SPECIAL USE EXCEPTION PETITION

CITY OF BALLWIN	}	FEE: with site plan review	$ 1,500.00
	}	without site plan review	$ 750.00
COUNTY OF ST. LOUIS	}	PAID:	✓
STATE OF MISSOURI	}	NUMBER:	SUE-2404

TO THE BOARD OF ALDERMEN
CITY OF BALLWIN

Type of Special Use Exception: Drive Thru

Code Section under which petition is being filed: Article XIV, Section 1, (26)

Now comes *(print name of Petitioner)* CAE Investments, Inc.
and states to the Board of Aldermen:

I. That he, she, it, they, has (have) the following legal interest in the tract of land and/or premises located within the corporate limits of Ballwin, Missouri, described in Section II of this petition.

A. State Legal Interest: Missouri

B. Documentation of Legal Interest must accompany this petition.

II. That the legal description of the property/premises, for which a Special Use Exception is desired, is enclosed.

III. That a survey or drawing of the property/premises, for which a Special Use Exception is requested, is enclosed, and said drawing is to a scale of 100 feet or less to the inch.

IV. That the street address of said property is: 15200 Manchester Rd.

V. That the area (acres or square feet) of said property is: 24,707 s.f.

VI. That the zoning classification of said property is: C-1 MRD Overlay

VII. That the present use of said property is: Vacant Lot

VIII. That the intended use of said property is: Drive Thru Coffee Shop - No Indoor Seating or public access.

IX. That the proposed Special Use Exception does not violate any private deed restrictions on said property.

X. That all information provided herein is true and a statement of fact.

I, the Petitioner, do hereby request an Ordinance of the Board of Aldermen approving and granting the herein described Special Use Exception.

PETITIONER: CAE Investments, Inc.

AUTHORIZED SIGNATURE: _____

AUTHORIZED SIGNATURE (*PRINTED*): Mako D. Kellman

ADDRESS: 1776 Montano Rd. NW. Suite 25

CITY/STATE/ZIP: Albuquerque, NM 87107

TELEPHONE NO. 505-450-2553 or 925-323-2263

I, (*print name of Petitioner*) CAE Investments, Inc., do hereby designate TWM Engineers as my agent for purposes of presenting this petition, negotiating with the City of Ballwin on all issues relative to this petition, and corresponding and communicating with representatives of the City of Ballwin relative to this petition.

AGENT'S SIGNATURE: _____

AGENT'S NAME (*PRINTED*): Eric L. Allmon

ADDRESS: 400 N. 5th Street, Suite 101

CITY/STATE/ZIP: St. Charles, MO 63301

TELEPHONE NO. 636-724-8300

Subscribed and sworn before me this 19th day of February, 20 24.

_____
Notary Public

My Commission Expires

Nov. 1, 2027

CARA SWANNE GEBELIN
Notary Public
State of New Mexico
Comm. # 2000780
My Comm. Exp. Nov 1, 2027

DEVELOPMENT PLAN APPROVAL PETITION

CITY OF BALLWIN }
}
COUNTY OF ST. LOUIS }
STATE OF MISSOURI }

FEE: $ 1,250.00

PAID: X

NUMBER: SUE-24-04

TO THE BOARD OF ALDERMEN
CITY OF BALLWIN

Type of Development Plan: Drive-Thru Coffee shop

Code Section under which Petition is being filed: Article XIIC Manchester Road Revitalization Overlay District Section 8 - Use Limitations

Now comes *(print name of Petitioner* Mako Kellman - Anvil Real Estate & Development, LLC and states to the Board of Aldermen:

I. That he, she, it, they, has (have) the following legal interest in the tract of land and/or premises located within the corporate limits of Ballwin, Missouri, described in Section II of this petition.

A. State Legal Interest: Owner/Developer

B. Documentation of Legal Interest must accompany this petition.

II. That the legal description of the property/premises, for which a subdivision plat is desired, is enclosed.

III. That a survey or drawing of the property/premises, for which a development plan approval is requested, is enclosed, and said drawing is to a scale of 100 feet or less to the inch.

IV. That the street address of said property is: 15200 Manchester Road

V. That the area (acres or square feet) of said property is: 1.24 acres (total)

VI. That the present zoning classification of said property is: C-1 MRD Overlay

VII. That the present use of said property is: Vacant lot

VIII. That the intended use of said property is: Drive-Thru Coffee Shop

IX. That the proposed development plan does not violate any private deed restrictions on said property.

X. That all information provided herein is true and a statement of fact.

I, the Petitioner, do hereby request an Ordinance of the Board of Aldermen approving and granting the herein requested Development Plan Approval.

PETITIONER: Anvil Real Estate & Development, LLC

AUTHORIZED SIGNATURE: _____

AUTHORIZED SIGNATURE (*PRINTED*): Mako Kellman

ADDRESS: 1776 Montano Rd. NW, Ste 25

CITY/STATE/ZIP: Albuquerque, NM 87017

TELEPHONE NO: 505-450-2553

E-MAIL: mkellman@swcp.com

I, (*print name of Petitioner*) Mako Kellman

do hereby designate Eric Allmon - TWM, Inc.

as my agent for purposes of presenting this petition, negotiating with the City of Ballwin on all issues relative to this petition, and corresponding and communicating with representatives of the City of Ballwin relative to this petition.

AGENT'S SIGNATURE: Mako Kellman

AGENT'S NAME (*PRINTED*): Mako Kellman

ADDRESS: 1776 Montano Rd. NW

CITY/STATE/ZIP: Albuquerque, NM 87107

TELEPHONE NO: 505-450-2553

E-MAIL: mkellman@swcp.com

Subscribed and sworn before me this 12th day of March, 20 24 .

Cara Gebelin

Notary Public Cara Gebelin

My Commission Expires

Nov 1, 2027

CARA SWANNE GEBELIN
Notary Public
State of New Mexico
Comm. # 2000780
My Comm. Exp. Nov 1, 2027

Petition Number: SUE-24-04

Petitioner: CAE Investments Inc.
1776 Montano Road Northwest, Suite 25
Albuquerque, New Mexico 87107

Requested action: Special Use Exception for a restaurant with a drive thru.

Project name: Dutch Bros Coffee

Location: 15200 Manchester Road

Existing Zoning: C-1 Commercial District

Surrounding Zoning & Use: North (across Manchester Rd)
C-1 Commercial District - Title Max & Enterprise
MRD Manchester Road Revitalization Overlay District - Dean Team Subaru & Volkswagen

East (across Old Ballwin Rd) MRD - Elco Cadillac

South - R-1 Single Family Dwelling District

West - C-1 McDonalds Restaurant

Figure 1 - Aerial view of the site and surrounding properties
Source: St Louis County GIS

Figure 2 - Street view of the site. The lot is proposed to be split from north to south

Project description:

This Petition is for a Special Use Exception for the construction of a coffee shop with drive thru and walk up facilities at 15200 Manchester Road. The property is located on the southwest corner of Manchester Road and Old Ballwin Road. The property is currently zoned MRD Manchester Road Revitalization District with C-1 Commercial District as the underlying zoning district. The properties to the north (across Manchester Road) are zoned C-1 and MRD. The property to the east (across Old Ballwin Road) is currently zoned MRD. The properties to the south are currently zoned R-1 Single Family Dwelling District and the property to the west is currently zoned C-1.

The purpose of the Manchester Road Revitalization District is to promote the local economy and mixed-use development within the Manchester Road corridor while simultaneously maintaining the functional capacity of the highway. The MRD encourages a wide range of well-planned, market sensitive commercial and mixed use development scenarios. The preferred land development pattern in the area will offer a pedestrian oriented development with a mix of residential and/or commercial uses that provide high quality services and amenities that prolong and enhance the shopping, working and living experience. Special effort should be given to tenant mixes and the configuration of tenant spaces to maximize convenience, visibility and aesthetics. The proposed development promotes pedestrian traffic by offering a walk up order window. The Petitioner is proposing a lot split (see SUB 24-01) leaving approximately 0.673 acre of the property vacant at this time, for future development.

Currently, there are two curb cuts on both Manchester Road and Old Ballwin Road onto this site. The easternmost curb cut on Manchester Road and the northernmost curb cut on Old Ballwin Road are proposed to be removed as part of this project. Cross access is required and shown on the plans, between the two proposed lots and the lot west of the site, currently occupied by McDonalds.

Staff analysis:

This Petition is for a Special Use Exception for the construction of a restaurant (coffee shop) with drive thru and walk up facilities at 15200 Manchester Road. The basis for this request is outlined in Appendix A, Article XIV, Section 1(20), which allows restaurants as a special use exception. In addition, requirements outlined in Appendix A, Article XIIB, Planned Overlay Districts (POD) and Article XIIC, Manchester Road Revitalization Overlay District (MRD) apply to this project.

In 2011, Petitions were approved to apply the MRD overlay to this property. As part of that approval, a site development plan for the development of a fifth-third bank was part of the approving ordinance. That development was never constructed. Now, for any new proposed development, an amended development plan is required to be incorporated into the ordinance. Should approval be granted, this plan must be recorded with the St. Louis County Recorder of Deeds' Office before any permits are issued for the project.

When reviewing a special use exception, the Planning & Zoning Commission and Board of Aldermen shall determine whether such use:

1. Will substantially increase traffic hazards or congestion.

Traffic poses a significant concern for the proposed development, especially considering the property's current undeveloped status, which will inevitably contribute to increased traffic volume. The developer's plan to mitigate this involves eliminating two out of the four existing curb cuts on Manchester Road and Old Ballwin Road in an effort to alleviate traffic hazards.

A traffic study was conducted, analyzing both current traffic conditions and those anticipated with the proposed development. The study found that the driveway access onto Old Ballwin Road functions efficiently, with delays averaging around ten seconds at most. However, the models for the Manchester Road driveway indicate much longer potential delays, with morning delays reaching nearly four minutes and evening delays approaching nine minutes.

According to the City's site development regulations, curb cuts are required to be a minimum of 500 feet apart, measured from centerline to centerline. The existing curb cuts are considered legally non-conforming (grandfathered) and are approximately 65 feet and 165 feet from McDonald's existing curb cut.

One potential solution to address these concerns is to redesign the development, removing the westernmost existing curb cut onto Manchester Road. Instead, vehicles could utilize the easternmost curb cut for left turns onto Manchester Road. Another option would involve utilizing the existing cross-access easement to the west, thereby integrating traffic flow with the McDonald's development. These alternatives aim to improve traffic efficiency and safety within the area.

2. Will adversely affect the character of the neighborhood.

The proposed development should not adversely affect the character of the neighborhood. The property is located at the intersection of Manchester Road and Old Ballwin Road.
Will adversely affect the general welfare of the community.
The proposed development should not adversely affect the welfare of the community.

3. Will overtax public utilities.

The proposed development should not overtax public utilities.

4. Will adversely affect public safety and health.

The proposed development should not adversely affect public safety and health.

5. Is consistent with good planning practice.

The proposed development would meet all current special use exception requirements and the Petitioner has addressed all aspects of the overlay district. The existing design of this site does not exhibit good planning practices. Traffic is a major concern for this type of development on this site.

6. Can be operated in a manner that is not detrimental to the permitted developments and uses in the district.

The proposed development could be detrimental to the permitted developments and uses in the district. Two high traffic restaurants with drive thru facilities in such close proximity could cause traffic hazards.

7. Can be developed and operated in a manner that is visually compatible with the permitted uses in the surrounding area.

The proposed development should be able to be operated in a manner that is visually compatible with the permitted uses in the surrounding area.

Staff recommendation:

Based on the information presented by the Petitioner and the traffic concerns raised, staff does not recommend approval of this Petition in its current form. It is advised that improvements to the site design be considered for further evaluation. Should the Petition be approved, it is recommended that the following conditions be included:

1. Approval of the Lot Split Petition (SUB 24-01).
2. Approval of the Amended Development Plan.
3. Acquisition of permits from the Metropolitan Sewer District (MSD) and the City of Ballwin prior to the commencement of any site work.
4. The Amended Development Plan must be recorded with the St. Louis County Recorder of Deeds' Office before any permits for the project are issued.
5. The curb cut on Manchester Road must be designated as "right in, right out."

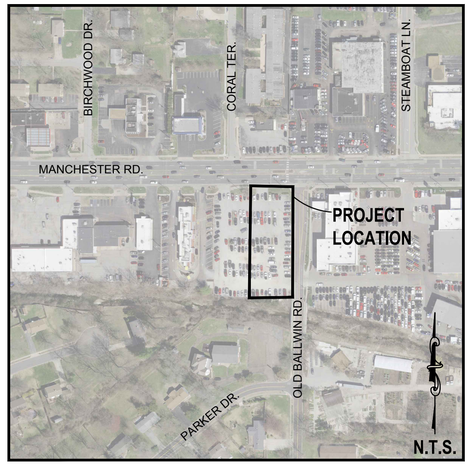
Submitted By: Lynn Sprick, City Planner

Date: May 6, 2024

DUTCH BROTHERS COFFEE

15200 MANCHESTER ROAD

BALLWIN, MISSOURI 63011



UTILITIES

WATER	MISSOURI AMERICAN	(314) 633-9000
SEWER	MSD	(314) 768-6272
ELECTRIC	AMEREN-MISSOURI	(314) 342-1000
GAS	SPIRE	(314) 621-6960
TELEPHONE	AT&T	(314) 655-0649
CABLE TV	CHARTER COMMUNICATIONS	(636) 387-6641
MISSOURI ONE-CALL		(800) DIG-RITE

ENGINEER

THOUVENOT, WADE & MOERCHEN, INC.
400 N. FIFTH ST., STE. 101
ST. CHARLES, MO 63301
636.724.8300
eallmon@twm-inc.com

OWNER'S NAME

ANVIL REAL ESTATE & DEVELOPMENT, LLC
MAKO KELLMAN
1776 MONTANO RD. NW, STE 25
ALBUQUERQUE, NM 87017
505.450.2553
mkellman@swcp.com

ABBREVIATIONS

AHEAD	AHD	PERMANENT	PERM.
ASPHALT	ASPH.	PAGE	PG.
ADJUST TO GRADE	ATG	PROFILE GRADE LINE	PGL
ADJUST TO GRADE BY OTHERS	ATGBO	POWER POLE	PP
BITUMINOUS	BIT.	PROPOSED	PR. OR PROP.
BACK	BK	PAVEMENT	PVMT.
BUILDING	BLDG.	RADIUS OR REMOVE	R
BACK OF CURB	BOC	REINFORCED CONCRETE PIPE	RCP
BEGINNING OF PROJECT	BOP	ROAD	RD
CENTER TO CENTER	C-C	REMOVED AND REPLACED	R&R
CONCRETE	CONC.	RIGHT OF WAY	R/W OR ROW
DO NOT DISTURB	DND	SIDEWALK	SDWK.
DRIVE	DR	SHOULDER	SHLDR.
EACH	EA.	STATION	STA.
ELEVATION	ELEV. OR EL.	STORM SEWER	STM
ENTRANCE	ENTR.	TEMPORARY CONSTRUCTION EASEMENT	T.C.E.
END OF PROJECT	EOP	TO BE ABANDONED	TBA
EDGE OF PAVEMENT	EOP	TO BE ABANDONED AND FILLED	TBA&F
EASEMENT	ESM'T.	TO BE REM'D AND REPLACED BY OTHERS	TBRBO
EXISTING	EX. OR EXIST.	TO BE REM'D AND RELOCATED (BY CONTRACTOR)	TBR+R
FACE OF CURB	FOC	TOP OF CURB	TC
FACE TO BASELINE	F-B	TEMPORARY	TEMP.
FACE TO CENTERLINE	F-C	TELEPHONE MANHOLE	TMH
FACE TO FACE	F-F	TYPICAL	TYP.
GAS VALVE	GV	UNDERDRAIN	U.D.
GATE POST	GP	USE IN PLACE	UIP
HYDRAULIC GRADE LINE	HGL	VITRIFIED CLAY PIPE	VCP
INFLOW	INF.	VERIFY IN THE FIELD	VIF
INVERT	INV.	WATER VALVE	WV
MANHOLE	MH	WATER METER	WM
MEET EXISTING	MIN.		
MINIMUM	MIN.		
NOT TO SCALE	NTS		
PROPOSED DRAINAGE EASEMENT	P.D.E.		

LEGEND

EX. CENTER LINE	
EX. EASEMENT	
EX. OVERHEAD ELECTRIC	OHE
EX. UNDERGROUND ELECTRIC	UE
EX. FENCE	X
EX. GAS LINE	G
EX. RIGHT-OF-WAY	
EX. SANITARY SEWER LINE	SAN
EX. SETBACK LINE	
EX. UNDERGROUND TELEPHONE	UT
EX. TREE LINE	
EX. WATER LINE	W
PR. FENCE	X

ITEM	EXISTING	PROPOSED
SIGNS		
TREES, GENERAL		
ELECTRIC BOX	E	E
ELECTRIC HANDHOLE		HH
LIGHT POLE		
POWER POLE		
SANITARY SEWER MANHOLE		
SEWER CLEANOUT		
INLET PROTECTION		IP
WATER VALVE	WV	WV
WATER METER	WM	WM
FIRE HYDRANT		
GAS VALVE	GV	GV
GAS METER	GM	GM
GAS MONITORING WELL		
TELEPHONE MANHOLE	T	T
TREES, SHRUBS OR BUSHES		

CONTROL POINT TABLE				
POINT NUMBER	NORTHING	EASTING	ELEVATION	DESCRIPTION
100	1004501.860	805002.306	586.74	SET IRON ROD WITH CAP
101	1004657.213	805006.060	588.93	CUT SQUARE ON LAMP POST BASE

NOTES:

SURVEY IS VALID ONLY TO ORIGINAL PURCHASER. IT IS NOT TRANSFERABLE TO ADDITIONAL INSTITUTIONS OR SUBSEQUENT OWNERS.

