Addendum

TO:	**William J Walker, PE** **Project Engineer** **Manhard Consulting** **8144 Walnut Hill Lane, Suite 750, Dallas, TX 75231**
FROM:	**Hetal Bhatt, P.E., PTOE** **Project Manager** **Lee Engineering, LLC (TBPE F-450)**
RE:	**Addendum for TIA23-0004 – Brush Creek Development TIA updated**
DATE:	**July 08, 2024**

DAT Approval (Revised Plans)

Development Services Department based upon recommendation from HR Green and staff. This conditional approval does not constitute full approval of these plans. The purpose of this conditional stamp is to allow the plans to proceed to Exhibit A. Once the remaining review deficiencies have been met, the plans will be stamped with an official stamped. All responsibility for the adequacy of these plans and for compliance with City of Denton specifications, standards, and codes remain with the engineer who prepared them. Review and approval of these plans by the City does not remove this responsibility.

07/24/2024

This updated TIA Addendum summarizes the changes in the site for the proposed Brush Creek development, which will be located northeast of the intersection of Fort Worth Drive (US 377) and Brush Creek Road in Denton, Texas, and subsequent changes to the elements TIA report prepared by Lee Engineering dated May 10, 2023. This TIA report is attached to this letter. The updated site plan is attached (Attachment A) to this letter. The site plan used in TIA23-0004 is provided in the Attachment B. The TIA report (TIA23-0004) is provided in Attachment C.

The changes in the site plan compared to the site plan used for the TIA23-0004 are listed below:

- Land-uses:
  - The site plan used in TIA23-0004 had 51 single family dwelling units and 25,300 square feet of retail.
  - The updated site plan shows 42 single family dwelling units and no retail development.
- Access to the site:
  - Site plan used in TIA23-0004 proposed:
    - Street A was proposed to be located approximately 380 feet south of a residential driveway.
    - Retail Driveway was proposed to be located approximately 410 feet north of Brush Creek Road.
    - Street D was proposed to be located approximately 500 feet east of Brush Creek Road.
  - The updated site plan proposes the following:
    - Street A to be located approximately 380 feet south of a residential driveway.
    - No retail driveway, and Street B (Street D of the old site plan) is to be located approximately 820 feet east of Brush Creek Road.

The following elements of TIA23-0004 are discussed based on the updated site plan:

- **Estimated Trips to be generated by the site**
  - Based on the trip generation estimates presented in the TIA23-0004, the proposed site was predicted to generate 1,922 daily trips, 100 trips during the AM peak hour (46 entering and 54 exiting), and 203 trips during the AM peak hour (108 entering and 95 exiting).
  - The proposed site with 42 single family dwelling units is predicted to generate 454 daily trips, 34 trips during the AM peak hour (8 entering and 26 exiting), and 44 trips during the AM peak hour (28 entering and 16 exiting).

  Please note that the trip generation estimates presented in TIA23-0004 are conservative estimates compared to the trip generation estimates based on the updated site plan. Therefore, no updates are necessary to TIA23-0004 based on the updated trip generation estimates using the land use information from the updated site plan. Any analysis presented in this addendum will also be based on the trip generation estimates presented in TIA23-0004. This approach is conservative.

- **Capacity Analysis**
  - Based on the updated trip generation estimates, no updates to the capacity analysis presented in TIA23-0004 are necessary.

- **Need for Deceleration Lanes**
  - Based on the analysis presented in TIA23-0004, right turn deceleration lanes are not warranted at the proposed Street A and proposed Street B.
  - The updated site plan indicates that left turn deceleration lanes will be provided along US 377 at Street A and Brush Creek Road. A left turn deceleration lane is not proposed at Street B. This is consistent with TIA23-0004.
    - As stated in TIA23-0004, based on Table 3-12 of TxDOT's *Roadway Design Manual* for two-lane rural highways (US 377), the deceleration lane along US 377 (55 mph speed limit) should be 605 feet long (100 feet storage + 505 feet deceleration).
  - As shown in the updated site plan, the proposed southbound left turn lanes at Street A and Brush Creek Road along US 377 are at least 330 feet long. *Highway Capacity Manual* analysis results indicated 95th percentile queues of one (1) vehicle at these locations, so the 100-foot minimum storage proposed is predicted to accommodate the left turning vehicles at these locations. Based on the proposed driveway locations (assuming one driveway for future retail development on US 377), a 605-foot-long deceleration lane is not possible. Therefore, TIA23-0004 recommended obtaining a variance from TxDOT for

shorter left turn deceleration lanes or providing a Two-Way Left Turn Lane (TWLTL) between Bonnie Brae Street and Brush Creek Road along US 377 if a variance is not provided. While a shorter deceleration lane will not provide the intended space for deceleration outside the through lanes, it will provide some dedicated space for deceleration and also separate left turn vehicles from through vehicles while waiting for gaps in opposing traffic to make a left turn maneuver.

- **Intersection Sight Distance**
    - Based on the analysis presented in TIA23-0004, the required intersection sight distance for Street A is 610 feet, and Street B is 335 feet. Per the updated site plan, the proposed site access locations appear to meet this requirement.

The updated site plan shows that the proposed development will have gates on Street A and Street B. The following analysis presents a queuing analysis for these gates. As noted earlier, this analysis is based on the trip generation estimates in TIA23-0004. Therefore, this analysis is a conservative analysis.

Assumptions for the Queuing Analysis:

- Stacking space per the attached exhibit provided by Manhard Consulting:
    - Street A = Four vehicles
    - Street B = Four vehicles
- Arrival Rate (λ) during the PM peak hour (worst case peak hour) per TIA23-0004:
    - Street B = 37 vehicles
    - Assuming 50% of traffic arrives in the peak 15 minutes. Therefore, the arrival rate for the peak 15 minutes is 1.27 vehicles per minute (19/15). At this rate, it takes three minutes to develop a queue of four vehicles.
- Service Rate (μ) = 190 vehicles per hour per attached presentation by RK Engineering Group, Inc. at Western ITE Conference – San Diego June 21, 2017.
    - The door can serve 3.17 vehicles per minute. At this rate, in three minutes, the gate can serve at least nine vehicles. Therefore, queuing at the gates is not predicted. Additionally, it is not uncommon for gated communities to keep the gates open during peak hours.

Based on this analysis, it was concluded that planned stacking space is predicted to meet projected queue demand.

If you have any questions regarding this memorandum, please contact me at (972) 248-3006.

Attachment A: Updated Site Plan

SHOWS THE EX TREES THAT WILL REMAIN ON THE SITE

LOT WIDTH LEGEND:

- [A] TYPE A LOT WIDTHS (39)
- [B] TYPE B LOT WIDTHS (3)

NOTES:

SEE SHEET EX–C3 FOR LOT DETAILS

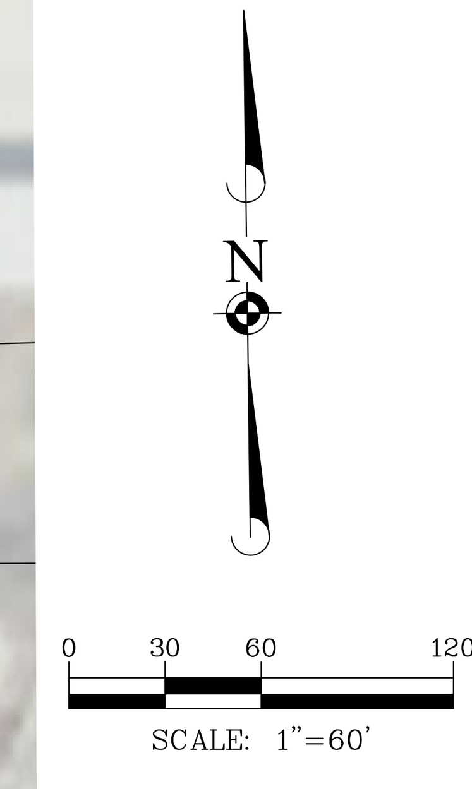
07–07–2023

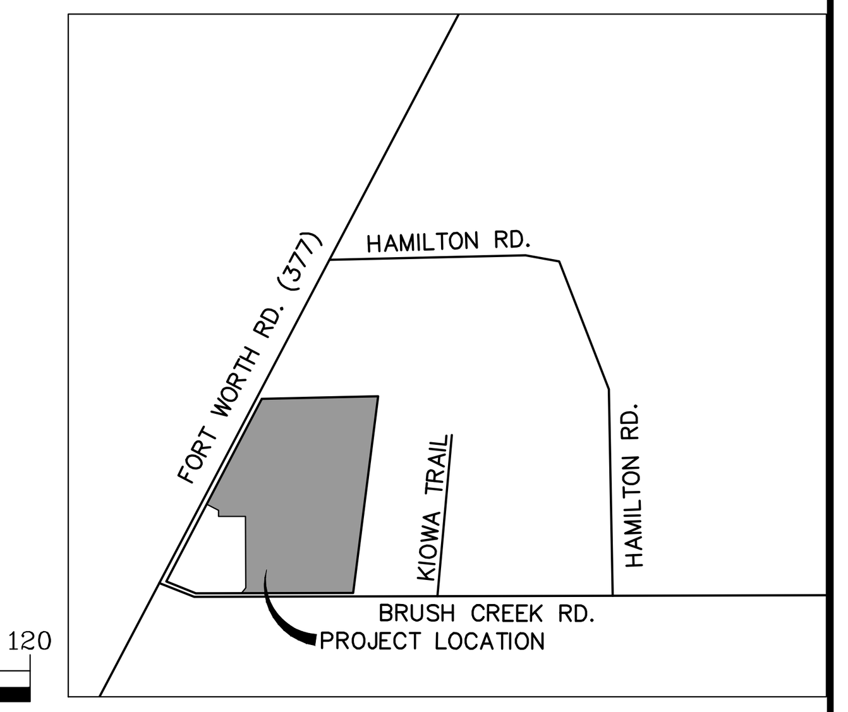
NOTES:

1. REFER TO LANDSCAPING FOR PARAMETER AND MASONRY FENCING.
2. NO FEMA 100–YEAR FLOODPLAIN AREAS LOCATED NEAR SUBJECT SITE.
3. SOLID WASTE LOCATIONS CONSIDERED NON APPLICABLE TO THIS SITE.
4. PARKING SPACES WILL NOT BE LOCATED ON SITE.
5. BICYCLE FACILITIES WILL NOT BE LOCATED ON SITE.
6. SINGLE PHASE DESIGN WILL BE UTILIZED FOR THIS SITE.
7. PROPOSED DEVELOPMENT IS NOT LOCATED WITHIN ESA BOUNDARY.
8. HOUSE ELEVATION TO BE PROVIDED. HEIGHTS SHALL NOT EXCEED 40'.

NOTES:

SEE SHEET EX–C3 FOR SECTION DETAIL





VICINITY MAP

N.T.S.

SITE DATA	
SITE AREA	
GROSS AREA	18.07 AC
PD GROSS AREA	15.75 AC
SETBACKS	
FRONT YARD	20 FT
SIDE YARD	5 FT
CORNER SIDE YARD	10 FT
REAR YARD	20 FT
LOT INFORMATION	
MINIMUM AREA	7000 SF
MINIMUM WIDTH	60 FT
MINIMUM DEPTH	120 FT
NUMBER OF LOTS	42

5% OF SITE TO BE OPEN SPACE
10% PROVIDED (SEE BELOW)

LAND USE SUMMARY TABLE

USE	ACRES	% OF TOTAL ACRES
SINGLE FAMILY	8.42	46.80%
HOA/OPEN SPACE	1.37	7.53%
WET POND	0.54	2.99%
PUBLIC ROAD/ROW	3.16	17.60%
ROAD/PWAY EASEMENT	0.52	2.90%
DETENTION	1.75	9.70%
REMAINDER TRACT	2.40	12.70%
PD ZONED AREA	15.75	87.30%
GROSS AREA	18.07	100.00%

42 TOTAL DWELLING UNITS WITH MAXIMUM
60 % BUILDING COVERAGE
5 TOTAL HOA LOTS
1 TOTAL HOA POND LOT

07–07–2023

NOTES:

1. WHERE MODIFICATIONS ARE NOT EXPRESSLY AUTHORIZED, ALL REQUIREMENTS OF THE DENTON DEVELOPMENT CODE, AS AMENDED MUST BE MET.
2. REFER TO COVER PAGE C1.0 FOR LEGEND & ABBREVIATIONS
3. ENGINEERING DOES NOT FORESEE ANY RETAINING WALL FOR THIS SITE. IF THEY ARE REQUIRED ENGINEERING WILL ENSURE THEY DO NOT CROSS ANY UTILITIES OR WITHIN PUBLIC EASEMENTS

Manhard CONSULTING™
12225 Greenville Avenue, Suite 1000, Dallas, TX 75243 ph:972.972.4250 manhard.com
Civil Engineers | Surveyors | Water Resource Engineers | Water & Waste Water Engineers
Construction Managers | Environmental Scientists | Landscape Architects | Planners
Texas Board of Professional Engineers and Land Surveyors Registration No. F-21732

BRUSH CREEK DENTON

DENTON, DENTON COUNTY, TX

DEVELOPMENT PLAN

PROJ. MGR.: RB
PROJ. ASSOC.: WW
DRAWN BY: WW
DATE: 6/4/2024

SHEET
EX-C1
611.115001

PENDING

DETAIL A
SCALE: 1"=20'

DETAIL B
SCALE: 1"=20'

VICINITY MAP
N.T.S.

07-07-2023

NOTES:

1. GATES TO BE KEPT OPEN DURING PEAK HOURS.

18.07 AC
787,119 S.F.

MMRO Land L.P.
Inst. No. 2014-93723
O.R.D.C.T.

STREET A
STREET B
STREET C
STREET D

BLOCK A
BLOCK B
BLOCK C

HOA LOT 3,819SF
HOA LOT 18,237 SF
HOA LOT 16,305 SF
HOA LOT 10,589 SF
HOA LOT 13,047 SF

(WET) 23293.75 SF

REMAINDER NOT PART OF THIS ZONING
ZONING: R-1
(2.4 ACRES)

AGAP ARGYLE LLC
CITY OF DENTON
LAND USE: R1

NORDSTROM ERIK LIEF & CLAIRE WILLIAMS
ETJ
LAND USE: RESIDENTIAL

WINDLE DAVID & JACQUELINE
ETJ
LAND USE: RESIDENTIAL

FLICK JANET
ETJ
LAND USE: RESIDENTIAL

FREY JOSHUA & ALLISON M
ETJ
LAND USE: RESIDENTIAL

PRATHER JONATHON R & ALLISON RENAE
ETJ
LAND USE: RESIDENTIAL

KUSHNIR AMY
ETJ
LAND USE: RESIDENTIAL

ARGYLE COMMUNITY CHURCH
ZONING: R2
LAND USE: RESIDENTIAL

CARMAN INVESTMENTS INC
ZONING: R2
LAND USE: RESIDENTIAL

US HIGHWAY 377
FORT WORTH RD. (377)
HAMILTON RD.
KIOWA TRAIL
BRUSH CREEK RD.
PROJECT LOCATION

PROP 12' LEFT TURN LANE
PROP 12' LEFT TURN LANE (BY RESIDENTIAL)
PROP STOP SIGN
PROP CALL BOX
PROP 24' MEDIAN OPENING
P-B VEHICLE NAME
PROP 10' UE
PROP 20' BUILDING SETBACK
PROP 5' SIDEWALK
PROP FH
55' RAUE
33' B-B
PROP BFR (TYP)
EX. ELECTRICAL FACILITY
EX. GAS WELL (ABANDONED)
SEE DETAIL A
SEE DETAIL B
POTENTIAL LOCATION FOR DOG PARK
14' RIGHT TURN LANE (BY FUTURE CORNER LOT)
VARIABLE WIDTH ROW DEDICATION
55' FUTURE ROW
136' ROW
BRUSH CREEK RD (PRESCRIPTIVE ROW)
840.63
TO NEXT POTENTIAL DRIVE
506.11'
APPROX DISTANCE TO KIOWA TRAIL
EX BRUSH CREEK CENTERLINE
EX. 20' ROAD
EX. 21' ROAD
APPROXIMATE ZONE A FLOODPLAIN
WIDTH AT GATE OPENING
TO THE NEXT DRIVEWAY OFF US 377

Manhard CONSULTING
12225 Greenville Avenue, Suite 1000, Dallas, TX 75243 ph:972.972.4259 manhard.com
Civil Engineers | Water Resource Engineers | Water & Wastewater Engineers
Construction Managers | Environmental Scientists | Landscape Architects | Planners
Texas Board of Professional Engineers and Land Surveyors Registration No. F-21732

DRAWN BY	REVISIONS	DATE

BRUSH CREEK DENTON
DENTON, DENTON COUNTY, TX
EXHIBIT

PROJ. MGR.: RB
PROJ. ASSOC.: WW
DRAWN BY: WW
DATE: 6/12/2024

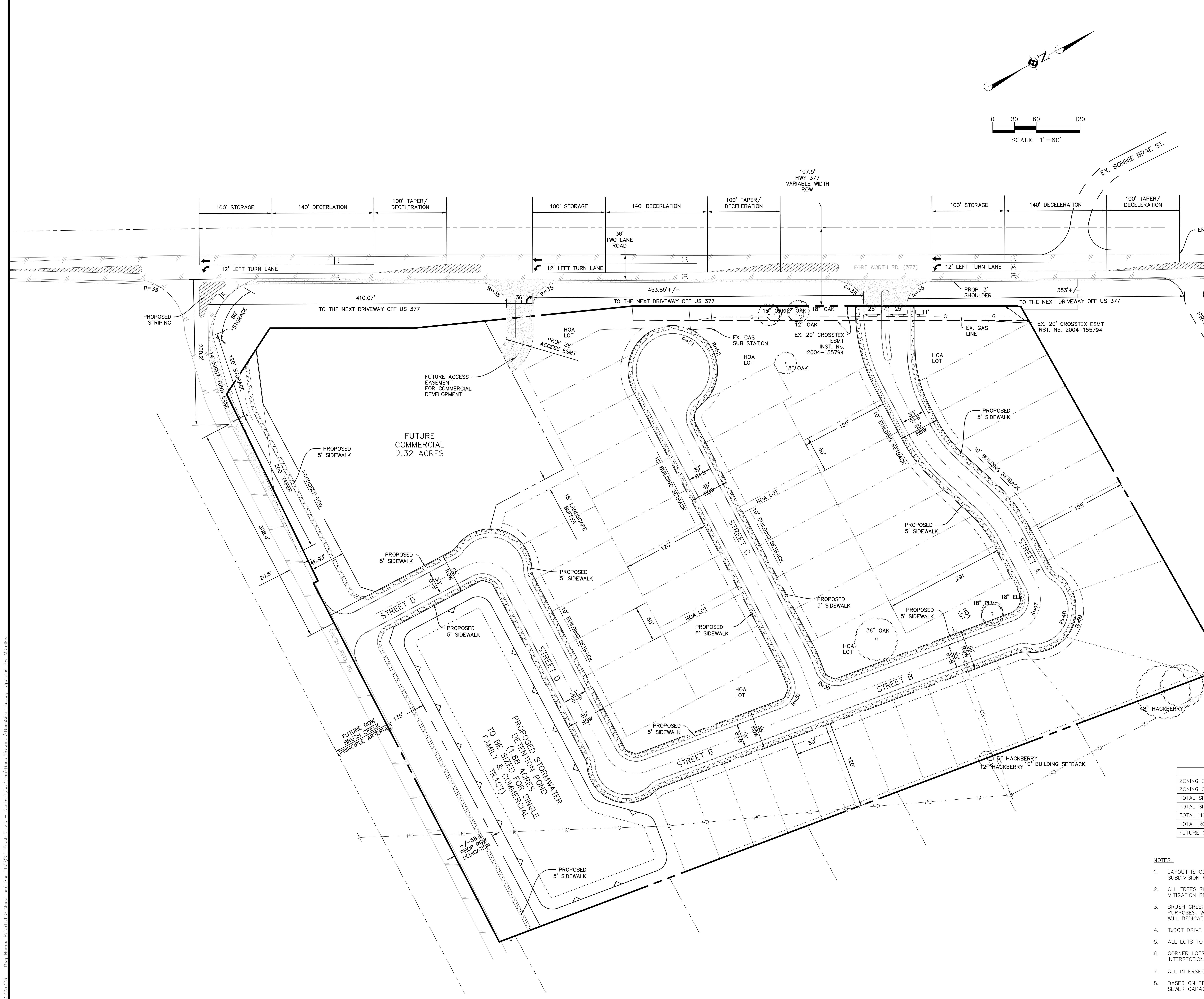
SHEET
EX

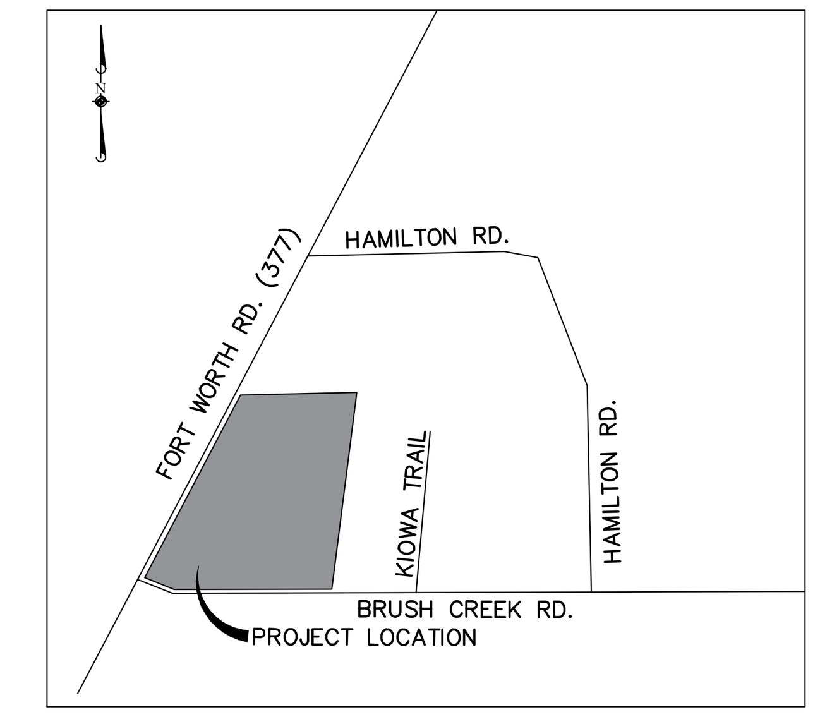
611.115001

PENDING

Plot Date: 07/16/24 Data Name: P:\611\115 Maggi and Son LLC\001 Brush Creek – Denton\Dwg\Dwg\Exhibits\Autosave Exhibits\AUTOSAVE Exhibit.dwg Updated By: Wbaker

Attachment B: Site Plan Used in TIA23-0004





VICINITY MAP

N.T.S.

SITE SUMMARY TABLE	
ZONING CATEGORY: R6 MIN. DIMENSIONS	50'W X 120'L
ZONING CATEGORY: R6 MIN. SQUARE FEET	6,000 SF
TOTAL SITE AREA	18.07 ACRES
TOTAL SINGLE FAMILY AREA	8.12 ACRES
TOTAL HOA AREA	3.53 ACRES
TOTAL ROW AREA	4.10 ACRES
FUTURE COMMERCIAL AREA	2.32 ACRES

NOTES:

1. LAYOUT IS CONCEPTUAL IN NATURE AND SUBJECT TO CITY OF DENTON SUBDIVISION REGULATIONS
2. ALL TREES SHOWN ON PLAN ARE PROPOSED TO BE PRESERVED PER COD MITIGATION REQUIREMENTS.
3. BRUSH CREEK FUTURE LAYOUT HAS BEEN SHOWN FOR CONTEXTUAL PURPOSES. WILL REQUIRE A 135 FT ROW IN FUTURE, THIS DEVELOPMENT WILL DEDICATE 62.5 FT FROM CENTERLINE OF EXISTING ROADWAY.
4. TxDOT DRIVE APPROACH TO BE PERMITTED AND APPROVED BY TxDOT.
5. ALL LOTS TO BE FRONT LOADED.
6. CORNER LOTS SHALL HAVE A MINIMUM DRIVEWAY SPACING OF 50FT FROM INTERSECTION ROW.
7. ALL INTERSECTING ROW'S TO HAVE A 10 FT X 10 FT CORNER CLIP.
8. BASED ON PRIOR CONVERSATIONS WITH STAFF, ADEQUATE WATER AND SEWER CAPACITY IS AVAILABLE FOR THIS DEVELOPMENT.

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Texas Board of Professional Engineers and Land Surveyors Registration No. F-21732

BRUSH CREEK DENTON

DENTON, DENTON COUNTY, TX

Z22-0022 CONCEPT PLAN

PROJ. MGR.: RB
PROJ. ASSOC.: WW
DRAWN BY: MD
DATE: 12/6/2022

SHEET **Z1**

611.115001

PENDING

Attachment C: TIA23-0004

TRAFFIC IMPACT ANALYSIS FOR BRUSH CREEK DEVELOPMENT DENTON, TEXAS

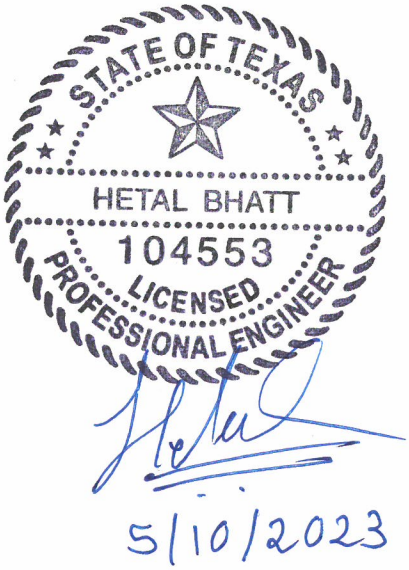
PROJECT NUMBER: TIA23-0004

Owner:
Deno Maggi
MMRQ Land L.P.
4332 Marsh Ridge Rd,
Carrollton, TX 75010

Developer and Applicant:
Omar Oweis
Sanger Texas Land Investment LLC
737, Evergreen Drive,
Hurst, TX 76054

Prepared for:
Manhard Consulting
12225 Greenville Avenue, Suite 1000
Dallas, Texas 75243

Prepared by:
LEE ENGINEERING
3030 LBJ Freeway, Suite 1660
Dallas, Texas 75234
(972) 248-3006
TBPE Firm F-450



May 2023
1st Submittal Date: February 28, 2023
2nd Submittal Date: March 28, 2023
3rd Submittal Date: April 25, 2023

T1849.11

ARIZONA
NEW MEXICO
OKLAHOMA
TEXAS

May 10, 2023

Mr. Reece Bierhalter, PE
Project Manager
Manhard Consulting
12225 Greenville Avenue, Suite 1000
Dallas, TX 75243

Re: *Responses to City of Denton Comments on Brush Creek Development TIA (TIA23-0004)*

Dear Mr. Bierhalter:

We received the City of Denton's comments to the TIA for the proposed Brush Creek Development located to the northeast of the intersection of Fort Worth Drive (US 377) and Brush Creek Road via email on 5/09/23. We offer the following responses to the City's new comments:

1. **Clarify which, if any, of the improvements identified at US 377/Bonnie Brae listed in the TIA are proposed or indicate that no action will be taken due to the proposed City roadway project along Brush Creek. The statement must be added under the list of improvements identified for the intersection)**

   As Bonnie Brae will ultimately be closed when Brush Creek/Hickory Creek is extended to the west, signalization is not a viable mitigation. In fact, based on the proposed timeline of the City of Denton CIP project for Brush Creek/Hickory Creek (currently slated for the 2026 Bond Election), any mitigation measure that requires new construction may not be feasible.

   - *US 377 and Bonnie Brae Street:*
   - *Install an eastbound left turn lane*
   - *Install a southbound right turn lane*
   - *Install a northbound left turn lane*
   - *Signalize the intersection*

Text updated as requested.

2. **The turn lane storage and taper requirements for TxDOT Roadway refers to Table 3-12 of Roadway Design Manual which is for turn lanes where medians are involved which US 377 does not have. We believe Table 3-3 of Roadway Design Manual must be utilized for turn lane storage and taper. That section has storage length calculations option using Synchro/HCS models and formulae. Please confirm with TxDOT and update TIA accordingly.**

In Chapter 3, Section 4 (Two-Lane Rural Highways) of the *Roadway Design Manual*, it states that "Lengths of left turn deceleration lanes are provided in Table 3-12." Underneath Table 3-12, it states that "For storage length calculations on multi-lane rural highways, the storage length calculations in Urban Streets apply." At 55 mph, the deceleration (505) and taper (100 feet) lengths provided in Tables 3-3 and 3-12 are identical, although Table 3-3 allows for a shorter deceleration length (up to 165 feet shorter) if more deceleration is allowed by left turn motorists in the through lanes before accessing the turn lane. The minimum storage

length identified in Table 3-3 is 100 feet and is recommended for the left turn bays as the Synchro reports provided in the Appendix of the previous TIA indicated 95th percentile southbound left turn queues of one (1) vehicle. The eventual design of the left turn lanes will be developed in discussions with TxDOT.

3. **Under List of variances – clarify that the variance for southbound left turn lanes on US 377 is for reduced storage lane and taper.**

Text updated as requested.

4. **Figure 3 must be revised - Does not reflect recommended/proposed improvements identified in the report.**

In the previous TIA, Figure 3 represented the lane configurations that were included in the Initial Site Plan provided in Figure 2 and were assumed in the intersection capacity analyses. As identified in the Recommendations section on both page 4 and page 38 of the previous TIA, "An updated Site Plan incorporating the proposed recommendations identified above is provided in **Figure 16**." Text has been added when discussing Figure 3 to help clarify any confusion.

If you have any questions or need additional information regarding these responses, feel free to contact me at (972) 248-3006.

Sincerely,

Hetal Bhatt, P.E., PTOE
Project Manager
Lee Engineering, LLC
TBPE Firm Registration F-450

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

This Traffic Impact Analysis (TIA) analyzes the potential traffic impacts of the proposed Brush Creek development, which will be located northeast of the intersection of Fort Worth Drive (US 377) and Brush Creek Road in Denton, Texas. The development will consist of 51 dwelling units of single-family detached housing and 25,300 square feet of commercial development. The single-family residential component is expected to be built-out by 2024, and for this analysis, the year 2025 was assumed as the site Build-Out Year based on discussions with the developer.

24-hour turning movement volumes were collected on Thursday, January 19, 2023, at the intersection of US 377 and Brush Creek Road.

The existing AM and PM peak periods (6:30-8:30 AM and 4:30-6:30 PM) turning movement volumes were collected on Thursday, January 19, 2023, at the intersection of US 377 at Bonnie Brae Street.

The proposed Brush Creek development is expected to generate 1,922 daily trips, with 100 trips during the AM peak hour and 203 trips during the PM peak hour.

Capacity Analysis for Existing (2023) Conditions

The stop-controlled approaches and movements at the existing study area intersections operate at LOS D or better under the Existing (2023) traffic conditions.

Capacity Analysis for Build-Out Year (2025) Conditions

The stop-controlled approaches and movements at the existing study area intersections are predicted to operate at LOS D or better under the Build-Out Year (2025) traffic conditions.

Capacity Analysis for Horizon Year (2030) Conditions

The eastbound approach of Bonnie Brae Street at US 377 is predicted to operate at LOS beyond D under the Horizon Year (2030) traffic conditions with or without the site traffic.

The westbound approach of Brush Creek Road at US 377 is predicted to operate at LOS beyond D under the Horizon Year (2030) traffic conditions with or without the site traffic. However, the projected volume-to-capacity ratio indicates that the projected volume is not predicted to exceed the available capacity.

The westbound approach of Retail Driveway at US 377 is predicted to operate at LOS beyond D during the PM peak hour of Horizon Year (2030) traffic conditions. However, the projected volume-to-capacity ratio indicates that the projected volume is not predicted to exceed the available capacity.

The approaches and movements at the other site access intersections are predicted to operate at LOS D or better under Horizon Year (2030) Total conditions.

