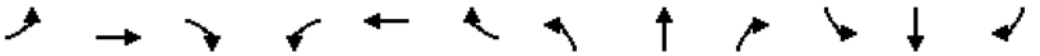
APPENDIX G

CAPACITY ANALYSES – HCM WORKSHEETS (SYNCHRO 12)

EXISTING CONDITIONS

HCM 7th Signalized Intersection Summary
3: Lovell Road & Yarnell Road/Bob Gray Road

04/21/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	240	127	140	123	90	93	113	559	83	29	739	131
Future Volume (veh/h)	240	127	140	123	90	93	113	559	83	29	739	131
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1738	1753	1738	2097	2097	2067	1949	1934	1979	1876	1862	1847
Adj Flow Rate, veh/h	276	146	161	141	103	107	130	643	95	33	849	151
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	1	0	1	0	0	2	2	3	0	0	1	2
Cap, veh/h	388	276	232	335	174	145	301	1706	779	379	1293	230
Arrive On Green	0.17	0.16	0.16	0.08	0.08	0.08	0.06	0.46	0.46	0.03	0.43	0.43
Sat Flow, veh/h	1655	1753	1473	1997	2097	1751	1856	3674	1677	1787	3000	534
Grp Volume(v), veh/h	276	146	161	141	103	107	130	643	95	33	500	500
Grp Sat Flow(s),veh/h/ln	1655	1753	1473	1997	2097	1751	1856	1837	1677	1787	1769	1766
Q Serve(g_s), s	14.6	7.7	10.3	6.3	4.7	6.0	3.8	11.4	3.2	1.0	22.5	22.5
Cycle Q Clear(g_c), s	14.6	7.7	10.3	6.3	4.7	6.0	3.8	11.4	3.2	1.0	22.5	22.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.30
Lane Grp Cap(c), veh/h	388	276	232	335	174	145	301	1706	779	379	762	761
V/C Ratio(X)	0.71	0.53	0.69	0.42	0.59	0.74	0.43	0.38	0.12	0.09	0.66	0.66
Avail Cap(c_a), veh/h	425	280	236	429	231	193	351	1706	779	486	762	761
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	32.2	38.7	39.8	37.4	44.2	44.8	17.3	17.4	15.2	15.1	22.6	22.6
Incr Delay (d2), s/veh	4.9	2.4	9.2	0.8	4.5	12.2	1.0	0.6	0.3	0.1	4.4	4.4
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.1	3.4	4.2	3.1	2.6	3.0	1.6	4.6	1.2	0.4	9.5	9.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	37.2	41.1	49.0	38.3	48.8	57.0	18.2	18.0	15.5	15.2	27.0	27.0
LnGrp LOS	D	D	D	D	D	E	B	B	B	B	C	C
Approach Vol, veh/h		583			351			868			1033	
Approach Delay, s/veh		41.4			47.1			17.8			26.6	
Approach LOS		D			D			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.0	52.9	22.8	15.3	12.3	49.6	15.3	22.8
Change Period (Y+Rc), s	6.0	6.5	6.0	7.0	6.5	6.5	7.0	7.0
Max Green Setting (Gmax), s	9.0	35.5	19.0	11.0	8.5	35.5	13.0	16.0
Max Q Clear Time (g_c+I1), s	3.0	13.4	16.6	8.0	5.8	24.5	8.3	12.3
Green Ext Time (p_c), s	0.0	6.1	0.2	0.3	0.1	5.8	0.1	0.6

Intersection Summary	
HCM 7th Control Delay, s/veh	29.5
HCM 7th LOS	C

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	232	5	2	276	27	2
Future Vol, veh/h	232	5	2	276	27	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	5	-	-	-5	-5	-
Peak Hour Factor	71	63	50	75	84	50
Heavy Vehicles, %	0	0	50	0	0	0
Mvmt Flow	327	8	4	368	32	4

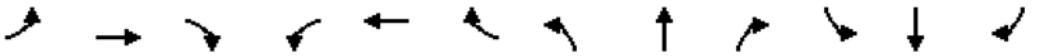
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	335	0	707	331
Stage 1	-	-	-	-	331	-
Stage 2	-	-	-	-	376	-
Critical Hdwy	-	-	4.6	-	5.4	5.7
Critical Hdwy Stg 1	-	-	-	-	4.4	-
Critical Hdwy Stg 2	-	-	-	-	4.4	-
Follow-up Hdwy	-	-	2.65	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	999	-	493	749
Stage 1	-	-	-	-	803	-
Stage 2	-	-	-	-	776	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	999	-	490	749
Mov Cap-2 Maneuver	-	-	-	-	490	-
Stage 1	-	-	-	-	803	-
Stage 2	-	-	-	-	772	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.09	12.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	510	-	-	19	-
HCM Lane V/C Ratio	0.071	-	-	0.004	-
HCM Control Delay (s/veh)	12.6	-	-	8.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

HCM 7th Signalized Intersection Summary
3: Lovell Road & Yarnell Road/Bob Gray Road

04/21/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	196	207	88	147	126	45	124	923	215	92	971	161
Future Volume (veh/h)	196	207	88	147	126	45	124	923	215	92	971	161
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1738	1753	1738	2097	2097	2067	1949	1934	1979	1876	1862	1847
Adj Flow Rate, veh/h	204	216	92	153	131	47	129	961	224	96	1011	168
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	0	1	0	0	2	2	3	0	0	1	2
Cap, veh/h	253	161	135	230	179	149	312	2066	943	325	1666	276
Arrive On Green	0.10	0.09	0.09	0.09	0.09	0.09	0.05	0.56	0.56	0.04	0.55	0.55
Sat Flow, veh/h	1655	1753	1473	1997	2097	1751	1856	3674	1677	1787	3036	504
Grp Volume(v), veh/h	204	216	92	153	131	47	129	961	224	96	588	591
Grp Sat Flow(s),veh/h/ln	1655	1753	1473	1997	2097	1751	1856	1837	1677	1787	1769	1771
Q Serve(g_s), s	12.0	11.0	7.3	8.3	7.3	3.0	3.6	18.6	8.1	2.8	27.0	27.1
Cycle Q Clear(g_c), s	12.0	11.0	7.3	8.3	7.3	3.0	3.6	18.6	8.1	2.8	27.0	27.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.28
Lane Grp Cap(c), veh/h	253	161	135	230	179	149	312	2066	943	325	971	972
V/C Ratio(X)	0.81	1.34	0.68	0.66	0.73	0.31	0.41	0.47	0.24	0.30	0.61	0.61
Avail Cap(c_a), veh/h	253	161	135	243	192	161	413	2066	943	491	971	972
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.6	54.5	52.8	45.2	53.6	51.6	14.5	15.6	13.3	12.2	18.3	18.3
Incr Delay (d2), s/veh	17.4	190.5	14.5	6.2	13.9	1.7	0.9	0.8	0.6	0.5	2.8	2.8
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	13.3	3.2	4.4	4.5	1.4	1.4	7.4	3.1	1.1	10.9	10.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	64.0	245.0	67.3	51.4	67.4	53.3	15.4	16.3	13.9	12.7	21.1	21.1
LnGrp LOS	E	F	E	D	E	D	B	B	B	B	C	C
Approach Vol, veh/h		512			331			1314			1275	
Approach Delay, s/veh		141.0			58.0			15.8			20.5	
Approach LOS		F			E			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.8	74.0	18.0	17.2	12.4	72.4	17.2	18.0
Change Period (Y+Rc), s	6.0	6.5	6.0	7.0	6.5	6.5	7.0	7.0
Max Green Setting (Gmax), s	16.0	55.5	12.0	11.0	12.5	58.5	11.0	11.0
Max Q Clear Time (g_c+I1), s	4.8	20.6	14.0	9.3	5.6	29.1	10.3	13.0
Green Ext Time (p_c), s	0.1	12.5	0.0	0.2	0.2	12.3	0.0	0.0

Intersection Summary	
HCM 7th Control Delay, s/veh	40.3
HCM 7th LOS	D

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	494	21	16	310	18	2
Future Vol, veh/h	494	21	16	310	18	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	5	-	-	-5	-5	-
Peak Hour Factor	91	75	44	88	64	50
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	543	28	36	352	28	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	571	0	982	557
Stage 1	-	-	-	-	557	-
Stage 2	-	-	-	-	425	-
Critical Hdwy	-	-	4.1	-	5.4	5.7
Critical Hdwy Stg 1	-	-	-	-	4.4	-
Critical Hdwy Stg 2	-	-	-	-	4.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1012	-	366	577
Stage 1	-	-	-	-	674	-
Stage 2	-	-	-	-	747	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1012	-	350	577
Mov Cap-2 Maneuver	-	-	-	-	350	-
Stage 1	-	-	-	-	674	-
Stage 2	-	-	-	-	714	-

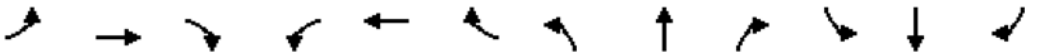
Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.81	15.73
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	368	-	-	168	-
HCM Lane V/C Ratio	0.087	-	-	0.036	-
HCM Control Delay (s/veh)	15.7	-	-	8.7	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-

PROJECTED CONDITIONS WITHOUT THE PROJECT

HCM 7th Signalized Intersection Summary
3: Lovell Road & Yarnell Road/Bob Gray Road

04/21/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	258	137	151	132	97	100	122	602	89	31	796	141
Future Volume (veh/h)	258	137	151	132	97	100	122	602	89	31	796	141
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1738	1753	1738	2097	2097	2067	1949	1934	1979	1876	1862	1847
Adj Flow Rate, veh/h	297	157	174	152	111	115	140	692	102	36	915	162
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	1	0	1	0	0	2	2	3	0	0	1	2
Cap, veh/h	405	292	246	347	183	153	272	1648	752	348	1240	220
Arrive On Green	0.18	0.17	0.17	0.09	0.09	0.09	0.06	0.45	0.45	0.03	0.41	0.41
Sat Flow, veh/h	1655	1753	1473	1997	2097	1751	1856	3674	1677	1787	3003	531
Grp Volume(v), veh/h	297	157	174	152	111	115	140	692	102	36	539	538
Grp Sat Flow(s),veh/h/ln	1655	1753	1473	1997	2097	1751	1856	1837	1677	1787	1769	1766
Q Serve(g_s), s	15.6	8.2	11.2	6.8	5.1	6.4	4.3	12.8	3.6	1.1	25.7	25.7
Cycle Q Clear(g_c), s	15.6	8.2	11.2	6.8	5.1	6.4	4.3	12.8	3.6	1.1	25.7	25.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.30
Lane Grp Cap(c), veh/h	405	292	246	347	183	153	272	1648	752	348	730	729
V/C Ratio(X)	0.73	0.54	0.71	0.44	0.61	0.75	0.51	0.42	0.14	0.10	0.74	0.74
Avail Cap(c_a), veh/h	425	292	246	431	231	193	315	1648	752	453	730	729
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.5	38.1	39.4	36.8	44.0	44.6	19.3	18.7	16.2	16.2	24.8	24.8
Incr Delay (d2), s/veh	6.1	2.5	9.9	0.9	4.6	14.1	1.5	0.8	0.4	0.1	6.6	6.6
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.7	3.6	4.6	3.3	2.8	3.3	1.8	5.2	1.4	0.4	11.2	11.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	37.7	40.7	49.2	37.7	48.6	58.7	20.9	19.5	16.6	16.3	31.3	31.4
LnGrp LOS	D	D	D	D	D	E	C	B	B	B	C	C
Approach Vol, veh/h		628			378			934			1113	
Approach Delay, s/veh		41.6			47.3			19.4			30.9	
Approach LOS		D			D			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.2	51.4	23.8	15.7	12.7	47.8	15.8	23.7
Change Period (Y+Rc), s	6.0	6.5	6.0	7.0	6.5	6.5	7.0	7.0
Max Green Setting (Gmax), s	9.0	35.5	19.0	11.0	8.5	35.5	13.0	16.0
Max Q Clear Time (g_c+I1), s	3.1	14.8	17.6	8.4	6.3	27.7	8.8	13.2
Green Ext Time (p_c), s	0.0	6.5	0.1	0.3	0.1	4.8	0.1	0.5

Intersection Summary	
HCM 7th Control Delay, s/veh	31.6
HCM 7th LOS	C

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	249	5	2	297	27	2
Future Vol, veh/h	249	5	2	297	27	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	5	-	-	-5	-5	-
Peak Hour Factor	71	63	50	75	84	50
Heavy Vehicles, %	0	0	50	0	0	0
Mvmt Flow	351	8	4	396	32	4