ALL BUILDINGS, SURFACE AND SUBSURFACE IMPROVEMENTS ON AND ADJACENT TO THE SITE ARE NOT NECESSARILY SHOWN.

BASIS OF BEARINGS AND COORDINATES: ALL DISTANCES AND COORDINATES ARE GROUND (GRID SCALED) VALUES, REFERENCED TO MISSOURI STATE PLANE COORDINATE SYSTEM, EAST ZONE 2401.

STATION: SEILER TREECOURT CORS ARP
CORS ID: MOSI
PID: DL3650
NORTHING: 302,843.569 (M)
EASTING: 253,367.387 (M)

TO CONVERT TO GRID, MULTIPLY BY A COMBINED SCALE FACTOR OF 0.99993347

LINEAR UNIT: US SURVEY FEET (SFT)
GEODETIC DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 88 (GEOID 12B)
PROJECT LOCATION:
LATITUDE: 38°35'32.45081"N NORTHING: 1004528.819 SFT
LONGITUDE: 90°33'11.81058"W EASTING: 804980.100 SFT
HEIGHT: 490.360 FT ELEV: 592.424 FT
CM SCALE FACTOR: 1.0000898104

STORMWATER MANAGEMENT FUTURE DISTURBANCE NOTE:

PROJECT DISTURBANCE = 0.809 ACRES
PROJECT RUNOFF DIFFERENTIAL = 0.276 CFS (DECREASE)

ANY FUTURE LAND DISTURBANCE AND/OR INCREASE IN IMPERVIOUS AREA ON THIS SITE MAY REQUIRE ADDITIONAL STORMWATER MANAGEMENT PER MSD REGULATIONS IN PLACE AT THAT TIME (INCLUDING TOTAL LAND DISTURBANCE AND/OR IMPERVIOUSNESS ADDED ON THIS PLAN.)

NO.	DRAWING TITLE
C100	COVER SHEET
C101	GENERAL NOTES
C200	EXISTING CONDITIONS & DEMOLITION PLAN
C300	SITE IMPROVEMENT PLAN
C400	UTILITY PLAN
~~C500~~	~~GRADING PLAN~~
~~C600~~	~~PRE-CONSTRUCTION DRAINAGE AREA MAP~~
~~C601~~	~~POST-CONSTRUCTION DRAINAGE AREA MAP~~
C700	PAVEMENT DETAILS - SHEET 1 OF 2
C701	PAVEMENT DETAILS - SHEET 2 OF 2
~~C800~~	~~SANITARY AND EROSION DETAILS~~
~~C801~~	~~STORM SEWER PROFILES~~

SITE ZONING -

C-1 MRD OVERLAY

SITE AREA CLASSIFICATIONS

LOT 1 AREA (DUTCH BROTHERS): 0.524 ACRES
LOT 2 AREA (FUTURE): 0.716 ACRES

F.E.M.A. CLASSIFICATION

FLOOD PLAIN MAP 29189C0283K, DATED 02-02-2015, SHOWS THAT NO PORTION OF SAID PROPERTY IS WITHIN A FLOOD PLAIN ZONE.

Call BEFORE you DIG
TOLL FREE
1-800-344-7483
MISSOURI ONE-CALL SYSTEM, INC.

WUNNENBERG MAP: 24DD-32
MSD MAP: 23S2
MSD No.: 24MSD-00077

TWM
CONSULTING ENGINEERING
GEOSPATIAL SERVICES
ILLINOIS: SWANSEA, COLUMBIA, GLEN CARBON, PEORIA, DECATUR
MISSOURI: ST. CHARLES, ST. LOUIS, COLUMBIA
TENNESSEE: NASHVILLE, CHATTANOOGA, ATHENS

THOUVENOT, WADE & MOERCHEN, INC.
WWW.TWM-INC.COM

PROF. LICENSE	NUMBER
IL. PROF. DESIGN FIRM	184-001220
IL. PROF. ENGR. CORP.	62-035370
IL. PROF. STR. ENGR. CORP.	81-005202
IL. PROF. LAND SURV. CORP.	048-000029
KS. PROF. ENGR. FACILITY	E-3256
MO. PROF. ENGR. CORP.	001528
MO. LAND SURVEYING CORP.	000346
TN. PROF. ENGR. FIRM	8974

SEAL

SIGNATURE: ERIC L. ALLMON
DATE SIGNED:
LICENSE EXPIRATION: 12/31/2025

ISSUED FOR PLANNING & ZONING
DATE OF ISSUANCE 05/01/2024

REV.	DATE	DESCRIPTION
1		
2		
3		
4		

DRAWN BY:	ELA
DESIGNED BY:	ELA
CHECKED BY:	NSG
APPROVED BY:	ELA
PROJECT NO:	230952

PROJECT:
MO0401_BALLWIN
DUTCH BROTHERS COFFEE
15200 MANCHESTER ROAD

TITLE:
COVER SHEET

C100

C:\Users\eallmon\AppData\Local\Temp\AcPublish_22480\C100_COVER SHEET.dwg Plotted By: eallmon

PROJECT CRITERIA

PRIOR TO COMMENCEMENT OF ANY WORK, OR ORDERING ANY MATERIALS, THE CONTRACTOR SHALL REVIEW ALL PLANS, SPECIFICATIONS, AND THE PROJECT SITE(S). THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING THE OWNER AND ENGINEER WHO PREPARED THE PLANS OF ANY DISCREPANCIES THAT MAY REQUIRE MODIFICATION TO THESE PLANS OR OF ANY FIELD CONFLICTS.

SHOULD IT APPEAR THAT THE WORK TO BE PERFORMED OR ANY MATTER RELATIVE THERETO IS NOT SUFFICIENTLY DETAILED OR EXPLAINED ON THE PLANS, THE CONTRACTOR SHALL CONTACT THE ENGINEER FOR SUCH FURTHER EXPLANATIONS AS MAY BE NECESSARY PRIOR TO COMMENCING WORK.

THESE PLANS AND SPECIFICATIONS ARE SUBJECT TO MODIFICATIONS DURING CONSTRUCTION WHEN CONDITIONS DEVELOP THAT WERE NOT APPARENT DURING THE DESIGN OF THE PLANS AND SPECIFICATIONS. ALL MODIFICATIONS MUST BE APPROVED BY ALL PERTINENT AGENCIES HAVING JURISDICTION OVER THIS PROJECT PRIOR TO CONSTRUCTION AN/OR IMPLEMENTATION OF PROPOSED CHANGES.

IN THE EVENT OF ANY DISCREPANCY BETWEEN ANY DRAWING OR ANY DRAWING AND SPECIFICATION AND FIGURES WRITTEN THEREON, THE CONTRACTOR SHALL NOTIFY ENGINEER FOR WRITTEN CLARIFICATION OF THE DISCREPANCY PRIOR TO COMMENCING THE WORK IN QUESTION. ONLY THOSE DIMENSIONS SHOWN ON THE DRAWINGS SHALL BE UTILIZED FOR DETERMINATION OF LOCATION AND SIZES OF PROPOSED IMPROVEMENTS. DO NOT SCALE DRAWINGS.

CONTRACTOR SAFETY RESPONSIBILITIES

THE CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, THE CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR PROJECT SITE(S) CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY. THIS REQUIREMENT SHALL BE MADE TO APPLY CONTINUOUSLY AND SHALL NOT BE LIMITED TO NORMAL WORKING HOURS. THE CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY AND HOLD THE OWNER AND DESIGN PROFESSIONAL HARMLESS OF ANY AND ALL LIABILITY, REAL, OR ALLEGED IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT.

TWM, INC. SHALL NOT BE RESPONSIBLE FOR OR HAVE CONTROL OVER CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES IN CONNECTION WITH THE WORK.

CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR PROVIDING AND INSTALLING ANY AND ALL TRAFFIC BARRICADES, MARKERS, SIGNS, FLAGMEN, TRAFFIC POLICE, AND/OR OTHER FACILITIES AS MAY BE REQUIRED BY THE VARIOUS JURISDICTIONS HAVING AUTHORITY OVER THIS PROJECT TO PROTECT THE GENERAL PUBLIC. SIGNS AND PROTECTIVE DEVICES SHALL CONFORM TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS. THE CONTRACTOR SHALL HAVE THE RESPONSIBILITY TO NOTIFY THE STATE AND LOCAL POLICE, EMERGENCY SERVICE AGENCIES, AMBULANCE SERVICES, AND FIRE DEPARTMENTS OF ANY PROPOSED TRAFFIC DIVERSIONS.

STRUCTURE ELEVATION REQUIREMENTS

MINIMUM FIRST FLOOR ELEVATION OF EACH BUILDING OR STRUCTURE SHALL BE EIGHTEEN (18) INCHES ABOVE THE STREET CENTERLINE ELEVATION. THIS ELEVATION SHALL BE MEASURED AT THE CENTER OF THE LOT FRONTAGE AND FOR CORNER LOTS THE HIGHEST ELEVATION STREET SHALL GOVERN. ALL DRIVEWAYS AT THE PROPERTY LINE SHALL BE A MINIMUM OF SIX (6) INCHES ABOVE THE STREET CENTERLINE ELEVATION. DRIVEWAY ELEVATIONS SHALL MATCH SIDEWALK GRADES AT THE BACK OF THE SIDEWALK LOCATION. CROSS SLOPES ON SIDEWALKS SHALL NOT EXCEED TWO (2) PERCENT.

SHOULD IT BE DIFFICULT TO CONFORM TO THESE REQUIREMENTS, OR SHOULD A WALK-OUT, OR PARTIALLY EXPOSED BASEMENT BE PROPOSED, THE LOT OWNER SHALL PRIOR TO CONSTRUCTION, RETAIN AND CONSULT WITH AN ENGINEER TO DETERMINE ALLOWABLE STRUCTURE ELEVATIONS TO PRECLUDE DAMAGE FROM STORM WATER.

UTILITIES

ANY RELOCATION OF PUBLIC OR PRIVATE UTILITIES SHALL BE UNDERTAKEN IN ACCORDANCE WITH ALL REQUIREMENTS OF THE UTILITY COMPANY AND WITH REGARD TO THE REQUIRED FEES, BONDS, PERMITS, AGREEMENTS, WORKING CONDITIONS, SAFETY CERTIFICATIONS, ETC. OF SAID COMPANY OR JURISDICTION. THE CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES AND JURISDICTIONS A MINIMUM OF 48 HOURS PRIOR TO COMMENCEMENT OF WORK TO ALLOW THE UTILITIES TO MARK THEIR SYSTEMS OR TO ALLOW THE PERTINENT JURISDICTIONS TIME TO COORDINATE THEIR STAFF, MATERIALS, AND EQUIPMENT TO CONDUCT INSPECTION.

ALL UTILITIES INCLUDING BUT NOT LIMITED TO FIRE HYDRANTS, VALVE PIT COVERS, VALVE BOXES, METER VAULTS, CURB STOP BOXES, FIRE OR POLICE CALL BOXES, TRAFFIC CONTROL SIGNALS OR OTHER UTILITY'S APPURTENANCES SHALL BE UN-OBSTRUCTED AND ACCESSIBLE DURING THE CONSTRUCTION PERIOD.

THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY AND ALL DAMAGE TO EXISTING OR INSTALLED UTILITIES OR STRUCTURES DURING CONSTRUCTION. THE CONTRACTOR SHALL CONTACT THE APPROPRIATE UTILITY OR JURISDICTION TO ENSURE APPROPRIATE REPAIR IS MADE IN ACCORDANCE WITH THE UTILITY OR JURISDICTIONS REQUIREMENTS. CONTRACTOR SHALL TAKE ALL PRECAUTIONS TO PROTECT EXISTING UTILITIES.

UTILITIES AND APPURTENANCES TO REMAIN IN THEIR PRESENT LOCATION SHALL BE ADJUSTED TO GRADE.

CONTRACTOR SHALL LOCATE AND DETERMINE SIZE OF EXISTING WATER SERVICE LINE TO DETERMINE IF IT CAN BE REUSED. CONTRACTOR IS RESPONSIBLE FOR COORDINATING NEW TAP WITH WATER COMPANY. CONNECTIONS SHALL BE MADE PER MISSOURI AMERICAN STANDARDS.

CONTRACTOR SHALL LOCATE EXISTING LATERAL DURING DEMOLITION AND REUSE THE CONNECTION TO THE SANITARY MAIN. CONNECTIONS SHALL BE MADE PER MSD STANDARDS.

TITLE / RIGHT-OF-WAY DISCLAIMER

TWM DOES NOT WARRANT THAT THESE DOCUMENTS CONTAIN COMPLETE INFORMATION REGARDING EASEMENTS, RESERVATIONS, RESTRICTIONS, RIGHT-OF-WAY BUILDING LINE SETBACKS AND OTHER ENCUMBRANCES. FOR COMPLETE INFORMATION, A CERTIFIED TITLE REPORT, OPINION, OR COMMITMENT FOR TITLE INSURANCE SHOULD BE OBTAINED AND THOROUGHLY REVIEWED.

UTILITY DISCLAIMER

THE TYPE, SIZE, AND LOCATION OF UTILITIES AS DELINEATED ON THESE DRAWINGS AND/OR CIVIL ENGINEERING DESIGN DOCUMENTS HAVE BEEN PROVIDED TO TWM BY KILLEEN STUDIO ARCHITECTS FROM A TOPOGRAPHIC SURVEY COMPLETED BY ALTEA, LLC. THE OWNER AND ENGINEER HAVE NOT UNDERTAKEN ANY EXPLORATORY INVESTIGATIONS TO CONFIRM OR VERIFY THE UTILITY LOCATION SHOWN ON THESE DOCUMENTS. THEREFORE, THE UTILITIES EXACT LOCATION, SIZE, TYPE, AND FUNCTION MUST BE CONSIDERED APPROXIMATE AND FIELD VERIFICATION OF UTILITIES BY THE CONTRACTOR MUST BE UNDERTAKEN.

THE OWNER AND ENGINEER FURTHER DO NOT WARRANT THAT ALL UTILITIES HAVE BEEN ILLUSTRATED ON THESE DOCUMENTS. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR CONTACTING MISSOURI ONE-CALL SYSTEM (MOCS) AND ALL NON-MEMBER MOCS UTILITIES THAT MAY BE AFFECTED BY CONSTRUCTION ACTIVITIES FOR FIELD VERIFICATION OF ALL UTILITIES ON THE SITE PRIOR TO CONSTRUCTION. IF THE CONTRACTOR DETERMINES THAT A SUBSTANTIAL DISCREPANCY EXISTS BETWEEN FIELD VERIFIED UTILITIES AND THOSE PRESENTED ON THESE PLANS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER FOR CLARIFICATION AND PROJECT DIRECTION.

GENERAL PROJECT SPECIFICATIONS

ALL WORK, INSTALLATION, PROCEDURES, MATERIALS, AND TESTING SHALL CONFORM TO THE FOLLOWING:

- *THE CITY OF BALLWIN, MISSOURI MUNICIPAL CODE, LATEST EDITION*
- *ST. LOUIS COUNTY SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, LATEST EDITION*
- *ST. LOUIS COUNTY DEPARTMENT OF TRANSPORTATION STANDARD DRAWINGS, LATEST EDITION*
- *MSD STANDARD CONSTRUCTION SPECIFICATIONS FOR SEWERS AND DRAINAGE FACILITIES, 2009*
- *MSD RULES REGULATIONS AND ENGINEERING DESIGN REQUIREMENTS FOR SANITARY SEWER AND STORMWATER DRAINAGE FACILITIES*

TO THE EXTENT IN WHICH ANY INCONSISTENCIES, OR DISCREPANCIES EXIST BETWEEN THE LISTED SPECIFICATION, STANDARD, CODES, OR GUIDELINES BY GOVERNING BODIES AND/OR THESE PLANS AND SPECIFICATIONS, THE MOST STRINGENT SPECIFICATION AND/OR STANDARD SHALL BE BINDING AND APPLICABLE.

THE CONTRACTOR IS RESPONSIBLE FOR CONFORMING TO ALL MDNR STORM WATER PERMIT REQUIREMENTS FOR CONSTRUCTION SITE ACTIVITIES, AND THE STORM WATER POLLUTION PREVENTION PLAN FOR THE PROJECT SITE.

WHERE SECTION OR SUB-SECTION SURVEY MONUMENTS ARE ENCOUNTERED, THE CONTRACTOR SHALL PROTECT AND CAREFULLY PRESERVE ALL PROPERTY MARKERS AND MONUMENTS UNTIL THE OWNER AND AUTHORIZED SURVEYING AGENT HAVE WITNESSED OR OTHERWISE REFERENCED THEIR LOCATION.

ALL ABANDONED UNDERGROUND STRUCTURES ENCOUNTERED SHALL BE REMOVED TO SUFFICIENT DEPTH TO ENABLE THE PERTINENT UTILITIES TO BE CONSTRUCTED.

ALL ITEMS DESIGNATED FOR REMOVAL SHALL BE DISPOSED OF OFF-SITE BY THE CONTRACTOR IN COMPLIANCE WITH ALL CITY, STATE, AND FEDERAL ENVIRONMENTAL REGULATIONS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO REMOVE FROM THE SITE ANY AND ALL CONSTRUCTION MATERIALS AND DEBRIS RESULTING FROM THE CONSTRUCTION OPERATIONS.

ALL WORK, MATERIALS, AND INSTALLATION SHALL NOT BE DEEMED SATISFACTORY UNTIL SUCH TIME THAT APPROVAL IS OBTAINED FROM THE AGENCY HAVING JURISDICTION OVER THE PROJECT.