The following improvements are identified to improve operations by the Horizon Year (2030). However, these potential improvements should be considered when the retail component is built-out:

1) US 377 and Bonnie Brae Street
   As Bonnie Brae will ultimately be closed when Brush Creek/Hickory Creek is extended to the west, signalization is not a viable mitigation. In fact, based on the proposed timeline of the City of Denton CIP project for Brush Creek/Hickory Creek (currently slated for the 2026 Bond Election), any mitigation measure that requires new construction may not be feasible.
   - Install an eastbound left turn lane
   - Install a southbound right turn lane
   - Install a northbound left turn lane
   - Signalize the intersection

   None of these improvements are recommended due to the proposed Brush Creek/Hickory Creek improvements, which would result in the closure of Bonnie Brae Street at US 377.
2) US 377 and Brush Creek Road
   - Install a southbound left turn lane
   - Install a westbound right turn lane
3) US 377 at Proposed Retail Driveway
   - Install a westbound right turn lane
   - Install a southbound left turn lane (Although a southbound left turn lane is not required to mitigate operations, it was assumed in the mitigation analysis, based on the left turn deceleration lane analysis.)

Capacity Analysis for Horizon Year (2030) Total Traffic Conditions with Mitigations

The intersection of Bonnie Brae Street at US 377 is predicted to operate at LOS D or better under the Horizon Year (2030) Total traffic conditions with the proposed mitigations identified. However, based on direction provided in a 4/18/23 email from City staff, "As Bonnie Brae will ultimately be closed when Brush Creek/Hickory Creek is extended to the west, signalization is not a viable mitigation" and "any mitigation measures that require new construction may not be feasible."

The westbound approach of Brush Creek Road at US 377 is predicted to operate at LOS beyond D during the AM and PM peak hours of the Horizon Year (2030) Total traffic conditions. However, the delays during the AM and PM peak hours with these improvements in place are predicted to be lower than the delays under Horizon Year (2030) Background conditions (without the site traffic).

The westbound approach of Retail Driveway at US 377 is predicted to operate at LOS D or better under the Horizon Year (2030) Total traffic conditions with the proposed mitigations.

Access Management Analyses

TxDOT's threshold volumes for considering right turn deceleration lanes at the site access locations on US 377 are not met. City of Denton threshold volumes for providing right turn deceleration lanes on Brush Creek Road are also not met. Therefore, northbound right turn deceleration lanes along US 377 and a westbound right turn deceleration lane along Brush Creek Road are not warranted at the proposed site driveways.

Left turn lanes are warranted based on TxDOT criteria at the future driveway intersections along US 377. Based on the capacity analysis results, a southbound left turn deceleration late is warranted along US 377 at Brush Creek Road under the Horizon Year total traffic conditions. Traffic characteristics at the Brush Creek Road and Street D intersection do not exceed City of Denton criteria for the installation of an eastbound left turn lane.

Based on Table 3-12 of TxDOT's *Roadway Design Manual* for two-lane rural highways (US 377), the deceleration lane along US 377 (55 mph speed limit) should be 605 feet long (100 feet storage + 505 feet deceleration). *Highway Capacity Manual* analysis results indicated 95th percentile queues of one (1) vehicle at these locations, so the 100-foot minimum storage proposed is predicted to accommodate the left turning vehicles at these locations. Based on the proposed driveway locations, a 605-foot long deceleration lane is not possible. Therefore, this study recommends obtaining a variance from TxDOT for shorter left turn deceleration lanes or providing a Two-Way Left Turn Lane (TWLTL) between Bonnie Brae Street and Brush Creek Road along US 377, if a variance is not provided.

The proposed Street D on Brush Creek Road meets the City's access spacing requirements.

Street A is planned to be located approximately 380 feet south of a private driveway which is approximately 10% below TxDOT's threshold and a variance for the location of Street A will need to be requested and obtained from TxDOT. The private driveway to the north serves a land use that is not predicted to generate high traffic volumes or long northbound right turn queues to cause queue interactions between two driveways. Therefore, a variance for the location of Street A should be granted by TxDOT.

The proposed Retail Driveway is planned to be located approximately 410 feet north of Brush Creek Road and is only 15 feet (5%) below TxDOT's required spacing requirement. Therefore, a variance will need to be requested and obtained from TxDOT. Since the spacing is slightly less than required (5%), a variance for the location of the proposed Retail Driveway should be granted.

If one or both of the variances for the access locations are not granted, the developer will be obligated to shift access locations to meet published full spacing requirements. If the number of driveways changes, a revised TIA may be required in the future.

Adequate sight distance is available for the vehicles exiting from the proposed site driveways on US 377 and Brush Creek Road.

Side Path (sidewalk) Discussion

As part of this development, a sidewalk will be provided along the site frontage on Brush Creek Road. Additionally, the development will also provide a side path (sidewalk) on Streets A, B, C, and D (public roadways internal to the site).

Recommendations:

The following improvements are recommended to improve the operations by the Horizon Year (2030).

This improvement should be constructed when the residential component is built-out:

1) US 377 at Street A
    - Install a southbound left turn lane

The following improvements should be constructed when the retail component is built-out:

2) US 377 at Retail Driveway
    - Install a southbound left turn lane
    - Install a westbound right turn lane
3) US 377 and Brush Creek Road
    - Install a southbound left turn lane
    - Install a westbound right turn lane

An updated Site Plan incorporating the proposed recommendations identified above is provided in **Figure 16**.

LIST OF VARIANCES

1) Access spacing variance is needed for Street A, and this study recommends granting the variance.
2) Access spacing variance is needed for the proposed Retail Driveway, and this study recommends granting the variance.
3) A variance for the reduced deceleration lengths of the southbound left turn lanes (minimum storage and taper lengths are proposed to be provided) is needed for the proposed left turn lanes along US 377 at Street A, Retail Driveway and Brush Creek Road. This study recommends granting this variance or providing a Two-Way Left Turn Lane (TWLTL) between Bonnie Brae Street and Brush Creek Road along US 377, if a variance is not provided.

INTRODUCTION

Purpose

This Traffic Impact Analysis (TIA) analyzes the potential traffic impacts of the proposed Brush Creek development, which will be located northeast of the intersection of Fort Worth Drive (US 377) and Brush Creek Road in Denton, Texas. The development will consist of 51 dwelling units of single-family detached housing and 25,300 square feet of commercial development. The single-family residential component is expected to be built-out by 2024, and for this analysis, the year 2025 was assumed as the site Build-Out Year based on discussions with the developer's representative.

A vicinity map of the study area is shown in **Figure 1**. The site plan initially assumed for this development is provided in **Figure 2**. The following elements were included in this study:

Methodology

Data Collection

- Collected 24-hour turning movement volumes at the intersection of Fort Worth Drive (US 377) and Brush Creek Road.
- Collected weekday AM and PM peak hour turning movement volumes at the intersection of Fort Worth Drive (US 377) and Bonnie Brae Street.
- Obtained the proposed site plan, information related to planned roadway improvements, and other relevant information.

Traffic Analysis

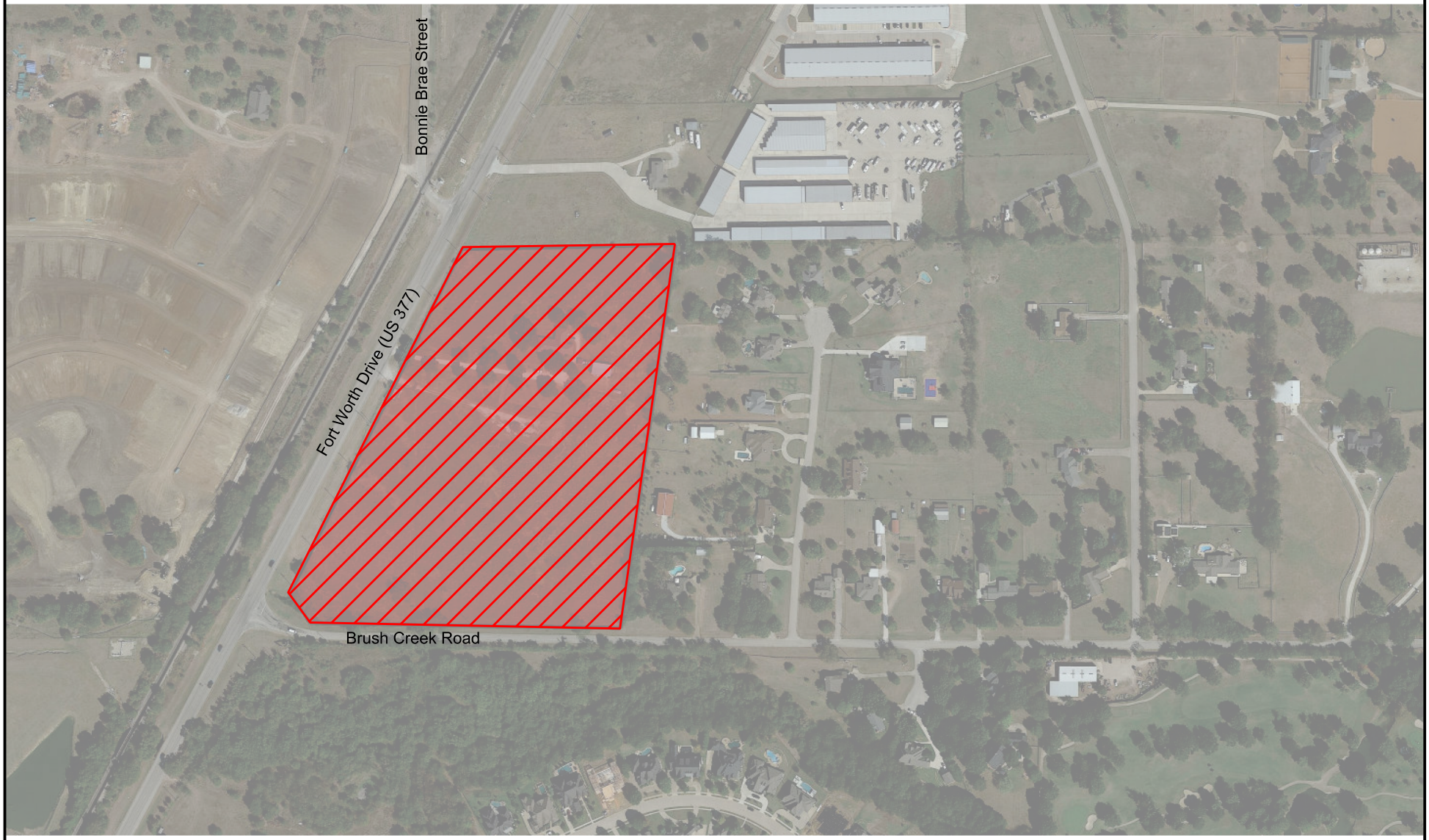
- Assessed the general accessibility of the site.
- Estimated the number of trips that will be generated by the proposed development.
- Estimated the directional distribution of traffic approaching/departing the proposed development.
- Assigned the estimated traffic to the street network.
- Performed capacity analyses for the critical intersections within the study area.

Recommendations

- Determined if any roadway improvements are needed to accommodate projected traffic generated by the proposed development.

Documentation

- Prepared a report documenting the study procedures and results.



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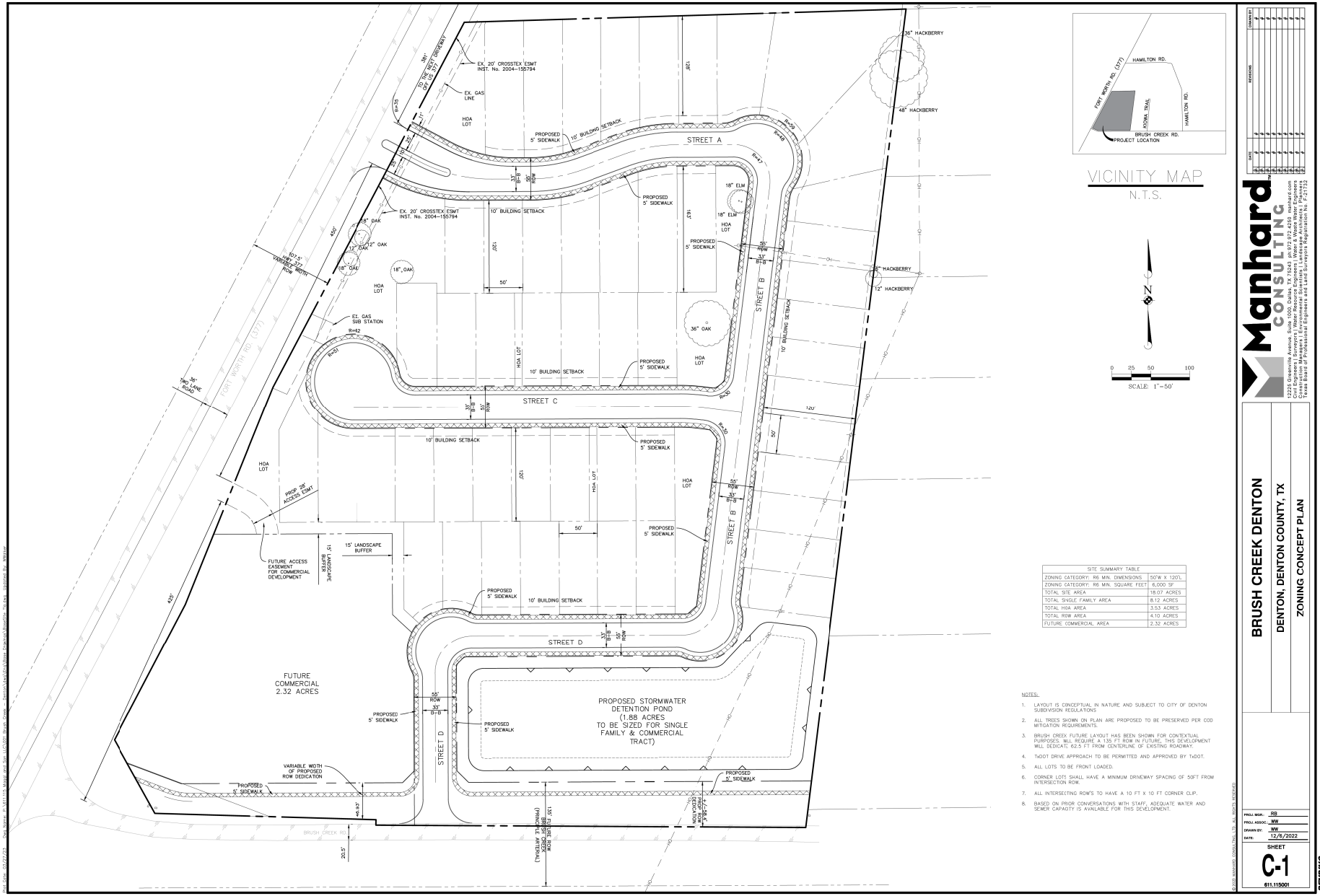
Vicinity Map

Figure 1



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Initial Site Plan

Figure 2

EXISTING AND PROPOSED LAND USE

The site is currently vacant and zoned residential (R1). The proposed Brush Creek development is planned to consist of 51 dwelling units of single-family detached housing and 25,300 square feet of commercial development. The single-family residential component is expected to be built-out by 2024, and for this analysis, the year 2025 was assumed as the site Build-Out Year based on discussions with the developer's representative.

The number of trips generated by a development is a function of the type and quantity of land use for the development. The number of vehicle trips generated by the proposed development was estimated based on the trip generation rates and equations provided in the publication entitled *Trip Generation Manual, 11th Edition*, by the Institute of Transportation Engineers (ITE). Estimates of the number of trips generated by the site were made for the AM and PM peak hours, as well as on a daily basis. The trip generation characteristics for the proposed development at Build-Out are shown in **Table 1**.

Table 1: Trip Generation Characteristics for Proposed Brush Creek Development

Use (ITE Land Use)	ITE Code	Variable (X)	Average Weekday			AM Peak Hour			PM Peak Hour		
Equation/Rates[1]											
Single-Family Detached Housing	210	Dwelling Units	Ln(T) = 0.92*Ln(X) + 2.68			Ln(T) = 0.91*Ln(X) + 0.12			Ln(T) = 0.94*Ln(X) + 0.27		
Strip Retail Plaza	822	1,000 SQFT	T = 54.45(Y)			T = 2.36(Y)			Ln(T) = 0.71*Ln(Y) + 2.72		
Directional Splits[2]											
Single-Family Detached Housing	210	Dwelling Units	50/50			25/75			63/37		
Strip Retail Plaza	822	1,000 SQFT	50/50			60/40			50/50		
Trips Generated											
Use (ITE Land Use)	**ITE Code**	**Quantity**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**
Single-Family Detached Housing	210	51	544	272	272	40	10	30	53	33	20
Strip Retail Plaza	822	25.3	1,378	689	689	60	36	24	150	75	75
TOTAL NEW TRIPS			**1,922**	**961**	**961**	**100**	**46**	**54**	**203**	**108**	**95**

[1]T = Trips Ends; X = Dwelling Units; Y= 1,000 Square-feet of Gross Floor Area

[2]XX / YY = % entering vehicles / % exiting vehicles

EXISTING AND PROPOSED TRAFFIC FLOW

Transportation System

Site accessibility describes the ease with which vehicles can get to and from a development. A site's accessibility is affected by the geographical location of the development with respect to other activity areas, the roadway system, and physical restraints such as rivers or lakes.

The existing and proposed lane configurations for the study area intersections within the study area are provided in **Figure 3**. Figure 3 shows the lane configurations based on the initial site plan (Figure 2) and was used for analysis purposes. Please refer to Figure 16 for recommended/proposed improvements identified in the later sections of the report. A description of the study area roadways includes:

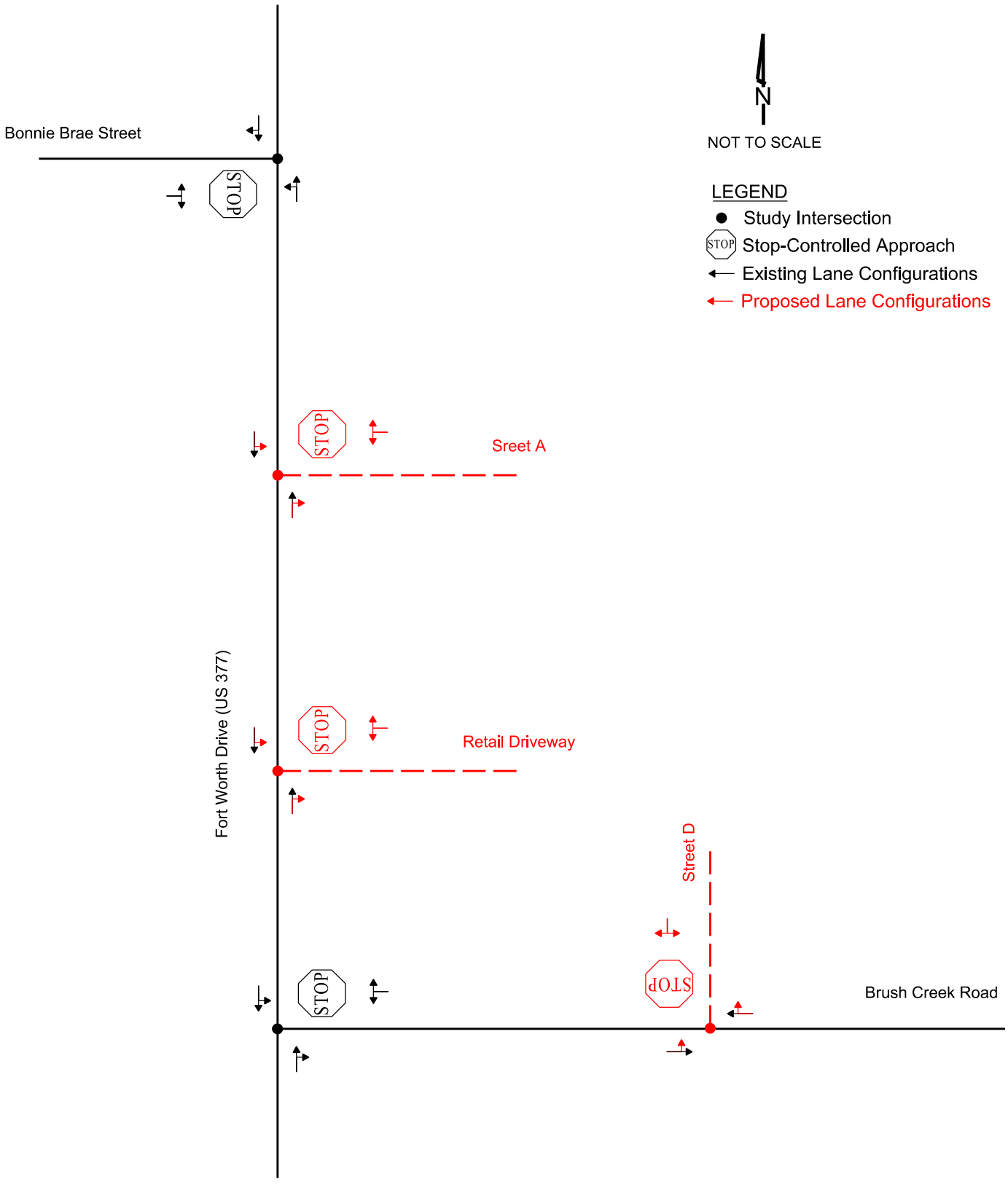
Bonnie Brae Street – Bonnie Brae Street is located northwest of the proposed development. Bonnie Brae Street is a two-lane undivided roadway with a posted speed limit of 30 mph and is classified as a Collector in the 2022 City of Denton *Thoroughfare Plan Map.* Based on discussions with City staff during the TIA scoping process, no improvements to Bonnie Brae Street were identified. Please note that Bonnie Brae Street west of US 377 will be closed once the western portion of Brush Creek Road is constructed. Since this study does not assume the western portion of Brush Creek Road, based on discussions with City staff, Bonnie Brae Street is assumed to remain open.

Brush Creek Road – Brush Creek Road is located south of the proposed development. Brush Creek Road is a two-lane undivided roadway with a posted speed limit of 30 mph and is classified as a Primary Arterial in the 2022 City of Denton *Thoroughfare Plan Map.* Based on discussions with City staff during the TIA scoping process, no improvements to Brush Creek Road were identified.

Fort Worth Drive (US 377) – Fort Worth Drive (US 377) is located west of the proposed development and is a two-lane undivided roadway with a posted speed limit of 55 mph. US 377 is classified as a Primary Arterial in the 2022 City of Denton *Thoroughfare Plan Map* and is classified as a Principal Arterial in TxDOT's *Statewide Planning Map*. While improvements to US 377 south of the study area are planned in the future, no improvements to US 377 within the study area are identified based on information in TxDOT's online Project Tracker.

Access to the proposed Brush Creek development will be provided by:

- A full-access driveway on Brush Creek Road.
- Two (2) full-access driveways on Fort Worth Drive (US 377).



These lane configurations are based on the initial site plan (Figure 2) and was used for analysis purposes. Please refer to Figure 16 for recommended/proposed improvements identified in the later sections of the report.

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Existing and Proposed Lane Configurations

Figure 3

Existing Traffic Volumes

Existing 24-hour turning movement volumes were collected on Thursday, January 19, 2023, at the intersection of US 377 and Brush Creek Road. The existing AM and PM peak periods (6:30-8:30 AM and 4:30-6:30 PM) turning movement volumes were collected on Thursday, January 19, 2023, at the intersection of US 377 at Bonnie Brae Street. **Figure 4** summarizes the existing traffic volumes during the AM and PM peak hours. The raw traffic count data is provided in the Appendix.

Background Traffic Volumes

Historical 24-hour traffic volumes in the area were obtained from TxDOT's online Traffic Count Database System (TCDS) and are presented in **Table 2**.

Table 2: Historical TxDOT TCDS

Year	Location
	Fort Worth Drive (US 377) South of Vintage Boulevard
2011	9,000
2012	9,400
2013	8,415
2014	9,030
2015	9,615
2016	9,806
2017	10,039
2018	10,039
2019	7,106
2020	6,879
2021	8,239
Average Annual Growth	**-3% / -1%** [1]

[1] 5-year growth rate / 10-year growth rate

Table 2 shows a negative traffic growth rate on US 377 south of Vintage Boulevard for the previous 5- and 10-year periods. For this analysis, a three percent (3%) traffic growth rate was used to estimate future traffic volumes under Build-Out Year (2025) and Horizon Year (2030) conditions. This growth rate assumption is consistent with that used in the Sagebrook TIA.

The Build-Out Year (2025) Background traffic volumes at the study intersections are provided in **Figure 5**. A residential development (Sagebrook) along US 377 is under construction west of the proposed site development, with 2028 assumed as the site Build-Out Year based on information provided in the TIA performed for that development. It was assumed that approximately 100 dwelling units per year would be constructed. Therefore, 40% of the peak hour traffic volumes of Sagebrook residential development were used as traffic generated by the Sagebrook residential

development by the year 2025, and 100% of the peak hour traffic volumes of the Sagebrook residential development were used by the year 2030. **Figure 6** shows peak hour traffic predicted to be generated by Sagebrook residential development by the Build-Out Year (2025).

The peak hour traffic volumes generated by Sagebrook residential development by the year 2025 were added to the initial Build-Out Year (2025) background traffic volumes shown in Figure 5 to obtain the Adjusted Build-Out Year (2025) Background traffic volumes presented in **Figure 7**.

The Horizon Year (2030) Background traffic volumes at the study intersections are provided in **Figure 8**, and **Figure 9** shows peak hour traffic predicted to be generated by Sagebrook residential development by the Horizon Year (2030).

The peak hour traffic volumes generated by Sagebrook residential development by the year 2030 were added to the initial Horizon Year (2030) background traffic volumes shown in Figure 8 to obtain the Adjusted Build-Out Year (2025) Background traffic volumes presented in **Figure 10**.

Trip Distribution

The existing traffic volumes and roadways in the area, along with the proposed site layout, were used to determine the directions from which traffic would approach and depart the proposed development. The assumed directional distribution is provided in **Figure 11**.

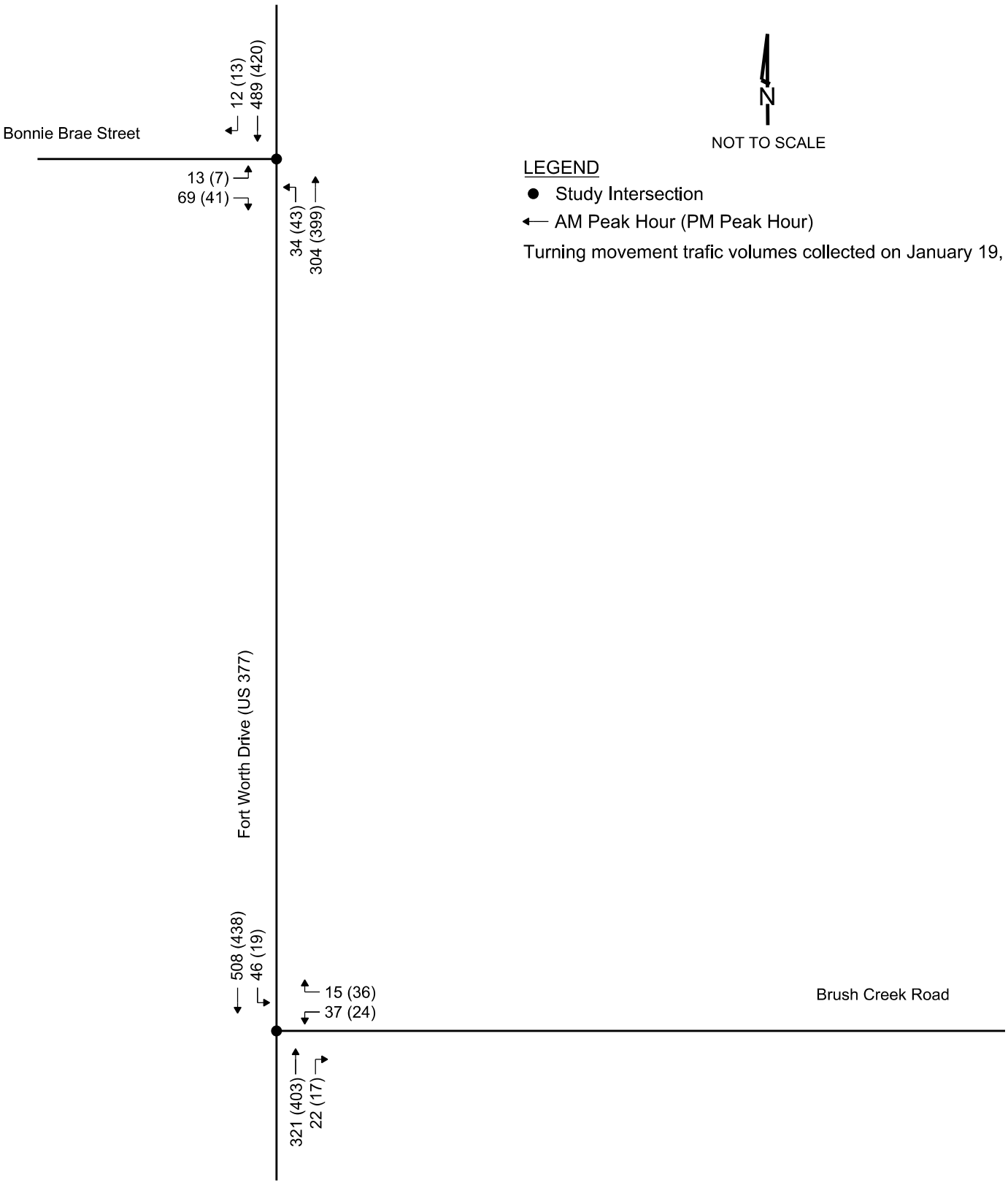
Site Traffic Volumes

Traffic volumes expected to be generated by the proposed development (Table 1) were assigned to the area roadways and site access points based on the directional distribution identified in Figure 11. The estimated total site generated traffic volumes are shown in **Figure 12**.

Total Traffic Conditions

Total (background + site) peak hour traffic conditions at Build-Out Year (2025) of the proposed Brush Creek development were obtained by adding the Adjusted Build-Out Year (2025) Background traffic volumes (Figure 7) to the total site generated traffic volumes (Figure 12) and are shown in **Figure 13**.

Similarly, total (background + site) peak hour traffic conditions at Horizon Year (2030) of the proposed Brush Creek development were obtained by adding the Adjusted Horizon Year (2030) Background traffic volumes (Figure 10) to the total site generated traffic volumes (Figure 12) and are shown in **Figure 14**.