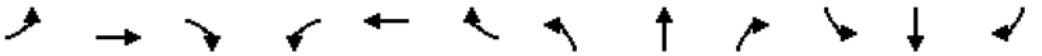
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	359	0	759	355
Stage 1	-	-	-	-	355	-
Stage 2	-	-	-	-	404	-
Critical Hdwy	-	-	4.6	-	5.4	5.7
Critical Hdwy Stg 1	-	-	-	-	4.4	-
Critical Hdwy Stg 2	-	-	-	-	4.4	-
Follow-up Hdwy	-	-	2.65	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	977	-	466	729
Stage 1	-	-	-	-	788	-
Stage 2	-	-	-	-	759	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	977	-	464	729
Mov Cap-2 Maneuver	-	-	-	-	464	-
Stage 1	-	-	-	-	788	-
Stage 2	-	-	-	-	755	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.09	13.06
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	483	-	-	18	-
HCM Lane V/C Ratio	0.075	-	-	0.004	-
HCM Control Delay (s/veh)	13.1	-	-	8.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

HCM 7th Signalized Intersection Summary
3: Lovell Road & Yarnell Road/Bob Gray Road

04/21/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	211	223	95	158	136	48	134	994	232	99	1046	173
Future Volume (veh/h)	211	223	95	158	136	48	134	994	232	99	1046	173
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1738	1753	1738	2097	2097	2067	1949	1934	1979	1876	1862	1847
Adj Flow Rate, veh/h	220	232	99	165	142	50	140	1035	242	103	1090	180
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	0	1	0	0	2	2	3	0	0	1	2
Cap, veh/h	252	161	135	240	189	158	284	2040	931	301	1649	272
Arrive On Green	0.10	0.09	0.09	0.09	0.09	0.09	0.05	0.56	0.56	0.04	0.54	0.54
Sat Flow, veh/h	1655	1753	1473	1997	2097	1751	1856	3674	1677	1787	3039	501
Grp Volume(v), veh/h	220	232	99	165	142	50	140	1035	242	103	633	637
Grp Sat Flow(s),veh/h/ln	1655	1753	1473	1997	2097	1751	1856	1837	1677	1787	1769	1772
Q Serve(g_s), s	12.0	11.0	7.9	8.9	7.9	3.2	4.0	20.9	9.0	3.1	30.6	30.8
Cycle Q Clear(g_c), s	12.0	11.0	7.9	8.9	7.9	3.2	4.0	20.9	9.0	3.1	30.6	30.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.28
Lane Grp Cap(c), veh/h	252	161	135	240	189	158	284	2040	931	301	959	961
V/C Ratio(X)	0.87	1.44	0.73	0.69	0.75	0.32	0.49	0.51	0.26	0.34	0.66	0.66
Avail Cap(c_a), veh/h	252	161	135	243	192	161	383	2040	931	464	959	961
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.2	54.5	53.1	44.4	53.3	51.1	16.5	16.5	13.9	13.0	19.6	19.6
Incr Delay (d2), s/veh	26.7	231.3	19.8	7.8	16.0	1.6	1.3	0.9	0.7	0.7	3.6	3.6
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.0	15.1	3.6	4.8	4.9	1.5	1.6	8.4	3.4	1.2	12.5	12.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	73.8	285.8	72.9	52.2	69.3	52.7	17.8	17.4	14.5	13.7	23.1	23.2
LnGrp LOS	E	F	E	D	E	D	B	B	B	B	C	C
Approach Vol, veh/h		551			357			1417			1373	
Approach Delay, s/veh		162.9			59.1			17.0			22.5	
Approach LOS		F			E			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.0	73.1	18.0	17.8	12.6	71.6	17.8	18.0
Change Period (Y+Rc), s	6.0	6.5	6.0	7.0	6.5	6.5	7.0	7.0
Max Green Setting (Gmax), s	16.0	55.5	12.0	11.0	12.5	58.5	11.0	11.0
Max Q Clear Time (g_c+I1), s	5.1	22.9	14.0	9.9	6.0	32.8	10.9	13.0
Green Ext Time (p_c), s	0.2	13.4	0.0	0.1	0.2	12.7	0.0	0.0

Intersection Summary	
HCM 7th Control Delay, s/veh	44.8
HCM 7th LOS	D

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	531	21	16	333	18	2
Future Vol, veh/h	531	21	16	333	18	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	5	-	-	-5	-5	-
Peak Hour Factor	91	75	44	88	64	50
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	584	28	36	378	28	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	612	0	1049	598
Stage 1	-	-	-	-	598	-
Stage 2	-	-	-	-	451	-
Critical Hdwy	-	-	4.1	-	5.4	5.7
Critical Hdwy Stg 1	-	-	-	-	4.4	-
Critical Hdwy Stg 2	-	-	-	-	4.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	977	-	340	550
Stage 1	-	-	-	-	653	-
Stage 2	-	-	-	-	732	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	977	-	324	550
Mov Cap-2 Maneuver	-	-	-	-	324	-
Stage 1	-	-	-	-	653	-
Stage 2	-	-	-	-	698	-

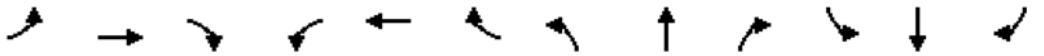
Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.77	16.63
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	342	-	-	158	-
HCM Lane V/C Ratio	0.094	-	-	0.037	-
HCM Control Delay (s/veh)	16.6	-	-	8.8	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-

PROJECTED CONDITIONS WITH THE PROJECT
BOB GRAY ROAD SUBDIVISION ONLY + LOVELL CROSSING DEVELOPMENT

HCM 7th Signalized Intersection Summary
3: Lovell Road & Yarnell Road/Bob Gray Road

04/21/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	260	143	151	149	107	110	127	608	91	32	810	141
Future Volume (veh/h)	260	143	151	149	107	110	127	608	91	32	810	141
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1738	1753	1738	2097	2097	2067	1949	1934	1979	1876	1862	1847
Adj Flow Rate, veh/h	299	164	174	171	123	126	146	699	105	37	931	162
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	1	0	1	0	0	2	2	3	0	0	1	2
Cap, veh/h	404	288	242	356	195	163	266	1625	742	341	1218	212
Arrive On Green	0.18	0.16	0.16	0.10	0.09	0.09	0.06	0.44	0.44	0.03	0.40	0.40
Sat Flow, veh/h	1655	1753	1473	1997	2097	1751	1856	3674	1677	1787	3012	524
Grp Volume(v), veh/h	299	164	174	171	123	126	146	699	105	37	546	547
Grp Sat Flow(s),veh/h/ln	1655	1753	1473	1997	2097	1751	1856	1837	1677	1787	1769	1767
Q Serve(g_s), s	15.6	8.6	11.2	7.6	5.7	7.0	4.5	13.1	3.7	1.2	26.6	26.7
Cycle Q Clear(g_c), s	15.6	8.6	11.2	7.6	5.7	7.0	4.5	13.1	3.7	1.2	26.6	26.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.30
Lane Grp Cap(c), veh/h	404	288	242	356	195	163	266	1625	742	341	715	715
V/C Ratio(X)	0.74	0.57	0.72	0.48	0.63	0.77	0.55	0.43	0.14	0.11	0.76	0.76
Avail Cap(c_a), veh/h	425	288	242	423	231	193	304	1625	742	444	715	715
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.1	38.5	39.6	35.9	43.7	44.3	20.2	19.2	16.6	16.7	25.7	25.7
Incr Delay (d2), s/veh	6.4	3.3	10.7	1.0	5.4	16.9	1.8	0.8	0.4	0.1	7.6	7.6
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.7	3.9	4.6	3.7	3.2	3.7	1.9	5.3	1.4	0.5	11.8	11.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	37.5	41.8	50.3	37.0	49.1	61.2	21.9	20.0	17.0	16.8	33.3	33.3
LnGrp LOS	D	D	D	D	D	E	C	C	B	B	C	C
Approach Vol, veh/h		637			420			950			1130	
Approach Delay, s/veh		42.1			47.8			20.0			32.7	
Approach LOS		D			D			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.2	50.7	23.8	16.3	13.0	47.0	16.6	23.4
Change Period (Y+Rc), s	6.0	6.5	6.0	7.0	6.5	6.5	7.0	7.0
Max Green Setting (Gmax), s	9.0	35.5	19.0	11.0	8.5	35.5	13.0	16.0
Max Q Clear Time (g_c+I1), s	3.2	15.1	17.6	9.0	6.5	28.7	9.6	13.2
Green Ext Time (p_c), s	0.0	6.5	0.1	0.3	0.1	4.3	0.1	0.5

Intersection Summary	
HCM 7th Control Delay, s/veh	32.8
HCM 7th LOS	C

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	258	5	2	334	27	2
Future Vol, veh/h	258	5	2	334	27	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	5	-	-	-5	-5	-
Peak Hour Factor	71	63	50	75	84	50
Heavy Vehicles, %	0	0	50	0	0	0
Mvmt Flow	363	8	4	445	32	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	371	0	821	367
Stage 1	-	-	-	-	367	-
Stage 2	-	-	-	-	453	-
Critical Hdwy	-	-	4.6	-	5.4	5.7
Critical Hdwy Stg 1	-	-	-	-	4.4	-
Critical Hdwy Stg 2	-	-	-	-	4.4	-
Follow-up Hdwy	-	-	2.65	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	966	-	436	718
Stage 1	-	-	-	-	781	-
Stage 2	-	-	-	-	731	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	966	-	434	718
Mov Cap-2 Maneuver	-	-	-	-	434	-
Stage 1	-	-	-	-	781	-
Stage 2	-	-	-	-	727	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.08	13.63
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	453	-	-	16	-
HCM Lane V/C Ratio	0.08	-	-	0.004	-
HCM Control Delay (s/veh)	13.6	-	-	8.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

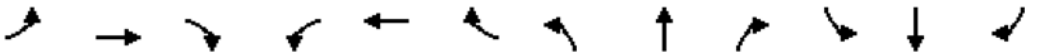
Intersection	
Int Delay, s/veh	0.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	253	7	4	302	34	6
Future Vol, veh/h	253	7	4	302	34	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	3	0	-
Peak Hour Factor	90	90	90	88	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	281	8	4	343	38	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	289	0	637	285
Stage 1	-	-	-	-	285	-
Stage 2	-	-	-	-	352	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1285	-	445	759
Stage 1	-	-	-	-	768	-
Stage 2	-	-	-	-	716	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1285	-	443	759
Mov Cap-2 Maneuver	-	-	-	-	443	-
Stage 1	-	-	-	-	768	-
Stage 2	-	-	-	-	713	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.1	13.41
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	472	-	-	23	-
HCM Lane V/C Ratio	0.094	-	-	0.003	-
HCM Control Delay (s/veh)	13.4	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	218	240	95	177	147	52	148	1014	242	105	1073	173
Future Volume (veh/h)	218	240	95	177	147	52	148	1014	242	105	1073	173
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1738	1753	1738	2097	2097	2067	1949	1934	1979	1876	1862	1847
Adj Flow Rate, veh/h	227	250	99	184	153	54	154	1056	252	109	1118	180
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	0	1	0	0	2	2	3	0	0	1	2
Cap, veh/h	248	161	135	243	192	161	280	2027	925	295	1639	263
Arrive On Green	0.10	0.09	0.09	0.09	0.09	0.09	0.05	0.55	0.55	0.04	0.54	0.54
Sat Flow, veh/h	1655	1753	1473	1997	2097	1751	1856	3674	1677	1787	3052	490
Grp Volume(v), veh/h	227	250	99	184	153	54	154	1056	252	109	646	652
Grp Sat Flow(s),veh/h/ln	1655	1753	1473	1997	2097	1751	1856	1837	1677	1787	1769	1773
Q Serve(g_s), s	12.0	11.0	7.9	9.9	8.6	3.5	4.4	21.7	9.5	3.3	32.0	32.3
Cycle Q Clear(g_c), s	12.0	11.0	7.9	9.9	8.6	3.5	4.4	21.7	9.5	3.3	32.0	32.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.28
Lane Grp Cap(c), veh/h	248	161	135	243	192	161	280	2027	925	295	950	952
V/C Ratio(X)	0.92	1.56	0.73	0.76	0.80	0.34	0.55	0.52	0.27	0.37	0.68	0.68
Avail Cap(c_a), veh/h	248	161	135	243	192	161	372	2027	925	455	950	952
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.5	54.5	53.1	44.6	53.4	51.1	17.6	16.9	14.2	13.4	20.3	20.3
Incr Delay (d2), s/veh	35.7	278.4	19.8	12.8	21.3	1.7	1.7	1.0	0.7	0.8	3.9	4.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	17.2	3.6	5.7	5.6	1.6	1.8	8.7	3.6	1.3	13.1	13.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	83.2	332.9	72.9	57.4	74.7	52.8	19.2	17.9	14.9	14.2	24.2	24.3
LnGrp LOS	F	F	E	E	E	D	B	B	B	B	C	C
Approach Vol, veh/h		576			391			1462			1407	
Approach Delay, s/veh		189.8			63.5			17.5			23.5	
Approach LOS		F			E			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.3	72.7	18.0	18.0	13.1	70.9	18.0	18.0
Change Period (Y+Rc), s	6.0	6.5	6.0	7.0	6.5	6.5	7.0	7.0
Max Green Setting (Gmax), s	16.0	55.5	12.0	11.0	12.5	58.5	11.0	11.0
Max Q Clear Time (g_c+I1), s	5.3	23.7	14.0	10.6	6.4	34.3	11.9	13.0
Green Ext Time (p_c), s	0.2	13.7	0.0	0.1	0.2	12.6	0.0	0.0