THE CONTRACTOR SHALL PROCEED AT HIS OWN RISK IN PERFORMING ANY WORK PRIOR TO VERIFYING OR RECEIVING ALL NECESSARY PERMITS.

MSD NOTES

BACKWATER VALVE NOTE:
A BACKWATER VALVE SHALL BE REQUIRED ON ALL BUILDING LATERALS PER LOCAL PLUMBING CODE.
CONSTRUCTION SITE RUNOFF:
CONSTRUCTION SITE RUNOFF SHALL NOT FLOW INTO BMP AREAS. ALL STORMWATER FLOW TO BMP AREAS SHALL BE DIVERTED, PLUGGED OR DISCONNECTED UNTIL THE CONSTRUCTION SITE IS STABLE AND THE MSD INSPECTOR PROVIDES APPROVAL TO PLACE THE BMP ON-LINE
DETAIL DRAWINGS:
THE DETAIL DRAWINGS SHOWN HERE ARE ONLY FOR PRIVATE CONSTRUCTION THAT IS NOT UNDER MSD PERMITS. REFER TO MSD SPECIFICATIONS AND STANDARD DETAILS FOR PUBLIC SEWER CONSTRUCTION OR PRIVATE CONSTRUCTION UNDER MSD PERMITS.
INFILTRATION BED:
TO PREVENT CONSTRUCTION SEDIMENT FROM CLOGGING INFILTRATION BED, AT NO TIME MAY CONSTRUCTION SEDIMENT ENTER THESE FACILITIES. ADDITIONALLY, THESE FACILITIES SHALL NOT BE CONSTRUCTED UNTIL ALL SURROUNDING AREA THAT DRAINS TO THEM IS FULLY STABLE/ESTABLISHED.
INFILTRATION TESTING - FOR WHEN UTILIZING ONSITE SOILS AND/OR MIXING ONSITE FOR PLANTING SOIL:
THE IN-PLACE PERMEABILITY OF THE PLANTING SOIL SHALL BE 2.0 TO 3.5 FT/DAY, AND VERIFIED BY AND INFILTRATION TEST PERFORMED PER THE MARYLAND STORMWATER MANUAL, APPENDIX D.1, "INFILTRATION TESTING REQUIREMENTS (FIELD TESTING REQUIRED)". A MINIMUM OF ONE PERCOLATION TEST SHALL BE PERFORMED PER FACILITY. THE MSD FIELD INSPECTOR SHALL BE ALLOWED TO SELECT THE LOCATION OF PERCOLATION TESTS. THE MSD FIELD INSPECTOR SHALL BE PROVIDED A COPY OF ALL TEST RESULTS, SIGNED AND SEALED BY A MISSOURI PROFESSIONAL ENGINEER. TEST RESULTS SHALL REPORT IN UNITS OF FT/DAY. RESULTS SHALL DEMONSTRATE ACCEPTABLE PERMEABILITY PRIOR TO CONSTRUCTION APPROVAL. NOTE THESE TESTS ARE NOT REQUIRED IF UTILIZING PREMIXED PLANTING SOIL SUPPLIED BY A LOCAL MSD APPROVED SOILS SUPPLIER.

MSD NOTES CONT:

LIMITS OF DISTURBANCE:
THE CONTRACTOR SHALL STAY WITHIN THE LIMITS OF DISTURBANCE AS SHOWN ON THE PLANS AND MINIMIZE DISTURBANCE WITHIN THE WORK AREA WHEREVER POSSIBLE.

SANITARY LATERALS:
LATERALS TO BE 6-INCH PVC AND CONSTRUCTED AT 2.0% MINIMUM SLOPE.

SEDIMENTATION BASIN - TEMPORARY:
DURING CONSTRUCTION; IF SITE RUNOFF FLOWS INTO A TEMPORARY SEDIMENT BASIN THAT WILL BE CONVERTED TO A PERMANENT BMP AREA, THEN AFTER THE TRIBUTARY AREA IS COMPLETELY STABLE THE SEDIMENT BASIN WILL NEED TO BE CLEANED OF ALL SILT, SEDIMENT, AND TRASH THAT HAS ACCUMULATED WITHIN IT. OVER EXCAVATE AS NEEDED TO ALLOW FULL DEPTH OF THE BMP SECTION. BMP PLANTING, IF APPLICABLE, CAN BE INSTALLED ONLY AFTER THIS HAS BEEN DONE AND THE MSD INSPECTOR PROVIDES APPROVAL TO PLACE THE PLANTINGS.

SHOP DRAWINGS FOR BMPS:
MSD SHOP DRAWING SUBMITTAL REQUIRED FOR BMP AND ITS COMPONENTS PRIOR TO CONSTRUCTION.
MSD CONTACT: PLEASE CONTACT THE DISTRICT'S CONSTRUCTION MANAGEMENT DIVISION AT (314) 335-2072 FOR QUESTIONS.

STANDARD CONSTRUCTION:
ALL STORM AND SANITARY SEWER STRUCTURES AND APPURTENANCES TO BE DEDICATED TO MSD, OR TO BE PRIVATE UNDER MSD INSPECTION, SHALL CONFORM TO THE METROPOLITAN ST. LOUIS SEWER DISTRICT, STANDARD CONSTRUCTION SPECIFICATIONS FOR SEWERS AND DRAINAGE FACILITIES, 2009. THAT WILL INCLUDE STANDARD DETAILS SHOWN THEREIN, AND SHALL INCLUDE ALL SUBSEQUENT CHANGES MADE THERETO.

SOME RECENT CHANGES CONCERN PLASTIC PIPE MATERIALS AND PIPE FIELD TESTING AND PERFORMANCE, AND INCLUDE THE FOLLOWING:

PART 2 - MATERIALS OF CONSTRUCTION

HIGH DENSITY POLYETHYLENE (HDPE) PIPE IS NOT ALLOWED FOR GRAVITY SEWERS FOR STORM, COMBINED, OR SANITARY SEWERS THAT ARE "PUBLIC" OR "PRIVATE UNDER MSD INSPECTION".

POLYPROPYLENE (PP) PIPE IS ALLOWED AS FOLLOWS FOR GRAVITY SEWERS THAT ARE "PUBLIC" OR "PRIVATE UNDER MSD INSPECTION:

FOR USE IN SANITARY AND COMBINED SEWERS 12 TO 60 INCHES IN DIAMETER IT SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2764 "STANDARD SPECIFICATION FOR 6 TO 60 IN. POLYPROPYLENE (PP) CORRUGATED DOUBLE AND TRIPLE WALL PIPE AND FITTINGS FOR NON- PRESSURE SANITARY SEWER APPLICATIONS."
FOR USE IN STORM SEWERS 12 TO 24 INCHES IN DIAMETER IT SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2881 "STANDARD SPECIFICATION FOR 12 TO 60 IN. POLYPROPYLENE (PP) DUAL WALL PIPE AND FITTINGS FOR NON-PRESSURE STORM SEWER APPLICATIONS;" OR
FOR USE IN STORM SEWERS 12 TO 60 INCHES IN DIAMETER IT SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2764 "STANDARD SPECIFICATION FOR 6 TO 60 IN. POLYPROPYLENE (PP) CORRUGATED DOUBLE AND TRIPLE WALL PIPE AND FITTINGS FOR NON- PRESSURE SANITARY SEWER APPLICATIONS."

PART 4 - PIPE SEWER CONSTRUCTION

SECTION B, PIPE FIELD TESTS, PARAGRAPH 2, REACH INTEGRITY TESTING - DELETE THE FIRST SENTENCE AND THE FOLLOWING REPLACEMENT APPLIES:

ALL SANITARY AND COMBINED SEWERS SHALL SUSTAIN A MAXIMUM LEAKAGE LIMIT OF 100 GALLONS/INCH OF PIPE DIAMETER/MILE OF LINE/DAY, AS REQUIRED BY THE MISSOURI DEPARTMENT OF NATURAL RESOURCES SPECIFICATIONS.

SECTION B, PIPE FIELD TESTS, PARAGRAPH 2, REACH INTEGRITY TESTING, SUBPARAGRAPH C, INFILTRATION/EXFILTRATION TESTING - DELETE THE SIXTH SENTENCE, CONCERNING LEAKAGE LIMITS, AND THE FOLLOWING REPLACEMENT APPLIES:

THE MEASUREMENT OF LEAKAGE SHALL NOT EXCEED 100 GALLONS/INCH OF PIPE DIAMETER/MILE OF LINE/DAY, AS REQUIRED BY THE MISSOURI DEPARTMENT OF NATURAL RESOURCES SPECIFICATIONS.

SECTION B, PIPE FIELD TESTS, PARAGRAPH 4, MANHOLE TESTING, SUBPARAGRAPH A, VACUUM TESTING - AFTER THE FIRST SENTENCE, THE FOLLOWING ADDITION APPLIES:

THE VACUUM TEST MUST BE PERFORMED PRIOR TO BACKFILLING AROUND THE MANHOLE UNLESS THE CONTRACTOR PROVIDES DOCUMENTATION FROM THE PRECAST MANHOLE MANUFACTURER STATING THAT THE MANHOLE MAY BE VACUUM TESTED AFTER BACKFILLING HAS TAKEN PLACE. THE CONTRACTOR MUST SUBMIT THIS DOCUMENTATION PRIOR TO BACKFILLING AROUND ANY MANHOLE.
SECTION B, PIPE FIELD TESTS, PARAGRAPH 4, MANHOLE TESTING, SUBPARAGRAPH B, EXFILTRATION TESTING - DELETE THE SECOND SENTENCE, CONCERNING LEAKAGE LIMITS, AND THE FOLLOWING ADDITION APPLIES:

FOR EXFILTRATION TESTING, THE ALLOWABLE LEAKAGE LIMIT IS 100 GALLONS/INCH OF PIPE DIAMETER/MILE OF LINE/DAY WHEN THE AVERAGE HEAD ON THE TEST SECTION IS THREE FEET (3') OR LESS.

IF REINFORCED CONCRETE PIPE IS USED FOR SANITARY OR COMBINED SEWERS LARGER THAN 27", ALL PIPE AND JOINTS SHALL CONFORM TO ASTM C 361. IN ADDITION, IF THE DIAMETER IS LARGER THAN 48", THE JOINT TYPE MUST INCLUDE A GASKET THAT IS CONFINED IN A GROOVE IN THE SPIGOT OF THE PIPE.

CONTRACTOR'S INSURANCE (OFFSITE)

PRIOR TO OBTAINING A CONSTRUCTION PERMIT FROM THE METROPOLITAN ST. LOUIS SEWER DISTRICT, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE THE DISTRICT WITH A COPY OF AN EXECUTED CERTIFICATE OF INSURANCE INDICATING THAT THE PERMITTEE HAS OBTAINED AND WILL CONTINUE TO CARRY COMMERCIAL GENERAL LIABILITY AND COMPREHENSIVE AUTO LIABILITY INSURANCE. THE REQUIREMENTS AND LIMITS SHALL BE AS STATED IN THE "RULES AND REGULATIONS AND ENGINEERING DESIGN REQUIREMENTS FOR SANITARY AND STORMWATER DRAINAGE FACILITY", SECTION 10.090 (ADDENDUM)

EARTHWORK NOTES

ANY EARTHWORK NECESSARY TO COMPLETE THE PROJECT, AS SHOWN IN THE PLANS, SHALL BE INCLUDED IN THE COST OF THE PROJECT AND WILL NOT BE MEASURED FOR SEPARATE PAYMENT. EARTHWORK SHALL INCLUDE, BUT NOT LIMITED TO EARTH EXCAVATION, FURNISHED EXCAVATION AND FINAL GRADING AND SHAPING.

ALL EXISTING VEGETATION AND TOPSOIL SHALL BE REMOVED FROM PLANNED CONSTRUCTION AREAS PRIOR TO PLACEMENT OF FILL. TOPSOIL THICKNESS VARIES OVER THE SITE AND WILL REQUIRE REMOVAL IN FILL AREAS.

ALL TOPSOIL REMOVED PRIOR TO BULK EARTH GRADING SHALL BE SPREAD EVENLY OVER THE LOT TO MEET THE FINAL GRADE PRIOR TO CONCLUDING EARTHWORK OPERATIONS.

DEWATERING OF AREAS TO BE EXCAVATED OR FILLED SHALL BE INCIDENTAL TO THE CONTRACT AND IS THE RESPONSIBILITY OF THE CONTRACTOR.

ALL TRENCH EXCAVATION FOR ALL UTILITIES WITHIN TWO (2) FEET OF ANY PAVEMENT SURFACE SHALL BE BACKFILLED WITH 100% MSD-1 BACKFILL COMPACTED TO 95% COMPACTION.

FILL AREAS BELOW FOOTINGS SHALL BE PLACED TO 98% OF THE MATERIAL'S STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D698). FILL AREAS BELOW SLABS AND PAVEMENT SHALL BE PLACED TO 95% OF THE MATERIAL'S STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D698). FILL AREAS IN UNSURFACED AREAS SHALL BE PLACED TO 95% OF THE MATERIAL'S STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D698).

COMPACTION TESTS ARE TO BE TAKEN IN BUILDABLE AREAS THE SITE. COMPACTION TESTS ARE REQUIRED FOR EACH FILL LIFT. NO LIFT TO EXCEED 12" IN DEPTH. ALL TESTING REPORTS SHALL BE SUBMITTED TO THE OWNER AND CONSTRUCTION INSPECTOR FOR REVIEW AND APPROVAL.

ALL EROSION CONTROL WORK SHALL BE DONE IN ACCORDANCE WITH THE PLANS.

MAXIMUM FILL SLOPES SHALL NOT EXCEED 3:1. EROSION CONTROL MEASURES SHOULD BE CONSIDERED ALONG THE FACE OF EACH SLOPE. EROSION CONTROL MEASURES TYPICALLY EMPLOYED WOULD INCLUDE SILT FENCES; DITCH CHECKS AND TIMELY SEEDING OR SODDING.

PERIMETER SILT FENCE SHALL BE INSTALLED AS DETAILED IN THE IMPROVEMENT PLANS PRIOR TO INITIAL LAND DISTURBANCE ACTIVITIES OR AS SOON AS PRACTICAL. CONTRACTOR SHALL MAINTAIN A THREE FOOT BUFFER STRIP OF EXISTING VEGETATION BETWEEN ANY DISTURBED AREA AND THE SILT FENCE AROUND THE PERIMETER OF THE SITE TO REDUCE OFF-SITE EROSION AND SEDIMENTATION.

CONTRACTOR SHALL USE STAGED CLEARING AND GRADING WHERE PRACTICAL TO REDUCE THE AMOUNT OF DISTURBED AREA TO THE ABSOLUTE MINIMUM NEEDED FOR IMMEDIATE CONSTRUCTION ACTIVITIES.

EXCEPT AS PREVENTED BY INCLEMENT WEATHER CONDITIONS, STABILIZING MEASURES, SUCH AS TEMPORARY SEEDING OR PERMANENT VEGETATION, SODDING, MULCHING, SEDIMENT BASINS, EROSION CONTROL BLANKETS, OR OTHER SPECIFIED PROTECTIVE PRACTICES SHALL BE INSTALLED ON ALL DISTURBED AREAS LEFT INACTIVE FOR SEVEN DAYS.

CONTRACTOR SHALL NOTIFY THE ENGINEER/PROJECT MANAGER OF THE INDIVIDUAL WHO IS RESPONSIBLE FOR THE ROUTINE DAILY INSPECTION/MAINTENANCE CHECKS OF ALL EROSION AND SEDIMENT CONTROL MEASURES. THE CONTRACTOR ON A DAILY BASIS SHALL CHECK ALL EROSION AND SEDIMENT CONTROL MEASURES DURING THE PERIOD OF CONSTRUCTION ACTIVITY, AND AFTER EACH STORM EVENT.

REPAIRS OR CLEANING OF EACH EROSION CONTROL DEVICE SHALL BE A REQUIRED IN ORDER TO MAINTAIN THE EFFECTIVENESS OF THE CONTROL DEVICE. ALL EROSION CONTROL DEVICES SHALL BE CLEANED WHEN ONE-HALF OF THEIR EFFECTIVE AREA IS COVERED.

ALL EROSION CONTROL AND SEDIMENTATION CONTROL MEASURES DETAILED ON THE IMPROVEMENT PLANS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO INSTALL AND MAINTAIN. THE MAINTENANCE OF THESE EROSION CONTROL AND SEDIMENTATION CONTROL MEASURES SHALL BE CONSIDERED INCIDENTAL TO THE DEVICES THEMSELVES. MAINTENANCE SHALL CONTINUE TO BE THE RESPONSIBILITY OF THE CONTRACTOR UNTIL THE OWNER TAKES OWNERSHIP OF THE IMPROVEMENTS.

AT THE COMPLETION OF CONSTRUCTION AND THE AREA STABILIZED, THE CONTRACTOR SHALL REMOVE EROSION CONTROL MEASURES NO LONGER NEEDED IN A MANNER THAT MINIMIZES SITE DISTURBANCE, AND SEED IMMEDIATELY OR COORDINATE THE TRANSFER OF MAINTENANCE RESPONSIBILITIES, AS REQUIRED WITH THE OWNER.

ALL EROSION CONTROL PRODUCTS FURNISHED SHALL BE SPECIFICALLY RECOMMENDED BY THE MANUFACTURER FOR THE USE SPECIFIED IN THE EROSION CONTROL PLAN, PRIOR TO APPROVAL AND USE OF THE PRODUCT. THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER A NOTARIZED CERTIFICATE BY THE PRODUCER STATING THE INTENDED USE OF THE PRODUCT AND THAT THE PHYSICAL PROPERTIES REQUIRED FOR THIS APPLICATION ARE MET OR EXCEEDED. THE CONTRACTOR SHALL PROVIDE A COPY OF THE MANUFACTURER'S RECOMMENDED INSTALLATION PROCEDURES TO FACILITATE THE ENGINEER IN CONSTRUCTION INSPECTION.