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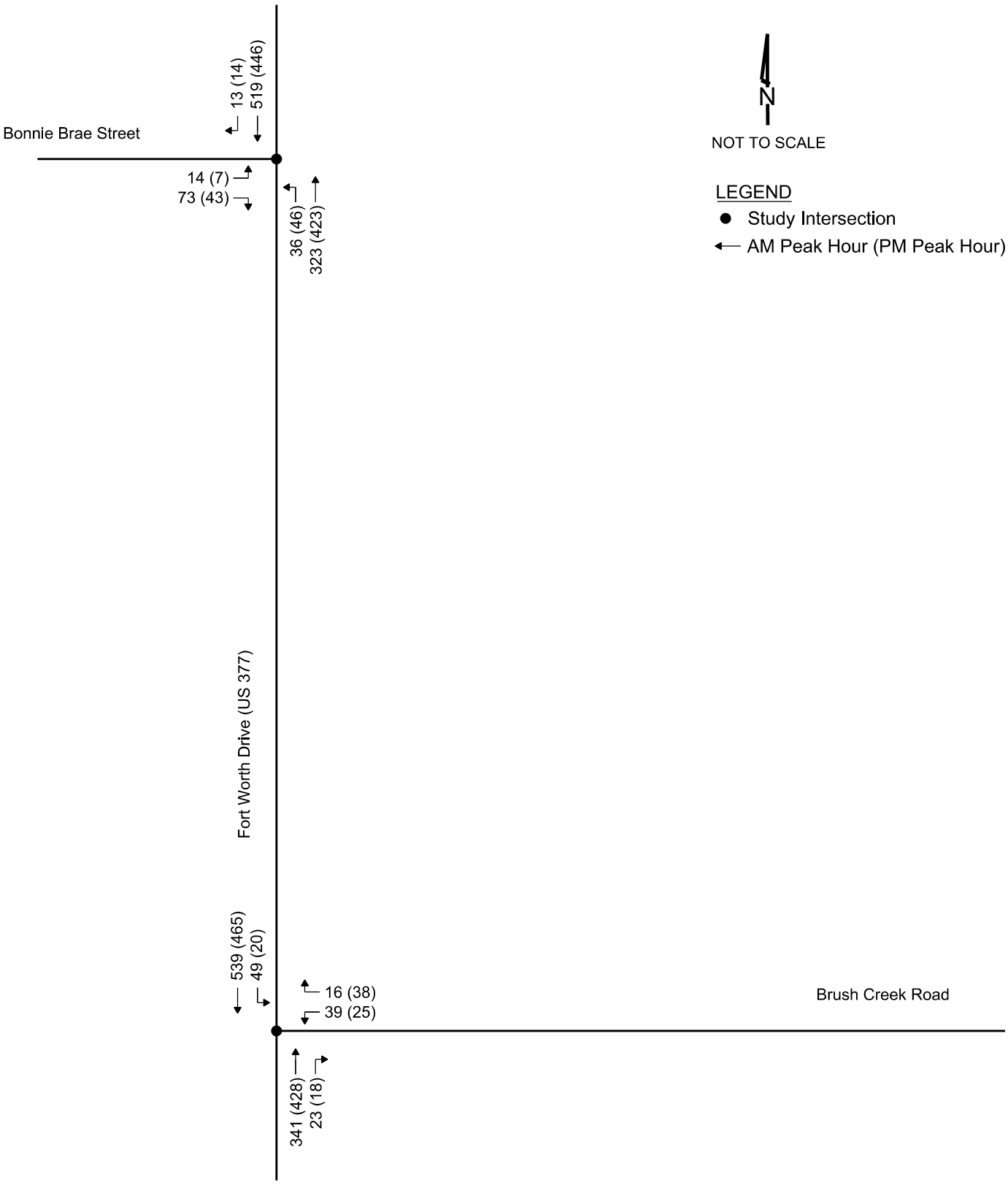
Existing (2023) Peak Hour Traffic Volumes

Figure 4



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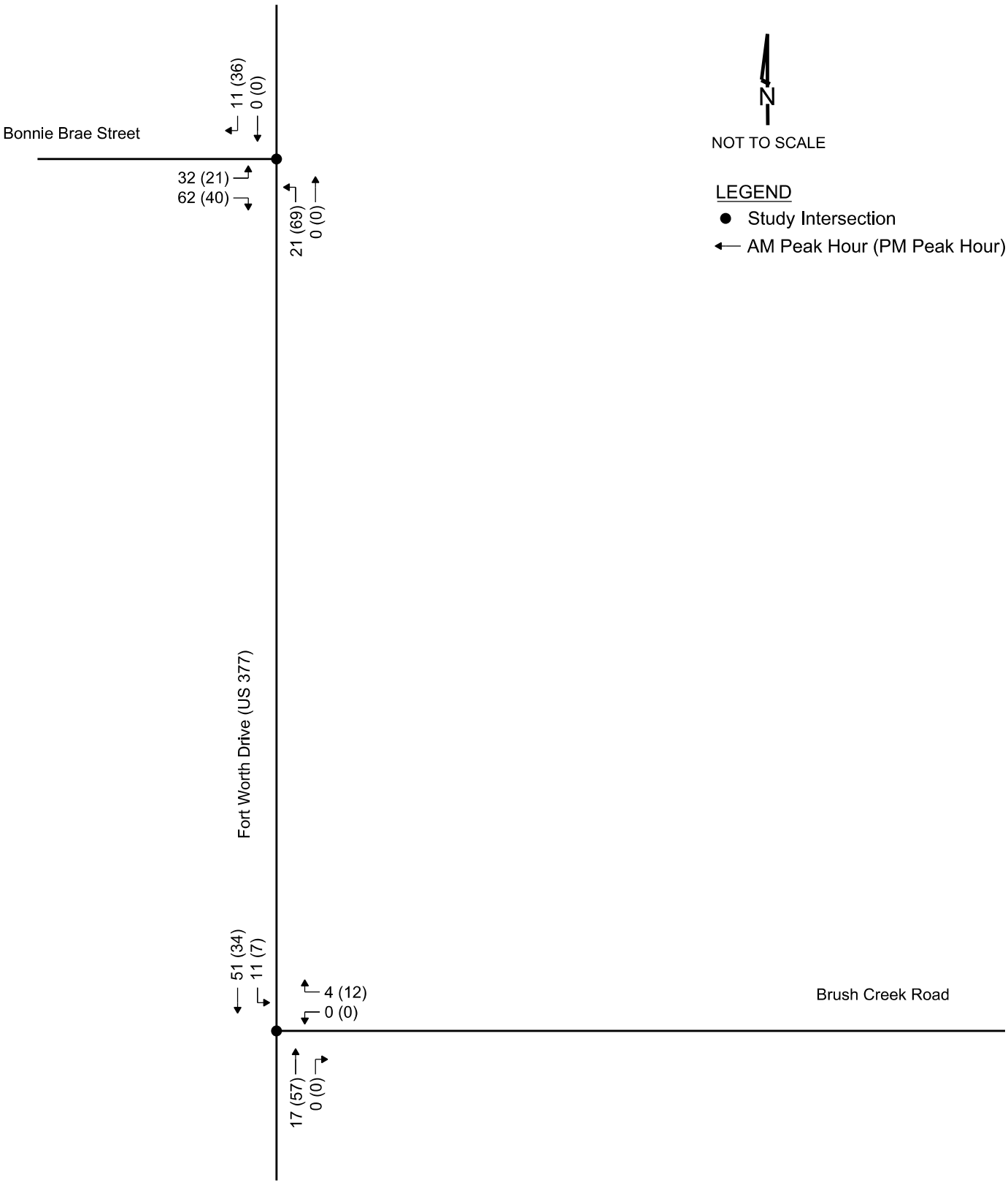
Build-out Year (2025) Background
Peak Hour Traffic Volumes

Figure 5



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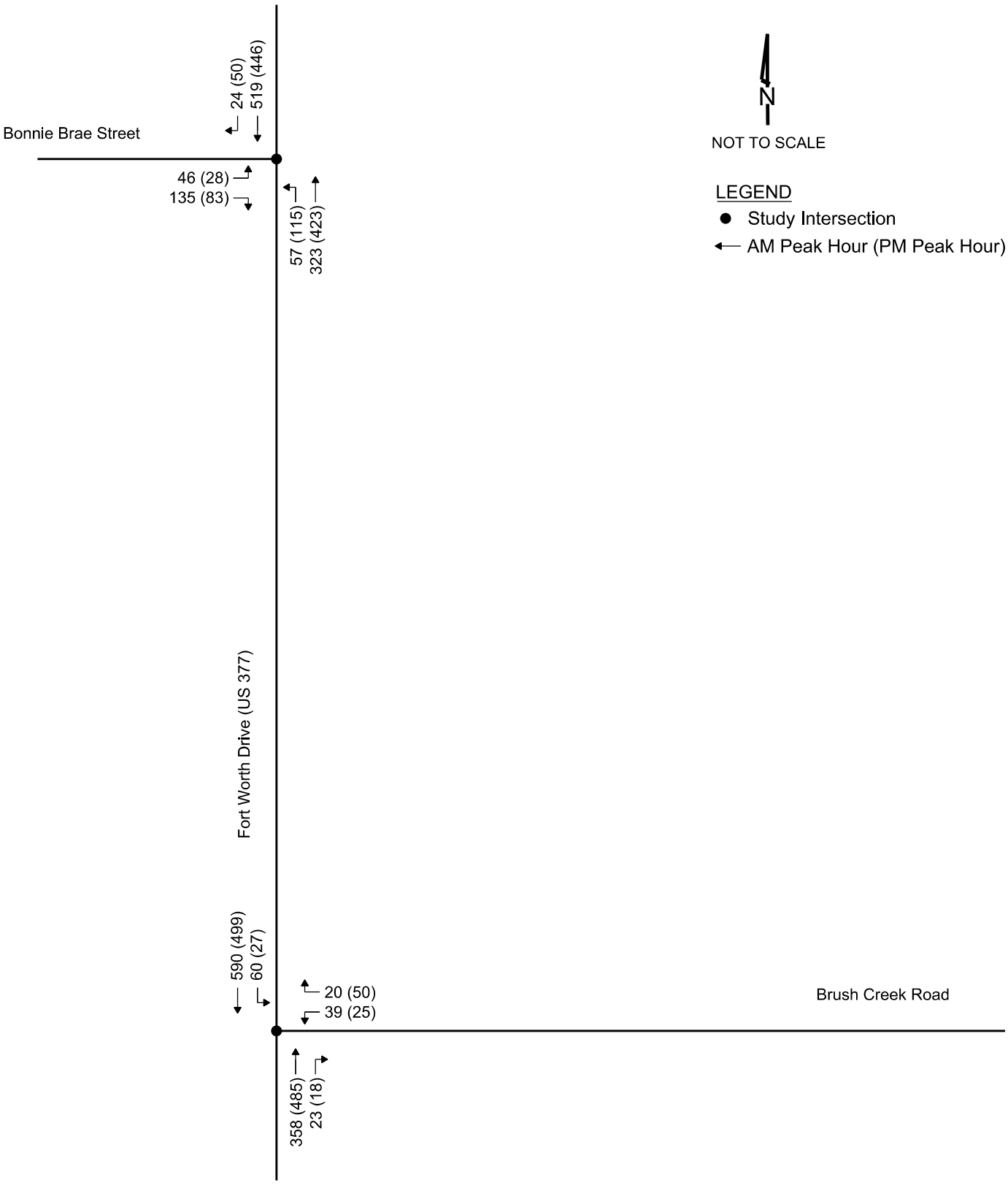
Build-out Year (2025) Peak Hour Traffic Volumes
by Sagebrook Residential Development

Figure 6



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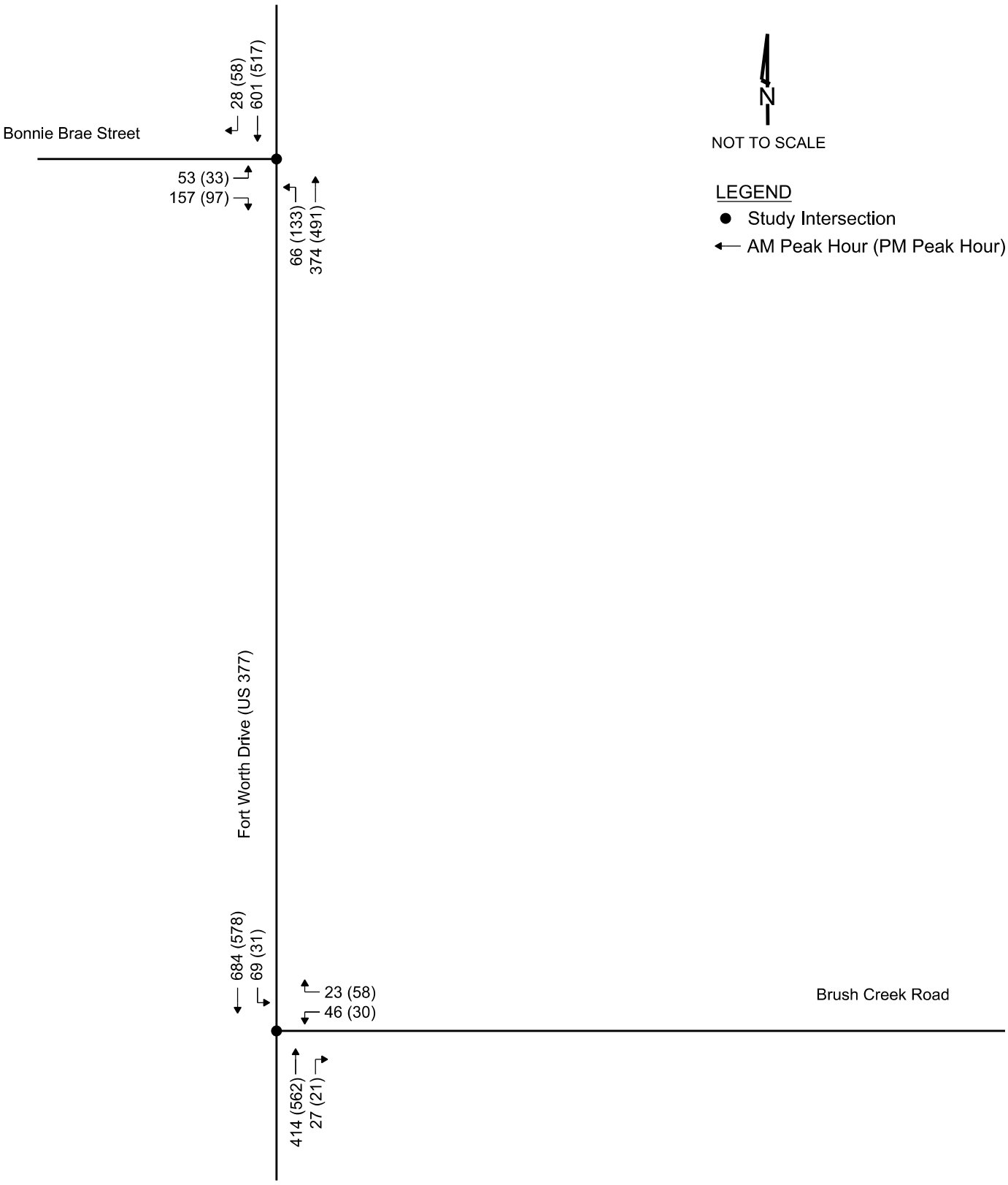
Adjusted Build-out Year (2025) Background
Peak Hour Traffic Volumes

Figure 7



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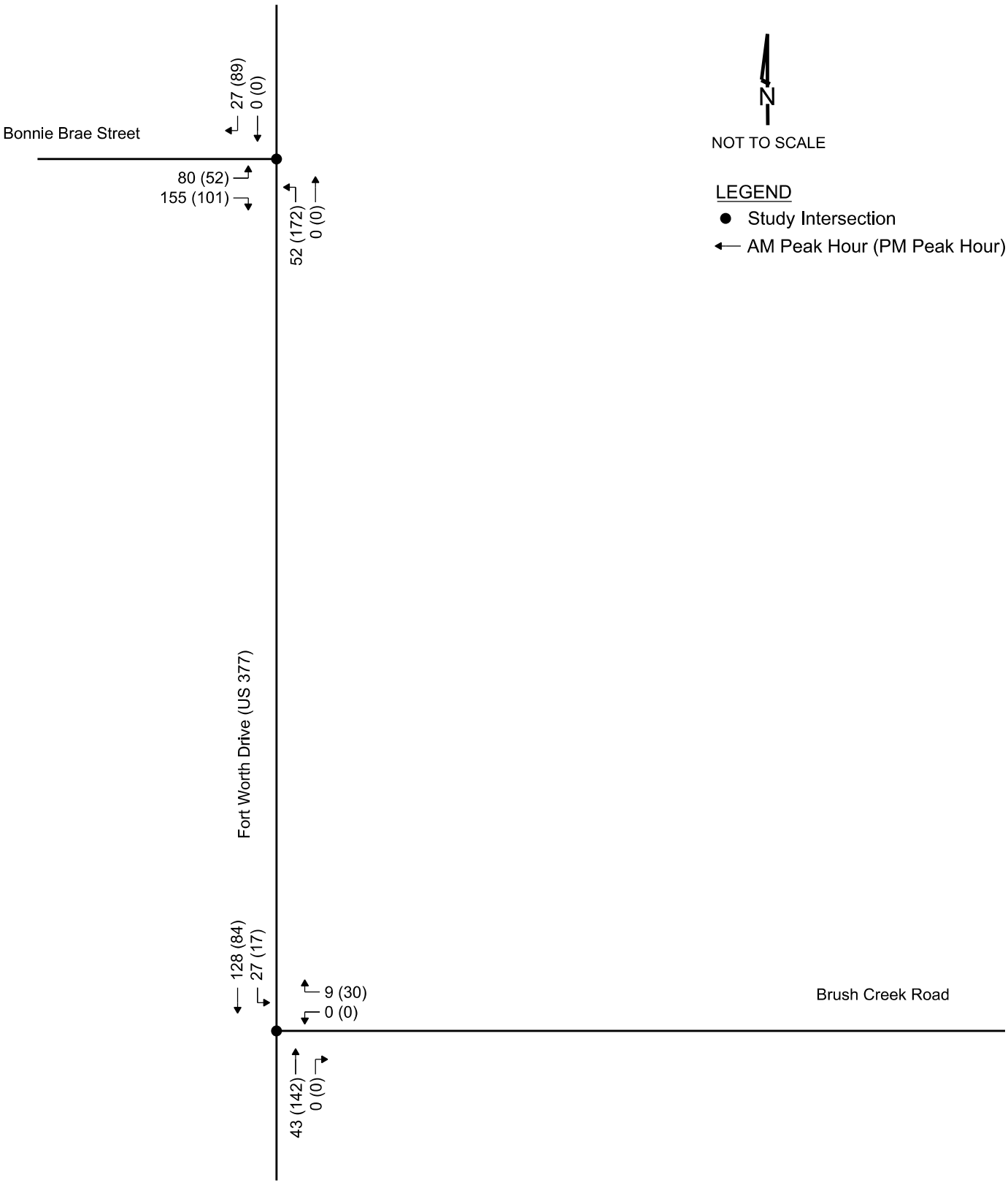
Horizon Year (2030) Background
Peak Hour Traffic Volumes

Figure 8



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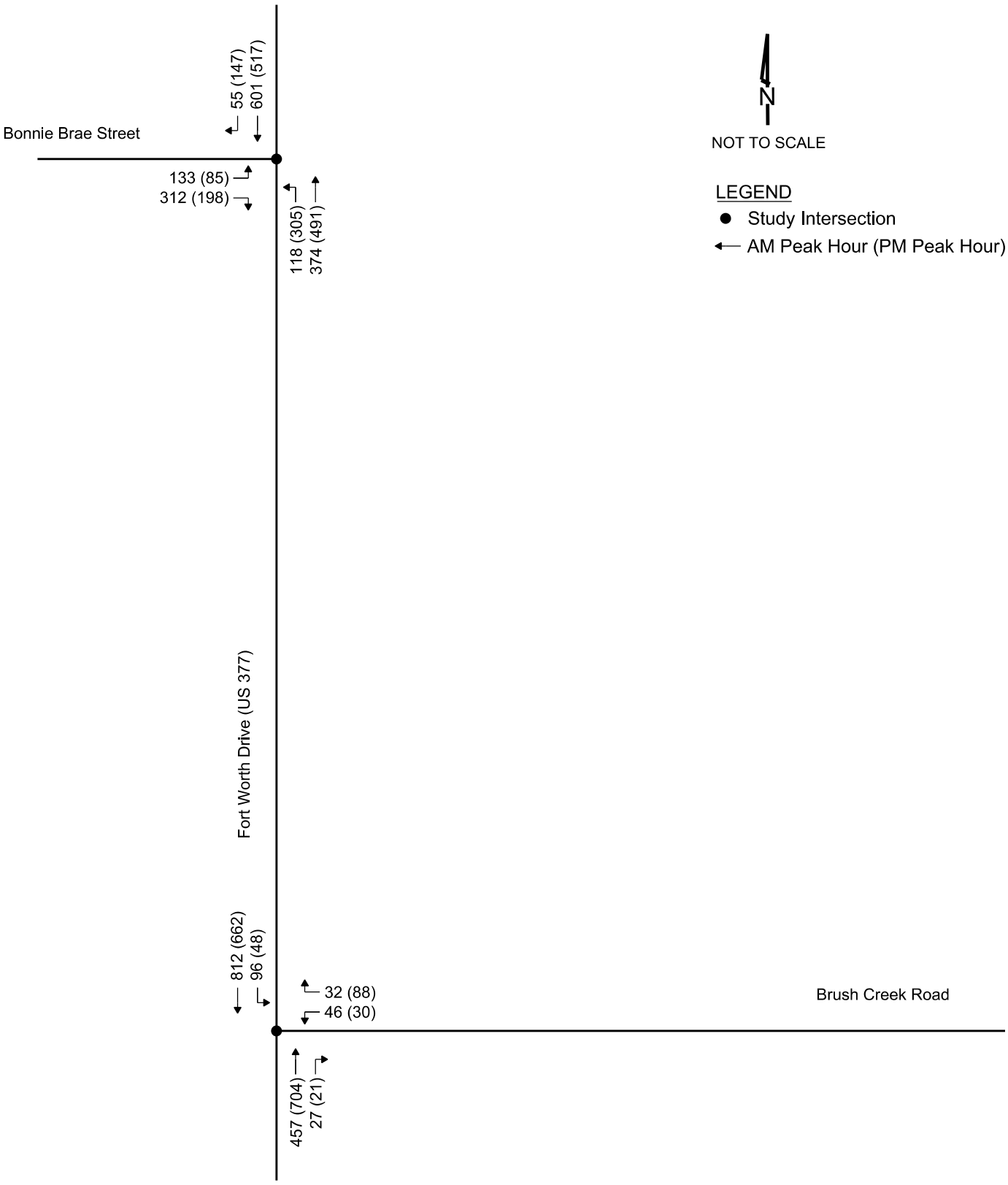
Horizon Year (2030) Peak Hour Traffic Volumes
by Sagebrook Residential Development

Figure 9



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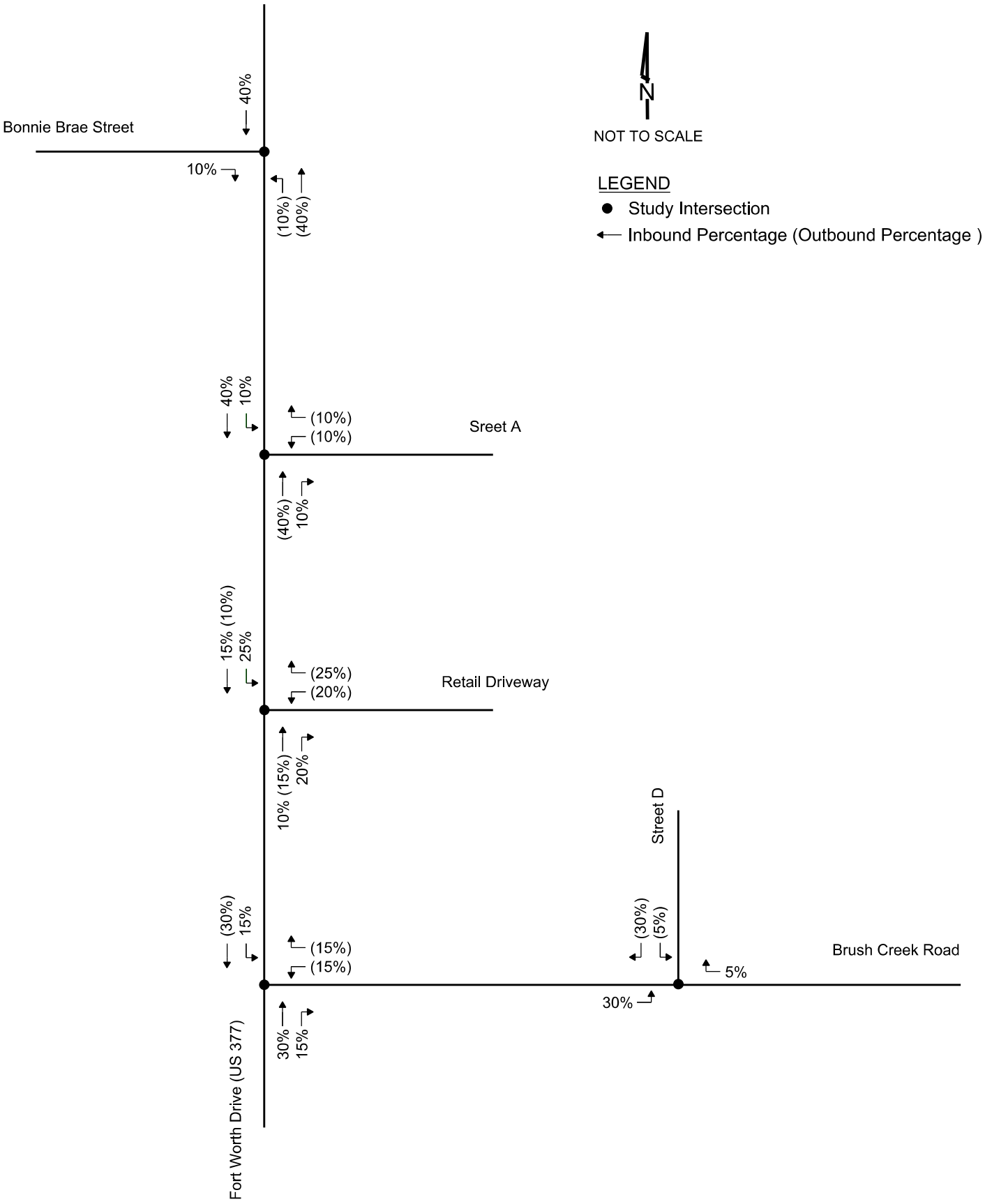
Adjusted Horizon Year (2030) Background
Peak Hour Traffic Volumes

Figure 10



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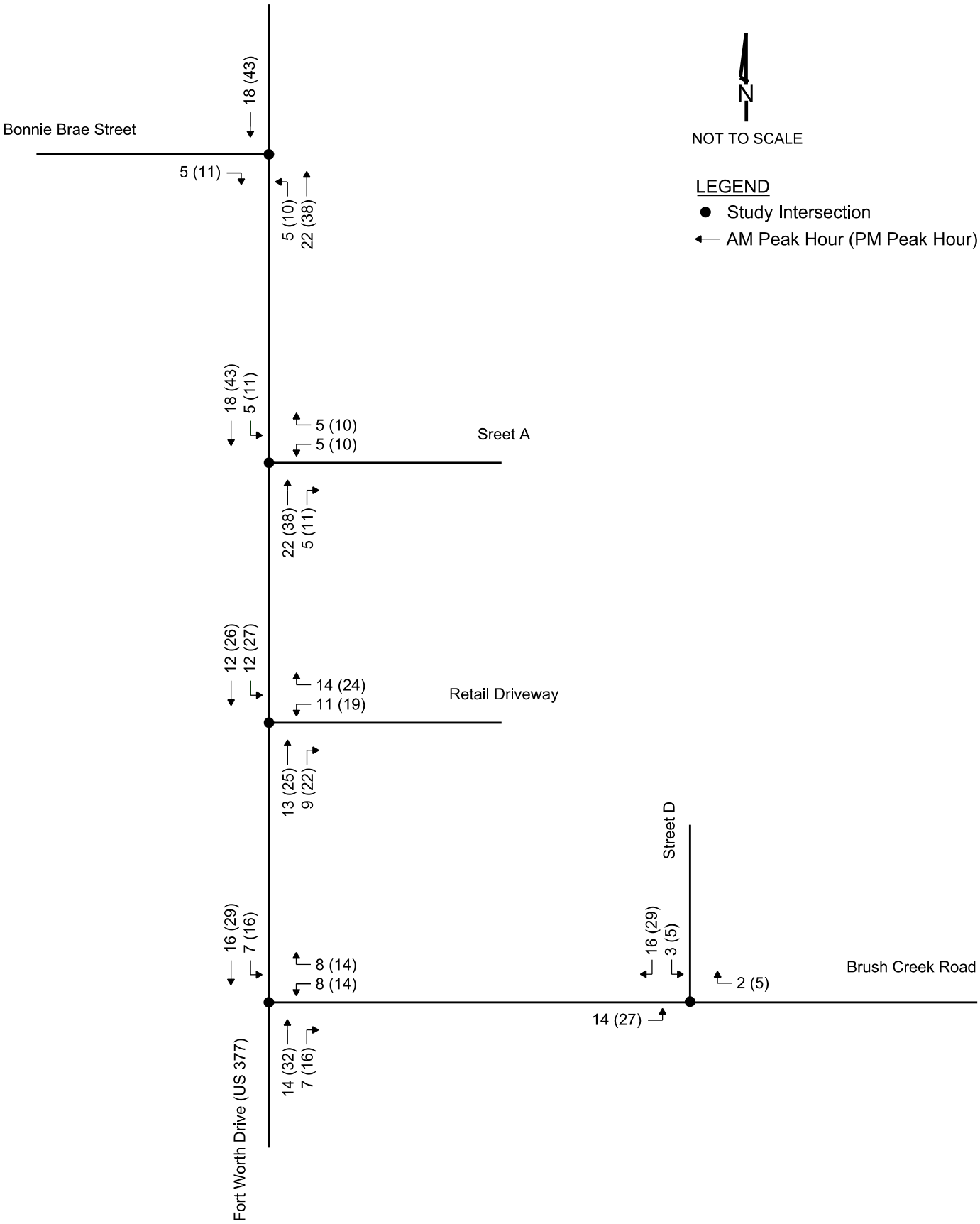
Assumed Directional Distribution

Figure 11



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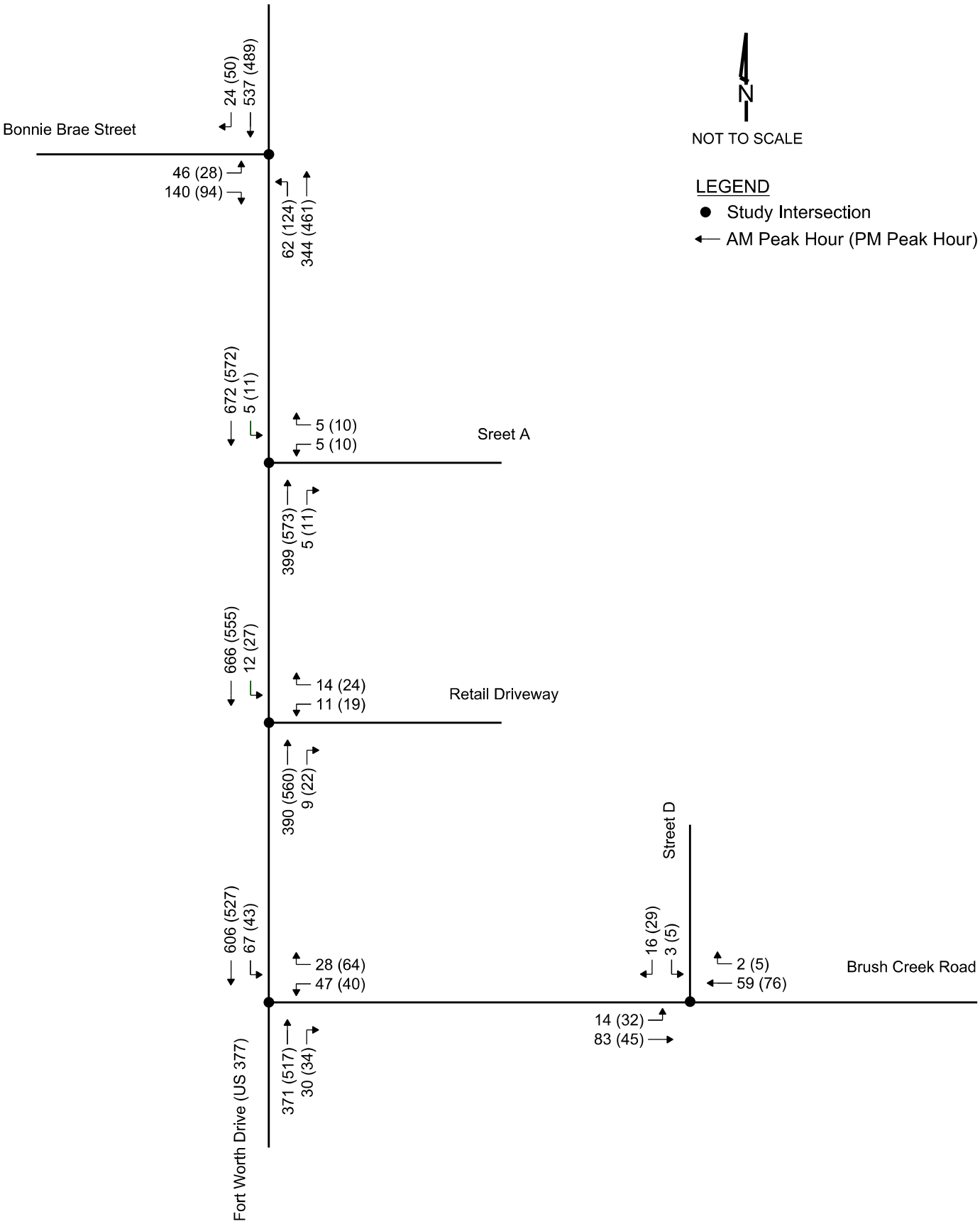
Site Generated
Peak Hour Traffic Volumes