Intersection Summary	
HCM 7th Control Delay, s/veh	50.3
HCM 7th LOS	D

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	564	21	16	367	18	2
Future Vol, veh/h	564	21	16	367	18	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	5	-	-	-5	-5	-
Peak Hour Factor	91	75	44	88	64	50
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	620	28	36	417	28	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	648	0	1124	634
Stage 1	-	-	-	-	634	-
Stage 2	-	-	-	-	490	-
Critical Hdwy	-	-	4.1	-	5.4	5.7
Critical Hdwy Stg 1	-	-	-	-	4.4	-
Critical Hdwy Stg 2	-	-	-	-	4.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	948	-	313	527
Stage 1	-	-	-	-	635	-
Stage 2	-	-	-	-	711	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	948	-	298	527
Mov Cap-2 Maneuver	-	-	-	-	298	-
Stage 1	-	-	-	-	635	-
Stage 2	-	-	-	-	675	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.72	17.73
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	315	-	-	144	-
HCM Lane V/C Ratio	0.102	-	-	0.038	-
HCM Control Delay (s/veh)	17.7	-	-	9	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.9

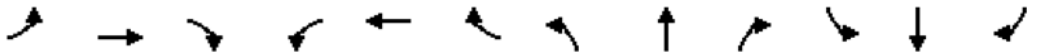
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	540	26	14	355	28	5
Future Vol, veh/h	540	26	14	355	28	5
Conflicting Peds, #/hr	0	0	0	0	5	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	3	0	-
Peak Hour Factor	71	90	90	75	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	761	29	16	473	31	6

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	789	0	1284	775
Stage 1	-	-	-	-	775	-
Stage 2	-	-	-	-	509	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	839	-	184	401
Stage 1	-	-	-	-	458	-
Stage 2	-	-	-	-	607	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	839	-	178	401
Mov Cap-2 Maneuver	-	-	-	-	178	-
Stage 1	-	-	-	-	458	-
Stage 2	-	-	-	-	590	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.3	27.75
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	195	-	-	57	-
HCM Lane V/C Ratio	0.188	-	-	0.019	-
HCM Control Delay (s/veh)	27.7	-	-	9.4	0
HCM Lane LOS	D	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0.1	-

PROJECTED CONDITIONS WITH THE PROJECT
COMBINED RESIDENTIAL SUBDIVISIONS + LOVELL CROSSING DEVELOPMENT



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	260	148	151	166	120	123	127	608	94	33	810	141
Future Volume (veh/h)	260	148	151	166	120	123	127	608	94	33	810	141
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1738	1753	1738	2097	2097	2067	1949	1934	1979	1876	1862	1847
Adj Flow Rate, veh/h	299	170	174	191	138	141	146	699	108	38	931	162
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	1	0	1	0	0	2	2	3	0	0	1	2
Cap, veh/h	402	284	239	365	211	176	262	1600	730	335	1198	208
Arrive On Green	0.18	0.16	0.16	0.10	0.10	0.10	0.07	0.44	0.44	0.03	0.40	0.40
Sat Flow, veh/h	1655	1753	1473	1997	2097	1751	1856	3674	1677	1787	3012	524
Grp Volume(v), veh/h	299	170	174	191	138	141	146	699	108	38	546	547
Grp Sat Flow(s),veh/h/ln	1655	1753	1473	1997	2097	1751	1856	1837	1677	1787	1769	1767
Q Serve(g_s), s	15.5	9.0	11.2	8.4	6.3	7.9	4.6	13.3	3.9	1.2	26.9	27.0
Cycle Q Clear(g_c), s	15.5	9.0	11.2	8.4	6.3	7.9	4.6	13.3	3.9	1.2	26.9	27.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.30
Lane Grp Cap(c), veh/h	402	284	239	365	211	176	262	1600	730	335	703	703
V/C Ratio(X)	0.74	0.60	0.73	0.52	0.65	0.80	0.56	0.44	0.15	0.11	0.78	0.78
Avail Cap(c_a), veh/h	425	284	239	416	231	193	299	1600	730	438	703	703
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.6	38.9	39.8	35.0	43.3	44.0	20.6	19.7	17.0	17.1	26.3	26.3
Incr Delay (d2), s/veh	6.6	4.1	11.5	1.2	6.9	20.9	1.8	0.9	0.4	0.1	8.2	8.3
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.6	4.1	4.7	4.1	3.6	4.3	1.9	5.4	1.5	0.5	12.0	12.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	37.2	42.9	51.3	36.1	50.2	64.9	22.5	20.6	17.5	17.2	34.5	34.5
LnGrp LOS	D	D	D	D	D	E	C	C	B	B	C	C
Approach Vol, veh/h		643			470			953			1131	
Approach Delay, s/veh		42.6			48.9			20.5			33.9	
Approach LOS		D			D			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.3	50.0	23.6	17.1	13.0	46.3	17.5	23.2
Change Period (Y+Rc), s	6.0	6.5	6.0	7.0	6.5	6.5	7.0	7.0
Max Green Setting (Gmax), s	9.0	35.5	19.0	11.0	8.5	35.5	13.0	16.0
Max Q Clear Time (g_c+I1), s	3.2	15.3	17.5	9.9	6.6	29.0	10.4	13.2
Green Ext Time (p_c), s	0.0	6.5	0.1	0.2	0.1	4.2	0.1	0.6

Intersection Summary	
HCM 7th Control Delay, s/veh	33.9
HCM 7th LOS	C

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	267	5	2	377	27	2
Future Vol, veh/h	267	5	2	377	27	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	5	-	-	-5	-5	-
Peak Hour Factor	71	63	50	75	84	50
Heavy Vehicles, %	0	0	50	0	0	0
Mvmt Flow	376	8	4	503	32	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	384	0	891	380
Stage 1	-	-	-	-	380	-
Stage 2	-	-	-	-	511	-
Critical Hdwy	-	-	4.6	-	5.4	5.7
Critical Hdwy Stg 1	-	-	-	-	4.4	-
Critical Hdwy Stg 2	-	-	-	-	4.4	-
Follow-up Hdwy	-	-	2.65	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	955	-	404	708
Stage 1	-	-	-	-	773	-
Stage 2	-	-	-	-	699	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	955	-	402	708
Mov Cap-2 Maneuver	-	-	-	-	402	-
Stage 1	-	-	-	-	773	-
Stage 2	-	-	-	-	695	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.07	14.33
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	422	-	-	14	-
HCM Lane V/C Ratio	0.086	-	-	0.004	-
HCM Control Delay (s/veh)	14.3	-	-	8.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	253	16	9	302	77	14
Future Vol, veh/h	253	16	9	302	77	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	3	0	-
Peak Hour Factor	90	90	90	88	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	281	18	10	343	86	16

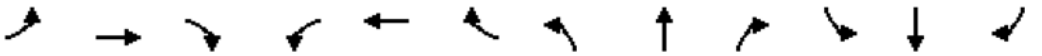
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	299	0	653	290
Stage 1	-	-	-	-	290	-
Stage 2	-	-	-	-	363	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1274	-	435	754
Stage 1	-	-	-	-	764	-
Stage 2	-	-	-	-	708	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1274	-	431	754
Mov Cap-2 Maneuver	-	-	-	-	431	-
Stage 1	-	-	-	-	764	-
Stage 2	-	-	-	-	701	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.22	14.98
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	461	-	-	51	-
HCM Lane V/C Ratio	0.219	-	-	0.008	-
HCM Control Delay (s/veh)	15	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.8	-	-	0	-

HCM 7th Signalized Intersection Summary
3: Lovell Road & Yarnell Road/Bob Gray Road

04/21/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	218	253	95	194	162	56	148	1014	255	112	1073	173
Future Volume (veh/h)	218	253	95	194	162	56	148	1014	255	112	1073	173
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1738	1753	1738	2097	2097	2067	1949	1934	1979	1876	1862	1847
Adj Flow Rate, veh/h	227	264	99	202	169	58	154	1056	266	117	1118	180
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	0	1	0	0	2	2	3	0	0	1	2
Cap, veh/h	238	161	135	243	192	161	280	2019	921	296	1639	263
Arrive On Green	0.10	0.09	0.09	0.09	0.09	0.09	0.05	0.55	0.55	0.05	0.54	0.54
Sat Flow, veh/h	1655	1753	1473	1997	2097	1751	1856	3674	1677	1787	3052	490
Grp Volume(v), veh/h	227	264	99	202	169	58	154	1056	266	117	646	652
Grp Sat Flow(s),veh/h/ln	1655	1753	1473	1997	2097	1751	1856	1837	1677	1787	1769	1773
Q Serve(g_s), s	12.0	11.0	7.9	11.0	9.6	3.7	4.4	21.8	10.2	3.5	32.0	32.3
Cycle Q Clear(g_c), s	12.0	11.0	7.9	11.0	9.6	3.7	4.4	21.8	10.2	3.5	32.0	32.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.28
Lane Grp Cap(c), veh/h	238	161	135	243	192	161	280	2019	921	296	950	952
V/C Ratio(X)	0.95	1.64	0.73	0.83	0.88	0.36	0.55	0.52	0.29	0.40	0.68	0.68
Avail Cap(c_a), veh/h	238	161	135	243	192	161	372	2019	921	451	950	952
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.6	54.5	53.1	45.0	53.8	51.2	17.6	17.1	14.5	13.5	20.3	20.3
Incr Delay (d2), s/veh	45.0	315.7	19.8	21.0	34.7	1.9	1.7	1.0	0.8	0.9	3.9	4.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.3	18.8	3.6	6.8	6.8	1.7	1.8	8.8	3.9	1.4	13.1	13.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	92.5	370.2	72.9	66.0	88.5	53.1	19.2	18.1	15.3	14.4	24.2	24.3
LnGrp LOS	F	F	E	E	F	D	B	B	B	B	C	C
Approach Vol, veh/h		590			429			1476			1415	
Approach Delay, s/veh		213.5			73.2			17.7			23.5	
Approach LOS		F			E			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.6	72.4	18.0	18.0	13.1	70.9	18.0	18.0
Change Period (Y+Rc), s	6.0	6.5	6.0	7.0	6.5	6.5	7.0	7.0
Max Green Setting (Gmax), s	16.0	55.5	12.0	11.0	12.5	58.5	11.0	11.0
Max Q Clear Time (g_c+I1), s	5.5	23.8	14.0	11.6	6.4	34.3	13.0	13.0
Green Ext Time (p_c), s	0.2	13.8	0.0	0.0	0.2	12.6	0.0	0.0

Intersection Summary	
HCM 7th Control Delay, s/veh	55.4
HCM 7th LOS	E

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	597	21	16	403	18	2
Future Vol, veh/h	597	21	16	403	18	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	5	-	-	-5	-5	-
Peak Hour Factor	91	75	44	88	64	50
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	656	28	36	458	28	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	684	0	1201	670
Stage 1	-	-	-	-	670	-
Stage 2	-	-	-	-	531	-
Critical Hdwy	-	-	4.1	-	5.4	5.7
Critical Hdwy Stg 1	-	-	-	-	4.4	-
Critical Hdwy Stg 2	-	-	-	-	4.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	919	-	288	505
Stage 1	-	-	-	-	617	-
Stage 2	-	-	-	-	688	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	919	-	273	505
Mov Cap-2 Maneuver	-	-	-	-	273	-
Stage 1	-	-	-	-	617	-
Stage 2	-	-	-	-	652	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.67	19
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	289	-	-	132	-
HCM Lane V/C Ratio	0.111	-	-	0.04	-
HCM Control Delay (s/veh)	19	-	-	9.1	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-