WUNNENBERG MAP: 24DD-32
MSD MAP: 23S2
MSD No.: 24MSD-00077

TWM
CONSULTING ENGINEERING
GEOSPATIAL SERVICES
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THOUVENOT, WADE & MOERCHEN, INC.

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IL. PROF. STR. ENGR. CORP.	81-005202
IL. PROF. LAND SURV. CORP.	048-000029
KS. PROF. ENGR. FACILITY	E-3256
MO. PROF. ENGR. CORP.	001528
MO. LAND SURVEYING CORP.	000346
TN. PROF. ENGR. FIRM	8974

SEAL

SIGNATURE: ERIC L. ALLMON
DATE SIGNED:
LICENSE EXPIRATION: 12/31/2025

ISSUED FOR PLANNING & ZONING
DATE OF ISSUANCE 05/01/2024

REV.	DATE	DESCRIPTION
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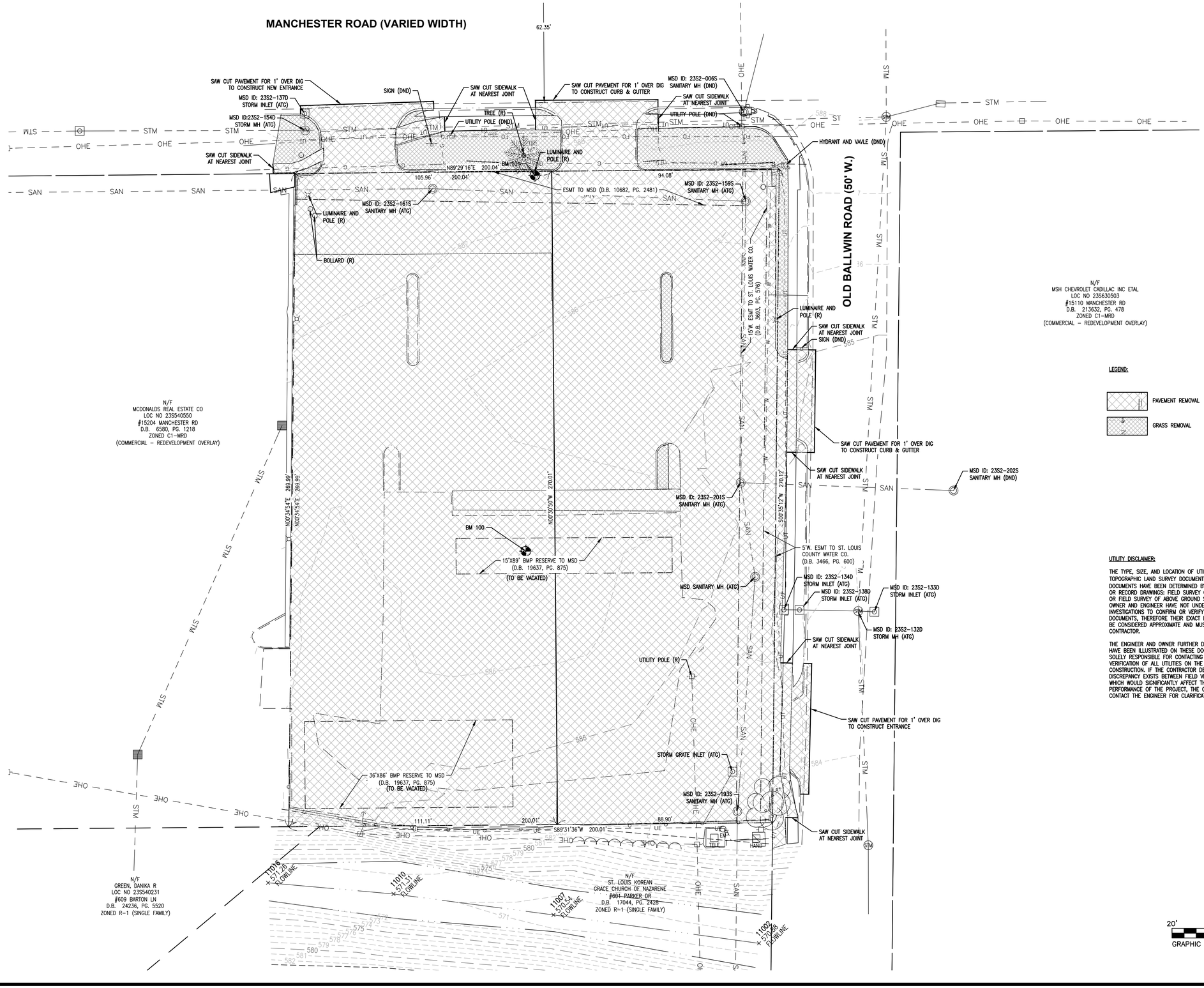
DRAWN BY:	ELA
DESIGNED BY:	ELA
CHECKED BY:	NSG
APPROVED BY:	ELA
PROJECT NO:	230952

PROJECT:
MO0401_BALLWIN
DUTCH BROTHERS COFFEE
15200 MANCHESTER ROAD

TITLE:
GENERAL NOTES

C101



WUNNENBERG MAP: 24DD-32
MSD MAP: 23S2
MSD No.: 24MSD-00077

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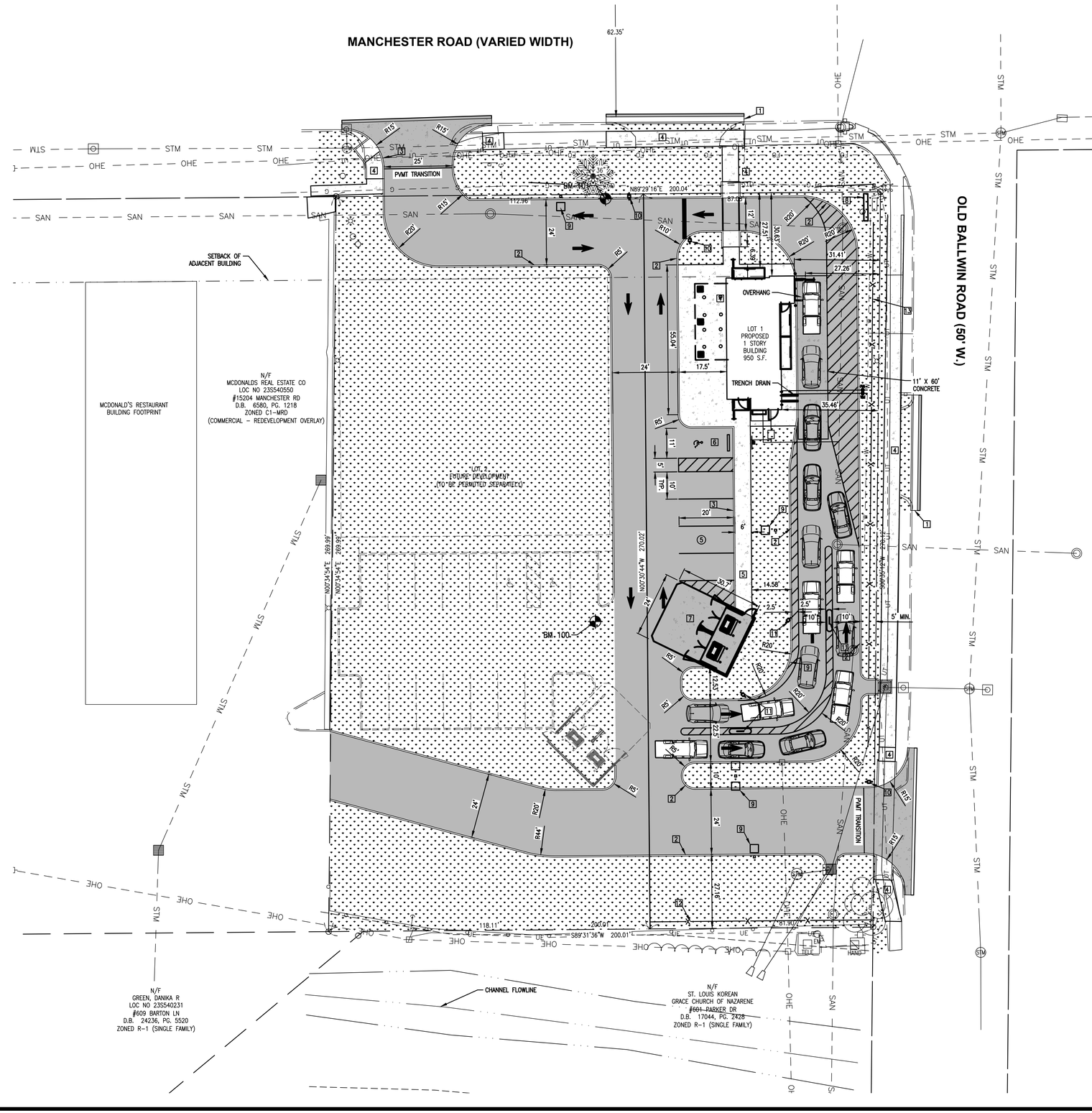
PROJECT:
MO0401_BALLWIN
DUTCH BROTHERS COFFEE
15200 MANCHESTER ROAD

TITLE:
EXISTING CONDITIONS AND DEMO SHEET

C200



P:\2023\230952\4 CADD - DWG\4-1 Comm\Sheets\C300_SITE PLAN.dwg Plotted By: eallmon

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ELEV=586.74

BENCHMARK #101
N: 1004657.213
E: 805006.060
ELEV=588.93

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GENERAL NOTES:

1. SEE ARCHITECTURAL PLANS FOR STRUCTURAL DESIGN OF BUILDING, TRASH ENCLOSURE, AND SIGN.
2. ALL WALKWAYS ARE TO BE CONSTRUCTED TO CURRENT ADAAG STANDARDS.
3. ALL DIMENSIONS ARE SHOWN TO FACE OF CURB UNLESS OTHERWISE NOTED.

KEYED NOTES:

1. 2.5' CURB AND GUTTER
2. BARRIER CURB
3. TRANSITION CURB (SEE GRADING PLAN)
4. 6' CONCRETE SIDEWALK
5. CONCRETE SIDEWALK WITH TURNDOWN CURB
6. VAN ACCESSIBLE ADA SPACE AND SIGN (SEE DETAILS)
7. DUMPSTER ENCLOSURE (SEE ARCHITECTURAL PLANS FOR DETAILS)
8. MONUMENT SIGN - TO BE PERMITTED SEPARATELY
9. POLE MOUNTED LUMINAIRE - SEE LIGHTING DIAGRAM
10. DIRECTIONAL SIGN - TO BE PERMITTED SEPARATELY
11. MENU SIGN - TO BE PERMITTED SEPARATELY
12. 6' VINYL SITE PROOF FENCE
13. METAL ORNAMENTAL FENCE

SITE CALCULATIONS / NOTES

BUILDING S.F.	950 S.F. BUILDING TOTAL
PARKING REQUIRED	1 PER 200 S.F. 5 SPACES REQUIRED
PARKING PROVIDED	5 INCLUDING 1 ADA SPACE
ALL SPACES ARE 10' X 20'	

LEGEND:

- HMA PAVEMENT
- PCC PAVEMENT
- PCC SIDEWALK
- SOD
- NUMBER OF PARKING SPACES

WUNNENBERG MAP: 24DD-32
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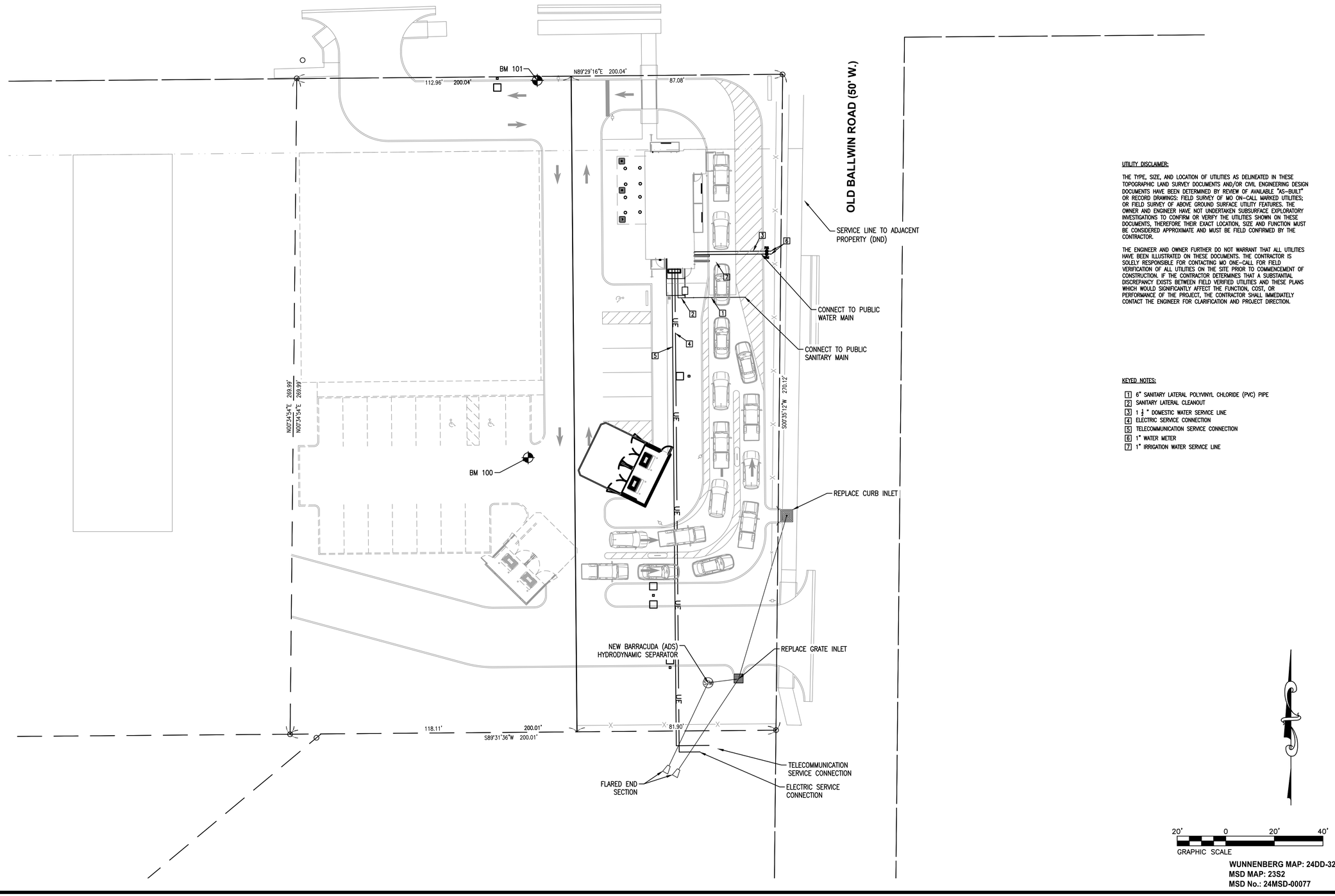
PROJECT:

MO0401_BALLWIN
DUTCH BROTHERS COFFEE
15200 MANCHESTER ROAD

TITLE:

SITE IMPROVEMENT PLAN

C300



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THE ENGINEER AND OWNER FURTHER DO NOT WARRANT THAT ALL UTILITIES HAVE BEEN ILLUSTRATED ON THESE DOCUMENTS. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR CONTACTING MO ONE-CALL FOR FIELD VERIFICATION OF ALL UTILITIES ON THE SITE PRIOR TO COMMENCEMENT OF CONSTRUCTION. IF THE CONTRACTOR DETERMINES THAT A SUBSTANTIAL DISCREPANCY EXISTS BETWEEN FIELD VERIFIED UTILITIES AND THESE PLANS WHICH WOULD SIGNIFICANTLY AFFECT THE FUNCTION, COST, OR PERFORMANCE OF THE PROJECT, THE CONTRACTOR SHALL IMMEDIATELY CONTACT THE ENGINEER FOR CLARIFICATION AND PROJECT DIRECTION.

KEYED NOTES:

1. 6" SANITARY LATERAL POLYVINYL CHLORIDE (PVC) PIPE
2. SANITARY LATERAL CLEANOUT
3. 1 ½" DOMESTIC WATER SERVICE LINE
4. ELECTRIC SERVICE CONNECTION
5. TELECOMMUNICATION SERVICE CONNECTION
6. 1" WATER METER
7. 1" IRRIGATION WATER SERVICE LINE

20' 0 20' 40'
GRAPHIC SCALE

WUNNENBERG MAP: 24DD-32
MSD MAP: 23S2
MSD No.: 24MSD-00077

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PROJECT NO:	230952

PROJECT:

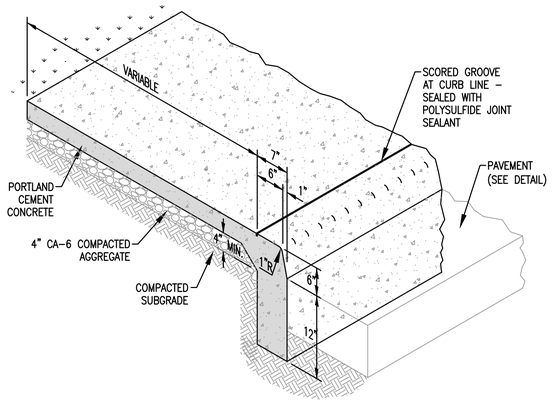
MO0401_BALLWIN
DUTCH BROTHERS COFFEE
15200 MANCHESTER ROAD

TITLE:

UTILITY PLAN

C400

P:\2023\230952\4 CADD - DWG\4.1 Comm\Sheets\C400_UTILITY PLAN.dwg Plotted By: eallmon

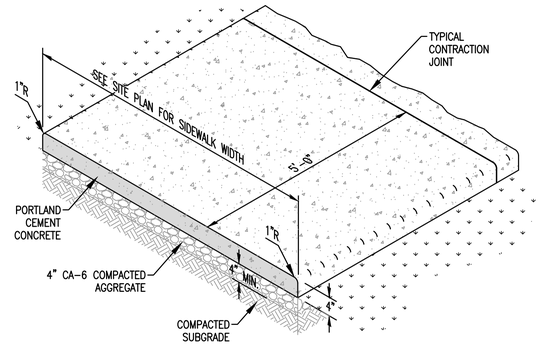


NOTE:

PROVIDE CONTROL JOINTS @ 5'–0" INTERVALS AND EXPANSION JOINTS @ 50'–0" INTERVALS.