Figure 12



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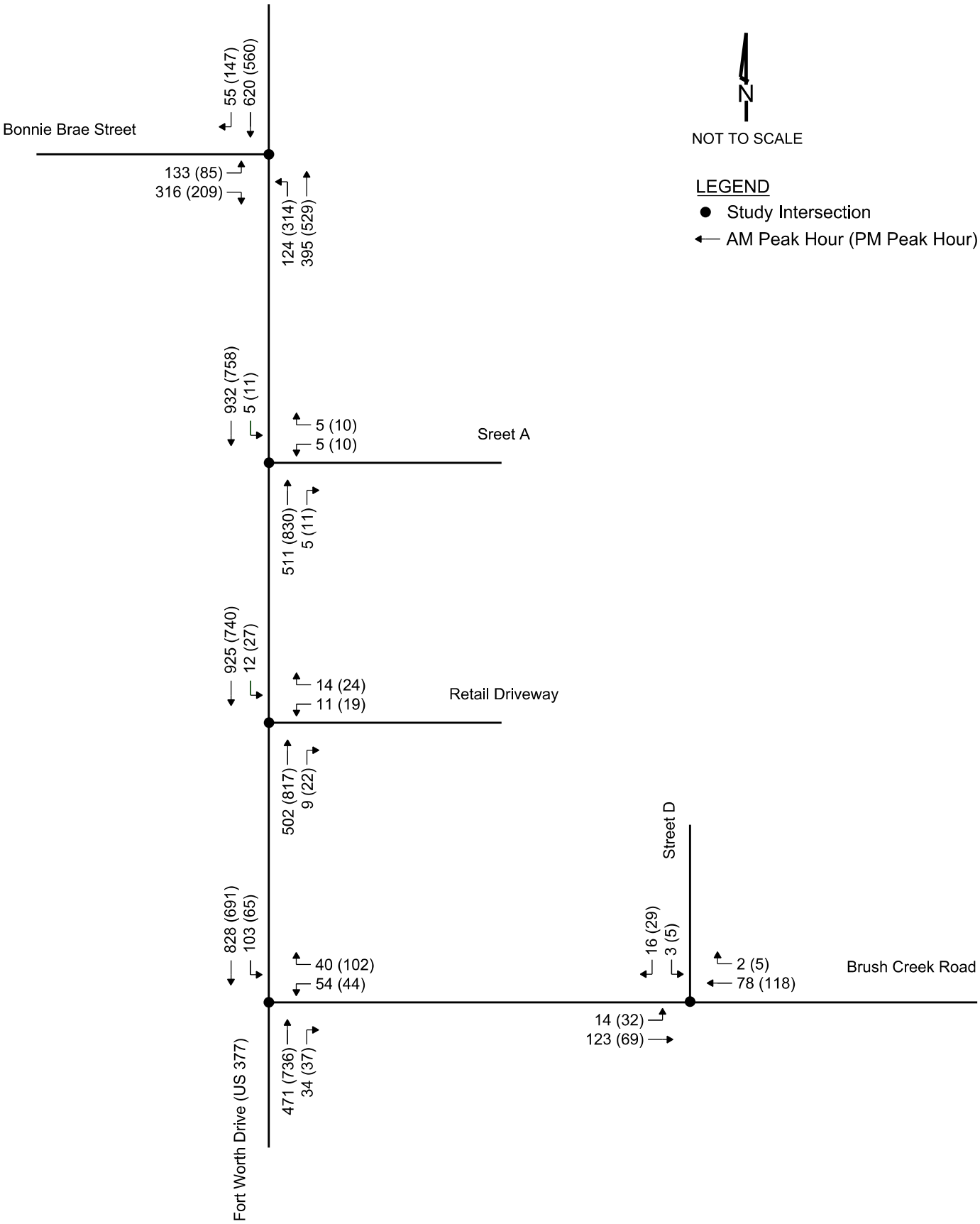
Build-out Year (2025) Total
Peak Hour Traffic Volumes

Figure 13



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Horizon Year (2030) Total
Peak Hour Traffic Volumes

Figure 14

TRAFFIC ANALYSES

Level of Service Evaluation

The Level of Service (LOS) of an intersection is a qualitative measure of capacity and operating conditions and is directly related to vehicle delay. The LOS criteria for an unsignalized intersection are shown in **Table 3**. LOS is given a letter designation from A to F, with LOS A representing very short delays (less than 10 seconds of average control delay per vehicle) and LOS F representing very long delays (more than 50 seconds of average control delay per vehicle). LOS D, ranging from 55.1 to 35.0 seconds of average control delay per vehicle, is considered the minimum acceptable condition in the City of Denton.

Capacity analyses were conducted for the study area intersections under the following analysis scenarios:

- Existing (2023) Traffic Conditions
- Build-Out Year (2025) Background Traffic Conditions
- Build-Out Year (2025) Total Traffic Conditions
- Horizon Year (2030) Background Traffic Conditions
- Horizon Year (2030) Total Traffic Conditions

The intersection capacity analyses were conducted using *Highway Capacity Manual (HCM) 6th Edition* methodologies in the *Synchro 11* traffic analysis software package. Printouts of the Synchro analysis results are provided in the Appendix. It should be noted that the HCM methodology does not provide intersection-wide delay or level of service for intersections operating under two-way stop control.

Additional performance measures such as volume to capacity (v/c) ratios and queue lengths also provide an indication of operations. For example, at two-way stop-controlled intersections, main street traffic volumes may impose longer average delays for a small number of side-street vehicles, thus creating vehicle delays which correspond to a poor level of service.

Table 3: Level of Service Criteria for Unsignalized Intersections

Level-of-Service (LOS)	Average Control Delay (seconds/vehicle)	Description
A	≤ 10.0	No delays at intersections with continuous flow of traffic. Uncongested operations: high frequency of long gaps available for all left and right turning traffic. No observable queues.
B	10.1 to 15.0	No delays at intersections with continuous flow of traffic. Uncongested operations: high frequency of long gaps available for all left and right turning traffic. No observable queues.
C	15.1 to 25.0	Moderate delays at intersections with satisfactory to good traffic flow. Light congestion; infrequent backups on critical approaches.
D	25.1 to 35.0	Increased probability of delays along every approach. Significant congestion on critical approaches, but intersection functional. No standing long lines formed.
E	35.1 to 50.0	Heavy traffic flow condition. Heavy delays probable. No available gaps for cross-street traffic or main street turning traffic. Limit of stable flow.
F	> 50.0 or v/c>1.0	Unstable traffic flow. Heavy congestion. Traffic moves in forced flow condition. Average delays greater than one minute highly probable. Total breakdown.

SOURCE: *Highway Capacity Manual, HCM (6th Edition)*, Transportation Research Board, 2016

Existing Traffic Conditions

The existing lane configurations shown in Figure 3 and the Existing (2023) traffic volumes shown in Figure 4 were used for the existing analyses. **Table 4** presents the capacity analysis results for the study intersections under existing conditions.

Table 4: Capacity Analysis Results – Existing (2023) Traffic Conditions

1: US 377 and Bonnie Brae Street (Side-Street Stop-Controlled)						
Scenario	Peak Hour	Intersection	EB	WB	NB Left	SB
Existing (2023) Conditions	AM	--[1]	14.9 (B)[2]	--	8.7 (A)	0.0 (A)
	PM	--	12.9 (B)	--	8.4 (A)	0.0 (A)
2: US 377 and Brush Creek Road (Side-Street Stop-Controlled)						
Scenario	Peak Hour	Intersection	EB	WB	NB	SB Left
Existing (2023) Conditions	AM	--[1]	--	20.1 (C)	0.0 (A)	8.2 (A)
	PM	--	--	15.1 (C)	0.0 (A)	8.3 (A)

[1] HCM methodology does not provide intersection-wide delay/level of service for Side-Street Stop-Controlled analysis
[2] Delay in seconds/vehicle (Level of Service)

The analysis results in Table 4 indicate the approaches and movements at the existing study area intersections operate at LOS D or better under the Existing (2023) traffic conditions.

Build-Out Year (2025) Traffic Conditions

The existing lane configurations (Figure 3) and Adjusted Build-Out Year (2025) Background traffic volumes (Figure 7) were used for the Build-Out Year (2025) background analysis. The future lane configurations (Figure 3) and Build-Out Year (2025) Total traffic volumes (Figure 13) were used for the Build-Out Year (2025) total analysis. **Table 5** presents the capacity analysis results for these conditions.

Table 5: Capacity Analysis Results – Build-Out Year (2025) Traffic Conditions

1: US 377 and Bonnie Brae Street (Side-Street Stop-Controlled)						
Scenario	Peak Hour	Intersection	EB	WB	NB Left	SB
Build-Out (2025) Background	AM	--[1]	25.5 (D)[2]	--	9.0 (A)	0.0 (A)
	PM	--	19.9 (C)	--	8.9 (A)	0.0 (A)
Build-Out (2025) Total	AM	--	28.3 (D)	--	9.1 (A)	0.0 (A)
	PM	--	23.0 (C)	--	9.1 (A)	0.0 (A)
2: US 377 and Brush Creek Road (Side-Street Stop-Controlled)						
Scenario	Peak Hour	Intersection	EB	WB	NB	SB Left
Build-Out (2025) Background	AM	--	--	25.1 (D)	0.0 (A)	8.4 (A)
	PM	--	--	17.6 (C)	0.0 (A)	8.6 (A)
Build-Out (2025) Total	AM	--	--	28.5 (D)	0.0 (A)	8.5 (A)
	PM	--	--	23.2 (C)	0.0 (A)	8.8 (A)
3: US 377 and Street A (Side-Street Stop-Controlled)						
Scenario	Peak Hour	Intersection	EB	WB	NB	SB Left
Build-Out (2025) Total	AM	--	--	16.9 (C)	0.0 (A)	8.2 (A)
	PM	--	--	19.9 (C)	0.0 (A)	8.8 (A)
4: Brush Creek Road and Street D (Side-Street Stop-Controlled)						
Scenario	Peak Hour	Intersection	EB Left	WB	NB	SB
Build-Out (2025) Total	AM	--	7.4 (A)	0.0 (A)	--	8.8 (A)
	PM	--	7.4 (A)	0.0 (A)	--	9.0 (A)
5: US 377 and Proposed Retail Driveway (Side-Street Stop-Controlled)						
Scenario	Peak Hour	Intersection	EB	WB	NB	SB Left
Build-Out (2025) Total	AM	--	--	18.5 (C)	0.0 (A)	8.2 (A)
	PM	--	--	23.3 (C)	0.0 (A)	8.9 (A)

[1] HCM methodology does not provide intersection-wide delay/level of service for Side-Street Stop-Controlled analysis
[2] Delay in seconds/vehicle (Level of Service)

The analysis results in Table 5 indicate the approaches and movements at the existing study area intersections are predicted to operate at LOS D or better under the Build-Out Year (2025) traffic conditions.

Horizon Year (2030) Traffic Conditions

The existing lane configurations (Figure 3) and Adjusted Horizon Year (2030) Background traffic volumes (Figure 10) were used for the Horizon Year (2030) background analysis. The future lane configurations (Figure 3) and the Horizon Year (2030) Total traffic volumes (Figure 14) were used for the Horizon Year (2030) total analyses. **Table 6** presents the capacity analysis results for these conditions. Shaded cells in this table indicate approaches predicted to operate at LOS beyond D.

Table 6: Capacity Analysis Results – Horizon Year (2030) Traffic Conditions

1: US 377 and Bonnie Brae Street (Side-Street Stop-Controlled)						
Scenario	Peak Hour	Intersection	EB	WB	NB Left	SB
Horizon (2030) Background	AM	--1	>300 (F)[2] *v/c = 2.01* [37]	--	9.9 (A)	0.0 (A)
	PM	--	>300 (F) *v/c = 2.57* [27]	--	11.2 (B)	0.0 (A)
Horizon (2030) Total	AM	--	>300 (F) *v/c = 2.17* [39]	--	10.0 (B)	0.0 (A)
	PM	--	>300 (F) *v/c = 3.29* [31]	--	11.7 (B)	0.0 (A)
2: US 377 and Brush Creek Road (Side-Street Stop-Controlled)						
Scenario	Peak Hour	Intersection	EB	WB	NB	SB Left
Horizon (2030) Background	AM	--	--	72.3 (F), *v/c = 0.65* [4]	0.0 (A)	8.9 (A)
	PM	--	--	35.4 (E), *v/c = 0.52* [3]	0.0 (A)	9.5 (A)
Horizon (2030) Total	AM	--	--	109.3 (F), *v/c = 0.84* [6]	0.0 (A)	9.1 (A)
	PM	--	--	73.9 (F), *v/c = 0.81* [6]	0.0 (A)	9.9 (A)
3: US 377 and Street A (Side-Street Stop-Controlled)						
Scenario	Peak Hour	Intersection	EB	WB	NB	SB Left
Horizon (2030) Total	AM	--	--	24.7 (C)	0.0 (A)	8.6 (A)
	PM	--	--	34.9 (D)	0.0 (A)	9.9 (A)
4: Brush Creek Road and Street D (Side-Street Stop-Controlled)						
Scenario	Peak Hour	Intersection	EB Left	WB	NB	SB
Horizon (2030) Total	AM	--	7.4 (A)	0.0 (A)	--	9.0 (A)
	PM	--	7.5 (A)	0.0 (A)	--	9.2 (A)
5: US 377 and Proposed Retail Driveway (Side-Street Stop-Controlled)						
Scenario	Peak Hour	Intersection[2]	EB	WB	NB	SB Left
Horizon (2030) Total	AM	--	--	24.9 (C)	0.0 (A)	8.6 (A)
	PM	--	--	40.5 (E), *v/c = 0.32* [2]	0.0 (A)	10.0 (B)

[1] HCM methodology does not provide intersection-wide delay/level of service for Side-Street Stop-Controlled analysis
[2] Delay in seconds/vehicle (Level of Service)

The following observations are made based on the results in Table 6:

- The eastbound approach of Bonnie Brae Street at US 377 is predicted to operate at LOS F under the Horizon Year (2030) traffic conditions with or without the site traffic.
- The westbound approach of Brush Creek Road at US 377 is predicted to operate at LOS E or LOS F under the Horizon Year (2030) traffic conditions with or without the site traffic. However, the projected volume-to-capacity ratio indicates that the projected volume is not predicted to exceed the available capacity.
- The westbound approach of Retail Driveway at US 377 is predicted to operate at LOS E under the Horizon Year (2030) Total traffic conditions. However, the projected volume-to-capacity ratio indicates that the projected volume is not predicted to exceed the available capacity.
- The approaches and movements at the other site access intersections are predicted to operate at LOS D or better under Horizon Year (2030) Total conditions.

Horizon Year (2030) Total Traffic Conditions - Mitigations

The following improvements are identified to improve operations by the Horizon Year (2030). However, these potential improvements should be considered when the retail component is built-out:

1) US 377 and Bonnie Brae Street
    - Install an eastbound left turn lane
    - Install a southbound right turn lane
    - Install a northbound left turn lane
    - Signalize the intersection
2) US 377 and Brush Creek Road
    - Install a southbound left turn lane
    - Install a westbound right turn lane
3) US 377 at Proposed Retail Driveway
    - Install a westbound right turn lane
    - Install a southbound left turn lane (Although a southbound left turn lane is not required to mitigate operations, it was assumed in the mitigation analysis, based on the left turn deceleration lane analysis and discussion in the next section.)

Table 7 presents the capacity analysis results for these conditions. Shaded cells indicate LOS beyond D.

Table 7: Capacity Analysis Results – Horizon Year (2030) Total Traffic Conditions - Mitigations

1: US 377 and Bonnie Brae Street (Signalized)						
Scenario	Peak Hour	Intersection	EB	WB	NB Left	SB
Horizon (2030) Total	AM	19.3 (B)	20.5 (C)	--	8.7 (A)	26.6 (C)
	PM	17.9 (B)	16.5 (B)	--	15.0 (B)	22.1 (C)
2: US 377 and Brush Creek Road (Side-Street Stop-Controlled)						
Scenario	Peak Hour	Intersection	EB	WB	NB	SB Left
Horizon (2030) Total	AM	--	--	63.0 (F), *v/c = 0.66* [4]	0.0 (A)	9.1 (A)
	PM	--	--	35.3 (E), *v/c = 0.49* [3]	0.0 (A)	9.9 (A)
5: US 377 and Proposed Retail Driveway (Side-Street Stop-Controlled)						
Scenario	Peak Hour	Intersection	EB	WB	NB	SB Left
Horizon (2030) Total	AM	--	--	23.8 (C)	0.0 (A)	8.6 (A)
	PM	--	--	34.6 (D)	0.0 (A)	10.0 (B)

[1] Delay in seconds/vehicle (Level of Service)
[2] HCM methodology does not provide intersection-wide delay/level of service for Side-Street Stop-Controlled analysis

The following observations are made based on the results in Table 7:

- The intersection of Bonnie Brae Street at US 377 is predicted to operate at LOS D or better under the Horizon Year (2030) Total traffic conditions with the proposed mitigations identified. However, based on direction provided in a 4/18/23 email from City staff, "As Bonnie Brae will ultimately be closed when Brush Creek/Hickory Creek is extended to the west, signalization is not a viable mitigation" and "any mitigation measures that require new construction may not be feasible."
- The westbound approach of Brush Creek Road at US 377 is predicted to operate at LOS beyond D during the AM and PM peak hours of the Horizon Year (2030) Total traffic conditions. However, the delays during the AM and PM peak hours with these improvements in place are predicted to be lower than the delays under Horizon Year (2030) Background conditions (without the site traffic) in Table 6.
- The westbound approach of Retail Driveway at US 377 is predicted to operate at LOS D or better under the Horizon Year (2030) Total traffic conditions with the proposed mitigations.

ACCESS MANAGEMENT ANALYSIS

As part of this study, access management analysis was performed to consider the need for deceleration lanes created by the projected site traffic at the existing site driveways.

Right Turn Deceleration Lane Analysis

The site driveways for the proposed development were analyzed to determine the need for right turn deceleration lanes. Guidelines in TxDOT's *Access Management Manual* state that for roadways with a posted limit greater than 45 mph (posted speed limit on US 77 = 55 mph), a right turn deceleration lane should be considered when peak right turn volumes are greater than 50 vehicles per hour.

Table 1.4.3.2 of the Denton *Transportation Criteria Manual* states that for roadways with a posted speed limit less than 45 mph (posted speed limit on Brush Creek Road = 30 mph), a right turn deceleration lane should be provided when peak right turn volumes are greater than 60 vehicles per hour. **Table 8** summarizes the projected right turn volumes for the site access connections to US 377 and Brush Creek Road under Horizon Year (2030) Total traffic conditions. Right turn deceleration lanes are not warranted at the site driveways.

Table 8: Right Turn Deceleration Lane Analysis Results

Intersection	Approach	Speed Limit (mph)	Threshold (vph)	Volume (vph) AM (PM)	Exceeds Threshold? AM (PM)
Street A at US 377	NB	55	50	5 (11)	NO (NO)
Retail Driveway at US 377	NB	55	50	9 (22)	NO (NO)
Street D at Brush Creek Rd	WB	30	60	2 (5)	NO (NO)

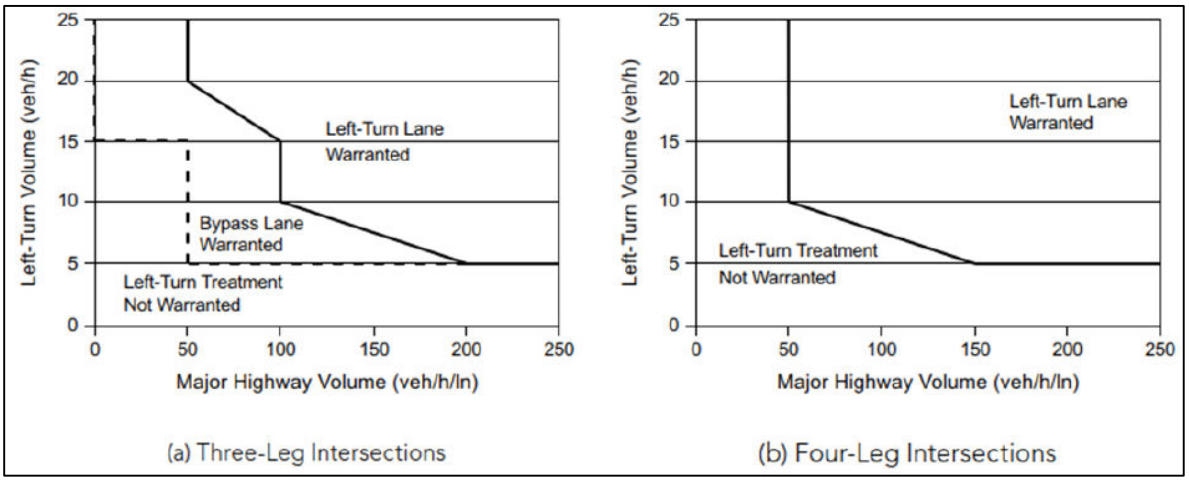
Left Turn Deceleration Lane Analysis

The southbound left turn volumes at the site driveways were analyzed to determine the necessity of left turn deceleration lanes. The analysis was performed based on the peak hour traffic volumes under Horizon Year (2030) Total traffic conditions (Figure 13). Left turn deceleration lane guidelines for two-lane undivided rural roadways are provided in TxDOT's *Roadway Design Manual* and presented in **Figure 15**.

Table 1.4.3.1 of the Denton *Transportation Criteria Manual* presents similar volume-based criteria for when to provide a left turn deceleration lane on City arterials and collectors.

Table 9 presents the left turn deceleration lane analysis results for the site access points during the AM and PM peak hours under Horizon Year (2030) Total traffic conditions. Based on the results shown in this table, the traffic characteristics at the two (2) site access connections on US 377 exceed TxDOT's warranting guidelines for the consideration of a left turn deceleration lane. The traffic characteristics on Brush Creek Road at Street D do not exceed the City's criteria for the installation of an eastbound left turn deceleration lane.

Figure 15: Guidelines for Left Turn Lanes on Two-Lane Highways



Source: Figure 3-8, TxDOT Roadway Design Manual

Table 9: Left Turn Deceleration Lane Analysis Results

Access Point	Peak	Left-Turn Volume (veh/hr)	Major Road Volume		Guidelines For Left-Turn Lane	Guidelines for Bypass Lane	Guidelines Met or Exceeded?
			Total (veh/hr)	Per Lane (veh/hr/lane)			
Street A at US 377 (SB)	AM Peak	5	1453	727	200	50	Yes (Left Turn Lane)
	PM Peak	11	1610	805	100	<50	Yes (Left Turn Lane)
Retail Driveway at US 377 (SB)	AM Peak	12	1448	724	100	<50	Yes (Left Turn Lane)
	PM Peak	27	1606	803	50	<50	Yes (Left Turn Lane)
Street D at Brush Creek Road[1] (EB)	AM Peak	14	217	109	250	N/A	No
	PM Peak	32	224	112	150	N/A	No

[1] Based on Table 1.4.3.1 of the Denton Transportation Criteria Manual

Based on Table 3-12 of TxDOT's *Roadway Design Manual* for two-lane rural highways (US 377), the deceleration lane along US 377 (55 mph speed limit) should be 605 feet long (100 feet storage + 505 feet deceleration). *Highway Capacity Manual* analysis results indicated 95th percentile queues of one (1) vehicle at these locations, so the 100-foot minimum storage proposed is predicted to accommodate the left turning vehicles at these locations. Based on the proposed driveway locations, a 605-foot long deceleration lane is not possible. Therefore, this study recommends obtaining a variance from TxDOT for shorter left turn deceleration lanes or providing a Two-Way Left Turn Lane (TWLTL) between Bonnie Brae Street and Brush Creek Road along US 377, if a variance is not provided. While a shorter deceleration lane will not provide the intended space for deceleration outside the through lanes, it will provide some dedicated space for deceleration and also separates left turn vehicles from through vehicles while waiting for gaps in opposing traffic to make a left turn maneuver.

Driveway Spacing Evaluation

Until otherwise specified, all the access spacing dimensions used in this analysis are based on the dimensions provided in the site plan.

According to the City of Denton's *Transportation Design Criteria Manual Table 1.4.5.1*, required intersection spacing is determined based on the classification of the roadway. Brush Creek Road is classified as a Primary Arterial in the 2022 Denton Thoroughfare Plan. The required minimum intersection spacing for a residential street intersection on a Primary Arterial is 400 feet. The proposed Street D on Brush Creek Road is proposed to be located more than 500 feet east of the US 377 and Brush Creek Road intersection and will exceed the City's spacing requirement.

The proposed Street D on Brush Creek Road is proposed to be located approximately 650 feet west of an existing driveway and will exceed the City's spacing requirement.

In TxDOT's *Access Management Manual*, required access point spacing on TxDOT roadways is determined based on the posted speed limit of the roadway. For a roadway with a posted speed greater than 50 mph, such as US 377, the minimum spacing between access points is 425 feet.

Street A is planned to be located approximately 380 feet south of a private driveway which is approximately 10% below TxDOT's threshold and a variance for the location of Street A will need to be requested and obtained from TxDOT. The private driveway to the north serves a land use that is not predicted to generate high traffic volumes or long northbound right turn queues to cause queue interactions between two driveways. Therefore, a variance for the location of Street A should be granted by TxDOT.

Based on the initial site plan, the proposed Retail Driveway is planned to be located approximately 425 feet north of Brush Creek Road. However, based on the capacity analysis results, this study recommended two outbound lanes for this driveway. With two outbound lanes, the proposed Retail Driveway is planned to be located approximately 410 feet north of Brush Creek Road and is only 15 feet (5%) below TxDOT's required spacing requirement. Therefore, a variance for the location of the proposed Retail Driveway will need to be requested and obtained from TxDOT. Since the spacing is slightly less than required (5%), a variance for the location of the proposed Retail Driveway should be granted.

If one or both of the variances for the access locations are not granted, the developer will be obligated to shift access locations to meet published full spacing requirements. If the number of driveways changes, a revised TIA may be required in the future.

Intersection Sight Distance

As part of this traffic analysis, the available and required sight distances for motorists accessing the adjacent roadways from the proposed site access driveways were analyzed. The sight distance required at the proposed driveway was estimated using the procedures developed by the American Association of State Highway and Transportation Officials (AASHTO) and published in the 2018

edition of *A Policy on Geometric Design of Highways and Streets*. At these locations, the motorist should be able to see if and when adequate gaps exist to perform their desired maneuver.

Table 10 presents the required and available intersection sight distances for vehicles exiting the proposed site driveways.

Table 10: Sight Distance Analysis for Proposed Site Driveways

Major Roadway	US 377		Brush Creek Road
Posted Speed Limit	55 mph		30 mph
Minor Roadway	Street A	Proposed Retail Driveway	Street D
Design Vehicle	Passenger Car		
Intersection Sight Distance	610’		335’
Available Sight Distance to the Left	>1,000’	>1,000’	~900’
Available Sight Distance to the Right	>1,000’	>1,000’	~520’
Sight Distance Available > Desirable			
To the Left	YES	YES	YES
To the Right	YES	YES	YES

The field investigation results of the available sight distance indicate that the available sight distance is predicted to meet/exceed the intersection sight distances at the proposed site driveways on US 377 and Brush Creek Road.

Side Path (sidewalk) Discussion

As part of this development, a sidewalk will be provided along the site frontage on Brush Creek Road. Additionally, the development will also provide a side path (sidewalk) on Streets A, B, C, and D (public roadways internal to the site).

CONCLUSIONS & RECOMMENDATIONS

Based on the analysis of the proposed site plan and characteristics of the proposed Brush Creek development, the following **conclusions** can be made:

- The proposed development is expected to generate 1,922 daily trips, with 100 trips during the AM peak hour and 203 trips during the PM peak hour.

Existing (2023) Conditions

- The stop-controlled approaches and movements at the existing study area intersections operate at LOS D or better under the Existing (2023) traffic conditions.

Build-Out Year (2025) Conditions

- The stop-controlled approaches and movements at the existing study area intersections are predicted to operate at LOS D or better under the Build-Out Year (2025) traffic conditions.

Horizon Year (2030) Conditions

- The eastbound approach of Bonnie Brae Street at US 377 is predicted to operate at LOS beyond D under the Horizon Year (2030) traffic conditions with or without the site traffic.
- The westbound approach of Brush Creek Road at US 377 is predicted to operate at LOS beyond D under the Horizon Year (2030) traffic conditions with or without the site traffic. However, the projected volume-to-capacity ratio indicates that the projected volume is not predicted to exceed the available capacity.
- The westbound approach of Retail Driveway at US 377 is predicted to operate at LOS beyond D during the PM peak hour of Horizon Year (2030) traffic conditions. However, the projected volume-to-capacity ratio indicates that the projected volume is not predicted to exceed the available capacity.
- The approaches and movements at the other site access intersections are predicted to operate at LOS D or better under Horizon Year (2030) Total conditions.

The following improvements are identified to improve operations by the Horizon Year (2030). However, these potential improvements should be considered when the retail component is built-out:

1) US 377 and Bonnie Brae Street
   As Bonnie Brae will ultimately be closed when Brush Creek/Hickory Creek is extended to the west, signalization is not a viable mitigation. In fact, based on the proposed timeline of the City of Denton CIP project for Brush Creek/Hickory Creek (currently slated for the 2026 Bond Election), any mitigation measure that requires new construction may not be feasible.
   - Install an eastbound left turn lane
   - Install a southbound right turn lane

- Install a northbound left turn lane
- Signalize the intersection

None of these improvements are recommended due to the proposed Brush Creek/Hickory Creek improvements, which would result in the closure of Bonnie Brae Street at US 377.

2) US 377 and Brush Creek Road
   - Install a southbound left turn lane
   - Install a westbound right turn lane
3) US 377 at Proposed Retail Driveway
   - Install a westbound right turn lane
   - Install a southbound left turn lane (Although a southbound left turn lane is not required to mitigate operations, it was assumed in the mitigation analysis, based on the left turn deceleration lane analysis.)

Horizon Year (2030) Total Conditions with Mitigations

- The intersection of Bonnie Brae Street at US 377 is predicted to operate at LOS D or better under the Horizon Year (2030) Total traffic conditions with the proposed mitigations identified. However, based on direction provided in a 4/18/23 email from City staff, "As Bonnie Brae will ultimately be closed when Brush Creek/Hickory Creek is extended to the west, signalization is not a viable mitigation" and "any mitigation measures that require new construction may not be feasible."
- The westbound approach of Brush Creek Road at US 377 is predicted to operate at LOS beyond D during the AM and PM peak hours of the Horizon Year (2030) Total traffic conditions. However, the delays during the AM and PM peak hours with these improvements in place are predicted to be lower than the delays under Horizon Year (2030) Background conditions (without the site traffic).
- The westbound approach of Retail Driveway at US 377 is predicted to operate at LOS D or better under the Horizon Year (2030) Total traffic conditions with the proposed mitigations.

Access Management Analyses

- TxDOT's threshold volumes for considering right turn deceleration lanes at the site access locations on US 377 are not met. City of Denton threshold volumes for providing right turn deceleration lanes on Brush Creek Road are also not met. Therefore, northbound right turn deceleration lanes along US 377 and a westbound right turn deceleration lane along Brush Creek Road are not warranted at the proposed site driveways.