Intersection	
Int Delay, s/veh	2.8

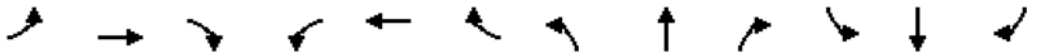
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	540	59	32	355	64	11
Future Vol, veh/h	540	59	32	355	64	11
Conflicting Peds, #/hr	0	0	0	0	5	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	3	0	-
Peak Hour Factor	71	90	90	75	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	761	66	36	473	71	12

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	826	0	1343	793
Stage 1	-	-	-	-	793	-
Stage 2	-	-	-	-	549	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	813	-	169	392
Stage 1	-	-	-	-	449	-
Stage 2	-	-	-	-	582	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	813	-	159	392
Mov Cap-2 Maneuver	-	-	-	-	159	-
Stage 1	-	-	-	-	449	-
Stage 2	-	-	-	-	545	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.67	43.49
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	174	-	-	126	-
HCM Lane V/C Ratio	0.48	-	-	0.044	-
HCM Control Delay (s/veh)	43.5	-	-	9.6	0
HCM Lane LOS	E	-	-	A	A
HCM 95th %tile Q(veh)	2.3	-	-	0.1	-

PROJECTED CONDITIONS WITH THE PROJECT
BOB GRAY ROAD SUBDIVISION ONLY + LOVELL CROSSING DEVELOPMENT
WITH MODIFIED SIGNAL TIMING

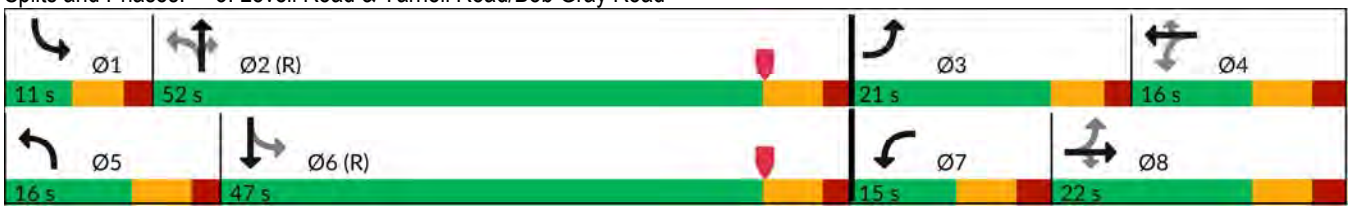


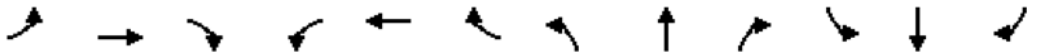
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	260	143	151	149	107	110	127	608	91	32	810	141
Future Volume (vph)	260	143	151	149	107	110	127	608	91	32	810	141
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			-5%			-2%			2%	
Storage Length (ft)	180		300	175		215	140		245	135		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	95			75			80			80		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850			0.850			0.850		0.978	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1742	1852	1559	1850	1947	1623	1787	3540	1631	1787	3456	0
Flt Permitted	0.415			0.653			0.114			0.378		
Satd. Flow (perm)	761	1852	1559	1272	1947	1623	214	3540	1631	711	3456	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			180			180			185		24	
Link Speed (mph)		40			40			45			45	
Link Distance (ft)		583			867			822			438	
Travel Time (s)		9.9			14.8			12.5			6.6	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	1%	0%	1%	0%	0%	2%	2%	3%	0%	0%	1%	2%
Adj. Flow (vph)	299	164	174	171	123	126	146	699	105	37	931	162
Shared Lane Traffic (%)												
Lane Group Flow (vph)	299	164	174	171	123	126	146	699	105	37	1093	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4		4	2		2	6		
Detector Phase	3	8	8	7	4	4	5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	6.0	8.0	8.0	6.0	8.0	8.0	6.0	25.0	25.0	5.0	25.0	
Minimum Split (s)	15.0	15.0	15.0	13.0	15.0	15.0	12.5	35.5	35.5	11.0	35.5	
Total Split (s)	21.0	22.0	22.0	15.0	16.0	16.0	16.0	52.0	52.0	11.0	47.0	
Total Split (%)	21.0%	22.0%	22.0%	15.0%	16.0%	16.0%	16.0%	52.0%	52.0%	11.0%	47.0%	
Maximum Green (s)	15.0	15.0	15.0	8.0	9.0	9.0	9.5	45.5	45.5	5.0	40.5	
Yellow Time (s)	4.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.5	
All-Red Time (s)	2.0	2.5	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	7.0	7.0	7.0	7.0	7.0	6.5	6.5	6.5	6.0	6.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	
Act Effct Green (s)	30.4	14.7	14.7	16.9	8.9	8.9	55.9	50.2	50.2	47.3	41.7	
Actuated g/C Ratio	0.30	0.15	0.15	0.17	0.09	0.09	0.56	0.50	0.50	0.47	0.42	
v/c Ratio	0.80	0.61	0.46	0.66	0.71	0.41	0.57	0.39	0.12	0.09	0.75	
Control Delay (s/veh)	46.3	50.1	9.7	42.4	66.9	6.1	21.1	17.2	0.3	10.7	28.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay (s/veh)	46.3	50.1	9.7	42.4	66.9	6.1	21.1	17.2	0.3	10.7	28.5	
LOS	D	D	A	D	E	A	C	B	A	B	C	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay (s/veh)		37.3			38.7			15.9			27.9	
Approach LOS		D			D			B			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay (s/veh): 27.6		Intersection LOS: C	
Intersection Capacity Utilization 76.7%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 3: Lovell Road & Yarnell Road/Bob Gray Road



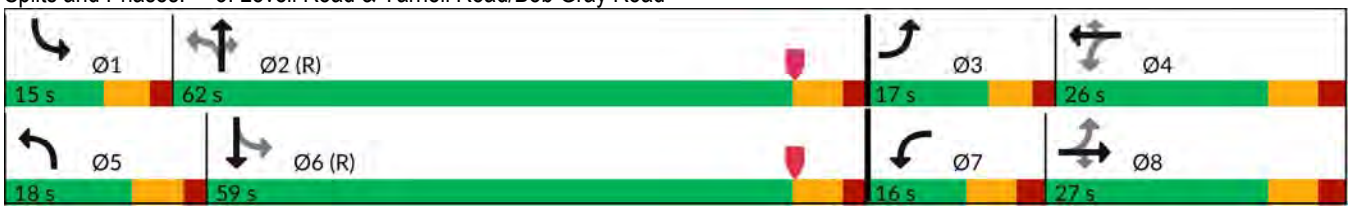


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	218	240	95	177	147	52	148	1014	242	105	1073	173
Future Volume (vph)	218	240	95	177	147	52	148	1014	242	105	1073	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			-5%			-2%			2%	
Storage Length (ft)	180		300	175		215	140		245	135		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	95			75			80			80		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850			0.850			0.850		0.979	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1742	1852	1559	1850	1947	1623	1787	3540	1631	1787	3459	0
Flt Permitted	0.541			0.330			0.078			0.177		
Satd. Flow (perm)	992	1852	1559	643	1947	1623	147	3540	1631	333	3459	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			150			150			252		19	
Link Speed (mph)		40			40			45			45	
Link Distance (ft)		580			867			822			438	
Travel Time (s)		9.9			14.8			12.5			6.6	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	1%	0%	1%	0%	0%	2%	2%	3%	0%	0%	1%	2%
Adj. Flow (vph)	227	250	99	184	153	54	154	1056	252	109	1118	180
Shared Lane Traffic (%)												
Lane Group Flow (vph)	227	250	99	184	153	54	154	1056	252	109	1298	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4		4	2		2	6		
Detector Phase	3	8	8	7	4	4	5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	6.0	8.0	8.0	6.0	8.0	8.0	6.0	25.0	25.0	5.0	25.0	
Minimum Split (s)	12.0	15.0	15.0	13.0	15.0	15.0	12.5	35.5	35.5	11.0	35.5	
Total Split (s)	17.0	27.0	27.0	16.0	26.0	26.0	18.0	62.0	62.0	15.0	59.0	
Total Split (%)	14.2%	22.5%	22.5%	13.3%	21.7%	21.7%	15.0%	51.7%	51.7%	12.5%	49.2%	
Maximum Green (s)	11.0	20.0	20.0	9.0	19.0	19.0	11.5	55.5	55.5	9.0	52.5	
Yellow Time (s)	4.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.5	
All-Red Time (s)	2.0	2.5	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	7.0	7.0	7.0	7.0	7.0	6.5	6.5	6.5	6.0	6.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	
Act Effct Green (s)	31.2	19.2	19.2	27.2	18.2	18.2	67.3	57.1	57.1	63.2	54.6	
Actuated g/C Ratio	0.26	0.16	0.16	0.23	0.15	0.15	0.56	0.48	0.48	0.53	0.46	
v/c Ratio	0.69	0.84	0.26	0.78	0.52	0.14	0.70	0.63	0.28	0.40	0.82	
Control Delay (s/veh)	47.3	73.7	3.3	58.4	53.4	0.8	37.8	25.9	3.1	15.5	33.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay (s/veh)	47.3	73.7	3.3	58.4	53.4	0.8	37.8	25.9	3.1	15.5	33.8	
LOS	D	E	A	E	D	A	D	C	A	B	C	

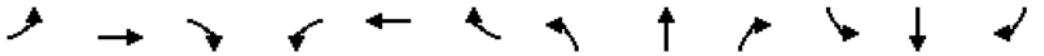
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay (s/veh)		51.2			48.5			23.2			32.4	
Approach LOS		D			D			C			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 30 (25%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.84			
Intersection Signal Delay (s/veh): 33.4		Intersection LOS: C	
Intersection Capacity Utilization 88.3%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 3: Lovell Road & Yarnell Road/Bob Gray Road



PROJECTED CONDITIONS WITH THE PROJECT
COMBINED RESIDENTIAL SUBDIVISIONS + LOVELL CROSSING DEVELOPMENT
WITH MODIFIED SIGNAL TIMING