USE 3/4" PREMOULDED JOINT FILLER AT ANY SIDEWALK AND BUILDING INTERFACE.

CONCRETE SIDEWALK (UNREINFORCED) WITH TURNDOWN CURB



PORTLAND CEMENT CONCRETE SHALL HAVE A MINIMUM OF 3,500 psi COMPRESSIVE STRENGTH AT 28 DAYS.

SUBGRADE SHALL BE THOROUGHLY COMPACTED TO 95% OS ASTM D–698 MAXIMUM DENSITY AT THE PROPER LINE AND GRADE PRIOR TO PLACEMENT OF THE CONCRETE.

SUBGRADE SHALL BE MOISTENED JUST BEFORE THE CONCRETE IS TO BE PLACED.

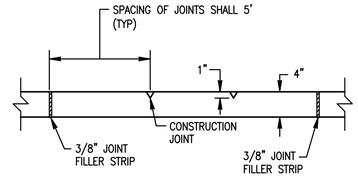
CONTRACTION JOINTS SHALL BE PLACED AT RIGHT ANGLES TO THE CENTERLINE OF THE SIDEWALK AT FIVE (5) FOOT INTERVALS AND SHALL HAVE A DEPTH 1/8" MIN. TO 1/4" MAX. THESE JOINTS SHALL BE EDGED WITH AN EDGING TOOL HAVING A 1/4" RADIUS. SIDEWALKS WIDER THAN 10 FEET AND GREATER SHALL HAVE A CONTRACTION JOINT AT EVERY 5 FOOT INTERVAL.

THE FINAL SURFACE OF THE SIDEWALK SHALL BE BRUSHED WITH A WHITEWASH BRUSH AT RIGHT ANGLES TO THE SURFACE PRODUCING A SLIGHTLY ROUGHENED SURFACE WITH PARALLEL BRUSH MARKS.

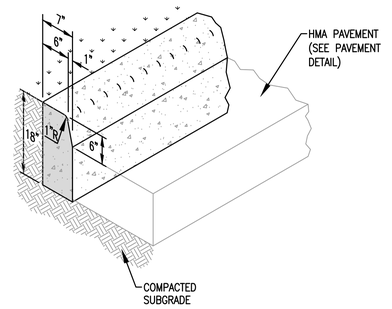
1/2" EXPANSION JOINTS SHALL BE PLACED BETWEEN THE SIDEWALK AND ALL STRUCTURES INCLUDING LIGHT STANDARDS, TRAFFIC LIGHT STANDARDS, POWER POLES, ETC.

3/4" EXPANSION JOINTS SHALL BE PLACED AT INTERVALS OF NOT MORE THAN 100 FEET. IF THE SIDEWALK IS ADJACENT TO PAVEMENT, THESE JOINTS SHALL MATCH THE PAVEMENT JOINTING PATTERN. EXPANSION JOINTS SHOULD ALSO BE PROVIDED BETWEEN DRIVEWAY PAVEMENT AND SIDEWALK, AND BETWEEN ACCESSIBILITY RAMPS AND CURBS.

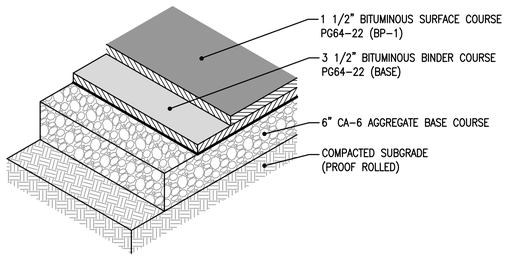
CONCRETE SIDEWALK (UNREINFORCED)



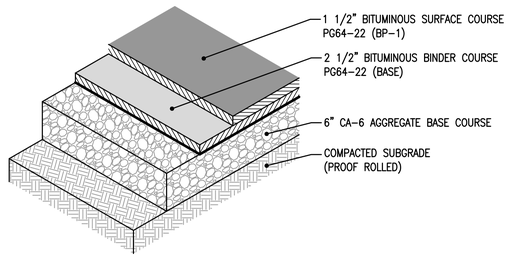
SIDEWALK JOINT DETAIL



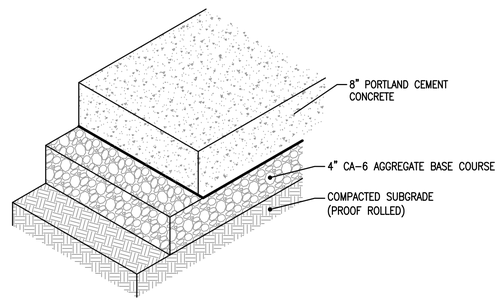
BARRIER CURB ADJACENT TO HMA PAVEMENT



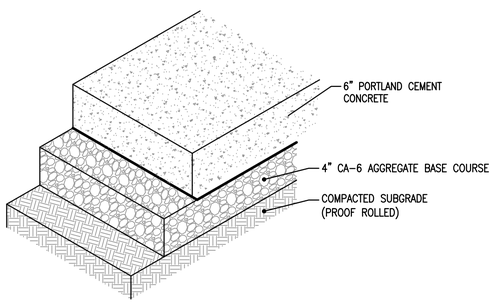
STANDARD HMA PAVEMENT DRIVE AISLES



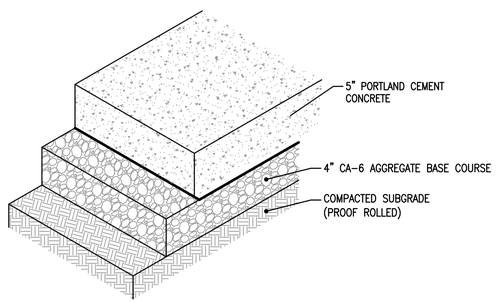
STANDARD HMA PAVEMENT PARKING AREAS



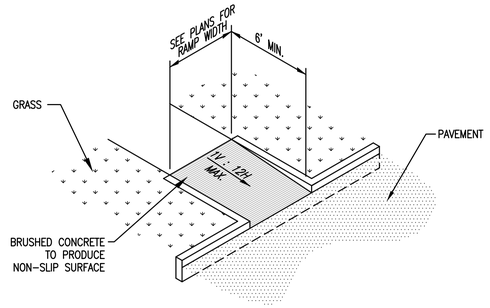
PCC PAVEMENT (DUMPSTER PAD)



PCC PAVEMENT DRIVE AISLES (ALTERATE)



PCC PAVEMENT PARKING AREAS (ALTERNATE)



NOTES:

1. DETECTABLE WARNINGS SHALL BE INSTALLED AT CURB RAMPS, MEDIANS, AND PEDESTRIAN REFUGE ISLANDS, AT GRADE RAILROAD CROSSINGS, TRANSIT PLATFORM EDGES, AND OTHER LOCATIONS WHERE PEDESTRIANS ARE REQUIRED TO CROSS A HAZARDOUS VEHICULAR WAY. DETECTABLE WARNINGS SHALL ALSO BE INSTALLED AT ALLEYS AND COMMERCIAL ENTRANCES WHEN PERMANENT TRAFFIC CONTROLS ARE PRESENT.
2. ALL RAMP MATERIALS, INSTALLATION, AND WORKMANSHIP SHALL COMPLY WITH THE AMERICANS WITH DISABILITIES ACT.

ACCESSIBLE RAMP

WUNNENBERG MAP: 24DD-32
MSD MAP: 23S2
MSD No.: 24MSD-00077

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APPROVED BY:	ELA
PROJECT NO:	230952

PROJECT:

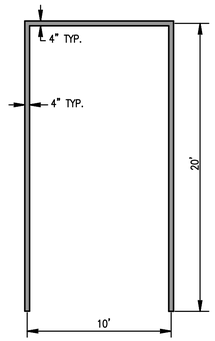
MO0401_BALLWIN
DUTCH BROTHERS COFFEE
15200 MANCHESTER ROAD

TITLE:

PAVEMENT DETAILS SHEET 1 OF 2

C700

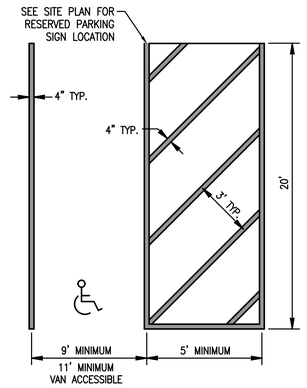
C:\Users\eallmon\AppData\Local\Temp\AcPublish_22480\C700_PAVEMENT DETAILS.dwg Plotted By: eallmon



NOTE:
PAVEMENT MARKING TO BE PAINTED WITH YELLOW PAVEMENT MARKING PAINT ACCORDING TO MUTCD.

ALL SURFACES TO BE PAINTED SHALL BE CLEAN AND AIR BLASTED PRIOR TO PAINTING.

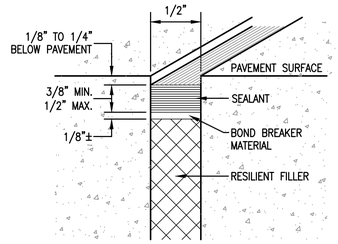
TYPCIAL PARKING SPACE PAVEMENT MARKING



ACCESSIBLE PARKING SYMBOL TO BE PAINTED WITH YELLOW PAVEMENT MARKING PAINT ACCORDING TO THE MUTCD.

ALL SURFACES TO BE PAINTED SHALL BE CLEAN AND AIR BLASTED PRIOR TO BEING PAINTED.

ACCESSBILE PARKING SPACE PAVEMENT MARKING

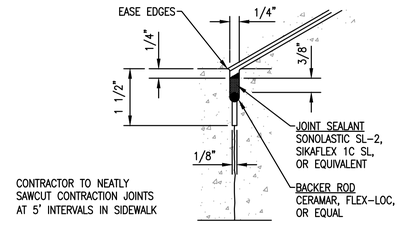


CONTRACTOR TO NEATLY SAWCUT EXPANSION JOINTS AT 15' INTERVALS IN SIDEWALK

EXPANSION / ISOLATION JOINT SEALANT DETAIL

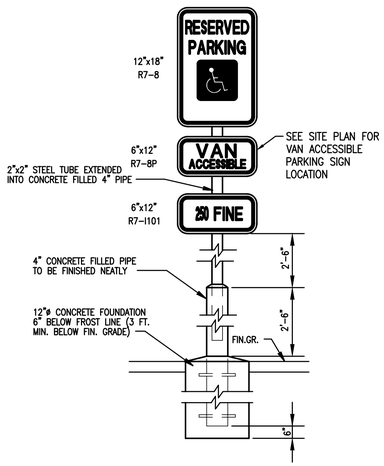
NOTE:

USE 3/4" PREMOULDED JOINT FILLER AT ANY SIDEWALK AND BUILDING INTERFACE.



CONTRACTOR TO NEATLY SAWCUT CONTRACTION JOINTS AT 5' INTERVALS IN SIDEWALK

CONTRACTION JOINT SEALANT DETAIL



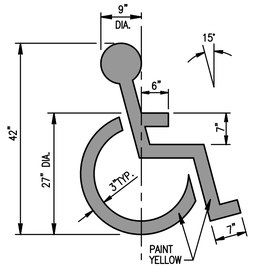
ADA ACCESSIBLE SIGNS AND POSTS TO CONFORM WITH U.S. DEPARTMENT OF TRANSPORTATION MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.

STANDARD ADA ACCESSIBLE PARKING SIGN TO BE MOUNTED ON PAINTED GALVANIZED STEEL POST; 10'-0" IN LENGTH. BOTTOM OF SIGN TO BE 5'-0" ABOVE GRADE.

CONTRACTOR TO PLACE SIGN IN THE CENTER OF THE COMBINED PARKING SPACE AND ACCESS AISLE MIN. ONE FOOT FROM CURB.

R7-8P SIGN SHALL ONLY BE INCLUDE ON VAN ACCESSIBLE PARKING SPOT. SHEET PLAN SHEET FOR LOCATION.

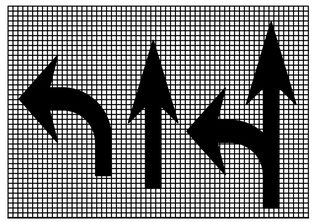
ACCESSIBLE SIGN WITH POST

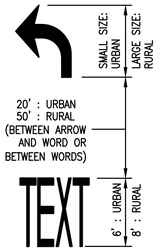


ACCESSIBLE PARKING SYMBOL TO BE PAINTED WITH YELLOW PAVEMENT MARKING PAINT ACCORDING TO THE MUTCD.

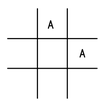
PAINTED ACCESSIBLE SYMBOL TO BE PLACED IN LOCATIONS AS DETAILED ON THE SITE PLAN.

ACCESSIBLE PARKING SYMBOL PAVEMENT MARKING





WORD AND ARROW LAYOUT



LEGEND HEIGHT	ARROW SIZE	A
6'	SMALL	2.9"
8'	LARGE	3.8"

THE SPACE BETWEEN ADJACENT LETTERS OR NUMERALS SHOULD BE APPROXIMATELY 3" FOR 6' LEGEND AND 4' FOR 8' LEGEND.

LETTER AND ARROW GRID SCALE

PAINTED DIRECTIONAL ARROWS AND TEXT

WUNNENBERG MAP: 24DD-32
MSD MAP: 23S2
MSD No.: 24MSD-00077

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MO0401_BALLWIN
DUTCH BROTHERS COFFEE
15200 MANCHESTER ROAD

TITLE:

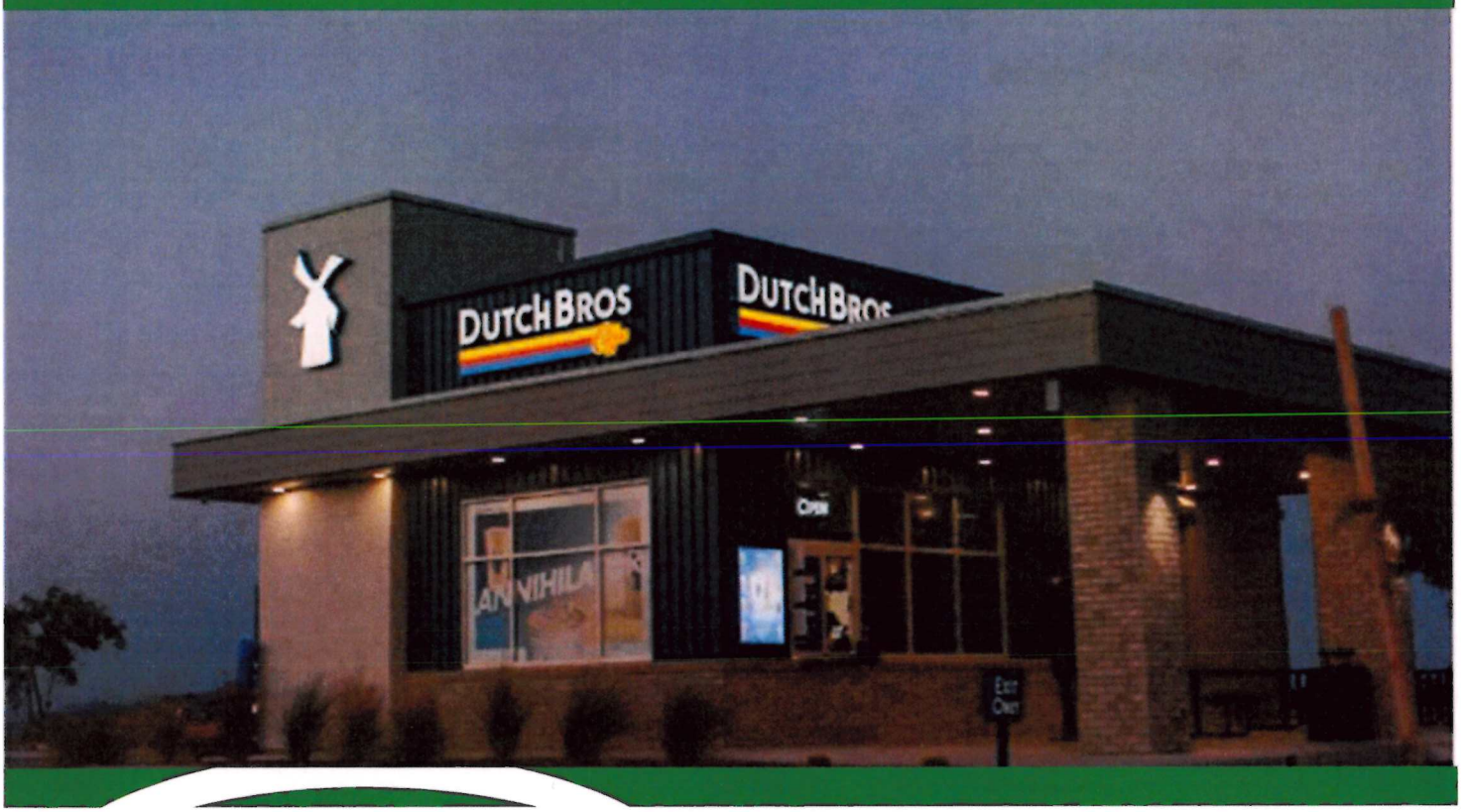
PAVEMENT DETAILS SHEET 2 OF 2

C701

SUE-24-04

TERRA ENGINEERING LTD.