- Left turn lanes are warranted based on TxDOT criteria at the future driveway intersections along US 377. Based on the capacity analysis results, a southbound left turn deceleration late is warranted along US 377 at Brush Creek Road under the Horizon Year total traffic conditions. Traffic characteristics at the Brush Creek Road and Street D intersection do not exceed City of Denton criteria for the installation of an eastbound left turn lane.

- Based on Table 3-12 of TxDOT's *Roadway Design Manual* for two-lane rural highways (US 377), the deceleration lane along US 377 (55 mph speed limit) should be 605 feet long (100 feet storage + 505 feet deceleration). *Highway Capacity Manual* analysis results indicated 95th percentile queues of one (1) vehicle at these locations, so the 100-foot minimum storage proposed is predicted to accommodate the left turning vehicles at these locations. Based on the proposed driveway locations, a 605-foot long deceleration lane is not possible. Therefore, this study recommends obtaining a variance from TxDOT for shorter left turn deceleration lanes or providing a Two-Way Left Turn Lane (TWLTL) between Bonnie Brae Street and Brush Creek Road along US 377, if a variance is not provided.

- The proposed Street D on Brush Creek Road meets the City's access spacing requirements.

- Street A is planned to be located approximately 380 feet south of a private driveway which is approximately 10% below TxDOT's threshold and a variance for the location of Street A will need to be requested and obtained from TxDOT. The private driveway to the north serves a land use that is not predicted to generate high traffic volumes or long northbound right turn queues to cause queue interactions between two driveways. Therefore, a variance for the location of Street A should be granted by TxDOT.

- The proposed Retail Driveway is planned to be located approximately 410 feet north of Brush Creek Road and is only 15 feet (5%) below TxDOT's required spacing requirement. Therefore, a variance will need to be requested and obtained from TxDOT. Since the spacing is slightly less than required (5%), the variance for the location of the proposed Retail Driveway should be granted.

- If one or both of the variances for the access locations are not granted, the developer will be obligated to shift access locations to meet published full spacing requirements. If the number of driveways changes, a revised TIA may be required in the future.

- Adequate sight distance is available for the vehicles exiting from the proposed site driveways on US 377 and Brush Creek Road.

Side Path (sidewalk) Discussion

- As part of this development, a sidewalk will be provided along the site frontage on Brush Creek Road. Additionally, the development will also provide a side path (sidewalk) on Streets A, B, C, and D (public roadways internal to the site).

Recommendations:

The following improvements are recommended to improve the operations by the Horizon Year (2030).

This improvement should be constructed when the residential component is built-out:

1) US 377 at Street A
    - Install a southbound left turn lane

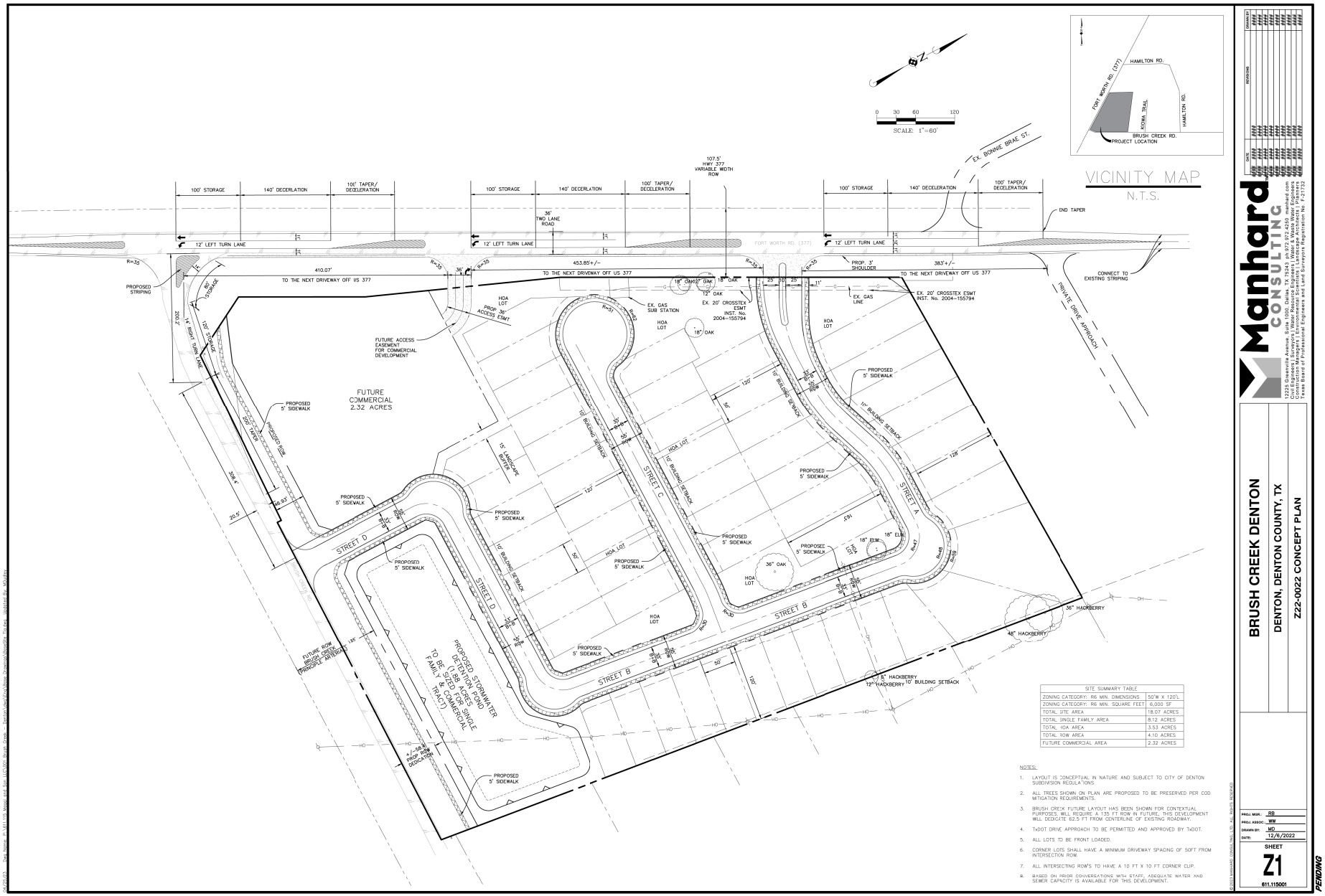
The following improvements should be constructed when the retail component is built-out:

2) US 377 at Retail Driveway
    - Install a southbound left turn lane
    - Install a westbound right turn lane
3) US 377 and Brush Creek Road
    - Install a southbound left turn lane
    - Install a westbound right turn lane

An updated Site Plan incorporating the proposed recommendations identified above is provided in **Figure 16**.

LIST OF VARIANCES

1) Access spacing variance is needed for Street A, and this study recommends granting the variance.
2) Access spacing variance is needed for the proposed Retail Driveway, and this study recommends granting the variance.
3) A variance for the reduced deceleration lengths of the southbound left turn lanes (minimum storage and taper lengths are proposed to be provided) is needed for the proposed left turn lanes along US 377 at Street A, Retail Driveway and Brush Creek Road. This study recommends granting this variance or providing a Two-Way Left Turn Lane (TWLTL) between Bonnie Brae Street and Brush Creek Road along US 377, if a variance is not provided.



LEE ENGINEERING
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DALLAS, TX 75234
PHONE: 972-248-3006
TBPE FIRM NO. F-450

Updated Site Plan
(With Mitigations)

Figure 16

APPENDIX

Kelly Parma

From: Kelly Parma
Sent: Wednesday, December 28, 2022 3:14 PM
To: Maldonado, Karina; Reece Bierhalter
Cc: Brian Bridgewater; Manglaris, Angela; Reynolds, Michelle
Subject: RE: Z22-0022 [Filed 28 Dec 2022 15:14]
Attachments: Z22-0022 Brush Creek Development - Draft TIA Scope.pdf; ZONING CONCEPT PLAN.pdf; Z22-0022 Brush Creek Development.kmz

Karina,

Based on our conversation this morning, I have attached the TIA Scoping Document for the Brush Creek development using the checklist you provided. A Concept Plan and Google Earth file is also attached, which can be found online here: https://www.google.com/maps/d/edit?mid=1Wn0tNb4YRe3VMjJP2uz3-IZW3olnmCY&usp=sharing

The highlighted text in the Scoping Document represents questions I had for the City. The TIA scope closely matches that of the TIA for the previous development on this site, which included 352 multifamily dwelling units and 42,000 square feet of retail. The previous development on this site would generate 2-3 times more peak hour trips than the proposed Brush Creek development.

Please review and let me know if you have any questions and the City's availability to meet. I am available the rest of this week and next week except Thursday (1/5) morning and Friday (1/6) morning.
Thanks,
Kelly

Kelly D. Parma, P.E., PTOE
Lee Engineering, LLC
(972) 456-9033 direct
(214) 405-2771 mobile

From: Maldonado, Karina <Karina.Maldonado@cityofdenton.com>
Sent: Thursday, December 15, 2022 8:24 AM
To: Reece Bierhalter <rbierhalter@manhard.com>
Cc: Brian Bridgewater <bbridgewater@manhard.com>; Kelly Parma <kparma@lee-eng.com>; Manglaris, Angela <Angela.Manglaris@cityofdenton.com>; Reynolds, Michelle <Michelle.Reynolds@cityofdenton.com>
Subject: RE: Z22-0022 [Filed 15 Dec 2022 08:32]

Reece, as a general policy, we do not review email submittals out of cycle or during a review unless a special exemption was granted by your project manager or the Director based upon an agreed upon schedule. I've copied your project manager to make the determination since official comments will be returned to you today from all reviewers.

I (informally) reviewed the document at a glance and it appears to have what I need. Based on the trip generation of the existing zoning and increased trips with the proposed zoning change, a TIA will be required at this stage. This will be reflected in my second review once this document is formally submitted unless your PM is willing to accept this document now.

Karina E Maldonado, AICP Candidate
Transportation Planner
Department of Development Services, Planning Division

TIA Scoping Email (1 of 3)

Brush Creek Development
TIA Scoping Meeting

Project Description

The proposed Brush Creek development will include 15.37 acres of R6 residential zoning and 2.32 acres of Suburban Corridor (retail) zoning. This development will be located northeast of the intersection of Fort Worth Drive (US 377) and Brush Creek Road. The site location and study area can be seen using the link below:
https://www.google.com/maps/d/edit?mid=1Wn0tNb4YRe3VMjJP2uz3-IZW3olnmCY&usp=sharing
A preliminary Site Layout is attached.

Trip Generation

The estimated trip generation for the Brush Creek development is summarized below and was presented in a Trip Generation Memo dated December 6. For the Suburban Corridor zoning (2.32 acres), a Floor-to-Area Ratio (FAR) of 0.25 was used for estimating the amount of retail for this development (approximately 25,300 ft^2).

Table 1: Estimated Trip Generation for the Brush Creek Development

Trips Generated										
Land Use	Size	Daily								
		Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit
Single-Family Detached Housing	51 Dwelling Units	544	272	272	40	10	30	53	33	20
Strip Retail Plaza	25,300 ft^2	1,378	689	689	60	36	24	150	75	75
Total Trips		**1,922**	**961**	**961**	**100**	**46**	**54**	**203**	**108**	**95**

Analysis Category

- Between 100 - 500 total peak hour trips – Category II Analysis required
- Analysis Periods: (weekday AM & PM peak hours)
  - Existing Year
  - Opening Year/Full Build-Out
  - Horizon Year (5 years after Full Buikld-Out)
- Minimum Study Area
  - All site access drives
  - All signalized and/or major unsignalized intersections within a 0.5 to 1-mile radius

Study Intersections

Signalized Intersections

- None

Major (Arterial/Arterial, Arterial/Collector) Unsignalized Intersections

- Bonnie Brae Street @ Fort Worth Drive (US 377)
- Brush Creek Road @ Fort Worth Drive (US 377)
- Two (2) site driveways – One on both adjacent roadways (US 377 & Brush Creek Road)

TIA Scoping Email (1 of 3)

Brush Creek Development
TIA Scoping Meeting

Known Existing Traffic Issues

Existing/Planned CIP, congestion, new traffic signal, safety concerns (Safety Assessment) etc.)

- Brush Creek Road extension west of US 377
- Brush Creek Road widening(?)

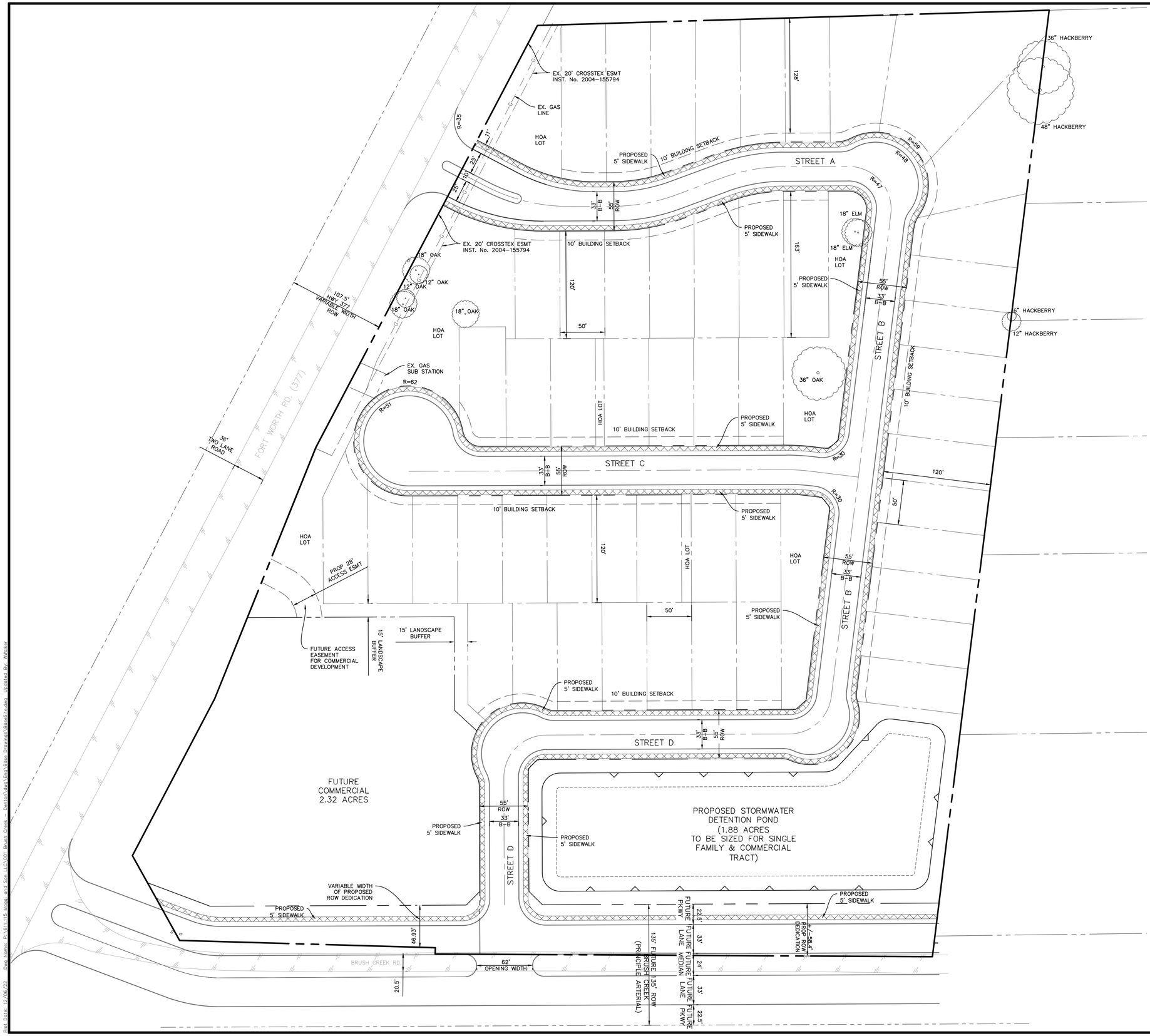
Known TxDOT Roadway Information/Background (existing/planned projects)

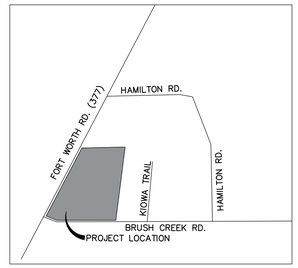
- US 377 improvements (?)

Existing setting = Rural / Residential

Evaluation of environment with approved adjacent developments

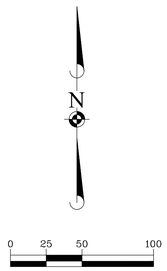
- To be provided by City of Denton staff





VICINITY MAP

N.T.S.



SITE SUMMARY TABLE	
ZONING CATEGORY: R6 MIN. DIMENSIONS	50'W X 120'L
ZONING CATEGORY: R6 MIN. SQUARE FEET	6,000 SF
TOTAL SITE AREA	18.07 ACRES
TOTAL SINGLE FAMILY AREA	8.12 ACRES
TOTAL HOA AREA	3.53 ACRES
TOTAL ROW AREA	4.10 ACRES
FUTURE COMMERCIAL AREA	2.32 ACRES

NOTES:

1. LAYOUT IS CONCEPTUAL IN NATURE AND SUBJECT TO CITY OF DENTON SUBDIVISION REGULATIONS
2. ALL TREES SHOWN ON PLAN ARE PROPOSED TO BE PRESERVED PER COD MITIGATION REQUIREMENTS.
3. BRUSH CREEK FUTURE LAYOUT HAS BEEN SHOWN FOR CONTEXTUAL PURPOSES. WILL REQUIRE A 135 FT ROW IN FUTURE, THIS DEVELOPMENT WILL DEDICATE 62.5 FT FROM CENTERLINE OF EXISTING ROADWAY.
4. TxDOT DRIVE APPROACH TO BE PERMITTED AND APPROVED BY TxDOT.
5. ALL LOTS TO BE FRONT LOADED.
6. CORNER LOTS SHALL HAVE A MINIMUM DRIVEWAY SPACING OF 50FT FROM INTERSECTION ROW.
7. ALL INTERSECTING ROW'S TO HAVE A 10 FT X 10 FT CORNER CLIP.
8. BASED ON PRIOR CONVERSATIONS WITH STAFF, ADEQUATE WATER AND SEWER CAPACITY IS AVAILABLE FOR THIS DEVELOPMENT.

DRAWN BY	REVISIONS	DATE

Manhard CONSULTING
12225 Greenville Avenue, Suite 1000, Dallas, TX 75243 ph:972.4259 manhard.com
Civil Engineers | Surveyors | Water Resource Engineers | Water & Wastewater Engineers
Construction Managers | Environmental Scientists | Landscape Architects | Planners
Texas Board of Professional Engineers and Land Surveyors Registration No. F-21732

BRUSH CREEK DENTON

DENTON, DENTON COUNTY, TX

ZONING CONCEPT PLAN

PROJ. MGR.: RB
PROJ. ASSOC.: WW
DRAWN BY: WW
DATE: 12/6/2022

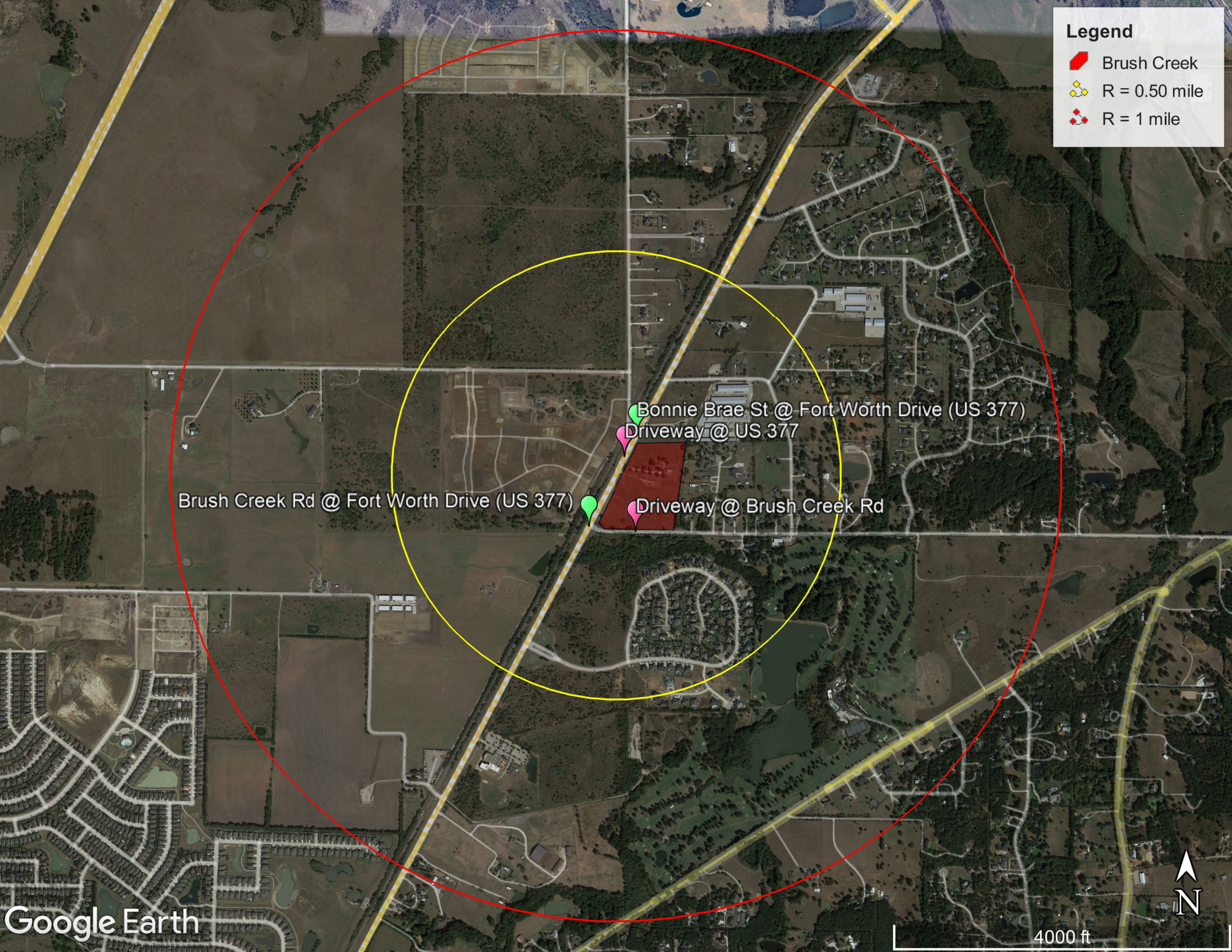
SHEET

C-1

611.115001

PENDING

Plot Date: 12/05/22 Dwg Name: P:\611\115 Mapp and Son II\CVD01 Brush Creek - Denton\Data\Engr\Base Drawings\BaseSite.dwg Updated By: WWalker


Legend
Brush Creek
R = 0.50 mile
R = 1 mile
Bonnie Brae St @ Fort Worth Drive (US 377)
Driveway @ US 377
Brush Creek Rd @ Fort Worth Drive (US 377)
Driveway @ Brush Creek Rd
N
4000 ft
Google Earth

Kelly Parma

From: Maldonado, Karina <Karina.Maldonado@cityofdenton.com>
Sent: Wednesday, January 18, 2023 9:39 AM
To: Kelly Parma; Reece Bierhalter
Cc: Brian Bridgewater; Manglaris, Angela; Reynolds, Michelle
Subject: RE: Z22-0022 [Filed 18 Jan 2023 10:13]
Attachments: Z22-0022 Brush Creek Development - Draft TIA Scope_CoD-TPResponse.pdf; Sagebrook TIA update - 2021-07-30.pdf

Kelly –

See minor comments on draft scope. Let me know if you have questions.

Karina E Maldonado, AICP
Transportation Planner
Department of Development Services, Planning Division

****DISCLAIMER:** If correspondences and voicemails are not returned in a desired timeline, please reach out to your assigned Project Facilitator to schedule a meeting with me. Due to high volume of requests and correspondences, please anticipate a delayed response. All correspondences will be returned in the order they were received. ******

From: Kelly Parma <kparma@lee-eng.com>
Sent: Wednesday, December 28, 2022 3:14 PM
To: Maldonado, Karina <Karina.Maldonado@cityofdenton.com>; Reece Bierhalter <rbierhalter@manhard.com>
Cc: Brian Bridgewater <bbridgewater@manhard.com>; Manglaris, Angela <Angela.Manglaris@cityofdenton.com>; Reynolds, Michelle <Michelle.Reynolds@cityofdenton.com>
Subject: RE: Z22-0022

Karina,

Based on our conversation this morning, I have attached the TIA Scoping Document for the Brush Creek development using the checklist you provided. A Concept Plan and Google Earth file is also attached, which can be found online here: https://www.google.com/maps/d/edit?mid=1Wn0tNb4YRe3VMjJP2uz3-IZW3olnmCY&usp=sharing

The highlighted text in the Scoping Document represents questions I had for the City. The TIA scope closely matches that of the TIA for the previous development on this site, which included 352 multifamily dwelling units and 42,000 square feet of retail. The previous development on this site would generate 2-3 times more peak hour trips than the proposed Brush Creek development.

Please review and let me know if you have any questions and the City's availability to meet. I am available the rest of this week and next week except Thursday (1/5) morning and Friday (1/6) morning.
Thanks,
Kelly

Kelly D. Parma, P.E., PTOE
Lee Engineering, LLC
(972) 456-9033 direct
(214) 405-2771 mobile

TIA Scoping Email (2 of 3)

Brush Creek Development
TIA Scoping Meeting

Project Description

The proposed Brush Creek development will include 15.37 acres of R6 residential zoning and 2.32 acres of Suburban Corridor (retail) zoning. This development will be located northeast of the intersection of Fort Worth Drive (US 377) and Brush Creek Road. The site location and study area can be seen using the link below:
https://www.google.com/maps/d/edit?mid=1Wn0tNb4YRe3VMjJP2uz3-IZW3olnmCY&usp=sharing
A preliminary Site Layout is attached.

Trip Generation

The estimated trip generation for the Brush Creek development is summarized below and was presented in a Trip Generation Memo dated December 6. For the Suburban Corridor zoning (2.32 acres), a Floor-to-Area Ratio (FAR) of 0.25 was used for estimating the amount of retail for this development (approximately 25,300 ft^2).

Table 1: Estimated Trip Generation for the Brush Creek Development

Trips Generated										
Land Use	Size	Daily								
		Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit
Single-Family Detached Housing	51 Dwelling Units	544	272	272	40	10	30	53	33	20
Strip Retail Plaza	25,300 ft^2	1,378	689	689	60	36	24	150	75	75
Total Trips		**1,922**	**961**	**961**	**100**	**46**	**54**	**203**	**108**	**95**

Analysis Category

- Between 100 - 500 total peak hour trips – Category II Analysis required
- Analysis Periods: (weekday AM & PM peak hours)
  - Existing Year
  - Opening Year/Full Build-Out
  - Horizon Year (5 years after Full Buikld-Out)
- Minimum Study Area
  - All site access drives include turn lane analysis on 377 and Brush Creek as DDC requires them.
  - All signalized and/or major unsignalized intersections within a 0.5 to 1-mile radius

Study Intersections

Signalized Intersections

- None

Major (Arterial/Arterial, Arterial/Collector) Unsignalized Intersections

- Bonnie Brae Street @ Fort Worth Drive (US 377)
- Brush Creek Road @ Fort Worth Drive (US 377)
- Two (2) site driveways – One on both adjacent roadways (US 377 & Brush Creek Road)

TIA Scoping Email (2 of 3)

Brush Creek Development
TIA Scoping Meeting

Known Existing Traffic Issues

Existing/Planned CIP, congestion, new traffic signal, safety concerns (Safety Assessment) etc.)

- Brush Creek Road extension west of US 377 This is part of the Sagebrook development versus a CIP project. City to share traffic study.
- ~~Brush Creek Road widening(?)~~

Known TxDOT Roadway Information/Background (existing/planned projects)

- US 377 improvements (?)

Existing setting = Rural / Residential Low residential/suburban development.

Evaluation of environment with approved adjacent developments

- To be provided by City of Denton staff

Sagebrook to the west (City to provide Traffic Study)

TRAFFIC IMPACT ANALYSIS UPDATE

Sagebrook Single-Family Residential Development

S. Bonnie Brae Street / Allred Road
Denton, Texas

July 30, 2021

PRELIMINARY
FOR REVIEW ONLY
This document is not for permit or construction.

Name: Stephen M. Moore, PE
License #: 95814
Date: 07/30/2021

Prepared for

Zena Land Development LP

*Approved subject to shifting of a temporary access to Bonnie Brae Street at the mid-way point between Allred Road and the Union Pacific Railroad crossing. This is reflected on the updated combined civil plan set of Phases 1 and 2A (CEP20-0074).

HALFF
1201 North Bowser Road
Richardson, Texas 75081
Firm Registration No. 312

AVO 36948

City of Denton
Development Assistance Team
Approval 09/1/21

Kelly Parma

From: Maldonado, Karina <Karina.Maldonado@cityofdenton.com>
Sent: Friday, February 3, 2023 12:47 PM
To: Kelly Parma; Reece Bierhalter
Cc: Brian Bridgewater; Manglaris, Angela; Reynolds, Michelle; Hetal Bhatt
Subject: RE: Z22-0022 [Filed 03 Feb 2023 13:38]

The latest approved study which has been provided.

*Apologies for the late response! I'm getting through emails today.

Karina E Maldonado, AICP
Transportation Planner
Department of Development Services, Planning Division

****Effective January 1, 2023, all development projects must submit a Tree Preservation Plan (TPP) application. The TPP is a separate application that is to be submitted with the Zoning Compliance Plan (multi-family and commercial) or Preliminary Plat (residential subdivision), or Planned Development or Specific Use Permit (if required for any use). If you experience any issues during the submittal process, please contact Planning Technicians at (940)349-7716 or PlanningTechnicians@cityofdenton.com**

From: Kelly Parma <kparma@lee-eng.com>
Sent: Monday, January 23, 2023 2:49 PM
To: Maldonado, Karina <Karina.Maldonado@cityofdenton.com>; Reece Bierhalter <rbierhalter@manhard.com>
Cc: Brian Bridgewater <bbridgewater@manhard.com>; Manglaris, Angela <Angela.Manglaris@cityofdenton.com>; Reynolds, Michelle <Michelle.Reynolds@cityofdenton.com>; Hetal Bhatt <hbhatt@lee-eng.com>
Subject: RE: Z22-0022

Karina,

Are you referring to the build-out assumption (no extension) used by Sagebrook in the January 2021 version of the TIA you provided or the initial Sagebrook TIA where the extension was assumed in their initial TIA, which we don't have a copy of?
Sorry for the question but wanted to make sure there are no issues as we put together the TIA for this development.

Thanks,
Kelly

Kelly D. Parma, P.E., PTOE
Lee Engineering, LLC
(972) 456-9033 direct
(214) 405-2771 mobile

From: Maldonado, Karina <Karina.Maldonado@cityofdenton.com>
Sent: Monday, January 23, 2023 2:37 PM
To: Kelly Parma <kparma@lee-eng.com>; Reece Bierhalter <rbierhalter@manhard.com>
Cc: Brian Bridgewater <bbridgewater@manhard.com>; Manglaris, Angela <Angela.Manglaris@cityofdenton.com>; Reynolds, Michelle <Michelle.Reynolds@cityofdenton.com>
Subject: RE: Z22-0022

Kelly –

See responses below in red.

Karina E Maldonado, AICP
Transportation Planner
Department of Development Services, Planning Division

From: Kelly Parma <kparma@lee-eng.com>
Sent: Wednesday, January 18, 2023 10:13 AM
To: Maldonado, Karina <Karina.Maldonado@cityofdenton.com>; Reece Bierhalter <rbierhalter@manhard.com>
Cc: Brian Bridgewater <bbridgewater@manhard.com>; Manglaris, Angela <Angela.Manglaris@cityofdenton.com>; Reynolds, Michelle <Michelle.Reynolds@cityofdenton.com>
Subject: RE: Z22-0022

Karina,

Thank you for the information. I did have a few questions regarding future Brush Creek improvements:

- The Halff TIA Update you provided did not assume the Brush Creek extension west of US 377 to be in place. Do we need to make the same assumption that the extension is **not** in place? Yes, the extension currently is not built. Use the same build-out assumption for that roadway that the Sagebrook TIA used.
- If we do need to assume the extension in place, then we would need to be provided the January 2021 TIA for the Sagebrook development. See above.
- Based on your comments, we will not assume the widening of Brush Creek Road east of US 377. There is no CIP planned in the near future to widen Brush Creek.
- Also, we will not assume any improvements to US 377. Please consult with the TxDOT Area Office regarding any assumed widening projects.