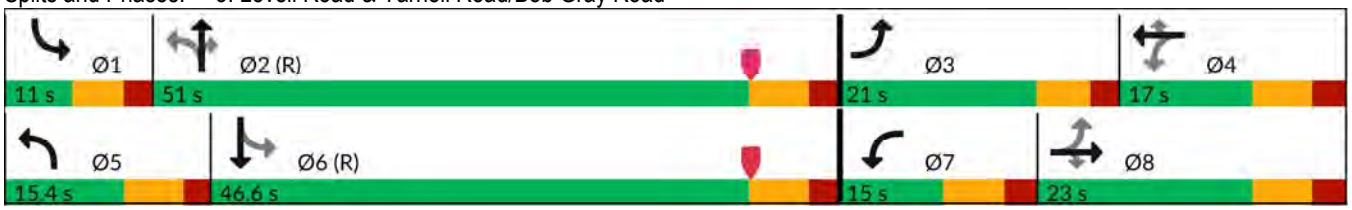


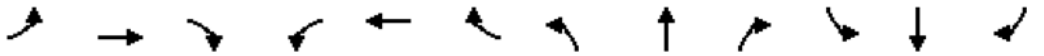
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	260	148	151	166	120	123	127	608	94	33	810	141
Future Volume (vph)	260	148	151	166	120	123	127	608	94	33	810	141
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			-5%			-2%			2%	
Storage Length (ft)	180		300	175		215	140		245	135		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	95			75			80			80		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850			0.850			0.850		0.978	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1742	1852	1559	1850	1947	1623	1787	3540	1631	1787	3456	0
Flt Permitted	0.404			0.650			0.111			0.373		
Satd. Flow (perm)	741	1852	1559	1266	1947	1623	209	3540	1631	702	3456	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			180			180			185		24	
Link Speed (mph)		40			40			45			45	
Link Distance (ft)		583			867			822			438	
Travel Time (s)		9.9			14.8			12.5			6.6	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	1%	0%	1%	0%	0%	2%	2%	3%	0%	0%	1%	2%
Adj. Flow (vph)	299	170	174	191	138	141	146	699	108	38	931	162
Shared Lane Traffic (%)												
Lane Group Flow (vph)	299	170	174	191	138	141	146	699	108	38	1093	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4		4	2		2	6		
Detector Phase	3	8	8	7	4	4	5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	6.0	8.0	8.0	6.0	8.0	8.0	6.0	25.0	25.0	5.0	25.0	
Minimum Split (s)	15.0	15.0	15.0	13.0	15.0	15.0	12.5	35.5	35.5	11.0	35.5	
Total Split (s)	21.0	23.0	23.0	15.0	17.0	17.0	15.4	51.0	51.0	11.0	46.6	
Total Split (%)	21.0%	23.0%	23.0%	15.0%	17.0%	17.0%	15.4%	51.0%	51.0%	11.0%	46.6%	
Maximum Green (s)	15.0	16.0	16.0	8.0	10.0	10.0	8.9	44.5	44.5	5.0	40.1	
Yellow Time (s)	4.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.5	
All-Red Time (s)	2.0	2.5	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	7.0	7.0	7.0	7.0	7.0	6.5	6.5	6.5	6.0	6.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	
Act Effct Green (s)	31.3	15.6	15.6	17.9	9.9	9.9	54.7	49.3	49.3	46.7	41.1	
Actuated g/C Ratio	0.31	0.16	0.16	0.18	0.10	0.10	0.55	0.49	0.49	0.47	0.41	
v/c Ratio	0.79	0.59	0.44	0.70	0.72	0.44	0.59	0.40	0.12	0.10	0.76	
Control Delay (s/veh)	44.9	48.3	9.2	44.6	65.6	7.4	23.2	17.9	0.4	11.1	29.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay (s/veh)	44.9	48.3	9.2	44.6	65.6	7.4	23.2	17.9	0.4	11.1	29.2	
LOS	D	D	A	D	E	A	C	B	A	B	C	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay (s/veh)		36.1			39.6			16.7			28.6	
Approach LOS		D			D			B			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay (s/veh): 28.2		Intersection LOS: C	
Intersection Capacity Utilization 76.7%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 3: Lovell Road & Yarnell Road/Bob Gray Road



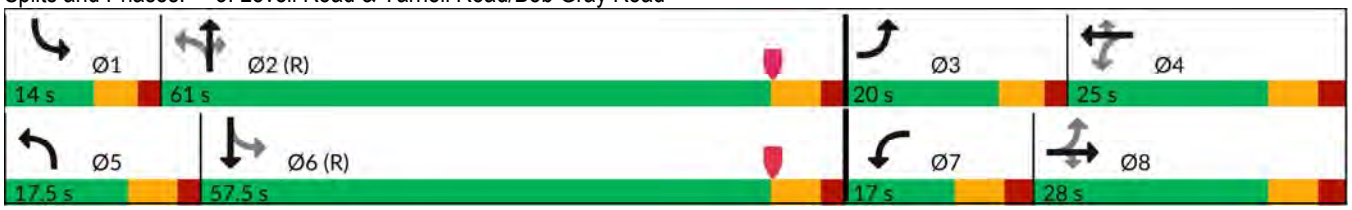


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	218	253	95	194	162	56	148	1014	255	112	1073	173
Future Volume (vph)	218	253	95	194	162	56	148	1014	255	112	1073	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			-5%			-2%			2%	
Storage Length (ft)	180		300	175		215	140		245	135		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	95			75			80			80		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850			0.850			0.850		0.979	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1742	1852	1559	1850	1947	1623	1787	3540	1631	1787	3459	0
Flt Permitted	0.450			0.340			0.072			0.171		
Satd. Flow (perm)	825	1852	1559	662	1947	1623	135	3540	1631	322	3459	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			150			150			266		19	
Link Speed (mph)		40			40			45			45	
Link Distance (ft)		580			867			822			438	
Travel Time (s)		9.9			14.8			12.5			6.6	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	1%	0%	1%	0%	0%	2%	2%	3%	0%	0%	1%	2%
Adj. Flow (vph)	227	264	99	202	169	58	154	1056	266	117	1118	180
Shared Lane Traffic (%)												
Lane Group Flow (vph)	227	264	99	202	169	58	154	1056	266	117	1298	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4		4	2		2	6		
Detector Phase	3	8	8	7	4	4	5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	6.0	8.0	8.0	6.0	8.0	8.0	6.0	25.0	25.0	5.0	25.0	
Minimum Split (s)	12.0	15.0	15.0	13.0	15.0	15.0	12.5	35.5	35.5	11.0	35.5	
Total Split (s)	20.0	28.0	28.0	17.0	25.0	25.0	17.5	61.0	61.0	14.0	57.5	
Total Split (%)	16.7%	23.3%	23.3%	14.2%	20.8%	20.8%	14.6%	50.8%	50.8%	11.7%	47.9%	
Maximum Green (s)	14.0	21.0	21.0	10.0	18.0	18.0	11.0	54.5	54.5	8.0	51.0	
Yellow Time (s)	4.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.5	
All-Red Time (s)	2.0	2.5	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	7.0	7.0	7.0	7.0	7.0	6.5	6.5	6.5	6.0	6.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	
Act Effct Green (s)	34.7	20.1	20.1	27.6	17.6	17.6	65.7	55.7	55.7	61.1	52.9	
Actuated g/C Ratio	0.29	0.17	0.17	0.23	0.15	0.15	0.55	0.46	0.46	0.51	0.44	
v/c Ratio	0.66	0.85	0.26	0.80	0.59	0.16	0.73	0.64	0.30	0.46	0.85	
Control Delay (s/veh)	42.8	72.9	3.2	58.8	57.1	0.9	43.4	27.1	3.2	18.0	36.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay (s/veh)	42.8	72.9	3.2	58.8	57.1	0.9	43.4	27.1	3.2	18.0	36.4	
LOS	D	E	A	E	E	A	D	C	A	B	D	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay (s/veh)		49.6			50.3			24.5			34.9	
Approach LOS		D			D			C			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay (s/veh): 34.9		Intersection LOS: C	
Intersection Capacity Utilization 89.9%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 3: Lovell Road & Yarnell Road/Bob Gray Road



APPENDIX H

LOCAL TRIP GENERATION DATA

Local Apartment
Trip Generation Study

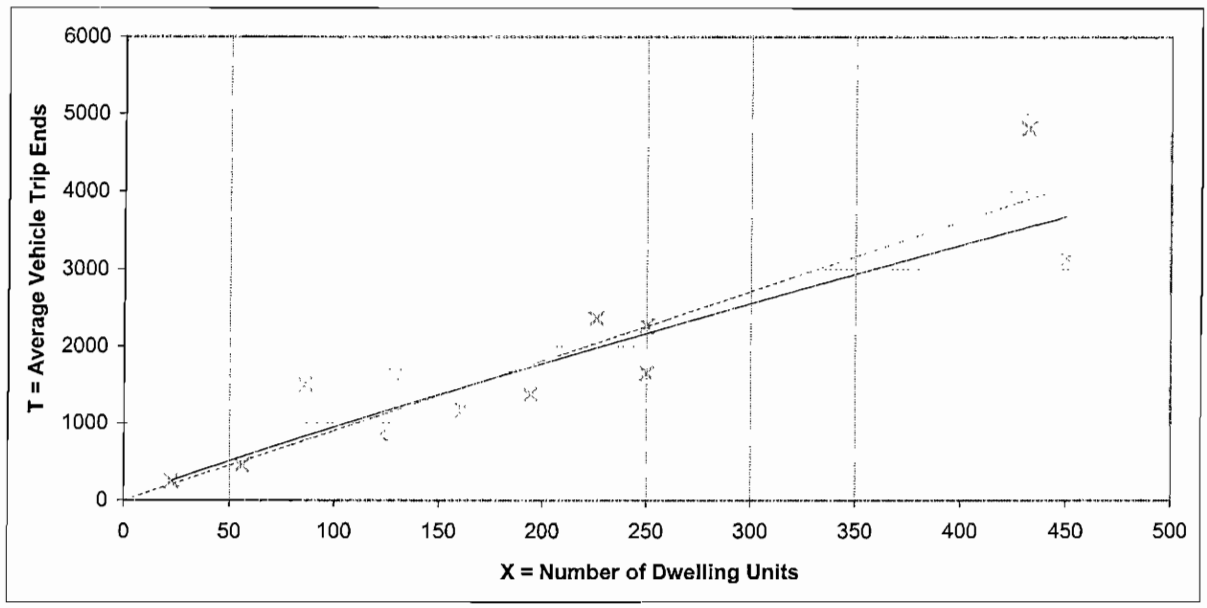
Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Number of Studies: 13
Average Number of Dwelling Units: 193
Directional Distribution: 50% entering, 50% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
9.03	6.59 - 17.41	2.47

Data Plot and Equation



X Actual Data Points ———— Fitted Curve Average Rate

Fitted Curve Equation: $T = 15.193(X)^{0.899}$ $R^2 = 0.88$

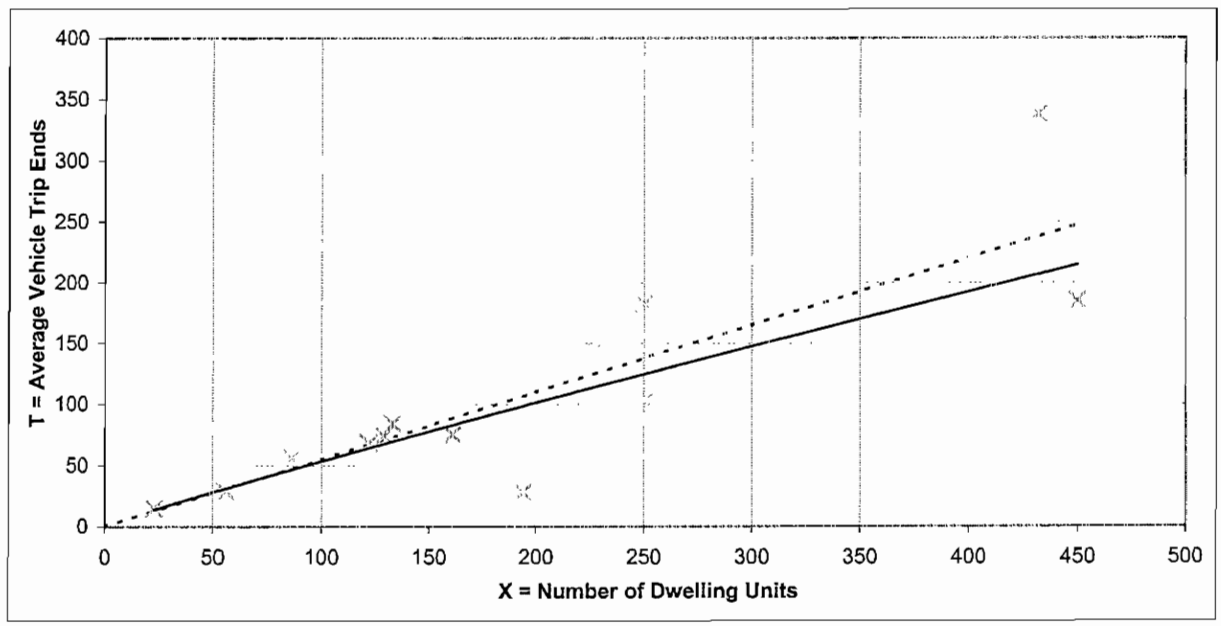
Local Apartment
Trip Generation Study

Average Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,** **Peak Hour of Adjacent Street Traffic,** **One Hour Between 7 and 9 a.m.**
Number of Studies:	13
Average Number of Dwelling Units:	193
Directional Distribution:	22% entering, 78% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.55	0.14 - 0.78	0.18