DUTCH BROS BALLWIN
TRAFFIC IMPACT STUDY



PROJECT ADDRESS

15200 Manchester Road
Saint Louis, MO 63011

PREPARED BY

Michael C. Hutchinson, P.E., PTOE
Senior Traffic Engineer

PREPARED FOR

CAE Investments
1776 Montano Rd. NW, Suite 25
Albuquerque, NM 87107

DRAFT REPORT DATE

May 1, 2024

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SECTION I

EXECUTIVE SUMMARY

This traffic impact study is to evaluate a new Dutch Bros coffee shop on the southwest corner of Manchester Road and Old Ballwin Road which includes two drive-through lanes and no indoor seating. Existing traffic data was collected in April 2024 at the intersections near the site to determine the existing traffic patterns around the vacant parcel. In the existing condition traffic model, it was noted that the adjacent signalized intersections performed well. It was also noted that during the AM peak, the intersections under two-way stop control (TWSC) operated well for the right turn movements but had significant modeled delays where left turns from the stop-controlled streets existed.

New vehicle trips were generated for the proposed site using the Land Use Code for Coffee/Donut shop w/Drive-Thru Window and No Indoor Seating. This estimated the total trip in the AM peak to the proposed site at 89 total trips (45 entering and 44 exiting) and 30 trips in the PM peak (15 entering, 15 exiting). Many of these trips are pass-by trips which are already in the network on Manchester Road.

The new trips were assigned to the network based on the existing traffic patterns in the network and where vehicles were likely to access the site. This information was then placed into the Synchro models for analysis and evaluation for Opening Day conditions which showed similar results to existing with the only areas of concern being for side street driveways which models estimate to have long delays.

To evaluate these theoretical model values, TERRA observed the adjacent driveway at a McDonalds restaurant during the AM peak. Video sampling of vehicles exiting the driveway were collected and analyzed for approximate waiting times before completing turns. This evaluation collected both left and right turning drivers and resulted in actual waiting times in the average range of 24.5 seconds for 33 total observations over the 30–45-minute period. The maximum queue within the McDonald's driveway exit was four (4) vehicles.

It appears the Dutch Bros driveways will operate with similar characteristics to other businesses in the area and the expected actual delay will be much lower than the modeled values. While some vehicles may experience long delays, it is expected that most vehicles will be able to exit onto Manchester Road during the gaps created by the platooning of vehicles in less than two minutes. It appears that the expected queues at the site will be contained within the project site and the new development should have little to no impact on the existing traffic flows on Manchester Road or Old Ballwin Road.

SECTION II

INTRODUCTION/SITE BACKGROUND

TERRA Engineering has been asked to evaluate the potential traffic impact of redeveloping a parcel at the southwest corner of Manchester Road and Old Ballwin Road in Ballwin, Missouri, a suburb in St. Louis County. The existing development is located on the parcel at 15200 Manchester Road and is proposed to be a new Dutch Bros Coffee Shop with an approximate size of 950 square feet. An additional parcel is located just west of the proposed coffee site and is slated for a future development but is not to be developed at this time. The existing site has two entrances from existing Manchester Road and another two entrances onto Old Ballwin Road.

Old Ballwin Road continues to the south of the proposed site and provides connections to residential neighborhoods located to the south of the site. Directly across Old Ballwin to the east is the existing Elco Cadillac car dealership. Directly to the west of the site is an existing McDonald's restaurant which provides cross access onto the proposed parcel at the south part of the site.

SECTION III

STUDY AREA

The existing site is located at 15200 Manchester Road. A layout of the site location and adjacent street network is provided in **Error! Reference source not found.** with the proposed site shown in blue. The roadways included as part of the study area around the proposed site development are described as follows:

Manchester Road (MO 100) is a five-lane (two lanes in each direction and one two-way left turn lane) road running in the east-west direction. It is considered a principal arterial which primarily serves businesses and collects vehicles from local roads near the project site. The posted speed limit is 40 miles-per-hour (mph). Sidewalk exists on both sides of Manchester Road. Near the intersection with Old Ballwin Road, there is a raised median on Manchester Road that provides a pedestrian refuge at a midblock crosswalk. The midblock crosswalk includes yield bars on Manchester and a Rectangular Rapid Flashing Beacon (RRFB) to

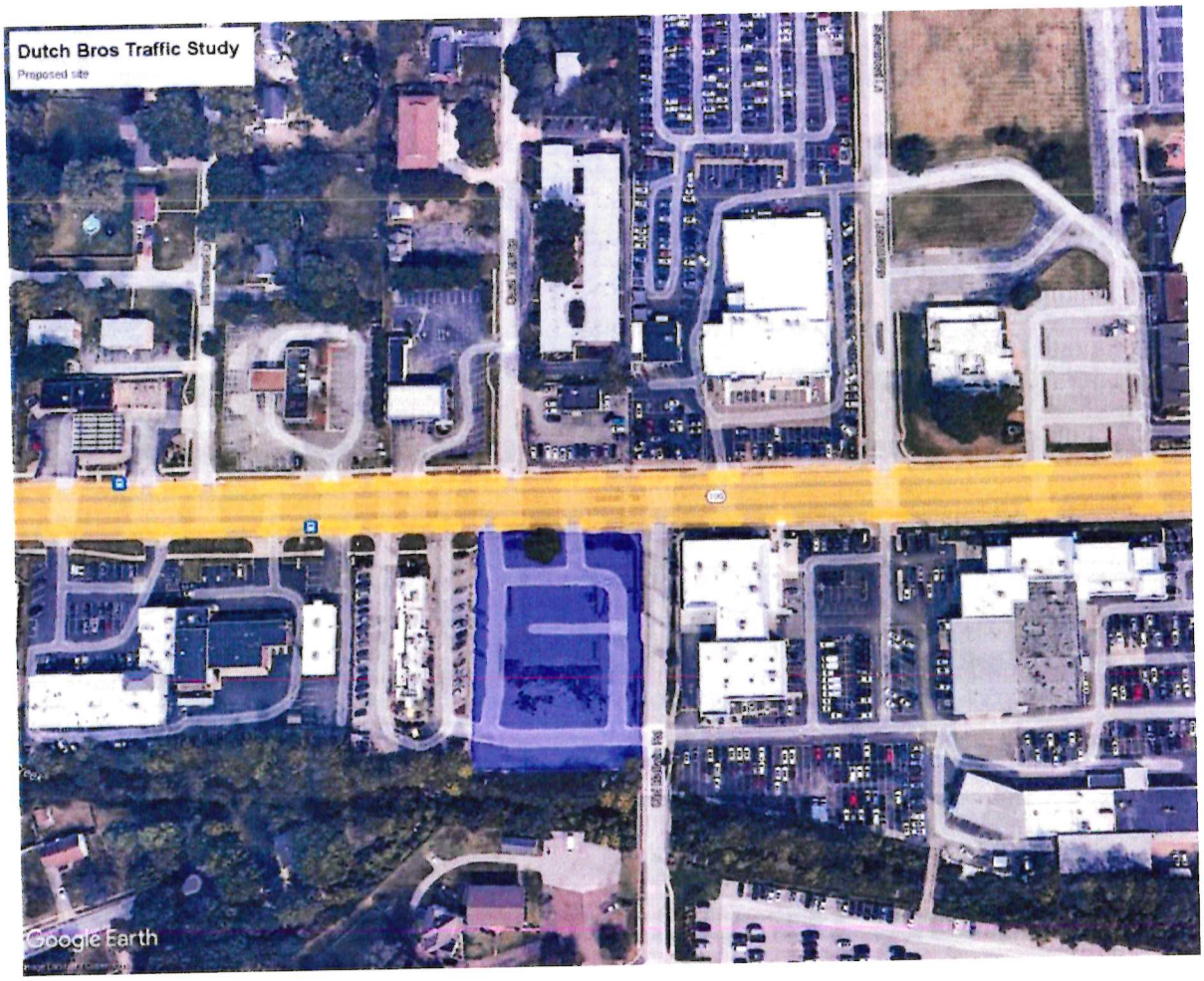


Figure 1 - Project area.

assist pedestrians in safely crossing Manchester Road at this location. This raised median would also prevent northbound left turns from Old Ballwin Road from turning into the Two-Way Left Turn Lane (TWLTL) to use it as an acceleration lane or storage area to head westbound on Manchester.

Old Ballwin Road is a two-lane (one lane in each direction) road running in the north-south direction. It primarily serves a residential area, with access to the proposed parcel, the Elco Cadillac site, and a church. Further to the south, it connects to The Pointe at Ballwin Commons which is a large recreation center for the City of Ballwin before turning to the west to connect to New Ballwin Road. Sidewalk exists on both sides of the road near the site and across Fishpot Creek and then terminates on the east side of the road. The posted speed limit is 25 mph along the roadway.

SECTION IV

EXISTING TRAFFIC CONDITIONS

Traffic data was collected on April 24, 2024, at the following locations:

- Manchester Rd & Old Ballwin Rd
- Manchester Rd & Coral Terrace/Site West Entrance
- Manchester Rd & Holloway Rd

Traffic data was collected on Manchester Road at the three subject intersections from 7:00 AM to 9:00 AM and from 3:00 PM to 6:00 PM to include the morning and evening peak hours of vehicle traffic, colloquially called "rush hour." This data is included in Appendix A. In addition, TERRA provided additional traffic data which was collected for another recent project at the intersection of Manchester Road and New Ballwin Road which was collected on March 12, 2024.

At the intersection of Manchester Road and New Ballwin Road, the AM peak hour of traffic occurred starting at 7:30 AM, and the PM peak hour of traffic occurred starting at 4:30 PM. These are the two hours in which the greatest number of vehicles were counted on the adjacent streets of Manchester Road and New Ballwin Road. At the intersections of Manchester with Coral Terrace, Old Ballwin Road and Holloway Rd, the AM peak hour was at from 7:45 AM to 8:45 AM. The PM peak hour was from 4:45 PM to 5:45 PM at the Old Ballwin and Coral Terrace intersections but was slightly earlier from 4:30 PM to 5:30 PM at the Holloway intersection.

The aim of this study is to estimate the impact of the proposed new coffee shop to be located on the southwest corner of the intersection of Manchester Road and Old Ballwin Road during these peak hours. To evaluate the worst-case scenario for the traffic along Manchester Road, TERRA will use the peak volumes of traffic during the AM and PM peak as shown in the traffic counts. As the times don't always match, the traffic volumes may not balance perfectly along the corridor, however this would be expected in any case due to the number of entrances to developments along Manchester Rd which add and subtract vehicles from the roadway throughout the study area. The existing traffic collected at each of the study area intersections is provided in Figure 2.

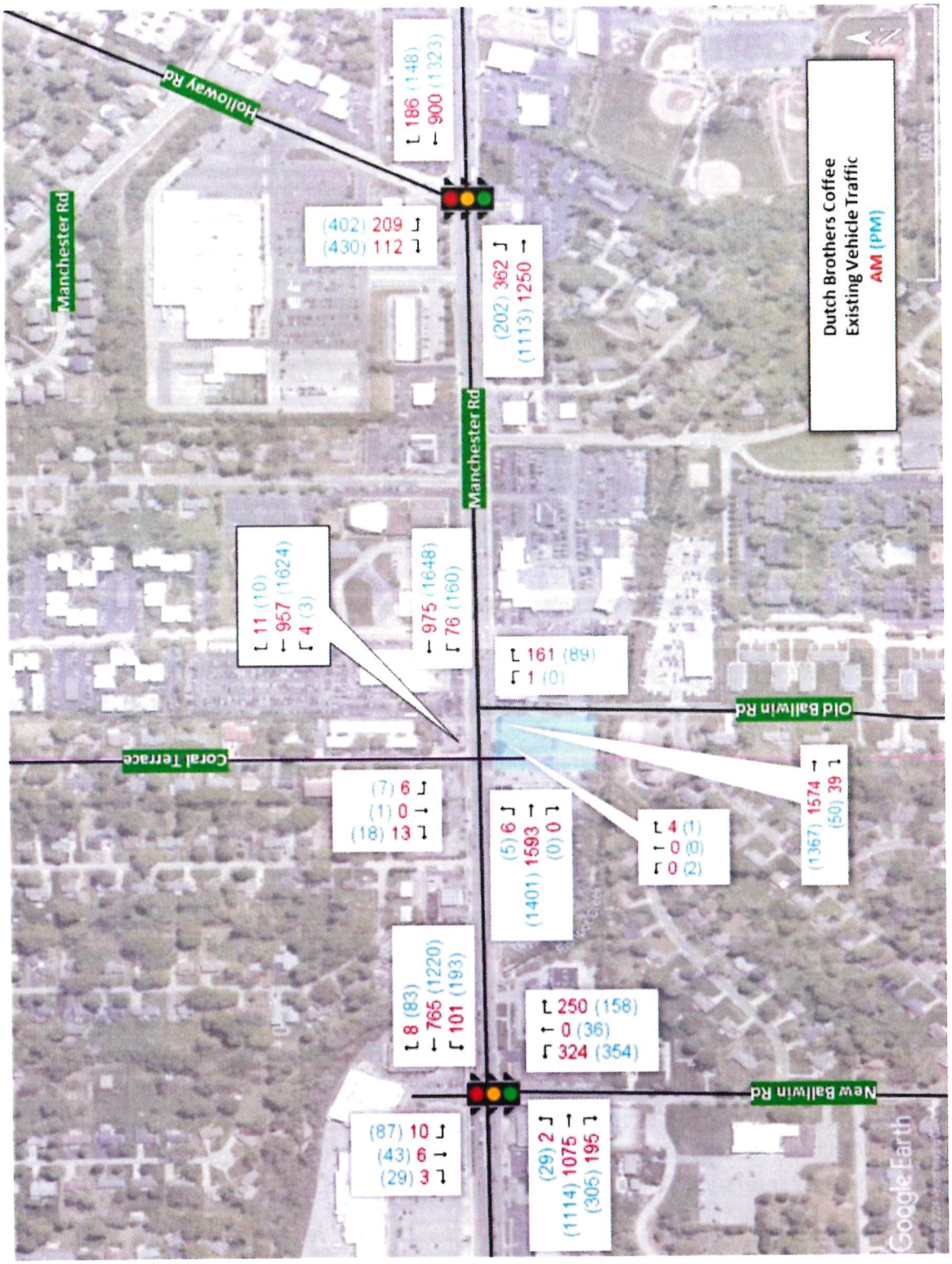


Figure 2 – Existing traffic.

Level of Service and Delay

Delay is one of the main components of measuring the service of an interrupted flow roadway. The principal measure of this delay is control delay which is defined by the Highway Capacity Manual (HCM) as "a quantitative stratification of a performance measure or measures representing quality of service."

The Level of Service (LOS) designation was created as a tool to help laypersons and decision makers determine the difference in operating conditions for a particular location. There are six representative levels of service defined for each type of facility which can be analyzed, and they are designated using letters A through F. These letters are an attempt to translate "complex numerical performance results into a simple A-F system representative of travelers' perceptions of the quality of service." LOS calculations are provided for different modes of travel such as motorized vehicle, pedestrian, bicycle and transit modes. Safety of the intersection is not included in the analysis of LOS. Level of Service is defined separately for signalized intersections and unsignalized intersections as shown in Table 1.

Table 1 - Vehicular Level of Service for Control Delay

Level of Service	Control Delay per Vehicle (seconds / vehicle)		Interpretation
	Signalized	Unsignalized	
A	0 - 10	0 - 10	Minimal control delay; traffic operates at primarily free-flow conditions; unimpeded movement within traffic stream.
B	10 - 20	10 - 15	Minor control delay at signalized intersections; traffic operates at an unimpeded level with slightly restricted movement within the traffic stream.
C	20 - 35	15 -25	Moderate control delay; movement within traffic stream more restricted than at LOS B; formation of queues contributes to lower average travel speeds.
D	35 - 55	25 - 35	Considerable control delay that may be substantially increased by small increases in flow; average travel speeds continue to decrease.
E	55 - 80	35 - 50	High control delay; average travel speed no more than 33 percent of free flow speed.
F	> 80	> 50	Extremely high control delay; extensive queuing and high volumes create exceedingly restricted traffic flow.

LOS is a measure of the acceptability of the amount of delay and is therefore considered slightly subjective as what is acceptable in a major metropolitan area may not be acceptable in a smaller city or rural area. These delays are computed as the average control delay per vehicle arriving at the intersection. For signalized intersections, delays are evaluated for the overall intersection; at intersections without traffic signals, delay is analyzed for each movement separately and only includes side street traffic and left turns from the major street as the through movements on the major road are free flow movements.

Another factor evaluated when determining traffic operations at an intersection is the volume to capacity (v/c) ratio of the critical lane group. This ratio compares the rate of flow to the available capacity of the intersection and is considered a measure of the degree of saturation. Sustainable values of a v/c ratio range from 0.01 to 1.0. Values in excess of 1.0 indicate a possible excess of capacity and are considered to be LOS F.

In a dense urban area, it is generally acceptable to provide LOS D in all areas but consider LOS E in certain situations where traffic demand is very high on major arterial routes. Occasionally, side streets will be allowed to operate at LOS F when volume and demand on the side street is considered very low and servicing these vehicles would cause a greater negative impact on the progression of through traffic on the main route.