Thanks,
Kelly

Kelly D. Parma, P.E., PTOE
Lee Engineering, LLC
(972) 456-9033 direct
(214) 405-2771 mobile

From: Maldonado, Karina <Karina.Maldonado@cityofdenton.com>
Sent: Wednesday, January 18, 2023 9:39 AM
To: Kelly Parma <kparma@lee-eng.com>; Reece Bierhalter <rbierhalter@manhard.com>
Cc: Brian Bridgewater <bbridgewater@manhard.com>; Manglaris, Angela <Angela.Manglaris@cityofdenton.com>; Reynolds, Michelle <Michelle.Reynolds@cityofdenton.com>
Subject: RE: Z22-0022

Kelly –

See minor comments on draft scope. Let me know if you have questions.

Karina E Maldonado, AICP
Transportation Planner
Department of Development Services, Planning Division

GRAM Traffic NTX Inc.

1120 W. Lovers Lane

Arlington, Texas, United States 76013
817.265.8968

Count Name: BRUSH CREEK RD @ US 377
Site Code:
Start Date: 01/19/2023

Turning Movement Data

Start Time	US 377 Southbound					BRUSH CREEK RD Westbound					US 377 Northbound					Eastbound St. Eastbound					
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
12:00 AM	0	5	0	0	5	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	9
12:15 AM	2	4	0	0	6	0	0	0	0	0	0	7	0	0	7	0	0	0	0	0	13
12:30 AM	0	4	0	0	4	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	6
12:45 AM	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	4
Hourly Total	2	14	0	0	16	0	0	0	0	0	0	16	0	0	16	0	0	0	0	0	32
1:00 AM	0	4	0	0	4	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	6
1:15 AM	0	3	0	0	3	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	7
1:30 AM	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3
1:45 AM	1	4	0	0	5	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	9
Hourly Total	1	13	0	0	14	0	0	0	0	0	0	11	0	0	11	0	0	0	0	0	25
2:00 AM	1	1	0	0	2	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	4
2:15 AM	0	2	0	0	2	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	8
2:30 AM	0	1	0	0	1	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	6
2:45 AM	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	3
Hourly Total	1	5	0	0	6	0	0	0	0	0	0	15	0	0	15	0	0	0	0	0	21
3:00 AM	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	3
3:15 AM	0	3	0	0	3	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	6
3:30 AM	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	4
3:45 AM	0	4	0	0	4	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	8
Hourly Total	0	8	0	0	8	0	0	0	0	0	0	13	0	0	13	0	0	0	0	0	21
4:00 AM	0	6	0	0	6	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	7
4:15 AM	1	7	0	0	8	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	11
4:30 AM	0	11	0	0	11	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	13
4:45 AM	3	9	0	0	12	1	0	1	0	2	0	5	1	0	6	0	0	0	0	0	20
Hourly Total	4	33	0	0	37	2	0	2	0	4	0	9	1	0	10	0	0	0	0	0	51
5:00 AM	2	14	0	0	16	1	0	1	0	2	0	10	0	0	10	0	0	0	0	0	28
5:15 AM	1	23	0	0	24	1	0	0	0	1	0	7	0	0	7	0	0	0	0	0	32
5:30 AM	1	25	0	0	26	0	0	1	0	1	0	11	0	0	11	0	0	0	0	0	38
5:45 AM	4	36	0	0	40	0	0	0	0	0	0	15	3	0	18	0	0	0	0	0	58
Hourly Total	8	98	0	0	106	2	0	2	0	4	0	43	3	0	46	0	0	0	0	0	156
6:00 AM	2	46	0	0	48	3	0	4	0	7	0	19	0	0	19	0	0	0	0	0	74
6:15 AM	2	58	0	0	60	0	0	2	0	2	0	23	0	0	23	0	0	0	0	0	85
6:30 AM	4	77	0	0	81	3	0	1	0	4	0	35	1	0	36	0	0	0	0	0	121
6:45 AM	3	107	0	0	110	5	0	2	0	7	0	27	1	0	28	0	0	0	0	0	145
Hourly Total	11	288	0	0	299	11	0	9	0	20	0	104	2	0	106	0	0	0	0	0	425
7:00 AM	7	99	0	0	106	12	0	4	0	16	0	57	3	0	60	0	0	0	0	0	182
7:15 AM	8	114	0	0	122	10	0	4	0	14	0	96	12	0	108	0	0	0	0	0	244
7:30 AM	10	166	0	0	176	3	0	5	0	8	0	74	5	0	79	0	0	0	0	0	263
7:45 AM	18	132	0	0	150	13	0	5	0	18	0	74	3	0	77	0	0	0	0	0	245
Hourly Total	43	511	0	0	554	38	0	18	0	56	0	301	23	0	324	0	0	0	0	0	934
8:00 AM	10	96	0	1	107	11	0	1	0	12	0	77	2	0	79	0	0	0	0	0	198
8:15 AM	9	77	0	0	86	3	0	1	0	4	0	79	4	0	83	0	0	0	0	0	173
8:30 AM	7	66	0	0	73	2	0	5	0	7	0	61	3	0	64	0	0	0	0	0	144
8:45 AM	8	96	0	0	104	5	0	4	0	9	0	60	1	0	61	0	0	0	0	0	174
Hourly Total	34	335	0	1	370	21	0	11	0	32	0	277	10	0	287	0	0	0	0	0	689
9:00 AM	4	66	0	1	71	5	0	4	0	9	0	71	7	0	78	0	0	0	0	0	158
9:15 AM	4	75	0	0	79	3	0	3	1	7	0	77	5	0	82	0	0	0	0	0	168
9:30 AM	2	70	0	0	72	3	0	6	0	9	0	64	3	0	67	0	0	0	0	0	148
9:45 AM	3	81	0	0	84	2	0	2	0	4	0	90	3	0	93	0	0	0	0	0	181
Hourly Total	13	292	0	1	306	13	0	15	1	29	0	302	18	0	320	0	0	0	0	0	655
10:00 AM	4	56	0	1	61	8	0	3	0	11	0	69	4	0	73	0	0	0	0	0	145
10:15 AM	5	71	0	0	76	2	0	7	0	9	0	67	4	0	71	0	0	0	0	0	156
10:30 AM	2	59	0	0	61	2	0	2	0	4	0	63	1	0	64	0	0	0	0	0	129
10:45 AM	1	69	0	0	70	4	0	5	0	9	0	81	5	0	86	0	0	0	0	0	165
Hourly Total	12	255	0	1	268	16	0	17	0	33	0	280	14	0	294	0	0	0	0	0	595
11:00 AM	5	71	0	0	76	2	0	4	0	6	0	62	1	0	63	0	0	0	0	0	145
11:15 AM	5	89	0	0	94	0	0	5	0	5	0	71	3	0	74	0	0	0	0	0	173
11:30 AM	5	71	0	0	76	1	0	5	0	6	0	63	4	0	67	0	0	0	0	0	149
11:45 AM	4	73	0	0	77	5	0	2	0	7	0	68	4	1	73	0	0	0	0	0	157
Hourly Total	19	304	0	0	323	8	0	16	0	24	0	264	12	1	277	0	0	0	0	0	624
12:00 PM	5	76	0	0	81	4	0	2	0	6	0	58	7	0	65	0	0	0	0	0	152
12:15 PM	4	55	0	0	59	5	0	4	0	9	0	66	4	0	70	0	0	0	0	0	138

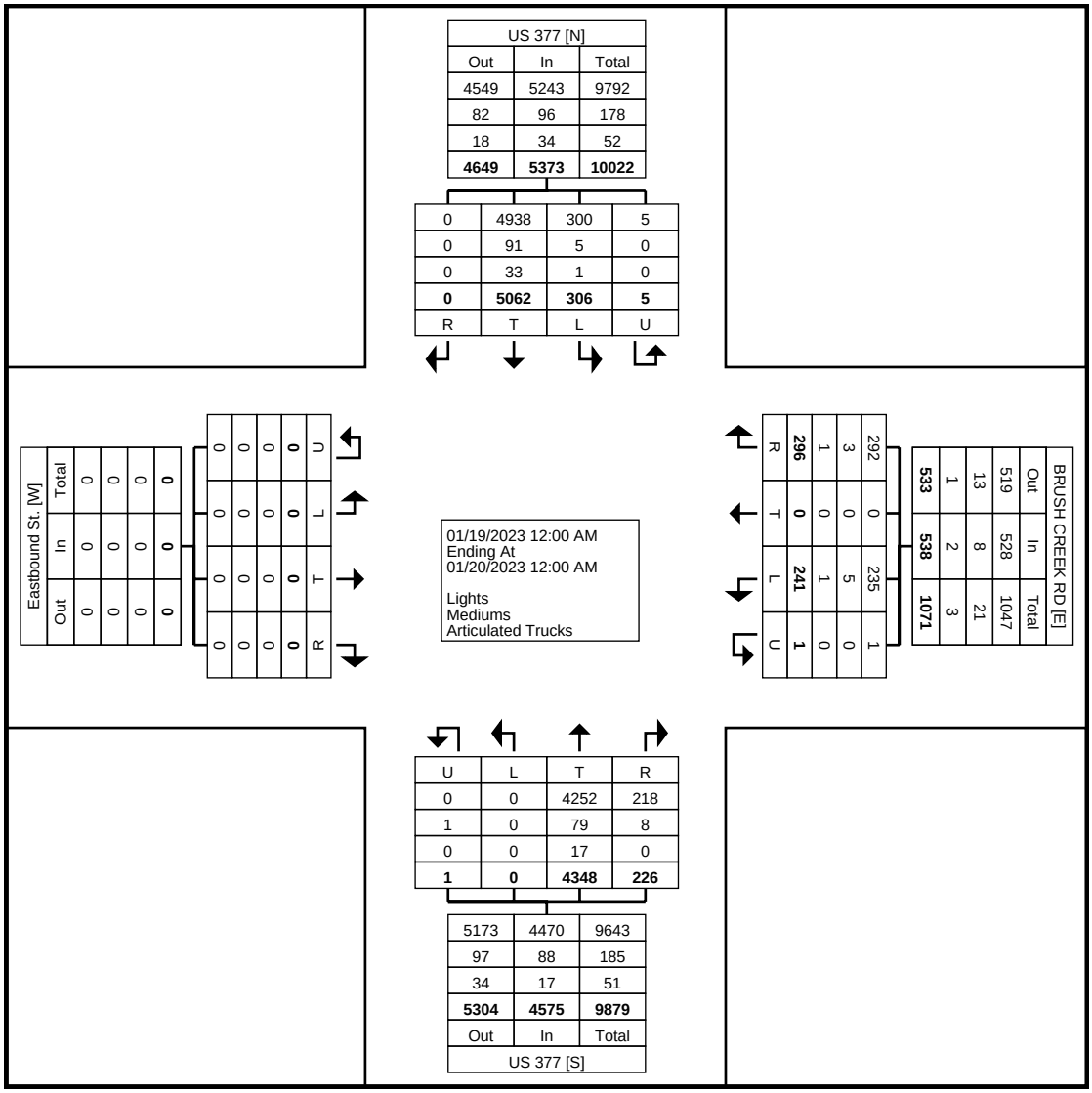
12:30 PM	4	78	0	0	82	2	0	9	0	11	0	85	4	0	89	0	0	0	0	0	182
12:45 PM	4	80	0	0	84	3	0	4	0	7	0	68	1	0	69	0	0	0	0	0	160
Hourly Total	17	289	0	0	306	14	0	19	0	33	0	277	16	0	293	0	0	0	0	0	632
1:00 PM	8	79	0	1	88	4	0	3	0	7	0	69	3	0	72	0	0	0	0	0	167
1:15 PM	4	77	0	0	81	4	0	4	0	8	0	67	1	0	68	0	0	0	0	0	157
1:30 PM	3	60	0	0	63	3	0	2	0	5	0	65	1	0	66	0	0	0	0	0	134
1:45 PM	0	77	0	0	77	3	0	5	0	8	0	63	5	0	68	0	0	0	0	0	153
Hourly Total	15	293	0	1	309	14	0	14	0	28	0	264	10	0	274	0	0	0	0	0	611
2:00 PM	2	83	0	0	85	4	0	7	0	11	0	65	4	0	69	0	0	0	0	0	165
2:15 PM	5	96	0	0	101	5	0	5	0	10	0	58	4	0	62	0	0	0	0	0	173
2:30 PM	3	105	0	0	108	4	0	5	0	9	0	70	6	0	76	0	0	0	0	0	193
2:45 PM	10	93	0	0	103	7	0	11	0	18	0	78	2	0	80	0	0	0	0	0	201
Hourly Total	20	377	0	0	397	20	0	28	0	48	0	271	16	0	287	0	0	0	0	0	732
3:00 PM	4	84	0	0	88	4	0	4	0	8	0	89	9	0	98	0	0	0	0	0	194
3:15 PM	6	86	0	0	92	4	0	3	0	7	0	62	3	0	65	0	0	0	0	0	164
3:30 PM	4	96	0	0	100	1	0	6	0	7	0	64	4	0	68	0	0	0	0	0	175
3:45 PM	7	113	0	0	120	3	0	5	0	8	0	59	4	0	63	0	0	0	0	0	191
Hourly Total	21	379	0	0	400	12	0	18	0	30	0	274	20	0	294	0	0	0	0	0	724
4:00 PM	7	89	0	0	96	3	0	7	0	10	0	80	6	0	86	0	0	0	0	0	192
4:15 PM	5	81	0	0	86	4	0	7	0	11	0	104	10	0	114	0	0	0	0	0	211
4:30 PM	3	91	0	1	95	4	0	8	0	12	0	100	6	0	106	0	0	0	0	0	213
4:45 PM	2	100	0	0	102	6	0	8	0	14	0	102	6	0	108	0	0	0	0	0	224
Hourly Total	17	361	0	1	379	17	0	30	0	47	0	386	28	0	414	0	0	0	0	0	840
5:00 PM	4	118	0	0	122	3	0	8	0	11	0	112	5	0	117	0	0	0	0	0	250
5:15 PM	10	99	0	0	109	6	0	9	0	15	0	97	5	0	102	0	0	0	0	0	226
5:30 PM	3	121	0	0	124	9	0	11	0	20	0	92	1	0	93	0	0	0	0	0	237
5:45 PM	7	89	0	0	96	6	0	5	0	11	0	92	2	0	94	0	0	0	0	0	201
Hourly Total	24	427	0	0	451	24	0	33	0	57	0	393	13	0	406	0	0	0	0	0	914
6:00 PM	6	65	0	0	71	2	0	6	0	8	0	80	1	0	81	0	0	0	0	0	160
6:15 PM	3	60	0	0	63	4	0	6	0	10	0	84	2	0	86	0	0	0	0	0	159
6:30 PM	6	75	0	0	81	1	0	4	0	5	0	64	5	0	69	0	0	0	0	0	155
6:45 PM	6	61	0	0	67	5	0	4	0	9	0	58	1	0	59	0	0	0	0	0	135
Hourly Total	21	261	0	0	282	12	0	20	0	32	0	286	9	0	295	0	0	0	0	0	609
7:00 PM	5	47	0	0	52	2	0	4	0	6	0	56	5	0	61	0	0	0	0	0	119
7:15 PM	3	62	0	0	65	3	0	6	0	9	0	47	1	0	48	0	0	0	0	0	122
7:30 PM	4	44	0	0	48	0	0	5	0	5	0	35	3	0	38	0	0	0	0	0	91
7:45 PM	0	30	0	0	30	3	0	3	0	6	0	58	1	0	59	0	0	0	0	0	95
Hourly Total	12	183	0	0	195	8	0	18	0	26	0	196	10	0	206	0	0	0	0	0	427
8:00 PM	2	39	0	0	41	2	0	4	0	6	0	34	3	0	37	0	0	0	0	0	84
8:15 PM	0	42	0	0	42	1	0	1	0	2	0	50	2	0	52	0	0	0	0	0	96
8:30 PM	0	33	0	0	33	0	0	4	0	4	0	27	1	0	28	0	0	0	0	0	65
8:45 PM	3	35	0	0	38	1	0	1	0	2	0	36	2	0	38	0	0	0	0	0	78
Hourly Total	5	149	0	0	154	4	0	10	0	14	0	147	8	0	155	0	0	0	0	0	323
9:00 PM	1	30	0	0	31	0	0	3	0	3	0	37	3	0	40	0	0	0	0	0	74
9:15 PM	0	33	0	0	33	0	0	3	0	3	0	25	1	0	26	0	0	0	0	0	62
9:30 PM	1	29	0	0	30	0	0	3	0	3	0	33	4	0	37	0	0	0	0	0	70
9:45 PM	2	14	0	0	16	0	0	0	0	0	0	20	1	0	21	0	0	0	0	0	37
Hourly Total	4	106	0	0	110	0	0	9	0	9	0	115	9	0	124	0	0	0	0	0	243
10:00 PM	0	10	0	0	10	1	0	1	0	2	0	17	1	0	18	0	0	0	0	0	30
10:15 PM	1	14	0	0	15	1	0	2	0	3	0	11	1	0	12	0	0	0	0	0	30
10:30 PM	0	16	0	0	16	0	0	2	0	2	0	20	0	0	20	0	0	0	0	0	38
10:45 PM	0	12	0	0	12	0	0	0	0	0	0	15	1	0	16	0	0	0	0	0	28
Hourly Total	1	52	0	0	53	2	0	5	0	7	0	63	3	0	66	0	0	0	0	0	126
11:00 PM	1	9	0	0	10	1	0	0	0	1	0	12	1	0	13	0	0	0	0	0	24
11:15 PM	0	8	0	0	8	1	0	1	0	2	0	13	0	0	13	0	0	0	0	0	23
11:30 PM	0	5	0	0	5	0	0	0	0	0	0	8	0	0	8	0	0	0	0	0	13
11:45 PM	0	7	0	0	7	1	0	1	0	2	0	8	0	0	8	0	0	0	0	0	17
Hourly Total	1	29	0	0	30	3	0	2	0	5	0	41	1	0	42	0	0	0	0	0	77
Grand Total	306	5062	0	5	5373	241	0	296	1	538	0	4348	226	1	4575	0	0	0	0	0	10486
Approach %	5.7	94.2	0.0	0.1	-	44.8	0.0	55.0	0.2	-	0.0	95.0	4.9	0.0	-	0.0	0.0	0.0	0.0	-	-
Total %	2.9	48.3	0.0	0.0	51.2	2.3	0.0	2.8	0.0	5.1	0.0	41.5	2.2	0.0	43.6	0.0	0.0	0.0	0.0	0.0	-
Lights	300	4938	0	5	5243	235	0	292	1	528	0	4252	218	0	4470	0	0	0	0	0	10241
% Lights	98.0	97.6	-	100.0	97.6	97.5	-	98.6	100.0	98.1	-	97.8	96.5	0.0	97.7	-	-	-	-	-	97.7
Mediums	5	91	0	0	96	5	0	3	0	8	0	79	8	1	88	0	0	0	0	0	192
% Mediums	1.6	1.8	-	0.0	1.8	2.1	-	1.0	0.0	1.5	-	1.8	3.5	100.0	1.9	-	-	-	-	-	1.8
Articulated Trucks	1	33	0	0	34	1	0	1	0	2	0	17	0	0	17	0	0	0	0	0	53
% Articulated Trucks	0.3	0.7	-	0.0	0.6	0.4	-	0.3	0.0	0.4	-	0.4	0.0	0.0	0.4	-	-	-	-	-	0.5

GRAM Traffic NTX Inc.

1120 W. Lovers Lane

Arlington, Texas, United States 76013
817.265.8968

Count Name: BRUSH CREEK RD @ US 377
Site Code:
Start Date: 01/19/2023
Page No: 3



Turning Movement Data Plot

GRAM Traffic NTX Inc.

1120 W. Lovers Lane

Arlington, Texas, United States 76013
817.265.8968

Count Name: BRUSH CREEK RD @ US 377
Site Code:
Start Date: 01/19/2023

Turning Movement Peak Hour Data (7:15 AM)

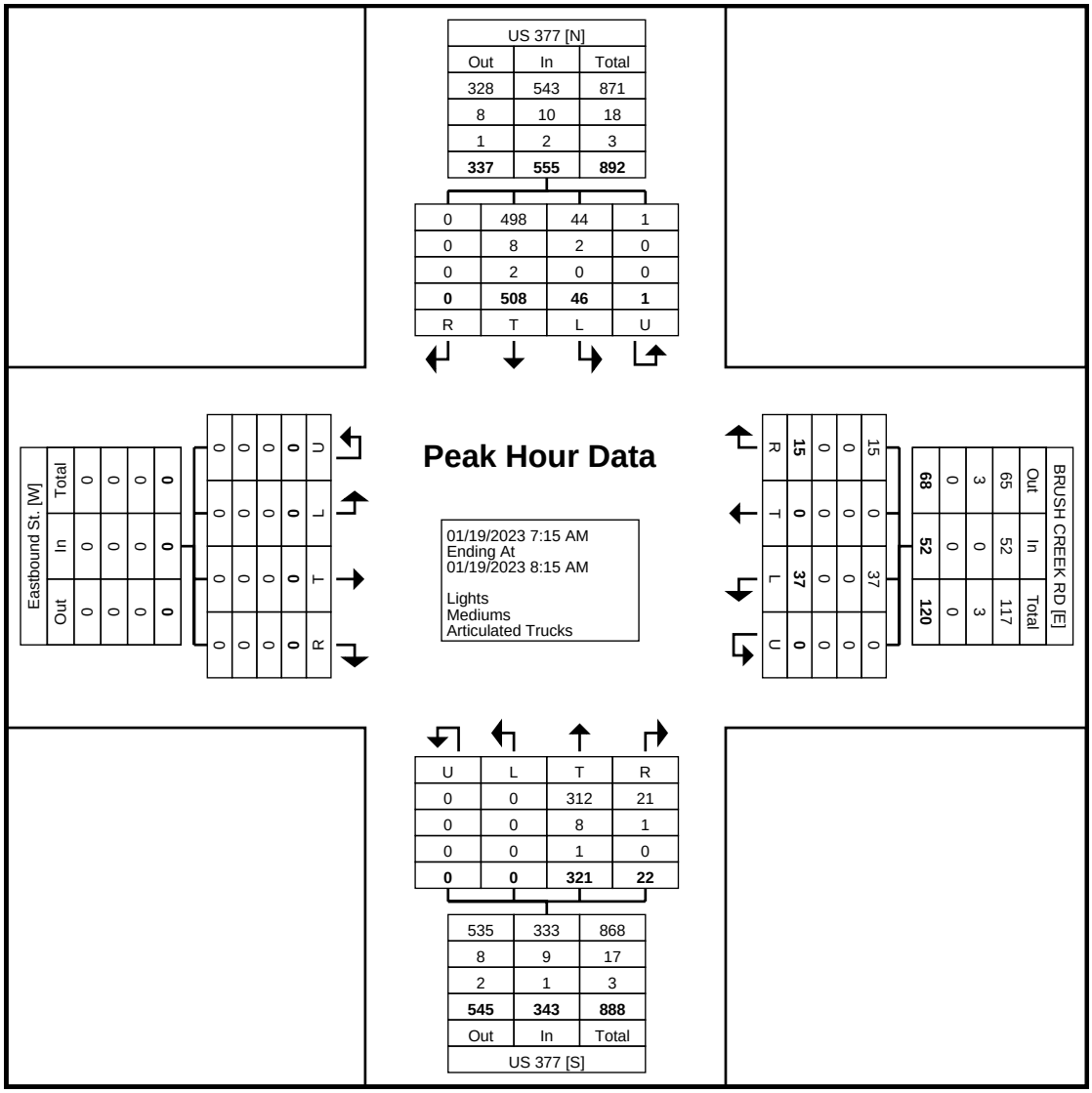
Start Time	US 377 Southbound					BRUSH CREEK RD Westbound					US 377 Northbound					Eastbound St. Eastbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
7:15 AM	8	114	0	0	122	10	0	4	0	14	0	96	12	0	108	0	0	0	0	0	244
7:30 AM	10	166	0	0	176	3	0	5	0	8	0	74	5	0	79	0	0	0	0	0	263
7:45 AM	18	132	0	0	150	13	0	5	0	18	0	74	3	0	77	0	0	0	0	0	245
8:00 AM	10	96	0	1	107	11	0	1	0	12	0	77	2	0	79	0	0	0	0	0	198
Total	46	508	0	1	555	37	0	15	0	52	0	321	22	0	343	0	0	0	0	0	950
Approach %	8.3	91.5	0.0	0.2	-	71.2	0.0	28.8	0.0	-	0.0	93.6	6.4	0.0	-	0.0	0.0	0.0	0.0	-	-
Total %	4.8	53.5	0.0	0.1	58.4	3.9	0.0	1.6	0.0	5.5	0.0	33.8	2.3	0.0	36.1	0.0	0.0	0.0	0.0	0.0	-
PHF	0.639	0.765	0.000	0.250	0.788	0.712	0.000	0.750	0.000	0.722	0.000	0.836	0.458	0.000	0.794	0.000	0.000	0.000	0.000	0.000	0.903
Lights	44	498	0	1	543	37	0	15	0	52	0	312	21	0	333	0	0	0	0	0	928
% Lights	95.7	98.0	-	100.0	97.8	100.0	-	100.0	-	100.0	-	97.2	95.5	-	97.1	-	-	-	-	-	97.7
Mediums	2	8	0	0	10	0	0	0	0	0	0	8	1	0	9	0	0	0	0	0	19
% Mediums	4.3	1.6	-	0.0	1.8	0.0	-	0.0	-	0.0	-	2.5	4.5	-	2.6	-	-	-	-	-	2.0
Articulated Trucks	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3
% Articulated Trucks	0.0	0.4	-	0.0	0.4	0.0	-	0.0	-	0.0	-	0.3	0.0	-	0.3	-	-	-	-	-	0.3

GRAM Traffic NTX Inc.

1120 W. Lovers Lane

Arlington, Texas, United States 76013
817.265.8968

Count Name: BRUSH CREEK RD @ US 377
Site Code:
Start Date: 01/19/2023
Page No: 5



Turning Movement Peak Hour Data Plot (7:15 AM)

GRAM Traffic NTX Inc.

1120 W. Lovers Lane

Arlington, Texas, United States 76013
817.265.8968

Count Name: BRUSH CREEK RD @ US 377
Site Code:
Start Date: 01/19/2023

Turning Movement Peak Hour Data (4:45 PM)

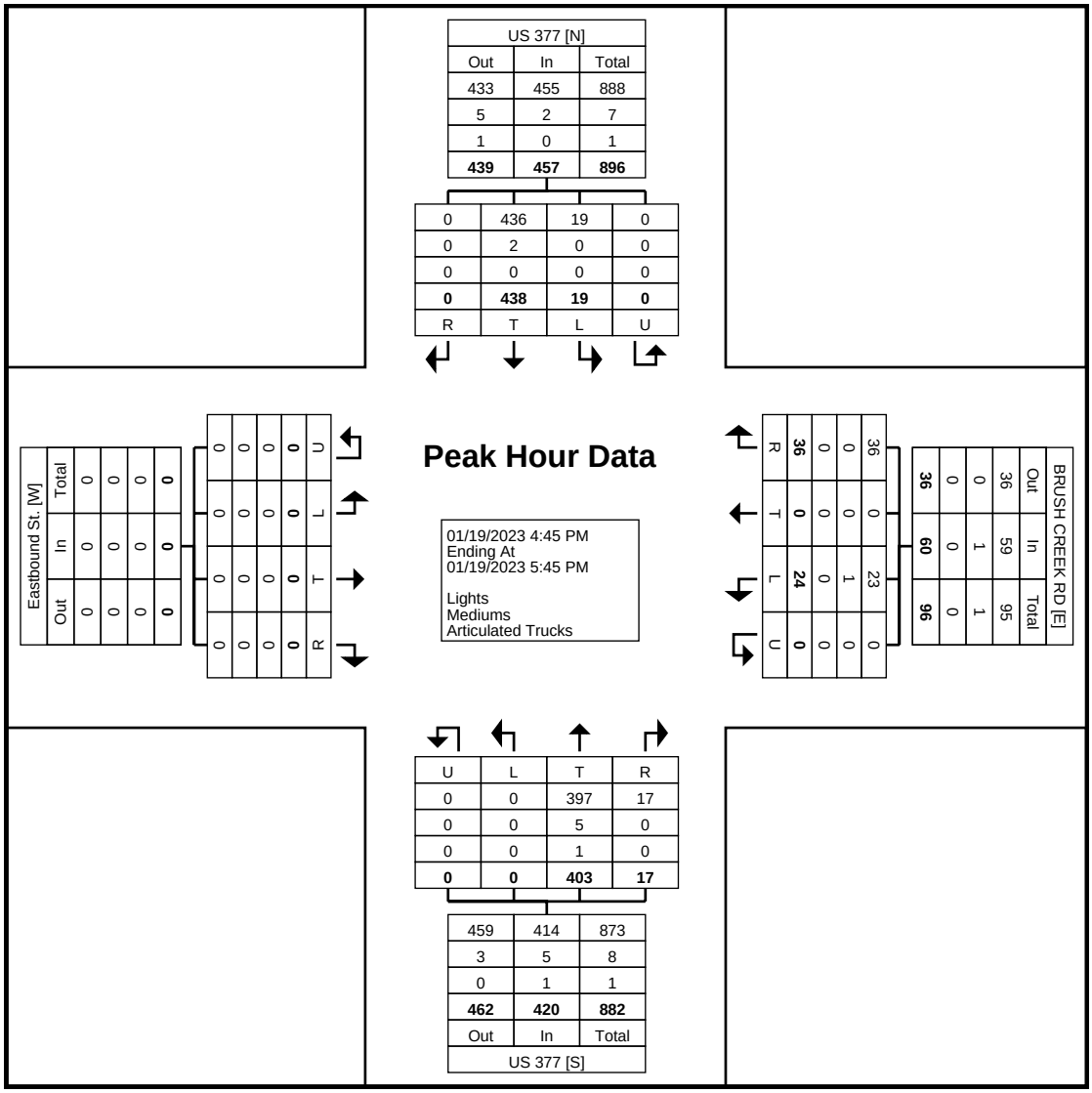
Start Time	US 377 Southbound					BRUSH CREEK RD Westbound					US 377 Northbound					Eastbound St. Eastbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
4:45 PM	2	100	0	0	102	6	0	8	0	14	0	102	6	0	108	0	0	0	0	0	224
5:00 PM	4	118	0	0	122	3	0	8	0	11	0	112	5	0	117	0	0	0	0	0	250
5:15 PM	10	99	0	0	109	6	0	9	0	15	0	97	5	0	102	0	0	0	0	0	226
5:30 PM	3	121	0	0	124	9	0	11	0	20	0	92	1	0	93	0	0	0	0	0	237
Total	19	438	0	0	457	24	0	36	0	60	0	403	17	0	420	0	0	0	0	0	937
Approach %	4.2	95.8	0.0	0.0	-	40.0	0.0	60.0	0.0	-	0.0	96.0	4.0	0.0	-	0.0	0.0	0.0	0.0	-	-
Total %	2.0	46.7	0.0	0.0	48.8	2.6	0.0	3.8	0.0	6.4	0.0	43.0	1.8	0.0	44.8	0.0	0.0	0.0	0.0	0.0	-
PHF	0.475	0.905	0.000	0.000	0.921	0.667	0.000	0.818	0.000	0.750	0.000	0.900	0.708	0.000	0.897	0.000	0.000	0.000	0.000	0.000	0.937
Lights	19	436	0	0	455	23	0	36	0	59	0	397	17	0	414	0	0	0	0	0	928
% Lights	100.0	99.5	-	-	99.6	95.8	-	100.0	-	98.3	-	98.5	100.0	-	98.6	-	-	-	-	-	99.0
Mediums	0	2	0	0	2	1	0	0	0	1	0	5	0	0	5	0	0	0	0	0	8
% Mediums	0.0	0.5	-	-	0.4	4.2	-	0.0	-	1.7	-	1.2	0.0	-	1.2	-	-	-	-	-	0.9
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
% Articulated Trucks	0.0	0.0	-	-	0.0	0.0	-	0.0	-	0.0	-	0.2	0.0	-	0.2	-	-	-	-	-	0.1

GRAM Traffic NTX Inc.