Data Plot and Equation



X Actual Data Points ——— Fitted Curve Average Rate

Fitted Curve Equation: $T = 0.758(X)^{0.924}$ $R^2 = 0.75$

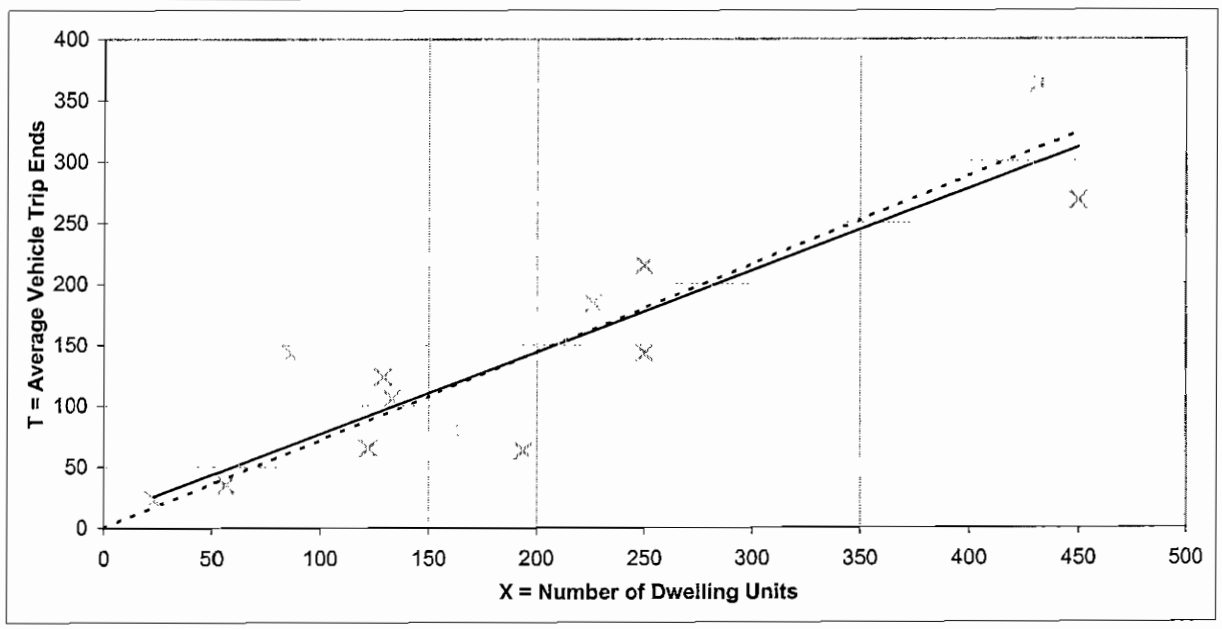
Local Apartment
Trip Generation Study

Average Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,** **Peak Hour of Adjacent Street Traffic,** **One Hour Between 4 and 6 p.m.**
Number of Studies:	13
Average Number of Dwelling Units:	193
Directional Distribution:	55% entering, 45% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.72	0.32 - 1.66	0.25

Data Plot and Equation



X Actual Data Points ——— Fitted Curve Average Rate

Fitted Curve Equation: T = 0.669(X) + 10.069 **R^2 = 0.79**

TRIP GENERATION FOR BOB GRAY ROAD SUBDIVISION

94 Multi-Family Attached Townhouses

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Townhouses	94 Townhouses	903	22%	78%		55%	45%	
				11	40	51	40	33	73
Total New Volume Site Trips			**903**	**11**	**40**	**51**	**40**	**33**	**73**

Data from Local Trip Rates and calculated by using Fitted Curve Equations

TRIP GENERATION FOR BOB GRAY ROAD SUBDIVISION

94 Townhouses

94 Units = X

Weekday:

Fitted Curve Equation: $T = 15.193(X)^{0.899}$

T = 15.193 * 59.41

T = 903 trips

Peak Hour of Adjacent Traffic between 7 and 9 am:

Fitted Curve Equation: $T = 0.758(X)^{0.924}$

T = 0.758 * 67

T = 51 trips

Peak Hour of Adjacent Traffic between 4 and 6 pm:

Fitted Curve Equation: $T = 0.669(X)+10.069$

T = 0.669 * 94 + 10.07

T = 73 trips

TRIP GENERATION FOR PARKWAY HEIGHTS TOWNHOUSES

123 Multi-Family Attached Townhouses

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Townhouses	123 Townhouses	1,150	22%	78%		55%	45%	
				14	51	65	51	42	93
Total New Volume Site Trips			**1,150**	**14**	**51**	**65**	**51**	**42**	**93**

Data from Local Trip Rates and calculated by using Fitted Curve Equations

TRIP GENERATION FOR PARKWAY HEIGHTS TOWNHOUSES

123 Townhouses

123 Units = X

Weekday:

Fitted Curve Equation: $T = 15.193(X)^{0.899}$

T = 15.193 * 75.65

T = 1150 trips

Peak Hour of Adjacent Traffic between 7 and 9 am:

Fitted Curve Equation: $T = 0.758(X)^{0.924}$

T = 0.758 * 85

T = 65 trips

Peak Hour of Adjacent Traffic between 4 and 6 pm:

Fitted Curve Equation: T = 0.669(X)+10.069

T = 0.669 * 123 + 10.07

T = 93 trips

TRIP GENERATION FOR COMBINED DEVELOPMENTS

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Townhouses	217 Townhouses	2,053	22%	78%		55%	45%	
				25	91	116	91	75	166
Total New Volume Site Trips			**2,053**	**25**	**91**	**116**	**91**	**75**	**166**

Data from Local Trip Rates and calculated by using Fitted Curve Equations

APPENDIX I

2021 CENSUS BUREAU DATA

United States Census Bureau OnTheMap

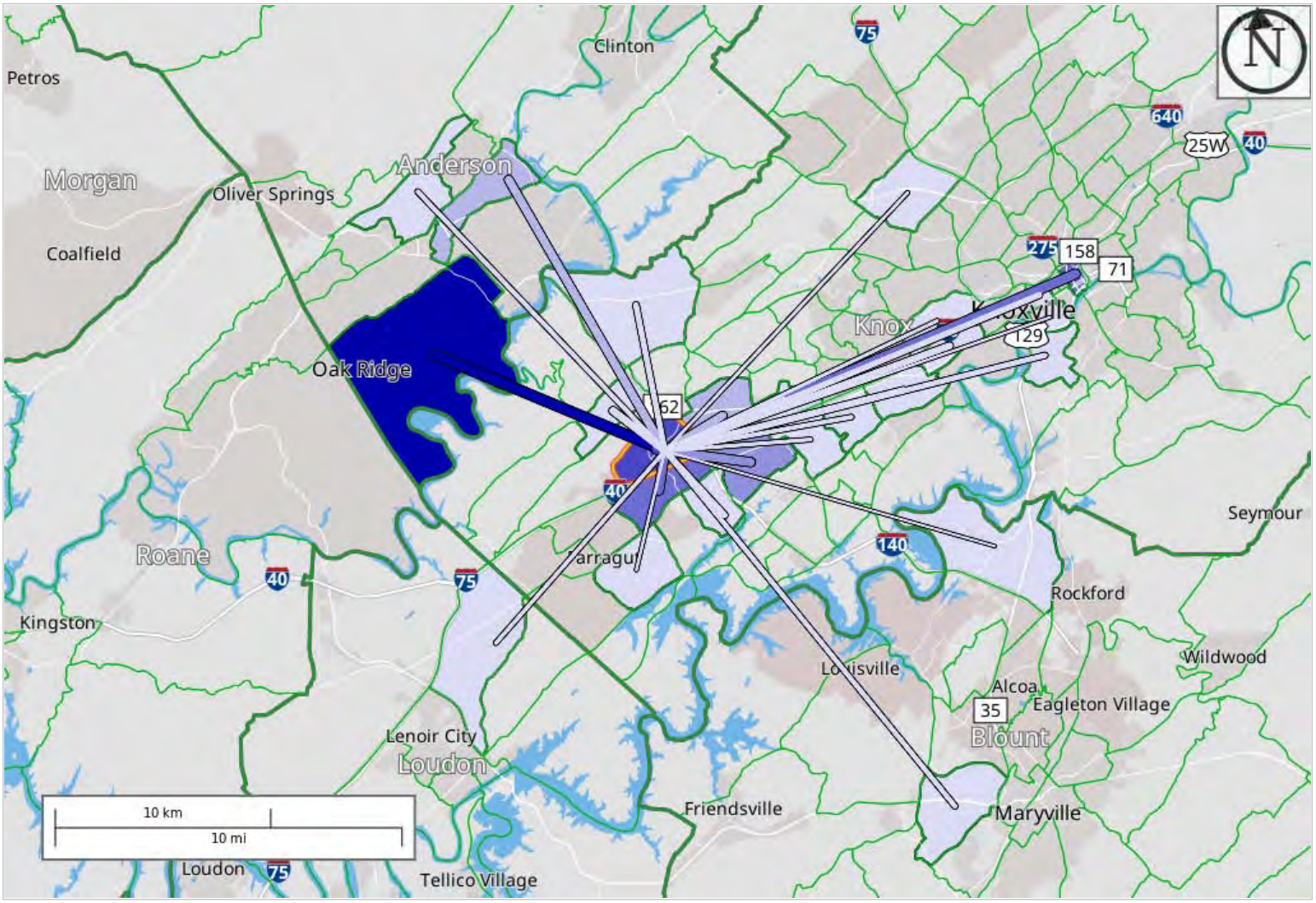
Destination Analysis

Workers: *Living in 59.11 (Knox, TN)*
Showing: *Employment locations grouped by Census Tracts*

Created by the U.S. Census Bureau's OnTheMap `https://onthemap.ces.census.gov` on 03/22/2024

Counts of All Jobs from Home Selection Area to Work Census Tracts in 2021

All Workers



Map Legend

Job Count
- 111 - 127
- 94 - 110
- 78 - 93
- 61 - 77
- 45 - 60
- 28 - 44
- 11 - 27

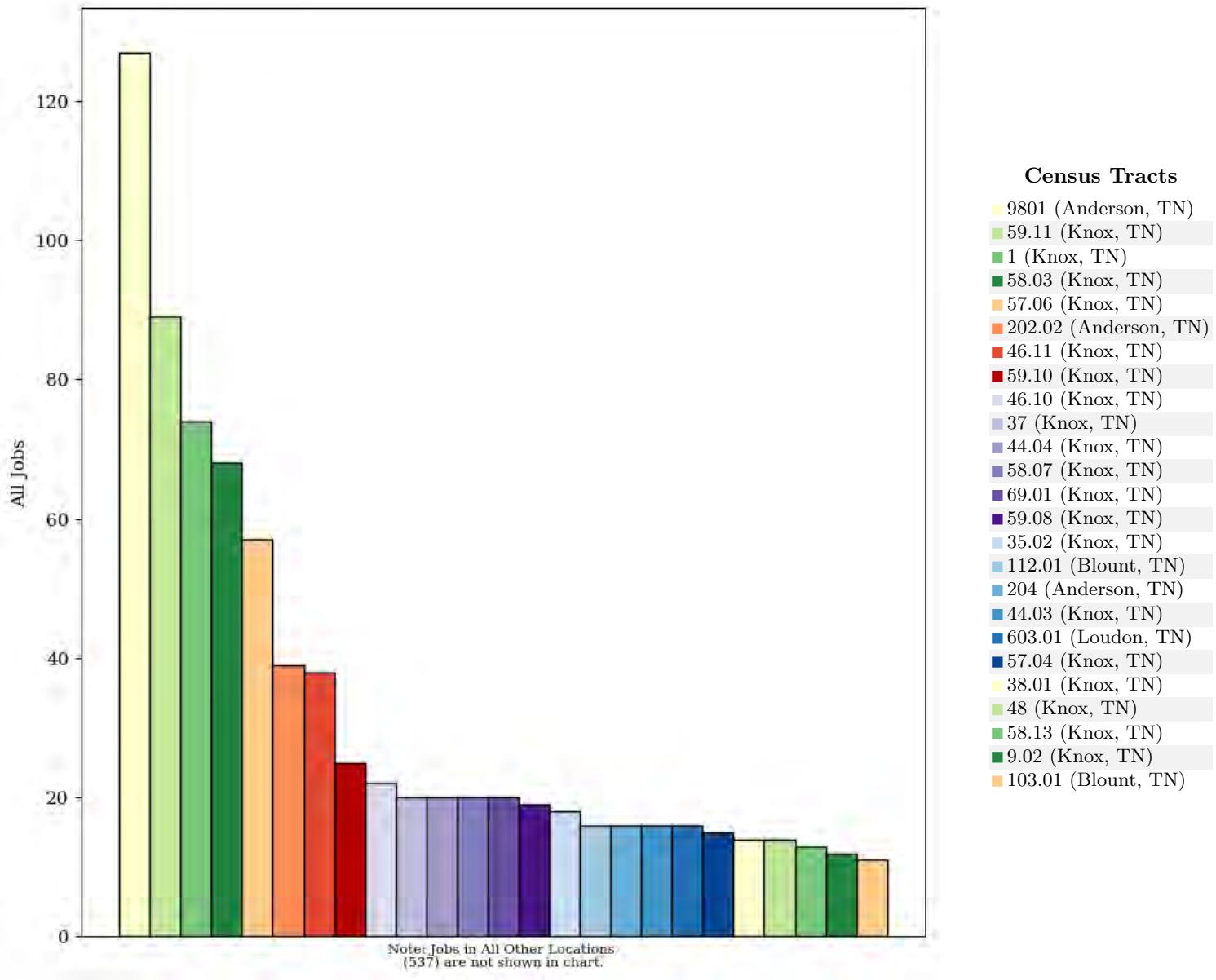
Selection Areas
- Home Area

Job Count
- 111 - 127
- 94 - 110
- 78 - 93
- 61 - 77
- 45 - 60
- 28 - 44
- 11 - 27