The peak hours of traffic from the collected traffic volumes were modeled in Synchro 12 modeling software for analysis. The analysis was conducted for the existing conditions during the peak hours of traffic in the morning and afternoon. Table 1 provides the results of the analysis, summarizing the Level of Service, delay, and the v/c ratio for the existing intersection conditions while the full model analysis is provided in Appendix B.

From the Synchro analysis using peak vehicle volume data at each intersection, the two signalized intersections appear to perform at acceptable levels for the overall intersection in both the AM and PM peak hours. It was noted that the signal cycle length for the AM peak is 130 seconds and the PM peak is 140 seconds. This leads to long side street delays while priority is given to Manchester Road traffic. This helps to provide good overall performance at the signalized intersections but provides longer average delays for the side streets which need to wait longer for their green indication to come up which results in LOS D and E for these movements.

Table 2 - Existing Traffic Analysis						
	Weekday AM Peak			Weekday PM Peak		
	LOS	Delay	v/c	LOS	Delay	v/c
Manchester Road & New Ballwin Road						
Overall Performance	**C**	**20.2**	**0.67**	**D**	**35.6**	**0.79**
Eastbound	C	20.2	0.58	C	28.6	0.71
Westbound	A	4.6	0.38	C	31.0	0.72
Northbound	D	42.9	0.67	E	57.6	0.79
Southbound	D	52.0	0.10	E	66.5	0.58
Manchester Road & Old Ballwin Rd						
Westbound Left	C	18.3	0.23	C	19.1	0.41
Northbound	D	34.2	0.61	C	19.6	0.28
Manchester Road & Coral Terrace/West Driveway						
Eastbound Left	B	10.5	0.02	C	15.6	0.02
Westbound Left	C	15.1	0.01	B	13.4	0.01
Northbound	C	17.3	0.17	F	224.4	0.17
Southbound	E	48.1	0.79	F	252.5	0.79
Manchester Road & Holloway Rd						
Overall Performance	**B**	**16.4**	**0.82**	**C**	**28.9**	**0.91**
Eastbound	A	9.4	0.82	B	12.8	0.78
Westbound	B	18.0	0.56	C	29.8	0.81
Southbound	D	45.8	0.62	D	52.7	0.91

At the two-way stop controlled (TWSC) intersections, Manchester Road is free flowing which provides no delays for through traffic. The left turning movements from Manchester onto Old Ballwin, Coral Grove and into the west site driveway have minimal waits of 20 seconds or less on average during the AM and PM peaks to turn resulting in LOS B and C. The side street movements are required to wait for a gap in traffic to exit onto Manchester Road. This can be difficult during the peak hour with the high volumes of up to 1575-1650 in the main direction of flow along Manchester Road. This can make left turns difficult in the northbound and southbound direction, while right turns are able to enter the traffic flow more easily. Northbound left turns from Old Ballwin Rd are prohibited, although one (q) vehicle was observed making this turn in the AM peak hour. This turn was omitted from the existing model as it was an illegal turn. LOS for the northbound movements at Old Ballwin Road and Manchester Rd function at LOS C or D. At Coral Terrace and the west driveway to the site, the northbound and southbound movements function at LOS C and E in the PM peak are LOS F, with very long delays due to the high volumes on Manchester Road.

SECTION V

SITE LAYOUT

The proposal for the site is to subdivide the existing lot into two different parcels, with the west parcel being left vacant for now and a new Dutch Bros coffee shop with approximately 900 square-feet of building with a dual drive through. The existing site has two driveways along Manchester Road and two driveways along Old Ballwin Road, however the driveways closest to the intersection of Manchester and Old Ballwin Road will be closed on both adjacent roadways leaving only 2 remaining driveways, leaving one (1) access drive on Manchester Road and one (1) access drive on Old Ballwin Road. Figure 3 shows the proposed site plan.

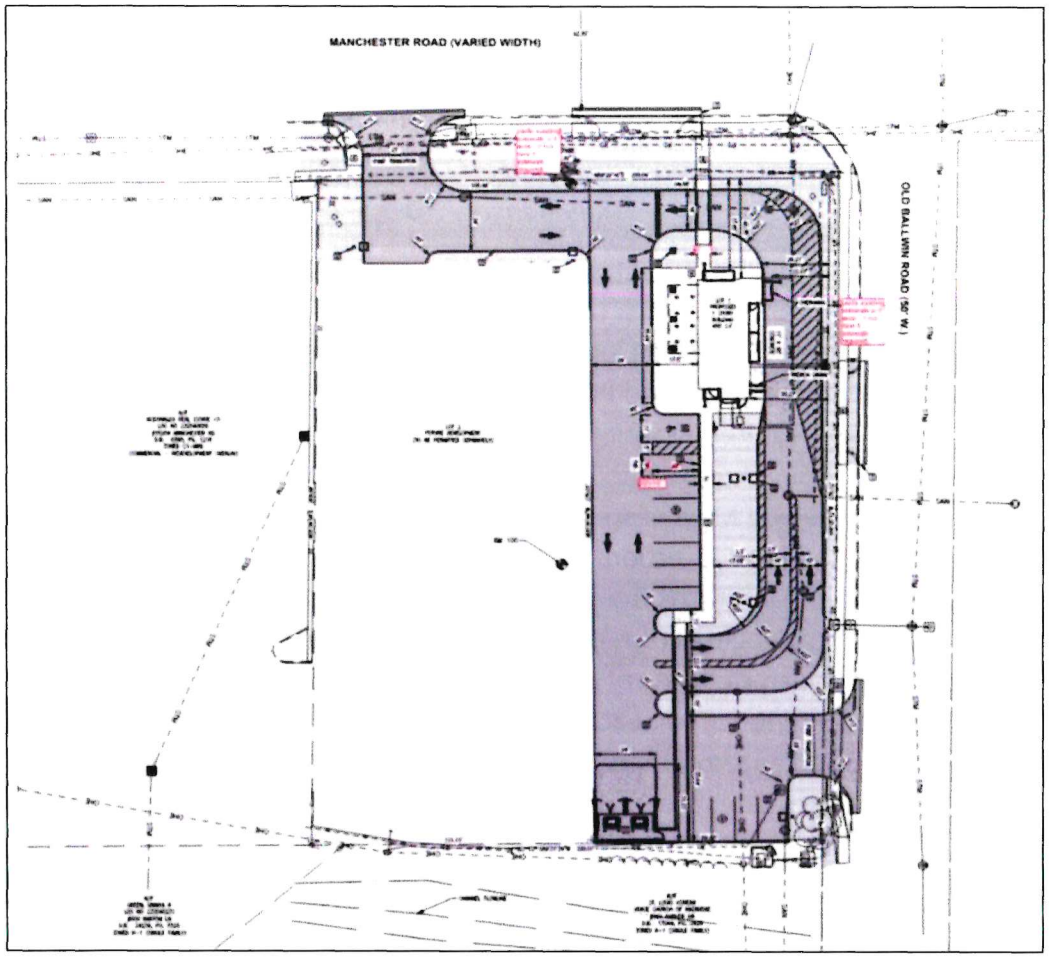


Figure 3 – Proposed site plan

SECTION VI

TRIP GENERATION

When evaluating proposed traffic at a new development, it is necessary to estimate the number of new vehicle trips which will be created by the new uses at the site. This estimation of trips is generated using data obtained from traffic counts at other similar locations or by using the Institute of Transportation Engineers (ITE) Trip Generation Manual. The ITE Manual collects data at existing sites for all types of uses such as schools, hotels, shopping centers, apartment complexes, subdivisions, offices, etc. and compiles it into book form as a reference for designers. The data in the 11th edition is based on more than 5,000 trip generation studies which have been collected over several decades by transportation professionals.

For most land uses, the collected data is broken into many different independent variables which can be used to perform the calculations, including comparing the number of trips to the gross floor area of the building, or in the case of residential comparing the number of trips to the number of housing units. Calculations can also be completed for an entire weekday, the traditional peak hours of adjacent street traffic (one hour between 7:00 AM and 9:00 AM or one hour between 4:00 PM and 6:00 PM), the peak hour of activity for the use type (known as AM Peak Generators or PM Peak Generators), Saturday traffic, or Sunday traffic.

For the proposed site, the trips generated by the land use could closely be modeled by Land Use (938) Coffee/Donut Shop with Drive-Through Window and No Indoor Seating. TERRA reviewed the description for the land use.

Land Use (938) Coffee/Donut Shop with Drive-Through Window and No Indoor Seating

"This land use includes any coffee and donut restaurant that has only drive-through window service. A patron cannot walk into the shop and purchase items. The restaurant sells freshly brewed coffee (along with coffee-related accessories) and a variety of food/drink products such as donuts, bagels, breads, muffins, cakes, sandwiches, wraps, salads, and other hot and cold beverages. The restaurant marketing and sales may emphasize coffee beverages over food (or vice versa).

The coffee/donut shops contained in this land use typically hold long store hours (more than 15 hours) with an early morning opening."

Trip Generation Calculations

For a complete evaluation, TERRA ran calculations on Land Use (938) Coffee/Donut Shop with Drive-Through Window and no Indoor Seating using the number of drive through lanes (2) as the independent variable. For the purpose of this study the trip generation plots used included the AM Peak of Adjacent Street Traffic from 7-9 AM and the PM Peak of Adjacent Street Traffic from 4-6 PM which coincide with the peak traffic volumes on Manchester Road which were collected.

Trip generation calculations are performed using both the average rate provided for the vehicle trips per unit, and a fitted curve equation which is developed from the plots of data collected. Using both methods allows the higher value to be chosen should there be a difference in the total trips, however for this use a fitted curve equation was only available for the AM Peak of Adjacent Street Traffic.

A summary of the calculations is provided in Table 3 for the proposed site while plots from the trip generation manual showing the plots of the data based on the proposed site of the shop are provided in Appendix C.

Table 3 - Trip Generation Data Land Use (937) Coffee/Donut Shop with Drive-Through Window				
	Average Rate		Fitted Curve	
	Enter	Exit	Enter	Exit
AM Peak of adj. street 7am-9am	40	40	45	44
PM Peak of adj. street 4pm-6pm	15	15	-	-

For external trips, The ITE manual differentiates between three different types of trips. "Primary Trips" are trips made for the sole purpose of visiting a site, meaning that drivers leave an origin for the specific purpose of visiting the site and then potentially return to the origin. "Pass-By" trips are trips made by vehicles already on the adjacent road which are driving past the access point to the site and enter the development as they are passing by before continuing on their original path to another destination. "Diverted Link" trips are vehicles that are nearby in the roadway network but alter their path from their primary destination along a roadway not connected to the site entrances to visit the site before rerouting back through the network toward their original destination.

The Trip Generation Manual provides data on Pass-by trips which are trips already in the network . The manual does include estimates for pass-by trips for the Land Use (938) Coffee/Donut Shop with Drive-Through Window and No Indoor Seating which has an average pass-by rate of 90% in the AM peak and 97.5% for the PM peak. This would imply that most trips to a coffee shop with only a drive through would be by vehicles already on

Manchester Road. The proposed percentages are shown in Table 4 – Percentage of Primary and Pass-by Trips

Table 4 – Percentage of Primary and Pass-by Trips Land Use (937) Coffee/Donut Shop with Drive-Through Window		
	AM Peak Hour of Traffic	PM Peak Hour of Traffic
Pass-By Trips	90%	97.5%
Non-Pass-By Trips	10%	2.5%

Using these values to adjust the previously calculated trips, we can split the values into primary trips which are new trips added to the network and pass-by trips which are captured from the existing volumes on Manchester Rd and Old Ballwin Rd.

Table 5 - Primary and Pass-by Trips Land Use (937) Coffee/Donut Shop with Drive-Through Window			
	Total Trips	Primary	Pass-by
AM Entering	45	4	41
AM Exiting	44	4	40
PM Entering	15	0	15
PM Exiting	15	0	15

These updated values will be used in the next step to assign trips into the roadway network and calculate future traffic volumes. It should be noted that as expected the volumes of traffic during the morning hours are much higher than what is seen in the afternoon. This may be a consideration as the morning volumes of traffic on Manchester are much lighter than the volumes in the afternoon.

SECTION VII

TRIP ASSIGNMENTS

After the total vehicle trips the development would generate into the traffic network was calculated, the next step was to determine how the vehicles entering or exiting the site would maneuver around the traffic network. This is done by determining where the generated vehicles would enter and exit the network and assigning the generated trips as turning movements throughout the network.

One method for evaluating the potential for trips would be to calculate flows based on the vehicles already in the network. The traffic volumes passing the site show that over 60% of the traffic in the area is travelling eastbound during the AM peak of flow with 57% coming from the west leg into the intersection and 61% continuing eastbound exiting the intersection which includes added traffic from northbound Old Ballwin Road, while conversely only about 35% is traveling westbound. During the PM peak the volumes are a little more split with slightly over 50% traveling westbound and around 44% eastbound. Table 6 shows the percent of vehicles in each direction vehicles entered and exited the intersection.

Table 6 - Directionality on Manchester Rd & Old Ballwin Rd		
	Entering Intersection	
	AM Peak	PM Peak
Westbound (east leg)	37%	54%
Northbound (south leg)	6%	3%
Eastbound (west leg)	57%	43%
	Exiting Intersection	
	AM Peak	PM Peak
Eastbound (east leg)	61%	44%
Southbound (south leg)	4%	6%
Westbound (west leg)	35%	50%

Primary trips were assigned entering and exiting the road network based on the percentages in Table 6. For vehicles exiting to the east along Manchester Road from the 50% were assigned making an eastbound left out of the coffee shop onto Old Ballwin Road, and 50% were assigned making a northbound right out of the site directly onto Manchester Road. Any trips wishing to travel west on Manchester would need to exit from the driveway along Manchester Road to make a left turn to head westbound, while vehicles headed to the south on Old Ballwin would make a right turn at the southern entrance. Figure 4 shows the primary trip assignment map.

For pass-by trips, the trips all come from the existing traffic. As over 90% of the traffic in the area is on Manchester Road, most of this volume comes from the eastbound and westbound traffic. Similarly, the percentages of traffic in the network can be used to assign these trips based on the direction vehicles entered and exited the intersection in the existing condition.

The trips were assigned based on the percentages with the primary trips shown in Figure 4. The assumptions split the primary trips approaching the site into eastbound, westbound and northbound trips to the site. Westbound trips were split equally between turning onto Old Ballwin to access the site and using the Manchester Road Driveway. Eastbound trips were split with 75% entering the Manchester driveway and 25% turning right onto Old Ballwin to enter the site. For trips exiting the site, all westbound trips made a left from the driveway onto Manchester Rd, while eastbound trips were split evenly between the Manchester Rd and Old Ballwin Rd. driveways.

Pass-by trips were developed similarly to the primary trips; however these trips require that negative values be assigned where trips deviate from their original path and that they then reenter the traffic stream in the same direction they were traveling. These trips are shown in Figure 5.

Finally, the Primary Trips and Pass-by trips are added together, including where numbers are negative in the pass-by trips to get a combined total trip values for the proposed site. These values are shown in the map provided in Figure 6. These combined trips will then be added to the existing traffic to provide an estimate of the traffic expected on the Opening Day of the development.

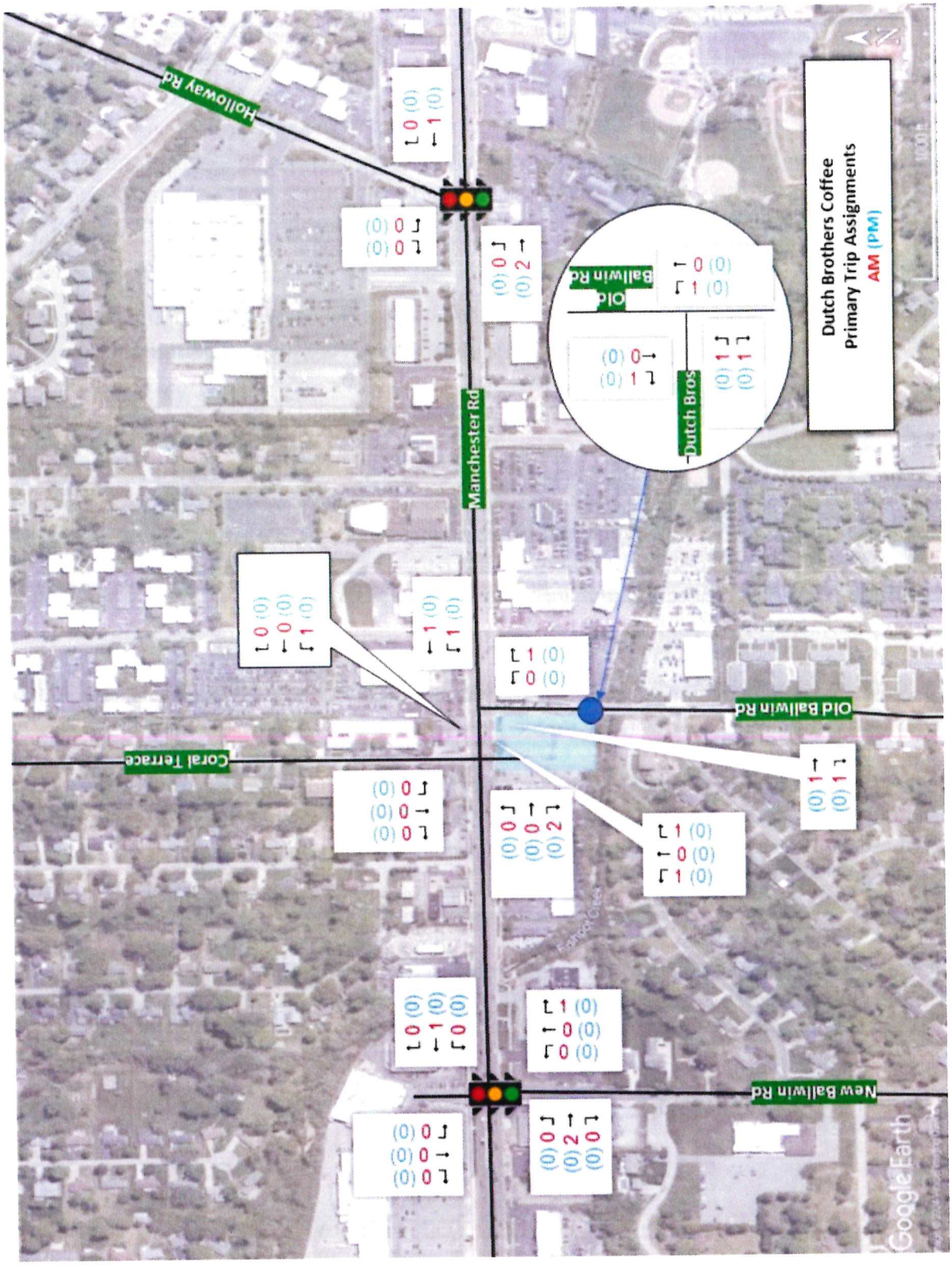


Figure 4 – Trip assignment map for primary trips.