1120 W. Lovers Lane

Arlington, Texas, United States 76013
817.265.8968

Count Name: BRUSH CREEK RD @ US 377
Site Code:
Start Date: 01/19/2023
Page No: 7



Turning Movement Peak Hour Data Plot (4:45 PM)

GRAM Traffic NTX Inc.

1120 W. Lovers Lane

Arlington, Texas, United States 76013
817.265.8968

Count Name: BONNIE BRAE ST @ US 377
Site Code:
Start Date: 01/19/2023

Turning Movement Data

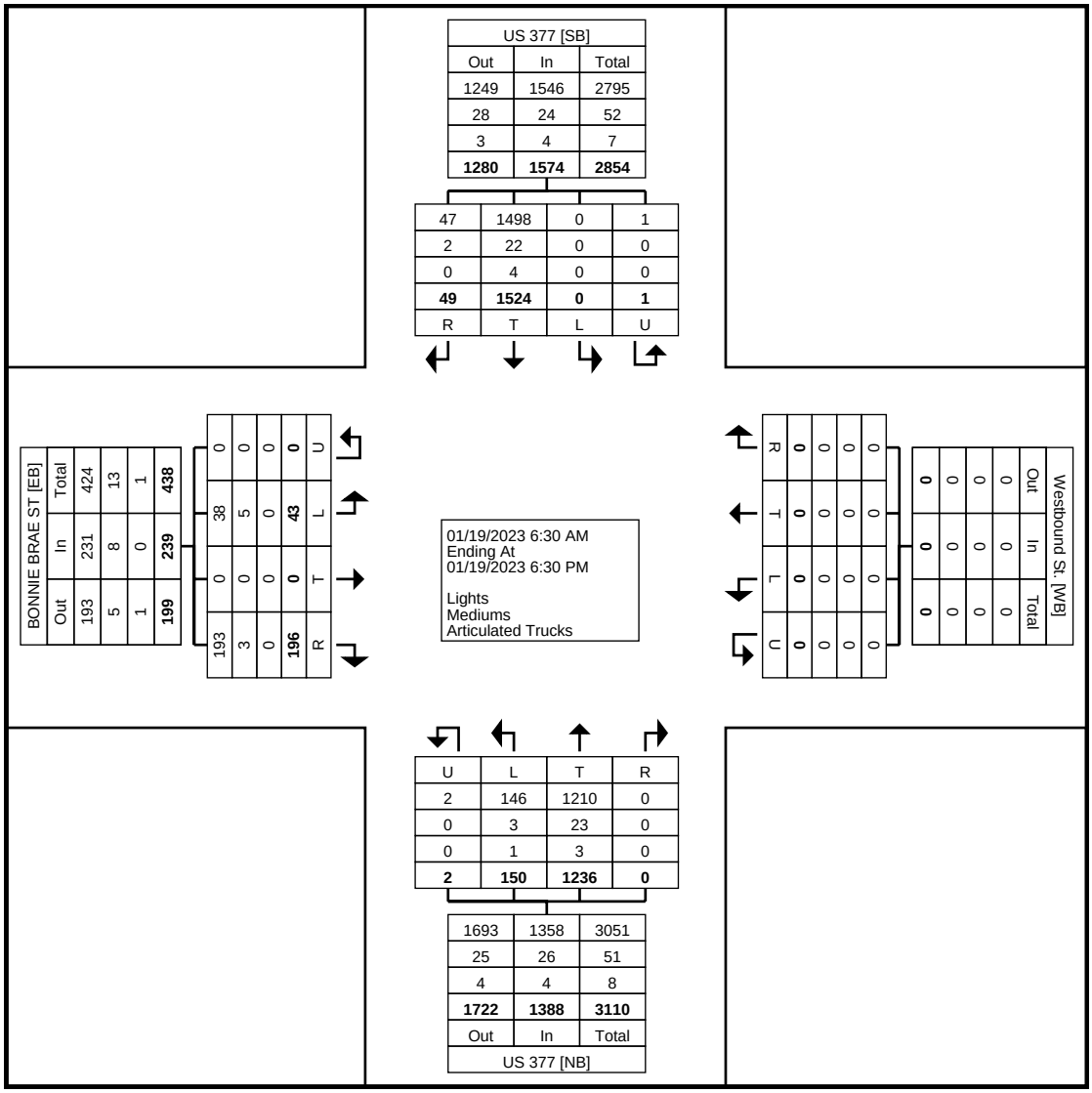
Start Time	US 377 Southbound					Westbound St. Westbound					US 377 Northbound					BONNIE BRAE ST Eastbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
6:30 AM	0	69	5	0	74	0	0	0	0	0	4	36	0	0	40	3	0	10	0	13	127
6:45 AM	0	104	2	0	106	0	0	0	0	0	3	21	0	0	24	2	0	6	0	8	138
Hourly Total	0	173	7	0	180	0	0	0	0	0	7	57	0	0	64	5	0	16	0	21	265
7:00 AM	0	95	4	0	99	0	0	0	0	0	10	55	0	0	65	3	0	14	0	17	181
7:15 AM	0	116	4	0	120	0	0	0	0	0	13	85	0	0	98	3	0	18	0	21	239
7:30 AM	0	152	4	1	157	0	0	0	0	0	8	69	0	0	77	4	0	18	0	22	256
7:45 AM	0	126	3	0	129	0	0	0	0	0	7	72	0	0	79	3	0	24	0	27	235
Hourly Total	0	489	15	1	505	0	0	0	0	0	38	281	0	0	319	13	0	74	0	87	911
8:00 AM	0	95	1	0	96	0	0	0	0	0	6	78	0	0	84	3	0	9	0	12	192
8:15 AM	0	72	4	0	76	0	0	0	0	0	11	72	0	0	83	2	0	12	0	14	173
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	167	5	0	172	0	0	0	0	0	17	150	0	0	167	5	0	21	0	26	365
4:30 PM	0	77	1	0	78	0	0	0	0	0	13	99	0	0	112	2	0	14	0	16	206
4:45 PM	0	97	4	0	101	0	0	0	0	0	9	99	0	1	109	2	0	11	0	13	223
Hourly Total	0	174	5	0	179	0	0	0	0	0	22	198	0	1	221	4	0	25	0	29	429
5:00 PM	0	116	0	0	116	0	0	0	0	0	12	110	0	0	122	1	0	5	0	6	244
5:15 PM	0	97	5	0	102	0	0	0	0	0	10	95	0	0	105	2	0	16	0	18	225
5:30 PM	0	110	4	0	114	0	0	0	0	0	12	95	0	0	107	2	0	9	0	11	232
5:45 PM	0	82	7	0	89	0	0	0	0	0	10	90	0	0	100	3	0	14	0	17	206
Hourly Total	0	405	16	0	421	0	0	0	0	0	44	390	0	0	434	8	0	44	0	52	907
6:00 PM	0	66	0	0	66	0	0	0	0	0	11	78	0	0	89	2	0	8	0	10	165
6:15 PM	0	50	1	0	51	0	0	0	0	0	11	82	0	1	94	6	0	8	0	14	159
Grand Total	0	1524	49	1	1574	0	0	0	0	0	150	1236	0	2	1388	43	0	196	0	239	3201
Approach %	0.0	96.8	3.1	0.1	-	0.0	0.0	0.0	0.0	-	10.8	89.0	0.0	0.1	-	18.0	0.0	82.0	0.0	-	-
Total %	0.0	47.6	1.5	0.0	49.2	0.0	0.0	0.0	0.0	0.0	4.7	38.6	0.0	0.1	43.4	1.3	0.0	6.1	0.0	7.5	-
Lights	0	1498	47	1	1546	0	0	0	0	0	146	1210	0	2	1358	38	0	193	0	231	3135
% Lights	-	98.3	95.9	100.0	98.2	-	-	-	-	-	97.3	97.9	-	100.0	97.8	88.4	-	98.5	-	96.7	97.9
Mediums	0	22	2	0	24	0	0	0	0	0	3	23	0	0	26	5	0	3	0	8	58
% Mediums	-	1.4	4.1	0.0	1.5	-	-	-	-	-	2.0	1.9	-	0.0	1.9	11.6	-	1.5	-	3.3	1.8
Articulated Trucks	0	4	0	0	4	0	0	0	0	0	1	3	0	0	4	0	0	0	0	0	8
% Articulated Trucks	-	0.3	0.0	0.0	0.3	-	-	-	-	-	0.7	0.2	-	0.0	0.3	0.0	-	0.0	-	0.0	0.2

GRAM Traffic NTX Inc.

1120 W. Lovers Lane

Arlington, Texas, United States 76013
817.265.8968

Count Name: BONNIE BRAE ST
@ US 377
Site Code:
Start Date: 01/19/2023



Turning Movement Data Plot

GRAM Traffic NTX Inc.

1120 W. Lovers Lane

Arlington, Texas, United States 76013
817.265.8968

Count Name: BONNIE BRAE ST @ US 377
Site Code:
Start Date: 01/19/2023

Turning Movement Peak Hour Data (7:15 AM)

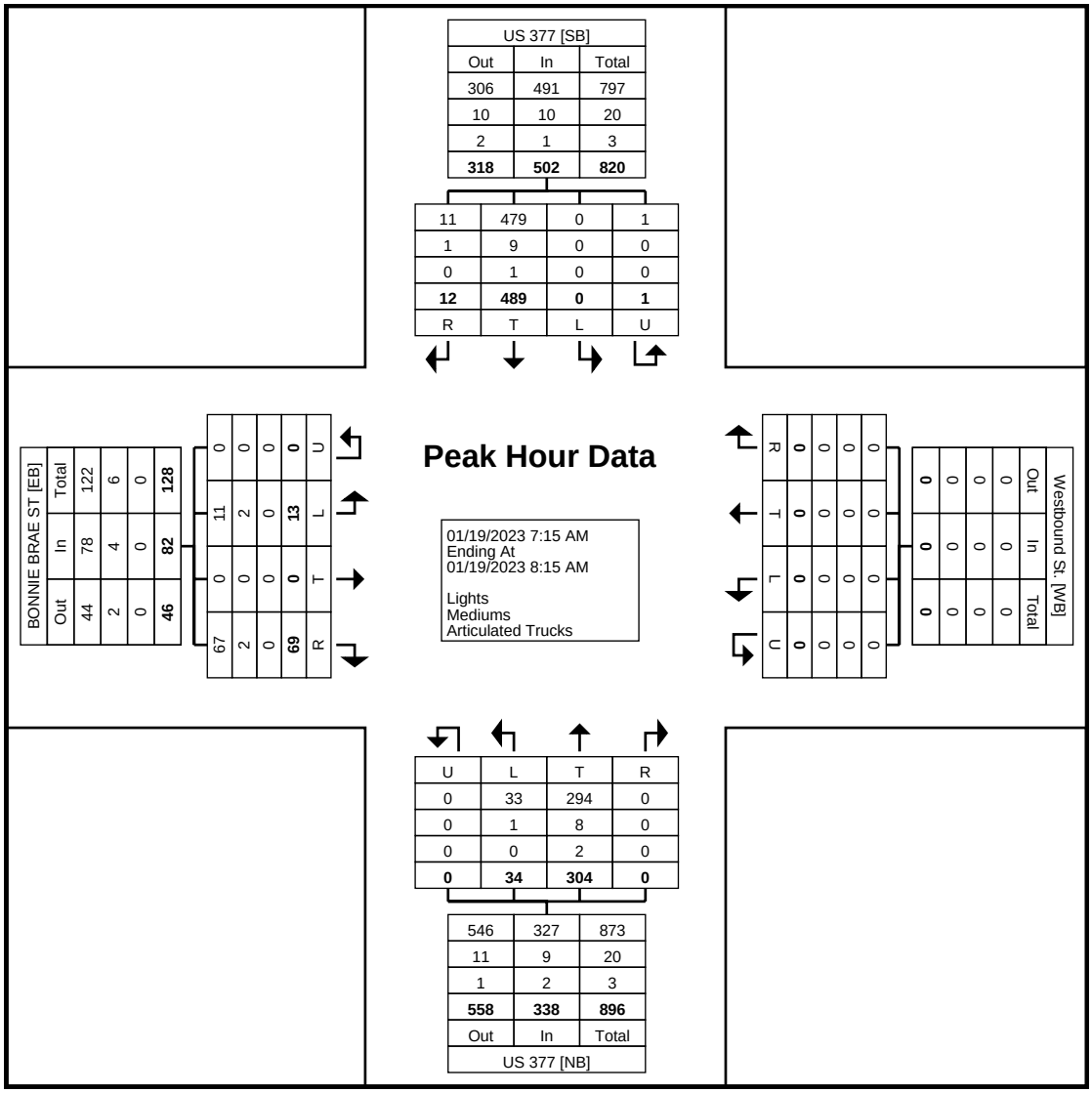
Start Time	US 377 Southbound					Westbound St. Westbound					US 377 Northbound					BONNIE BRAE ST Eastbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
7:15 AM	0	116	4	0	120	0	0	0	0	0	13	85	0	0	98	3	0	18	0	21	239
7:30 AM	0	152	4	1	157	0	0	0	0	0	8	69	0	0	77	4	0	18	0	22	256
7:45 AM	0	126	3	0	129	0	0	0	0	0	7	72	0	0	79	3	0	24	0	27	235
8:00 AM	0	95	1	0	96	0	0	0	0	0	6	78	0	0	84	3	0	9	0	12	192
Total	0	489	12	1	502	0	0	0	0	0	34	304	0	0	338	13	0	69	0	82	922
Approach %	0.0	97.4	2.4	0.2	-	0.0	0.0	0.0	0.0	-	10.1	89.9	0.0	0.0	-	15.9	0.0	84.1	0.0	-	-
Total %	0.0	53.0	1.3	0.1	54.4	0.0	0.0	0.0	0.0	0.0	3.7	33.0	0.0	0.0	36.7	1.4	0.0	7.5	0.0	8.9	-
PHF	0.000	0.804	0.750	0.250	0.799	0.000	0.000	0.000	0.000	0.000	0.654	0.894	0.000	0.000	0.862	0.813	0.000	0.719	0.000	0.759	0.900
Lights	0	479	11	1	491	0	0	0	0	0	33	294	0	0	327	11	0	67	0	78	896
% Lights	-	98.0	91.7	100.0	97.8	-	-	-	-	-	97.1	96.7	-	-	96.7	84.6	-	97.1	-	95.1	97.2
Mediums	0	9	1	0	10	0	0	0	0	0	1	8	0	0	9	2	0	2	0	4	23
% Mediums	-	1.8	8.3	0.0	2.0	-	-	-	-	-	2.9	2.6	-	-	2.7	15.4	-	2.9	-	4.9	2.5
Articulated Trucks	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	3
% Articulated Trucks	-	0.2	0.0	0.0	0.2	-	-	-	-	-	0.0	0.7	-	-	0.6	0.0	-	0.0	-	0.0	0.3

GRAM Traffic NTX Inc.

1120 W. Lovers Lane

Arlington, Texas, United States 76013
817.265.8968

Count Name: BONNIE BRAE ST
@ US 377
Site Code:
Start Date: 01/19/2023



Turning Movement Peak Hour Data Plot (7:15 AM)

GRAM Traffic NTX Inc.

1120 W. Lovers Lane

Arlington, Texas, United States 76013
817.265.8968

Count Name: BONNIE BRAE ST @ US 377
Site Code:
Start Date: 01/19/2023

Turning Movement Peak Hour Data (4:45 PM)

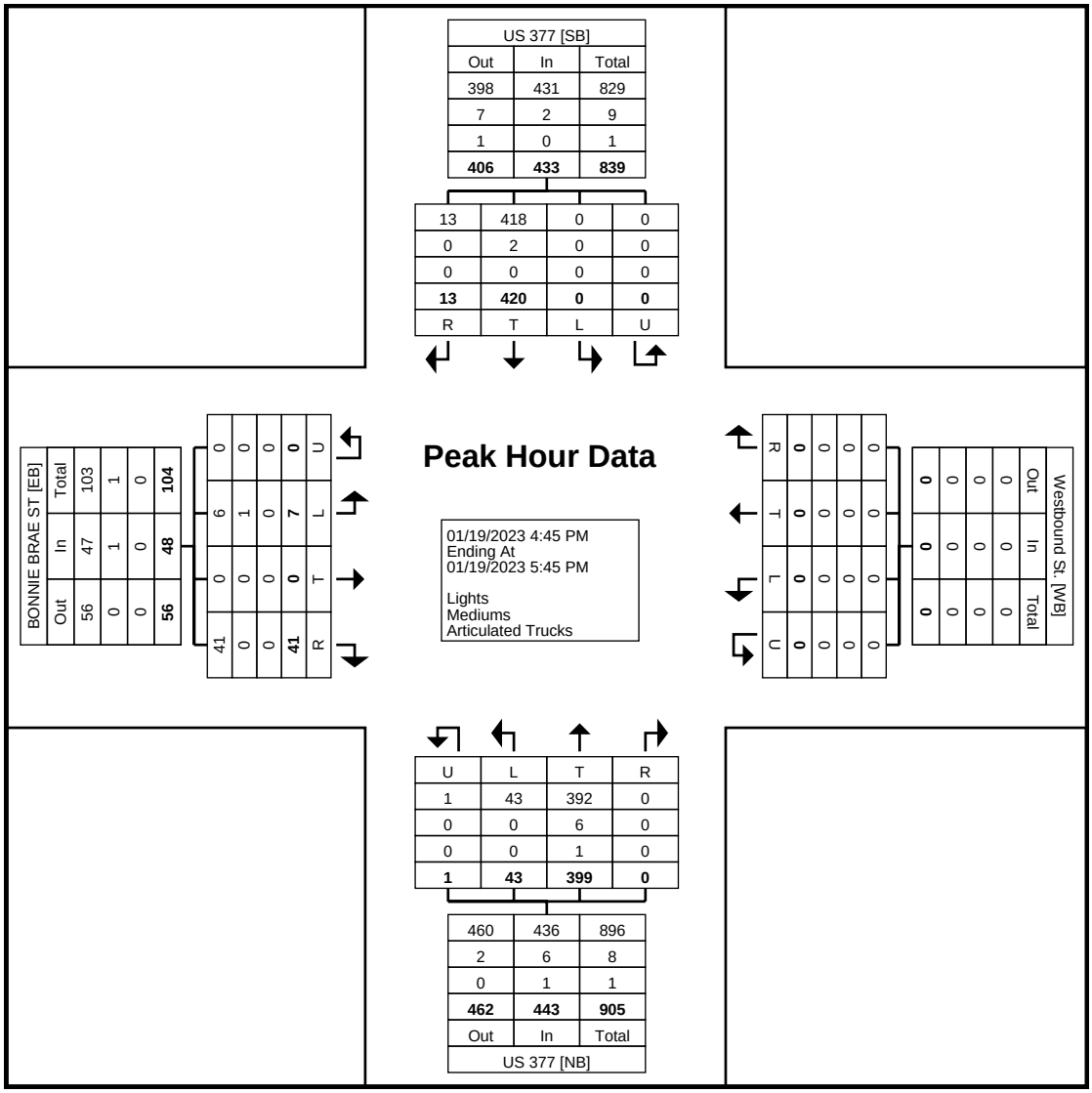
Start Time	US 377 Southbound					Westbound St. Westbound					US 377 Northbound					BONNIE BRAE ST Eastbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
4:45 PM	0	97	4	0	101	0	0	0	0	0	9	99	0	1	109	2	0	11	0	13	223
5:00 PM	0	116	0	0	116	0	0	0	0	0	12	110	0	0	122	1	0	5	0	6	244
5:15 PM	0	97	5	0	102	0	0	0	0	0	10	95	0	0	105	2	0	16	0	18	225
5:30 PM	0	110	4	0	114	0	0	0	0	0	12	95	0	0	107	2	0	9	0	11	232
Total	0	420	13	0	433	0	0	0	0	0	43	399	0	1	443	7	0	41	0	48	924
Approach %	0.0	97.0	3.0	0.0	-	0.0	0.0	0.0	0.0	-	9.7	90.1	0.0	0.2	-	14.6	0.0	85.4	0.0	-	-
Total %	0.0	45.5	1.4	0.0	46.9	0.0	0.0	0.0	0.0	0.0	4.7	43.2	0.0	0.1	47.9	0.8	0.0	4.4	0.0	5.2	-
PHF	0.000	0.905	0.650	0.000	0.933	0.000	0.000	0.000	0.000	0.000	0.896	0.907	0.000	0.250	0.908	0.875	0.000	0.641	0.000	0.667	0.947
Lights	0	418	13	0	431	0	0	0	0	0	43	392	0	1	436	6	0	41	0	47	914
% Lights	-	99.5	100.0	-	99.5	-	-	-	-	-	100.0	98.2	-	100.0	98.4	85.7	-	100.0	-	97.9	98.9
Mediums	0	2	0	0	2	0	0	0	0	0	0	6	0	0	6	1	0	0	0	1	9
% Mediums	-	0.5	0.0	-	0.5	-	-	-	-	-	0.0	1.5	-	0.0	1.4	14.3	-	0.0	-	2.1	1.0
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
% Articulated Trucks	-	0.0	0.0	-	0.0	-	-	-	-	-	0.0	0.3	-	0.0	0.2	0.0	-	0.0	-	0.0	0.1

GRAM Traffic NTX Inc.

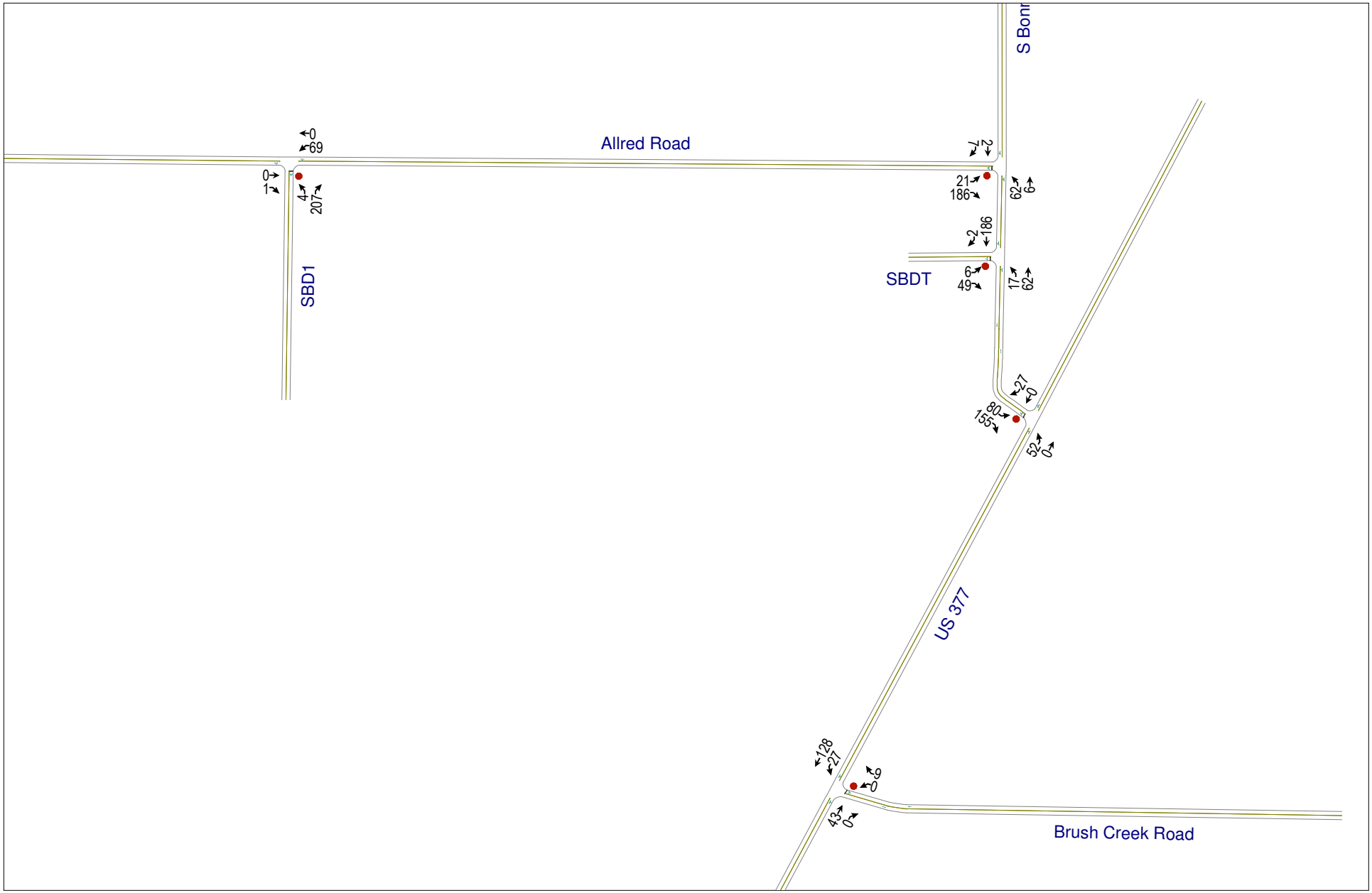
1120 W. Lovers Lane

Arlington, Texas, United States 76013
817.265.8968

Count Name: BONNIE BRAE ST
@ US 377
Site Code:
Start Date: 01/19/2023



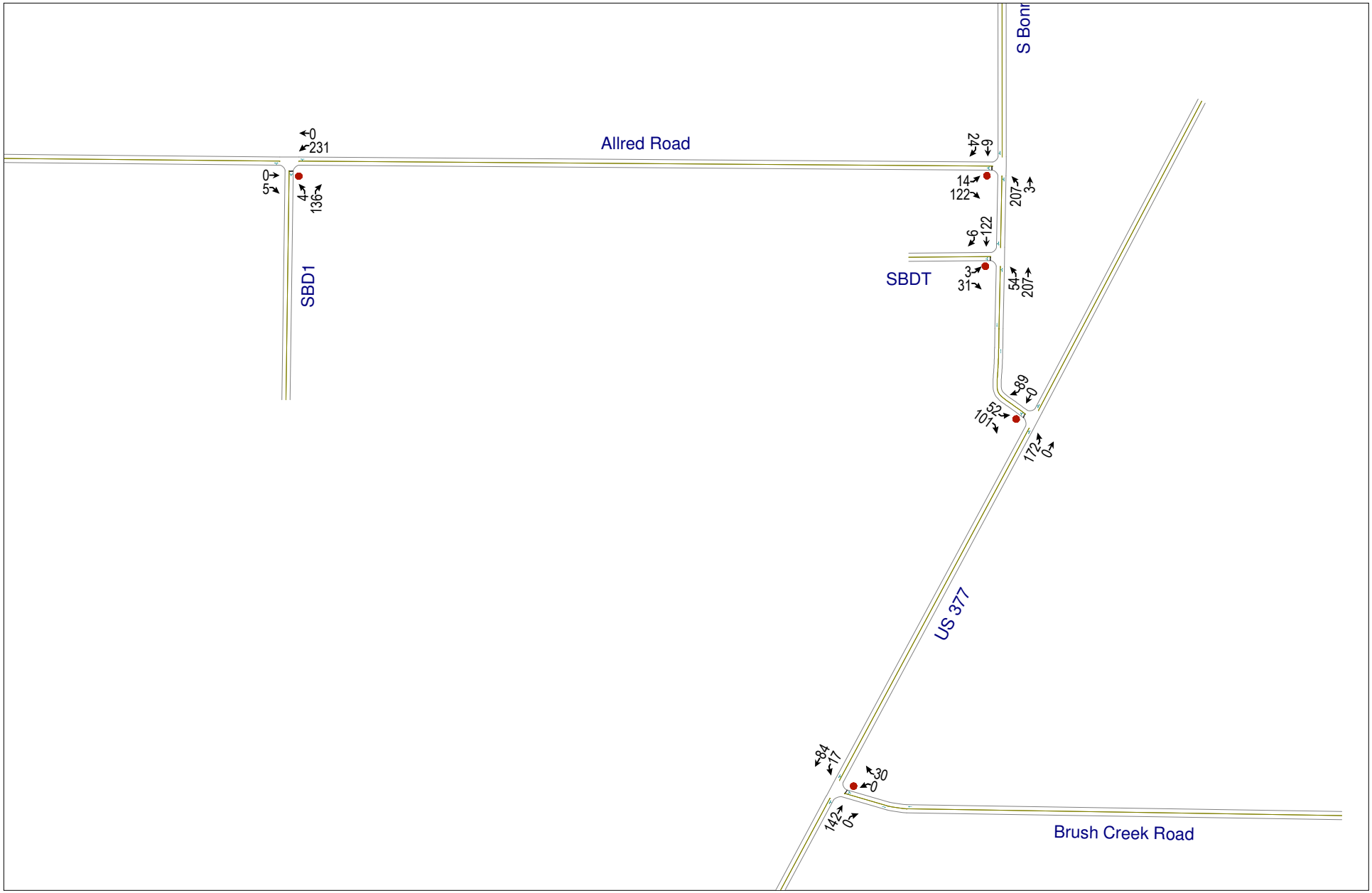
Turning Movement Peak Hour Data Plot (4:45 PM)



Development Trips - AM peak hour
Build Out / Horizon Year

Figure 8

City of Denton
Development Assistance Team
Approval 09/1/21



Development Trips - PM peak hour
Build Out / Horizon Year

Figure 9

City of Denton
Development Assistance Team
Approval 09/1/21

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	13	69	34	304	489	12
Future Vol, veh/h	13	69	34	304	489	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	15	3	3	3	2	8
Mvmt Flow	14	77	38	338	543	13

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	964	550	556	0	-	0
Stage 1	550	-	-	-	-	-
Stage 2	414	-	-	-	-	-
Critical Hdwy	6.55	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.55	-	-	-	-	-
Critical Hdwy Stg 2	5.55	-	-	-	-	-
Follow-up Hdwy	3.635	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	268	533	1010	-	-	-
Stage 1	553	-	-	-	-	-
Stage 2	640	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	256	533	1010	-	-	-
Mov Cap-2 Maneuver	256	-	-	-	-	-
Stage 1	528	-	-	-	-	-
Stage 2	640	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.9	0.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1010	-	455	-	-
HCM Lane V/C Ratio	0.037	-	0.2	-	-
HCM Control Delay (s)	8.7	0	14.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.7	-	-

Intersection	
Int Delay, s/veh	1.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	37	15	321	22	46	508
Future Vol, veh/h	37	15	321	22	46	508
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	3	5	4	2
Mvmt Flow	41	17	357	24	51	564

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1035	369	0	0	381	0
Stage 1	369	-	-	-	-	-
Stage 2	666	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.14	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.236	-
Pot Cap-1 Maneuver	257	677	-	-	1167	-
Stage 1	699	-	-	-	-	-
Stage 2	511	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	241	677	-	-	1167	-
Mov Cap-2 Maneuver	241	-	-	-	-	-
Stage 1	699	-	-	-	-	-
Stage 2	478	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.1	0	0.7
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	296	1167	-
HCM Lane V/C Ratio	-	-	0.195	0.044	-
HCM Control Delay (s)	-	-	20.1	8.2	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.7	0.1	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	7	41	43	399	420	13
Future Vol, veh/h	7	41	43	399	420	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	14	2	2	2	2	2
Mvmt Flow	7	43	45	420	442	14

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	959	449	456	0	-	0
Stage 1	449	-	-	-	-	-
Stage 2	510	-	-	-	-	-
Critical Hdwy	6.54	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.54	-	-	-	-	-
Critical Hdwy Stg 2	5.54	-	-	-	-	-
Follow-up Hdwy	3.626	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	271	610	1105	-	-	-
Stage 1	618	-	-	-	-	-
Stage 2	579	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	257	610	1105	-	-	-
Mov Cap-2 Maneuver	257	-	-	-	-	-
Stage 1	585	-	-	-	-	-
Stage 2	579	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.9	0.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1105	-	508	-	-
HCM Lane V/C Ratio	0.041	-	0.099	-	-
HCM Control Delay (s)	8.4	0	12.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.3	-	-