United States Census Bureau

All Jobs from Home Selection Area to Work Census Tracts in 2021

All Workers



All Jobs from Home Selection Area to Work Census Tracts in 2021

All Workers

Census Tracts as Work Destination Area	2021 Count	2021 Share
All Census Tracts	1,336	100.0%
9801 (Anderson, TN)	127	9.5%
59.11 (Knox, TN)	89	6.7%
1 (Knox, TN)	74	5.5%
58.03 (Knox, TN)	68	5.1%
57.06 (Knox, TN)	57	4.3%
202.02 (Anderson, TN)	39	2.9%
46.11 (Knox, TN)	38	2.8%
59.10 (Knox, TN)	25	1.9%
46.10 (Knox, TN)	22	1.6%
37 (Knox, TN)	20	1.5%

Census Tracts as Work Destination Area	2021 Count	2021 Share
44.04 (Knox, TN)	20	1.5%
58.07 (Knox, TN)	20	1.5%
69.01 (Knox, TN)	20	1.5%
59.08 (Knox, TN)	19	1.4%
35.02 (Knox, TN)	18	1.3%
112.01 (Blount, TN)	16	1.2%
204 (Anderson, TN)	16	1.2%
44.03 (Knox, TN)	16	1.2%
603.01 (Loudon, TN)	16	1.2%
57.04 (Knox, TN)	15	1.1%
38.01 (Knox, TN)	14	1.0%
48 (Knox, TN)	14	1.0%
58.13 (Knox, TN)	13	1.0%
9.02 (Knox, TN)	12	0.9%
103.01 (Blount, TN)	11	0.8%
All Other Locations	537	40.2%

Additional Information

Analysis Settings

Analysis Type	Destination
Destination Type	Census Tracts
Selection area as	Home
Year(s)	2021
Job Type	All Jobs
Selection Area	59.11 (Knox, TN) from Census Tracts
Selected Census Blocks	48
Analysis Generation Date	03/22/2024 16:56 - OnTheMap 6.23.5
Code Revision	61ba66adb1494f11636f474452a03e1039f6f3a0
LODES Data Vintage	20231016_1512

Data Sources

Source: U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics (Beginning of Quarter Employment, 2nd Quarter of 2002-2021).

Notes

1. Race, Ethnicity, Educational Attainment, and Sex statistics are beta release results and are not available before 2009.
2. Educational Attainment is only produced for workers aged 30 and over.
3. Firm Age and Firm Size statistics are beta release results for All Private jobs and are not available before 2011.

APPENDIX J

KNOX COUNTY TURN LANE VOLUME THRESHOLD WORKSHEETS

TABLE 5A

LEFT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH

(If the left-turn volume exceeds the table value a left -turn lane is needed)

302

253+7 = 260

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149	250	180	140	110	80	70
150 - 199	200	140	105	90	70	60
200 - 249	160	115	85	75	60	55
250 - 299	130	100	75	65	60	50
300 - 349	110	90	70	60	55	45
350 - 399	100	80	65	55	50	40
400 - 449	90	70	60	50	45	35
450 - 499	80	65	55	45	40	30
500 - 549	70	60	50	45	40	25
550 - 599	65	55	45	40	35	25
600 - 649	60	45	40	35	30	25
650 - 699	55	35	35	30	30	20
700 - 749	50	35	30	25	25	20
750 or More	45	35	25	25	20	20

Bob Gray Road at the Proposed Entrance:
Bob Gray Road Subdivision Only +
Lovell Crossing Development

2027 Projected AM
WB Left Turns = 4

Left Turn Lane NOT Warranted

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	=/ > 600
100 - 149	70	60	50	45	40	35
150 - 199	60	55	45	40	35	30
200 - 249	55	50	40	35	30	30
250 - 299	50	45	35	30	30	30
300 - 349	45	40	35	30	25	25
350 - 399	40	35	30	25	25	20
400 - 449	35	30	30	25	20	20
450 - 499	30	25	25	20	20	20
500 - 549	25	25	20	20	20	15
550 - 599	25	20	20	20	20	15
600 - 649	25	20	20	20	20	15
650 - 699	20	20	20	20	20	15
700 - 749	20	20	20	15	15	15
750 or More	20	20	20	15	15	15

* Or through volume only if a right-turn lane exists

TABLE 5B

RIGHT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH

253

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
7 Fewer Than 25						
25 - 49						
50 - 99						
100 - 149						
150 - 199						
200 - 249						Yes
250 - 299					Yes	Yes
300 - 349					Yes	Yes
350 - 399					Yes	Yes
400 - 449					Yes	Yes
450 - 499			Yes	Yes	Yes	Yes
500 - 549		Yes	Yes	Yes	Yes	Yes
550 - 599	Yes	Yes	Yes	Yes	Yes	Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

Bob Gray Road at the Proposed Entrance:
Bob Gray Road Subdivision Only +
Lovell Crossing Development

2027 Projected AM
EB Right Turns = 7

Right Turn Lane NOT Warranted

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25						
25 - 49					Yes	Yes
50 - 99				Yes	Yes	Yes
100 - 149			Yes	Yes	Yes	Yes
150 - 199		Yes	Yes	Yes	Yes	Yes
200 - 249	Yes	Yes	Yes	Yes	Yes	Yes
250 - 299	Yes	Yes	Yes	Yes	Yes	Yes
300 - 349	Yes	Yes	Yes	Yes	Yes	Yes
350 - 399	Yes	Yes	Yes	Yes	Yes	Yes
400 - 449	Yes	Yes	Yes	Yes	Yes	Yes
450 - 499	Yes	Yes	Yes	Yes	Yes	Yes
500 - 549	Yes	Yes	Yes	Yes	Yes	Yes
550 - 599	Yes	Yes	Yes	Yes	Yes	Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

* Or through volume only if a left-turn lane exists.

TABLE 5A

LEFT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH

(If the left-turn volume exceeds the table value a left -turn lane is needed)

355

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149 150 - 199	250 200			110 90	80 70	70 60
200 - 249 250 - 299	160 130			75 65	65 60	55 50
300 - 349 350 - 399	110 100			60 55	55 50	45 40
400 - 449 450 - 499	90 80			50 45	45 40	35 30
500 - 549 550 - 599	70 65	60 55	45 40	35 35	35 30	25 25
600 - 649 650 - 699	60 55	45 35	35 35	30 30	25 25	25 20
700 - 749 750 or More	50 45	35 35	30 25	25 25	20 20	20 20

Bob Gray Road at the Proposed Entrance:
Bob Gray Road Subdivision Only +
Lovell Crossing Development

2027 Projected PM
WB Left Turns = 14

Left Turn Lane NOT Warranted

540+26 = 566

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	=/ > 600
100 - 149 150 - 199	70 60	60 55	50 45	45 40	40 35	35 30
200 - 249 250 - 299	55 50	50 45	40 35	35 30	30 30	30 30
300 - 349 350 - 399	45 40	40 35	35 30	30 25	25 25	25 20
400 - 449 450 - 499	35 30	30 25	30 25	25 20	20 20	20 20
500 - 549 550 - 599	25 25	25 20	20 20	20 20	20 20	15 15
600 - 649 650 - 699	25 20	20 20	20 20	20 20	20 20	15 15
700 - 749 750 or More	20 20	20 20	20 20	15 15	15 15	15 15

* Or through volume only if a right-turn lane exists

TABLE 5B

RIGHT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25 25 - 49 50 - 99						
100 - 149 150 - 199						
200 - 249 250 - 299					Yes	Yes Yes
300 - 349 350 - 399			Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

540

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99				Yes	Yes Yes	Yes Yes
100 - 149 150 - 199		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes				Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes				Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes				Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes				Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

26

Bob Gray Road at the Proposed Entrance:
Bob Gray Road Subdivision Only +
Lovell Crossing Development

2027 Projected PM
EB Right Turns = 26

Right Turn Lane NOT Warranted

* Or through volume only if a left-turn lane exists.

TABLE 5A

LEFT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH

(If the left-turn volume exceeds the table value a left -turn lane is needed)

302

253+16 = 269

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149 150 - 199	250 200	180 140	140 105	110 90	80 70	70 60
200 - 249 250 - 299	160 130	115 100	85 75	75 65	60	55 50
300 - 349 350 - 399	110 100	90 80	70	60	55	45 40
400 - 449 450 - 499	90 80	70 65				35 30
500 - 549 550 - 599	70 65	60 55				25 25
600 - 649 650 - 699	60 55	45 35				25 20
700 - 749 750 or More	50 45	35 35				20 20

Bob Gray Road at the Proposed Entrance:
Combined Residential Subdivisions +
Lovell Crossing Development

2027 Projected AM
WB Left Turns = 9

Left Turn Lane NOT Warranted

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	=/ > 600
100 - 149 150 - 199	70 60	60 55	50 45	45 40	40 35	35 30
200 - 249 250 - 299	55 50	50 45	40 35	35 30	30 30	30 30
300 - 349 350 - 399	45 40	40 35	35 30	30 25	25 25	25 20
400 - 449 450 - 499	35 30	30 25	30 25	25 20	20 20	20 20
500 - 549 550 - 599	25 25	25 20	20 20	20 20	20 20	15 15
600 - 649 650 - 699	25 20	20 20	20 20	20 20	20 20	15 15
700 - 749 750 or More	20 20	20 20	20 20	15 15	15 15	15 15

* Or through volume only if a right-turn lane exists

TABLE 5B

RIGHT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH

253

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
16 Fewer Than 25						
25 - 49						
50 - 99						
100 - 149						
150 - 199						
200 - 249						Yes
250 - 299					Yes	Yes
300 - 349					Yes	Yes
350 - 399					Yes	Yes
400 - 449					Yes	Yes
450 - 499			Yes	Yes	Yes	Yes
500 - 549		Yes	Yes	Yes	Yes	Yes
550 - 599	Yes	Yes	Yes	Yes	Yes	Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

Bob Gray Road at the Proposed Entrance:
Combined Residential Subdivisions + Lovell Crossing Development

2027 Projected AM
EB Right Turns = 16

Right Turn Lane NOT Warranted

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25						
25 - 49					Yes	Yes
50 - 99				Yes	Yes	Yes
100 - 149			Yes	Yes	Yes	Yes
150 - 199		Yes	Yes	Yes	Yes	Yes
200 - 249	Yes	Yes	Yes	Yes	Yes	Yes
250 - 299	Yes	Yes	Yes	Yes	Yes	Yes
300 - 349	Yes	Yes	Yes	Yes	Yes	Yes
350 - 399	Yes	Yes	Yes	Yes	Yes	Yes
400 - 449	Yes	Yes	Yes	Yes	Yes	Yes
450 - 499	Yes	Yes	Yes	Yes	Yes	Yes
500 - 549	Yes	Yes	Yes	Yes	Yes	Yes
550 - 599	Yes	Yes	Yes	Yes	Yes	Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

* Or through volume only if a left-turn lane exists.

TABLE 5A

LEFT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH

(If the left-turn volume exceeds the table value a left -turn lane is needed)

355

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149 150 - 199	250 200			110 90	80 70	70 60
200 - 249 250 - 299	160 130			75 65	65 60	55 50
300 - 349 350 - 399	110 100			60 55	55 50	45 40
400 - 449 450 - 499	90 80			50 45	45 40	35 30
500 - 549 550 - 599	70 65	60 55	45 40	35 35	35 30	25 25
600 - 649 650 - 699	60 55	45 35	35 35	30 30	25 25	25 20
700 - 749 750 or More	50 45	35 35	30 25	25 25	20 20	20 20

Bob Gray Road at the Proposed Entrance:
Combined Residential Subdivisions +
Lovell Crossing Development

2027 Projected PM
WB Left Turns = 32

Left Turn Lane
Warranted

540+59 = 599

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	=/ >600
100 - 149 150 - 199	70 60	60 55	50 45	45 40	40 35	35 30
200 - 249 250 - 299	55 50	50 45	40 35	35 30	30 30	30 30
300 - 349 350 - 399	45 40	40 35	35 30	30 25	25 25	25 20
400 - 449 450 - 499	35 30	30 25	30 25	25 20	20 20	20 20
500 - 549 550 - 599	25 25	25 20	20 20	20 20	20 20	15 15
600 - 649 650 - 699	25 20	20 20	20 20	20 20	20 20	15 15
700 - 749 750 or More	20 20	20 20	20 20	15 15	15 15	15 15

* Or through volume only if a right-turn lane exists

TABLE 5B

RIGHT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25 25 - 49 50 - 99						
100 - 149 150 - 199						
200 - 249 250 - 299					Yes	Yes Yes
300 - 349 350 - 399			Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99				Yes	Yes Yes	Yes Yes
100 - 149 150 - 199		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes				Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes				Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes				Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes				Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

540

59

Bob Gray Road at the Proposed Entrance:
Combined Residential Subdivisions +
Lovell Crossing Development

2027 Projected PM
EB Right Turns = 59

Right Turn Lane
Warranted

* Or through volume only if a left-turn lane exists.