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	24	36	403	17	19	438
Future Vol, veh/h	24	36	403	17	19	438
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	4	2	2	2	2	2
Mvmt Flow	26	38	429	18	20	466

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	944	438	0	0	447	0
Stage 1	438	-	-	-	-	-
Stage 2	506	-	-	-	-	-
Critical Hdwy	6.44	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	289	619	-	-	1113	-
Stage 1	646	-	-	-	-	-
Stage 2	601	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	282	619	-	-	1113	-
Mov Cap-2 Maneuver	282	-	-	-	-	-
Stage 1	646	-	-	-	-	-
Stage 2	587	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.1	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	419	1113	-
HCM Lane V/C Ratio	-	-	0.152	0.018	-
HCM Control Delay (s)	-	-	15.1	8.3	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0.1	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	46	135	57	323	519	24
Future Vol, veh/h	46	135	57	323	519	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	15	3	3	3	2	8
Mvmt Flow	51	150	63	359	577	27

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1076	591	604	0	-	0
Stage 1	591	-	-	-	-	-
Stage 2	485	-	-	-	-	-
Critical Hdwy	6.55	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.55	-	-	-	-	-
Critical Hdwy Stg 2	5.55	-	-	-	-	-
Follow-up Hdwy	3.635	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	229	505	969	-	-	-
Stage 1	529	-	-	-	-	-
Stage 2	593	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	210	505	969	-	-	-
Mov Cap-2 Maneuver	210	-	-	-	-	-
Stage 1	486	-	-	-	-	-
Stage 2	593	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	25.5	1.3	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	969	-	372	-	-
HCM Lane V/C Ratio	0.065	-	0.541	-	-
HCM Control Delay (s)	9	0	25.5	-	-
HCM Lane LOS	A	A	D	-	-
HCM 95th %tile Q(veh)	0.2	-	3.1	-	-

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	39	20	358	23	60	590
Future Vol, veh/h	39	20	358	23	60	590
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	3	5	4	2
Mvmt Flow	43	22	398	26	67	656

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1201	411	0	0	424	0
Stage 1	411	-	-	-	-	-
Stage 2	790	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.14	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.236	-
Pot Cap-1 Maneuver	204	641	-	-	1125	-
Stage 1	669	-	-	-	-	-
Stage 2	447	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	185	641	-	-	1125	-
Mov Cap-2 Maneuver	185	-	-	-	-	-
Stage 1	669	-	-	-	-	-
Stage 2	405	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	25.1	0	0.8
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	244	1125	-
HCM Lane V/C Ratio	-	-	0.269	0.059	-
HCM Control Delay (s)	-	-	25.1	8.4	0
HCM Lane LOS	-	-	D	A	A
HCM 95th %tile Q(veh)	-	-	1.1	0.2	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	0	0	0	0
Future Vol, veh/h	0	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	0

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1	0	0	0	0	0
Stage 1	0	-	-	-	-	-
Stage 2	1	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	1022	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	1022	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	1022	-	-	-	-	-
Mov Cap-2 Maneuver	1022	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	1022	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	0	0	0
Future Vol, veh/h	0	0	0	0	0	0
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, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1	0	-	0	1	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1622	-	-	-	1022	1084
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1622	-	-	-	1022	1084
Mov Cap-2 Maneuver	-	-	-	-	1022	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1622	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	0	0	0	0
Future Vol, veh/h	0	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	0

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1	0	0	0	0	0
Stage 1	0	-	-	-	-	-
Stage 2	1	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	1022	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	1022	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	1022	-	-	-	-	-
Mov Cap-2 Maneuver	1022	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	1022	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	-	-

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	28	83	115	423	446	50
Future Vol, veh/h	28	83	115	423	446	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	14	2	2	2	2	2
Mvmt Flow	29	87	121	445	469	53

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1183	496	522	0	-	0
Stage 1	496	-	-	-	-	-
Stage 2	687	-	-	-	-	-
Critical Hdwy	6.54	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.54	-	-	-	-	-
Critical Hdwy Stg 2	5.54	-	-	-	-	-
Follow-up Hdwy	3.626	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	198	574	1044	-	-	-
Stage 1	588	-	-	-	-	-
Stage 2	478	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	168	574	1044	-	-	-
Mov Cap-2 Maneuver	168	-	-	-	-	-
Stage 1	497	-	-	-	-	-
Stage 2	478	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	19.9	1.9	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1044	-	357	-	-
HCM Lane V/C Ratio	0.116	-	0.327	-	-
HCM Control Delay (s)	8.9	0	19.9	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.4	-	1.4	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	50	485	18	27	499
Future Vol, veh/h	25	50	485	18	27	499
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	4	2	2	2	2	2
Mvmt Flow	27	53	516	19	29	531

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1115	526	0	0	535	0
Stage 1	526	-	-	-	-	-
Stage 2	589	-	-	-	-	-
Critical Hdwy	6.44	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	228	552	-	-	1033	-
Stage 1	589	-	-	-	-	-
Stage 2	551	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	219	552	-	-	1033	-
Mov Cap-2 Maneuver	219	-	-	-	-	-
Stage 1	589	-	-	-	-	-
Stage 2	529	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.6	0	0.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	366	1033	-
HCM Lane V/C Ratio	-	-	0.218	0.028	-
HCM Control Delay (s)	-	-	17.6	8.6	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0.1	-

Intersection	
Int Delay, s/veh	5.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	46	140	62	344	537	24
Future Vol, veh/h	46	140	62	344	537	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	15	3	3	3	2	8
Mvmt Flow	51	156	69	382	597	27

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1131	611	624	0	-	0
Stage 1	611	-	-	-	-	-
Stage 2	520	-	-	-	-	-
Critical Hdwy	6.55	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.55	-	-	-	-	-
Critical Hdwy Stg 2	5.55	-	-	-	-	-
Follow-up Hdwy	3.635	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	212	492	952	-	-	-
Stage 1	517	-	-	-	-	-
Stage 2	571	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	192	492	952	-	-	-
Mov Cap-2 Maneuver	192	-	-	-	-	-
Stage 1	469	-	-	-	-	-
Stage 2	571	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	28.3	1.4	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	952	-	355	-	-
HCM Lane V/C Ratio	0.072	-	0.582	-	-
HCM Control Delay (s)	9.1	0	28.3	-	-
HCM Lane LOS	A	A	D	-	-
HCM 95th %tile Q(veh)	0.2	-	3.5	-	-

Intersection	
Int Delay, s/veh	2.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	47	28	371	30	67	606
Future Vol, veh/h	47	28	371	30	67	606
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	3	5	4	2
Mvmt Flow	52	31	412	33	74	673

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1250	429	0	0	445	0
Stage 1	429	-	-	-	-	-
Stage 2	821	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.14	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.236	-
Pot Cap-1 Maneuver	191	626	-	-	1105	-
Stage 1	657	-	-	-	-	-
Stage 2	432	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	171	626	-	-	1105	-
Mov Cap-2 Maneuver	171	-	-	-	-	-
Stage 1	657	-	-	-	-	-
Stage 2	386	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	28.5	0	0.8
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	235	1105	-
HCM Lane V/C Ratio	-	-	0.355	0.067	-
HCM Control Delay (s)	-	-	28.5	8.5	0
HCM Lane LOS	-	-	D	A	A
HCM 95th %tile Q(veh)	-	-	1.5	0.2	-

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	5	399	5	5	672
Future Vol, veh/h	5	5	399	5	5	672
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	5	434	5	5	730

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1177	437	0	0	439	0
Stage 1	437	-	-	-	-	-
Stage 2	740	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	211	620	-	-	1121	-
Stage 1	651	-	-	-	-	-
Stage 2	472	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	209	620	-	-	1121	-
Mov Cap-2 Maneuver	209	-	-	-	-	-
Stage 1	651	-	-	-	-	-
Stage 2	468	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.9	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	313	1121	-
HCM Lane V/C Ratio	-	-	0.035	0.005	-
HCM Control Delay (s)	-	-	16.9	8.2	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	14	83	59	2	3	16
Future Vol, veh/h	14	83	59	2	3	16
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, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	90	64	2	3	17

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	66	0	-	0	185	65
Stage 1	-	-	-	-	65	-
Stage 2	-	-	-	-	120	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1536	-	-	-	804	999
Stage 1	-	-	-	-	958	-
Stage 2	-	-	-	-	905	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1536	-	-	-	796	999
Mov Cap-2 Maneuver	-	-	-	-	796	-
Stage 1	-	-	-	-	948	-
Stage 2	-	-	-	-	905	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1536	-	-	-	960
HCM Lane V/C Ratio	0.01	-	-	-	0.022
HCM Control Delay (s)	7.4	0	-	-	8.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	14	11	390	9	12	666
Future Vol, veh/h	14	11	390	9	12	666
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	12	424	10	13	724

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1179	429	0	0	434	0
Stage 1	429	-	-	-	-	-
Stage 2	750	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	211	626	-	-	1126	-
Stage 1	657	-	-	-	-	-
Stage 2	467	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	207	626	-	-	1126	-
Mov Cap-2 Maneuver	207	-	-	-	-	-
Stage 1	657	-	-	-	-	-
Stage 2	458	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.5	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	293	1126	-
HCM Lane V/C Ratio	-	-	0.093	0.012	-
HCM Control Delay (s)	-	-	18.5	8.2	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	28	94	124	461	489	50
Future Vol, veh/h	28	94	124	461	489	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	14	2	2	2	2	2
Mvmt Flow	29	99	131	485	515	53

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1289	542	568	0	-	0
Stage 1	542	-	-	-	-	-
Stage 2	747	-	-	-	-	-
Critical Hdwy	6.54	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.54	-	-	-	-	-
Critical Hdwy Stg 2	5.54	-	-	-	-	-
Follow-up Hdwy	3.626	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	171	540	1004	-	-	-
Stage 1	560	-	-	-	-	-
Stage 2	448	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	140	540	1004	-	-	-
Mov Cap-2 Maneuver	140	-	-	-	-	-
Stage 1	460	-	-	-	-	-
Stage 2	448	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	23	1.9	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1004	-	326	-	-
HCM Lane V/C Ratio	0.13	-	0.394	-	-
HCM Control Delay (s)	9.1	0	23	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.4	-	1.8	-	-

Intersection	
Int Delay, s/veh	2.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	40	64	517	34	43	527
Future Vol, veh/h	40	64	517	34	43	527
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	4	2	2	2	2	2
Mvmt Flow	43	68	550	36	46	561

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1221	568	0	0	586	0
Stage 1	568	-	-	-	-	-
Stage 2	653	-	-	-	-	-
Critical Hdwy	6.44	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	197	522	-	-	989	-
Stage 1	563	-	-	-	-	-
Stage 2	514	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	184	522	-	-	989	-
Mov Cap-2 Maneuver	184	-	-	-	-	-
Stage 1	563	-	-	-	-	-
Stage 2	479	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	23.3	0	0.7
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	306	989	-
HCM Lane V/C Ratio	-	-	0.362	0.046	-
HCM Control Delay (s)	-	-	23.3	8.8	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.6	0.1	-

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	10	573	11	11	572
Future Vol, veh/h	10	10	573	11	11	572
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	11	623	12	12	622

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1275	629	0	0	635	0
Stage 1	629	-	-	-	-	-
Stage 2	646	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	184	482	-	-	948	-
Stage 1	531	-	-	-	-	-
Stage 2	522	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	181	482	-	-	948	-
Mov Cap-2 Maneuver	181	-	-	-	-	-
Stage 1	531	-	-	-	-	-
Stage 2	512	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.9	0	0.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	263	948	-
HCM Lane V/C Ratio	-	-	0.083	0.013	-
HCM Control Delay (s)	-	-	19.9	8.8	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	32	45	76	5	5	29
Future Vol, veh/h	32	45	76	5	5	29
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, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	35	49	83	5	5	32

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	88	0	-	0	205	86
Stage 1	-	-	-	-	86	-
Stage 2	-	-	-	-	119	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1508	-	-	-	783	973
Stage 1	-	-	-	-	937	-
Stage 2	-	-	-	-	906	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1508	-	-	-	764	973
Mov Cap-2 Maneuver	-	-	-	-	764	-
Stage 1	-	-	-	-	915	-
Stage 2	-	-	-	-	906	-

Approach	EB	WB	SB
HCM Control Delay, s	3.1	0	9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1508	-	-	-	935
HCM Lane V/C Ratio	0.023	-	-	-	0.04
HCM Control Delay (s)	7.4	0	-	-	9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	24	19	560	22	27	555
Future Vol, veh/h	24	19	560	22	27	555
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	26	21	609	24	29	603

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1282	621	0	0	633	0
Stage 1	621	-	-	-	-	-
Stage 2	661	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	182	487	-	-	950	-
Stage 1	536	-	-	-	-	-
Stage 2	514	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	174	487	-	-	950	-
Mov Cap-2 Maneuver	174	-	-	-	-	-
Stage 1	536	-	-	-	-	-
Stage 2	490	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	23.3	0	0.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	243	950	-
HCM Lane V/C Ratio	-	-	0.192	0.031	-
HCM Control Delay (s)	-	-	23.3	8.9	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.7	0.1	-

Intersection	
Int Delay, s/veh	140.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	133	312	118	374	601	55
Future Vol, veh/h	133	312	118	374	601	55
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	15	3	3	3	2	8
Mvmt Flow	148	347	131	416	668	61

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1377	699	729	0	-	0
Stage 1	699	-	-	-	-	-
Stage 2	678	-	-	-	-	-
Critical Hdwy	6.55	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.55	-	-	-	-	-
Critical Hdwy Stg 2	5.55	-	-	-	-	-
Follow-up Hdwy	3.635	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	150	438	870	-	-	-
Stage 1	470	-	-	-	-	-
Stage 2	481	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 121	438	870	-	-	-
Mov Cap-2 Maneuver	~ 121	-	-	-	-	-
Stage 1	378	-	-	-	-	-
Stage 2	481	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	$ 501.6	2.4	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	870	-	246	-	-
HCM Lane V/C Ratio	0.151	-	2.01	-	-
HCM Control Delay (s)	9.9	0	$ 501.6	-	-
HCM Lane LOS	A	A	F	-	-
HCM 95th %tile Q(veh)	0.5	-	36.2	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	4.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	46	32	457	27	96	812
Future Vol, veh/h	46	32	457	27	96	812
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	3	5	4	2
Mvmt Flow	51	36	508	30	107	902

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1639	523	0	0	538	0
Stage 1	523	-	-	-	-	-
Stage 2	1116	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.14	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.236	-
Pot Cap-1 Maneuver	110	554	-	-	1020	-
Stage 1	595	-	-	-	-	-
Stage 2	313	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	87	554	-	-	1020	-
Mov Cap-2 Maneuver	87	-	-	-	-	-
Stage 1	595	-	-	-	-	-
Stage 2	247	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	72.3	0	0.9
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	133	1020	-
HCM Lane V/C Ratio	-	-	0.652	0.105	-
HCM Control Delay (s)	-	-	72.3	8.9	0
HCM Lane LOS	-	-	F	A	A
HCM 95th %tile Q(veh)	-	-	3.5	0.3	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	0	0	0	0
Future Vol, veh/h	0	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	0

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1	0	0	0	0	0
Stage 1	0	-	-	-	-	-
Stage 2	1	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	1022	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	1022	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	1022	-	-	-	-	-
Mov Cap-2 Maneuver	1022	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	1022	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	0	0	0
Future Vol, veh/h	0	0	0	0	0	0
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, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1	0	-	0	1	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1622	-	-	-	1022	1084
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1622	-	-	-	1022	1084
Mov Cap-2 Maneuver	-	-	-	-	1022	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1622	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	0	0	0	0
Future Vol, veh/h	0	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	0

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1	0	0	0	0	0
Stage 1	0	-	-	-	-	-
Stage 2	1	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	1022	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	1022	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	1022	-	-	-	-	-
Mov Cap-2 Maneuver	1022	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	1022	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	-	-

Intersection	
Int Delay, s/veh	130.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	85	198	305	491	517	147
Future Vol, veh/h	85	198	305	491	517	147
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	14	2	2	2	2	2
Mvmt Flow	89	208	321	517	544	155

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1781	622	699	0	-	0
Stage 1	622	-	-	-	-	-
Stage 2	1159	-	-	-	-	-
Critical Hdwy	6.54	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.54	-	-	-	-	-
Critical Hdwy Stg 2	5.54	-	-	-	-	-
Follow-up Hdwy	3.626	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	~ 84	487	898	-	-	-
Stage 1	513	-	-	-	-	-
Stage 2	283	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 42	487	898	-	-	-
Mov Cap-2 Maneuver	~ 42	-	-	-	-	-
Stage 1	256	-	-	-	-	-
Stage 2	283	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	$ 789.3	4.3	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	898	-	116	-	-
HCM Lane V/C Ratio	0.358	-	2.568	-	-
HCM Control Delay (s)	11.2	0	$ 789.3	-	-
HCM Lane LOS	B	A	F	-	-
HCM 95th %tile Q(veh)	1.6	-	26.9	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	30	88	704	21	48	662
Future Vol, veh/h	30	88	704	21	48	662
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	4	2	2	2	2	2
Mvmt Flow	32	94	749	22	51	704

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1566	760	0	0	771	0
Stage 1	760	-	-	-	-	-
Stage 2	806	-	-	-	-	-
Critical Hdwy	6.44	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	121	406	-	-	844	-
Stage 1	458	-	-	-	-	-
Stage 2	436	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	109	406	-	-	844	-
Mov Cap-2 Maneuver	109	-	-	-	-	-
Stage 1	458	-	-	-	-	-
Stage 2	393	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	35.4	0	0.6
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	240	844	-
HCM Lane V/C Ratio	-	-	0.523	0.061	-
HCM Control Delay (s)	-	-	35.4	9.5	0
HCM Lane LOS	-	-	E	A	A
HCM 95th %tile Q(veh)	-	-	2.8	0.2	-

Intersection	
Int Delay, s/veh	158.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	133	316	124	395	620	55
Future Vol, veh/h	133	316	124	395	620	55
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	15	3	3	3	2	8
Mvmt Flow	148	351	138	439	689	61

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1435	720	750	0	-	0
Stage 1	720	-	-	-	-	-
Stage 2	715	-	-	-	-	-
Critical Hdwy	6.55	6.23	4.13	-	-	-
Critical Hdwy Stg 1	5.55	-	-	-	-	-
Critical Hdwy Stg 2	5.55	-	-	-	-	-
Follow-up Hdwy	3.635	3.327	2.227	-	-	-
Pot Cap-1 Maneuver	~ 138	426	855	-	-	-
Stage 1	459	-	-	-	-	-
Stage 2	462	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 109	426	855	-	-	-
Mov Cap-2 Maneuver	~ 109	-	-	-	-	-
Stage 1	361	-	-	-	-	-
Stage 2	462	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	$ 578.7	2.4	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	855	-	229	-	-
HCM Lane V/C Ratio	0.161	-	2.179	-	-
HCM Control Delay (s)	10	0	$ 578.7	-	-
HCM Lane LOS	B	A	F	-	-
HCM 95th %tile Q(veh)	0.6	-	38.6	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	7.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	54	40	471	34	103	828
Future Vol, veh/h	54	40	471	34	103	828
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	3	5	4	2
Mvmt Flow	60	44	523	38	114	920

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1690	542	0	0	561	0
Stage 1	542	-	-	-	-	-
Stage 2	1148	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.14	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.236	-
Pot Cap-1 Maneuver	103	540	-	-	1000	-
Stage 1	583	-	-	-	-	-
Stage 2	302	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	79	540	-	-	1000	-
Mov Cap-2 Maneuver	79	-	-	-	-	-
Stage 1	583	-	-	-	-	-
Stage 2	232	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	109.3	0	1
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	124	1000	-
HCM Lane V/C Ratio	-	-	0.842	0.114	-
HCM Control Delay (s)	-	-	109.3	9.1	0
HCM Lane LOS	-	-	F	A	A
HCM 95th %tile Q(veh)	-	-	5.2	0.4	-

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	5	511	5	5	932
Future Vol, veh/h	5	5	511	5	5	932
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	5	555	5	5	1013

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1581	558	0	0	560	0
Stage 1	558	-	-	-	-	-
Stage 2	1023	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	120	529	-	-	1011	-
Stage 1	573	-	-	-	-	-
Stage 2	347	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	119	529	-	-	1011	-
Mov Cap-2 Maneuver	119	-	-	-	-	-
Stage 1	573	-	-	-	-	-
Stage 2	343	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	24.7	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	194	1011	-
HCM Lane V/C Ratio	-	-	0.056	0.005	-
HCM Control Delay (s)	-	-	24.7	8.6	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	14	123	73	2	3	16
Future Vol, veh/h	14	123	73	2	3	16
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, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	134	79	2	3	17

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	81	0	-	0	244	80
Stage 1	-	-	-	-	80	-
Stage 2	-	-	-	-	164	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1517	-	-	-	744	980
Stage 1	-	-	-	-	943	-
Stage 2	-	-	-	-	865	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1517	-	-	-	736	980
Mov Cap-2 Maneuver	-	-	-	-	736	-
Stage 1	-	-	-	-	933	-
Stage 2	-	-	-	-	865	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1517	-	-	-	931
HCM Lane V/C Ratio	0.01	-	-	-	0.022
HCM Control Delay (s)	7.4	0	-	-	9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	14	502	9	12	925
Future Vol, veh/h	11	14	502	9	12	925
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	15	546	10	13	1005

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1582	551	0	0	556	0
Stage 1	551	-	-	-	-	-
Stage 2	1031	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	120	534	-	-	1015	-
Stage 1	577	-	-	-	-	-
Stage 2	344	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	117	534	-	-	1015	-
Mov Cap-2 Maneuver	117	-	-	-	-	-
Stage 1	577	-	-	-	-	-
Stage 2	334	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	24.9	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	208	1015	-
HCM Lane V/C Ratio	-	-	0.131	0.013	-
HCM Control Delay (s)	-	-	24.9	8.6	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0	-

Intersection	
Int Delay, s/veh	181.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	85	209	314	529	560	147
Future Vol, veh/h	85	209	314	529	560	147
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	14	2	2	2	2	2
Mvmt Flow	89	220	331	557	589	155

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1886	667	744	0	-	0
Stage 1	667	-	-	-	-	-
Stage 2	1219	-	-	-	-	-
Critical Hdwy	6.54	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.54	-	-	-	-	-
Critical Hdwy Stg 2	5.54	-	-	-	-	-
Follow-up Hdwy	3.626	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	~ 72	459	864	-	-	-
Stage 1	488	-	-	-	-	-
Stage 2	264	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 32	459	864	-	-	-
Mov Cap-2 Maneuver	~ 32	-	-	-	-	-
Stage 1	217	-	-	-	-	-
Stage 2	264	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, $	1127.2	4.4	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	864	-	94	-	-
HCM Lane V/C Ratio	0.383	-	3.292	-	-
HCM Control Delay (s)	11.7	$	1127.2	-	-
HCM Lane LOS	B	A	F	-	-
HCM 95th %tile Q(veh)	1.8	-	30.7	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	6.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	44	102	736	37	65	691
Future Vol, veh/h	44	102	736	37	65	691
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	4	2	2	2	2	2
Mvmt Flow	47	109	783	39	69	735

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1676	803	0	0	822	0
Stage 1	803	-	-	-	-	-
Stage 2	873	-	-	-	-	-
Critical Hdwy	6.44	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	104	383	-	-	807	-
Stage 1	437	-	-	-	-	-
Stage 2	405	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	89	383	-	-	807	-
Mov Cap-2 Maneuver	89	-	-	-	-	-
Stage 1	437	-	-	-	-	-
Stage 2	346	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	73.9	0	0.8
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	192	807	-
HCM Lane V/C Ratio	-	-	0.809	0.086	-
HCM Control Delay (s)	-	-	73.9	9.9	0
HCM Lane LOS	-	-	F	A	A
HCM 95th %tile Q(veh)	-	-	5.7	0.3	-

Intersection	
Int Delay, s/veh	0.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	10	830	11	11	758
Future Vol, veh/h	10	10	830	11	11	758
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	11	902	12	12	824

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1756	908	0	0	914	0
Stage 1	908	-	-	-	-	-
Stage 2	848	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	93	334	-	-	746	-
Stage 1	393	-	-	-	-	-
Stage 2	420	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	90	334	-	-	746	-
Mov Cap-2 Maneuver	90	-	-	-	-	-
Stage 1	393	-	-	-	-	-
Stage 2	407	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	34.9	0	0.1
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	142	746	-
HCM Lane V/C Ratio	-	-	0.153	0.016	-
HCM Control Delay (s)	-	-	34.9	9.9	0
HCM Lane LOS	-	-	D	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0	-

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	27	32	118	5	5	29
Future Vol, veh/h	27	32	118	5	5	29
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, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	29	35	128	5	5	32

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	133	0	-	0	224	131
Stage 1	-	-	-	-	131	-
Stage 2	-	-	-	-	93	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1452	-	-	-	764	919
Stage 1	-	-	-	-	895	-
Stage 2	-	-	-	-	931	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1452	-	-	-	749	919
Mov Cap-2 Maneuver	-	-	-	-	749	-
Stage 1	-	-	-	-	877	-
Stage 2	-	-	-	-	931	-

Approach	EB	WB	SB
HCM Control Delay, s	3.4	0	9.2
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1452	-	-	-	889
HCM Lane V/C Ratio	0.02	-	-	-	0.042
HCM Control Delay (s)	7.5	0	-	-	9.2
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	19	24	817	22	27	740
Future Vol, veh/h	19	24	817	22	27	740
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	26	888	24	29	804

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1762	900	0	0	912	0
Stage 1	900	-	-	-	-	-
Stage 2	862	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	93	337	-	-	747	-
Stage 1	397	-	-	-	-	-
Stage 2	414	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	86	337	-	-	747	-
Mov Cap-2 Maneuver	86	-	-	-	-	-
Stage 1	397	-	-	-	-	-
Stage 2	385	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	40.5	0	0.4
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	147	747	-
HCM Lane V/C Ratio	-	-	0.318	0.039	-
HCM Control Delay (s)	-	-	40.5	10	0
HCM Lane LOS	-	-	E	B	A
HCM 95th %tile Q(veh)	-	-	1.3	0.1	-

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	133	316	124	395	620	55
Future Volume (vph)	133	316	124	395	620	55
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	25.0	25.0	12.0	25.0	25.0	25.0
Total Split (s)	30.0	30.0	15.0	60.0	45.0	45.0
Total Split (%)	33.3%	33.3%	16.7%	66.7%	50.0%	50.0%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	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
Total Lost Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None	None	None	Min	Min	Min
Act Effct Green (s)	12.9	12.9	43.3	43.3	32.4	32.4
Actuated g/C Ratio	0.18	0.18	0.61	0.61	0.46	0.46
v/c Ratio	0.52	0.67	0.41	0.39	0.81	0.09
Control Delay	36.5	13.7	9.7	8.3	28.2	8.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.5	13.7	9.7	8.3	28.2	8.2
LOS	D	B	A	A	C	A
Approach Delay	20.5			8.7	26.6	
Approach LOS	C			A	C	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 71.2	
Natural Cycle: 75	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.81	
Intersection Signal Delay: 19.3	Intersection LOS: B
Intersection Capacity Utilization 64.4%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: US 377 & Bonnie Brae Street

Intersection	
Int Delay, s/veh	4.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	54	40	471	34	103	828
Future Vol, veh/h	54	40	471	34	103	828
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	100	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	3	5	4	2
Mvmt Flow	60	44	523	38	114	920

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1690	542	0	0	561	0
Stage 1	542	-	-	-	-	-
Stage 2	1148	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.14	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.236	-
Pot Cap-1 Maneuver	103	540	-	-	1000	-
Stage 1	583	-	-	-	-	-
Stage 2	302	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	91	540	-	-	1000	-
Mov Cap-2 Maneuver	91	-	-	-	-	-
Stage 1	583	-	-	-	-	-
Stage 2	268	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	63	0	1
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	91	540	1000	-
HCM Lane V/C Ratio	-	-	0.659	0.082	0.114	-
HCM Control Delay (s)	-	-	100.6	12.3	9.1	-
HCM Lane LOS	-	-	F	B	A	-
HCM 95th %tile Q(veh)	-	-	3.2	0.3	0.4	-

Intersection	
Int Delay, s/veh	0.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	14	502	9	12	925
Future Vol, veh/h	11	14	502	9	12	925
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	15	546	10	13	1005

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1582	551	0	0	556	0
Stage 1	551	-	-	-	-	-
Stage 2	1031	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	120	534	-	-	1015	-
Stage 1	577	-	-	-	-	-
Stage 2	344	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	118	534	-	-	1015	-
Mov Cap-2 Maneuver	118	-	-	-	-	-
Stage 1	577	-	-	-	-	-
Stage 2	340	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	23.8	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	118	534	1015	-
HCM Lane V/C Ratio	-	-	0.101	0.028	0.013	-
HCM Control Delay (s)	-	-	38.9	11.9	8.6	-
HCM Lane LOS	-	-	E	B	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0.1	0	-

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	85	209	314	529	560	147
Future Volume (vph)	85	209	314	529	560	147
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	25.0	25.0	12.0	25.0	25.0	25.0
Total Split (s)	30.0	30.0	15.0	60.0	45.0	45.0
Total Split (%)	33.3%	33.3%	16.7%	66.7%	50.0%	50.0%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	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
Total Lost Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None	None	None	Min	Min	Min
Act Effct Green (s)	9.3	9.3	41.1	41.1	25.7	25.7
Actuated g/C Ratio	0.14	0.14	0.63	0.63	0.40	0.40
v/c Ratio	0.39	0.53	0.82	0.47	0.80	0.23
Control Delay	32.9	9.8	27.1	7.8	26.1	6.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.9	9.8	27.1	7.8	26.1	6.7
LOS	C	A	C	A	C	A
Approach Delay	16.5			15.0	22.1	
Approach LOS	B			B	C	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 64.8	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.82	
Intersection Signal Delay: 17.9	Intersection LOS: B
Intersection Capacity Utilization 69.1%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: US 377 & Bonnie Brae Street

Intersection	
Int Delay, s/veh	3.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	44	102	736	37	65	691
Future Vol, veh/h	44	102	736	37	65	691
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	100	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	4	2	2	2	2	2
Mvmt Flow	47	109	783	39	69	735

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1676	803	0	0	822	0
Stage 1	803	-	-	-	-	-
Stage 2	873	-	-	-	-	-
Critical Hdwy	6.44	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	104	383	-	-	807	-
Stage 1	437	-	-	-	-	-
Stage 2	405	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	95	383	-	-	807	-
Mov Cap-2 Maneuver	95	-	-	-	-	-
Stage 1	437	-	-	-	-	-
Stage 2	370	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	35.3	0	0.8
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	95	383	807	-
HCM Lane V/C Ratio	-	-	0.493	0.283	0.086	-
HCM Control Delay (s)	-	-	75.1	18.1	9.9	-
HCM Lane LOS	-	-	F	C	A	-
HCM 95th %tile Q(veh)	-	-	2.1	1.1	0.3	-

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	19	24	817	22	27	740
Future Vol, veh/h	19	24	817	22	27	740
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	26	888	24	29	804

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1762	900	0	0	912	0
Stage 1	900	-	-	-	-	-
Stage 2	862	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	93	337	-	-	747	-
Stage 1	397	-	-	-	-	-
Stage 2	414	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	89	337	-	-	747	-
Mov Cap-2 Maneuver	89	-	-	-	-	-
Stage 1	397	-	-	-	-	-
Stage 2	398	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	34.6	0	0.4
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	89	337	747	-
HCM Lane V/C Ratio	-	-	0.232	0.077	0.039	-
HCM Control Delay (s)	-	-	57.3	16.6	10	-
HCM Lane LOS	-	-	F	C	B	-
HCM 95th %tile Q(veh)	-	-	0.8	0.2	0.1	-