APPENDIX K

SIMTRAFFIC VEHICLE QUEUE WORKSHEETS

Intersection: 3: Lovell Road & Yarnell Road/Bob Gray Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	248	220	98	159	154	74	154	225	193	55	185	371
Average Queue (ft)	134	94	46	72	71	32	61	125	83	20	30	218
95th Queue (ft)	216	174	80	131	126	58	116	197	162	45	117	328
Link Distance (ft)		537			772			778	778			393
Upstream Blk Time (%)												0
Queuing Penalty (veh)												0
Storage Bay Dist (ft)	180		300	175		215	140			245	135	
Storage Blk Time (%)	3	1		0	0		0	5	0			25
Queuing Penalty (veh)	9	2		1	0		1	6	0			8

Intersection: 3: Lovell Road & Yarnell Road/Bob Gray Road

Movement	SB
Directions Served	TR
Maximum Queue (ft)	323
Average Queue (ft)	171
95th Queue (ft)	279
Link Distance (ft)	393
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 7: Highvue Drive & Bob Gray Road

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	19	41
Average Queue (ft)	1	19
95th Queue (ft)	10	44
Link Distance (ft)	729	385
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Proposed Entrance & Bob Gray Road

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	29	56
Average Queue (ft)	1	24
95th Queue (ft)	14	49
Link Distance (ft)	442	332
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 27

Intersection: 3: Lovell Road & Yarnell Road/Bob Gray Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	275	559	425	230	273	57	219	362	309	108	214	410
Average Queue (ft)	270	549	302	122	118	22	93	218	174	44	81	279
95th Queue (ft)	317	557	600	208	228	44	193	325	272	89	200	396
Link Distance (ft)		533			772			775	775			392
Upstream Blk Time (%)		83										1
Queuing Penalty (veh)		0										0
Storage Bay Dist (ft)	180		300	175		215	140			245	135	
Storage Blk Time (%)	21	92		6	6		2	17	1		0	24
Queuing Penalty (veh)	70	288		11	13		8	26	1		0	25

Intersection: 3: Lovell Road & Yarnell Road/Bob Gray Road

Movement	SB
Directions Served	TR
Maximum Queue (ft)	402
Average Queue (ft)	245
95th Queue (ft)	361
Link Distance (ft)	392
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 7: Highvue Drive & Bob Gray Road

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	2	52	37
Average Queue (ft)	0	8	14
95th Queue (ft)	2	35	39
Link Distance (ft)	772	736	386
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 8: Proposed Entrance & Bob Gray Road

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	8	68	50
Average Queue (ft)	0	9	23
95th Queue (ft)	7	40	48
Link Distance (ft)	736	470	256
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 443

Intersection: 3: Lovell Road & Yarnell Road/Bob Gray Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	246	264	141	175	175	81	147	243	203	55	182	370
Average Queue (ft)	137	99	48	82	78	33	64	129	85	21	32	225
95th Queue (ft)	220	194	100	150	144	60	119	208	173	45	119	328
Link Distance (ft)		537			772			778	778			393
Upstream Blk Time (%)												0
Queuing Penalty (veh)												0
Storage Bay Dist (ft)	180		300	175		215	140			245	135	
Storage Blk Time (%)	4	1		0	1		0	6	0			27
Queuing Penalty (veh)	13	3		1	3		1	8	0			9

Intersection: 3: Lovell Road & Yarnell Road/Bob Gray Road

Movement	SB
Directions Served	TR
Maximum Queue (ft)	326
Average Queue (ft)	178
95th Queue (ft)	282
Link Distance (ft)	393
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 7: Highvue Drive & Bob Gray Road

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	16	39
Average Queue (ft)	1	18
95th Queue (ft)	9	43
Link Distance (ft)	729	385
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Proposed Entrance & Bob Gray Road

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	41	85
Average Queue (ft)	3	36
95th Queue (ft)	19	63
Link Distance (ft)	442	332
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 37

Intersection: 3: Lovell Road & Yarnell Road/Bob Gray Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	275	565	425	232	373	195	219	340	312	118	214	406
Average Queue (ft)	267	546	305	146	167	40	89	217	180	47	88	276
95th Queue (ft)	330	596	602	244	346	174	186	313	275	93	211	392
Link Distance (ft)		533			772			775	775			392
Upstream Blk Time (%)		84										1
Queuing Penalty (veh)		0										0
Storage Bay Dist (ft)	180		300	175		215	140			245	135	
Storage Blk Time (%)	17	94		14	12		1	17	1		0	24
Queuing Penalty (veh)	61	294		29	30		4	26	2		2	27

Intersection: 3: Lovell Road & Yarnell Road/Bob Gray Road

Movement	SB
Directions Served	TR
Maximum Queue (ft)	388
Average Queue (ft)	237
95th Queue (ft)	349
Link Distance (ft)	392
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 7: Highvue Drive & Bob Gray Road

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	59	44
Average Queue (ft)	9	15
95th Queue (ft)	38	42
Link Distance (ft)	736	386
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Proposed Entrance & Bob Gray Road

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	8	82	75
Average Queue (ft)	0	15	36
95th Queue (ft)	4	52	61
Link Distance (ft)	736	470	256
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 474

Intersection: 3: Lovell Road & Yarnell Road/Bob Gray Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	234	222	96	171	175	70	150	202	174	57	197	349
Average Queue (ft)	137	99	45	86	77	32	60	112	67	18	27	198
95th Queue (ft)	214	183	77	148	139	58	111	180	142	42	102	302
Link Distance (ft)		537			772			778	778			393
Upstream Blk Time (%)												0
Queuing Penalty (veh)												0
Storage Bay Dist (ft)	180		300	175		215	140			245	135	
Storage Blk Time (%)	4	1		0	0		0	3	0			20
Queuing Penalty (veh)	11	3		1	1		1	4	0			6

Intersection: 3: Lovell Road & Yarnell Road/Bob Gray Road

Movement	SB
Directions Served	TR
Maximum Queue (ft)	282
Average Queue (ft)	156
95th Queue (ft)	257
Link Distance (ft)	393
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Lovell Road & Yarnell Road/Bob Gray Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	269	400	193	228	352	128	220	420	376	154	214	412
Average Queue (ft)	154	211	51	134	133	30	107	245	200	57	99	320
95th Queue (ft)	270	389	171	233	321	135	220	359	311	117	233	432
Link Distance (ft)		537			772			778	778			393
Upstream Blk Time (%)		2			0							3
Queuing Penalty (veh)		0			0							0
Storage Bay Dist (ft)	180		300	175		215	140			245	135	
Storage Blk Time (%)	8	23		14	4		2	23	1		0	33
Queuing Penalty (veh)	28	73		27	9		8	35	3		1	35

Intersection: 3: Lovell Road & Yarnell Road/Bob Gray Road

Movement	SB
Directions Served	TR
Maximum Queue (ft)	405
Average Queue (ft)	282
95th Queue (ft)	397
Link Distance (ft)	393
Upstream Blk Time (%)	2
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Lovell Road & Yarnell Road/Bob Gray Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	256	234	103	189	210	73	138	204	170	49	162	338
Average Queue (ft)	140	102	46	96	83	33	60	113	71	19	23	194
95th Queue (ft)	225	187	80	163	151	60	110	181	146	42	81	298
Link Distance (ft)		537			772			778	778			393
Upstream Blk Time (%)												0
Queuing Penalty (veh)												0
Storage Bay Dist (ft)	180		300	175		215	140			245	135	
Storage Blk Time (%)	4	1		1	1		0	3				19
Queuing Penalty (veh)	13	3		2	2		1	4				6

Intersection: 3: Lovell Road & Yarnell Road/Bob Gray Road

Movement	SB
Directions Served	TR
Maximum Queue (ft)	271
Average Queue (ft)	153
95th Queue (ft)	254
Link Distance (ft)	393
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Lovell Road & Yarnell Road/Bob Gray Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	275	436	219	240	307	123	220	429	372	137	214	408
Average Queue (ft)	153	217	52	139	135	24	118	256	208	61	112	325
95th Queue (ft)	275	407	181	235	280	80	235	368	318	114	245	439
Link Distance (ft)		537			772			778	778			393
Upstream Blk Time (%)		1										5
Queuing Penalty (veh)		0										0
Storage Bay Dist (ft)	180		300	175		215	140			245	135	
Storage Blk Time (%)	8	24		13	5		3	25	2		0	34
Queuing Penalty (veh)	28	75		28	13		14	37	4		1	39

Intersection: 3: Lovell Road & Yarnell Road/Bob Gray Road

Movement	SB
Directions Served	TR
Maximum Queue (ft)	410
Average Queue (ft)	284
95th Queue (ft)	406
Link Distance (ft)	393
Upstream Blk Time (%)	2
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

APPENDIX L

RESPONSE LETTER TO ADDRESS REVIEW COMMENTS

AJAX ENGINEERING
CIVIL ENGINEERING / TRAFFIC ENGINEERING

11812 Black Road
Knoxville, Tennessee 37932
Phone (865) 556-0042
ajaxengineering@gmail.com

August 16, 2024

PROJECT NAME: Bob Gray Road Subdivision (6-SB-24-C / 6-E-24-DP)
TO: Knoxville-Knox County Planning
SUBJECT: Response Document for Bob Gray Road Subdivision TIS Review Comments

Knoxville-Knox County Planning and Knox County Engineering Staff:

The following response document addresses the comments in emails from Mike Conger, PE, dated August 14 and 16, 2024. This letter is added to the end of the revised report in Appendix L.

1. **TDOT would want some direct language saying something like "If a connection to Odin St (Parkway Heights Neighborhood) is pursued as part of this project, then the connection of Odin St to Pellissippi Parkway must be closed". TDOT is not comfortable with the possibility of adding additional traffic at-grade to Pellissippi Parkway or creating a cut through that would allow motorists to avoid utilizing the existing interchanges at Dutchtown & Lovell.**

   Response: This language has been included at the end of Pages 4 and 66 in the updated report.

2. **My preference would be if you could swap out the site plan with the new one and put in an introductory paragraph stating the change in lot count and how the rest of the analysis was based on a larger number and therefore represents a slightly conservative analysis and does not significantly affect the numbers and resulting recommendations.**

   Response: A note reflecting this comment has been added to the first page of the updated report. In addition, all the figures have been updated to reflect the final concept plan with a single entrance to Bob Gray Road. The final proposed townhouse unit count is 85, but the updated report maintains the calculations and analysis with 94 townhouse units and results in a conservative analysis.

In addition to the revisions listed above, other changes in the report include the following:

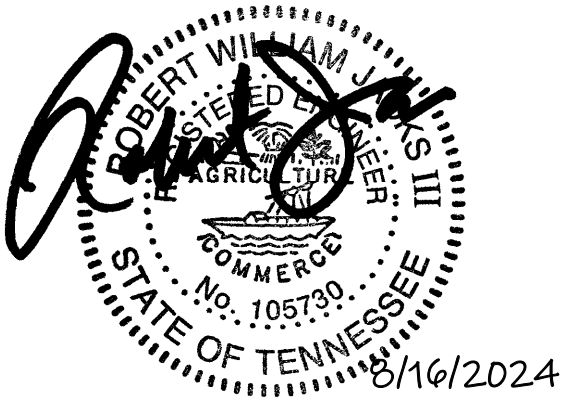
- Updated Title Page
- Updated Table of Contents

- Updated Page Footers
- A few minor grammatical changes
- Added Appendix L to include this response letter

If you have any questions or further comments, don't hesitate to get in touch with me. We look forward to your approval.

Sincerely,

Ajax Engineering, LLC
Robert W. Jacks, P.E.



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