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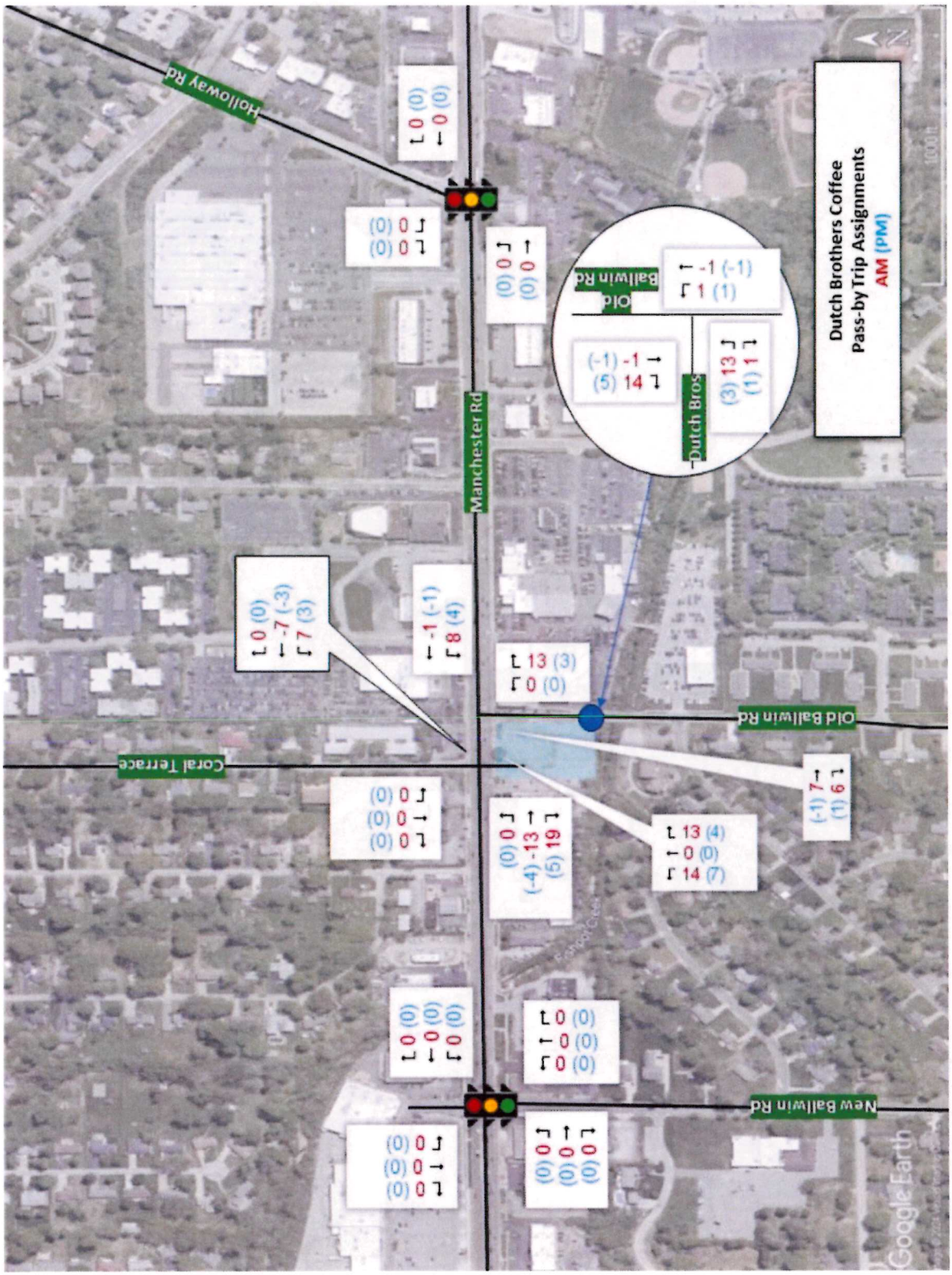

Figure 5 – Trip assignment map for pass-by trips.

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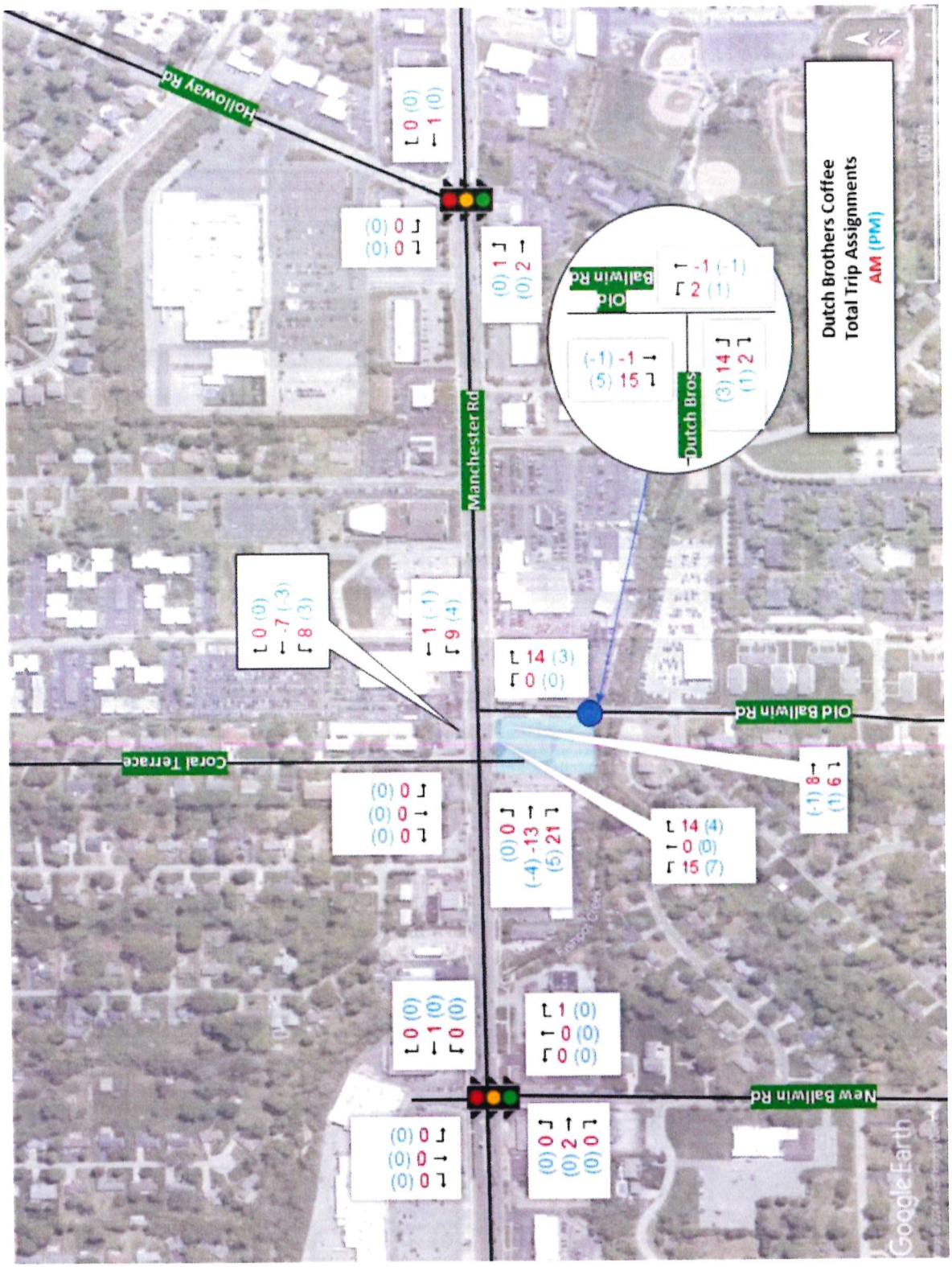

Figure 6 – Combined Trip assignment map.

SECTION VIII

OPENING DAY ANALYSIS

The next step in the process was to develop the expected trips on the opening day of the development. As it is expected that it will take some time to construct the new site, it is expected that the opening day will potentially be a year in the future. To account for potential background growth of traffic, it is necessary to estimate some increase in traffic which is typically seen year over year. For this study, it was assumed that the area is fairly stable, but a 0.5% increase in traffic may be possible. The existing traffic counts were increased by this percentage for one year.

The newly generated trips were then added to increased volumes to develop "Opening Day" traffic volumes which are shown in Figure 7. The opening day traffic model represents traffic around the study area with the new development fully built out and in operation.

The opening day traffic volumes were inserted into the Synchro 12 traffic modeling software and compared with the existing traffic model to determine if there were any significant changes to the traffic delay or LOS levels at the study intersections around the site. The modeled traffic performance of the intersection network for opening day is shown in Table 7. The full Synchro analysis is included in Appendix D.

Comparing the opening day scenario to the existing scenario, there is very little impact to the signalized intersections upstream and downstream of the site as the increase in new traffic volumes in very small. It was noted that the delay does go up slightly with additional average delays of less than half a second at each of the signalized intersections.

The entrance from the Dutch Bros site onto Old Ballwin Road functions well with little to no delay and LOS B with 10 second delays leaving the driveway and LOS A for those northbound on Old Ballwin to turn into the new site. This could drive additional exiting traffic from the site this driveway if there are backups for the right turn onto Manchester Road.

The Manchester Road at Old Ballwin Rd right turn gains additional traffic during the AM peak which increases the average delay from 34.2 seconds to 39.7 seconds and changes the LOS from LOS D to LOS E. In the PM peak the delay for northbound left turns also increases, but only by 0.3 seconds from 19.6 to 19.9 seconds.

The most significant impacts appear to occur at the west driveway from the Dutch Bros site onto Manchester Road. This driveway will allow for left turns onto Manchester and provide the only westbound access from the site. During the AM Peak in the existing condition there

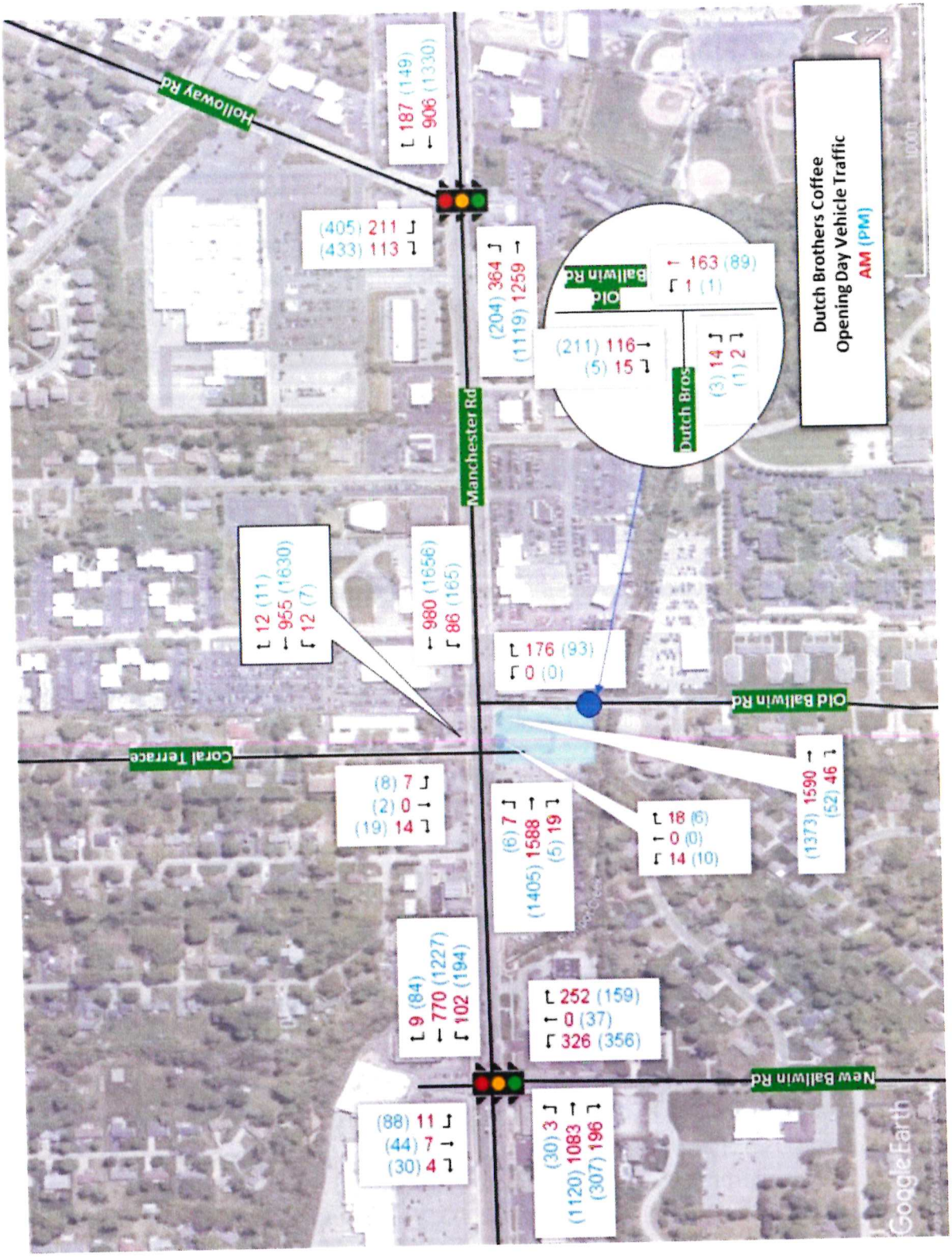

Figure 7 – Opening Day traffic

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Table 7 – Opening Day Traffic Analysis						
	Weekday AM Peak			Weekday PM Peak		
	LOS	Delay	v/c	LOS	Delay	v/c
Manchester Road & New Ballwin Road						
Overall Performance	**C**	**20.5**	**0.68**	**D**	**35.9**	**0.79**
Eastbound	C	20.4	0.59	C	28.8	0.72
Westbound	A	4.9	0.39	C	31.3	0.73
Northbound	D	43.2	0.68	E	57.9	0.79
Southbound	D	50.8	0.11	E	66.8	0.59
Manchester Road & Old Ballwin Rd						
Westbound Left	C	19.2	0.27	C	19.6	0.42
Northbound	E	39.7	0.67	C	19.9	0.30
Manchester Road & Coral Terrace/West Driveway						
Eastbound Left	B	10.5	0.02	C	15.7	0.02
Westbound Left	C	15.5	0.04	B	13.5	0.02
Northbound	F	234.9	0.83	F	565.4	1.07
Southbound	F	56.6	0.25	F	386.9	1.07
Manchester Road & Holloway Rd						
Overall Performance	**B**	**16.8**	**0.83**	**C**	**29.4**	**0.92**
Eastbound	A	9.8	0.83	B	13.3	0.79
Westbound	B	18.5	0.57	C	30.4	0.82
Southbound	D	45.7	0.62	D	53.0	0.92
Manchester Road & Old Ballwin Rd						
Eastbound	B	10.3	0.02	B	10.2	0.01
Northbound Left	A	7.5	0.01	A	7.7	0.01

were only 4 right turns from the existing driveway, which is currently an empty lot with no buildings, and no left turns were observed. The delays for these right turns averaged 17.3 seconds for the right turn and are LOS C. In the PM peak there were two left turns noted as exiting from the existing driveway and the LOS was F with significant theoretical delays of near 225 seconds (3 minutes and 45 seconds). The addition of more left turns to this driveway appears to have a significant impact on the average delay with AM theoretical values in the model of 234.9 seconds and 565.4 seconds for the PM peak.

To validate the model results, TERRA traffic staff observed the adjacent driveway at the existing McDonald's drive-through during the AM peak for approximately 45 minutes. This driveway allows full access and is located approximately 60 feet west of the Dutch Bros driveway. TERRA staff observed that the signal coordination for eastbound Manchester created large platoons of vehicles which could cause some delay for vehicles exiting the McDonald's driveway, however it also created large gaps which allowed the queue of cars to clear the driveway. TERRA recorded some turning movements to estimate the actual delays experienced for northbound turns during a typical peak hour as shown in Table 8.

Table 8 – Field Turning Movement Observations		
Vehicle Observation	Turning Direction	Elapsed Time (sec)
1	Left	65
2	Right	15
3	Left	14
4	Right	8
5	Left	13
6	Left	7
7	Left	36
8	Right	16
9	Right	5
10	Right	53
11	Right	35
12	Right	12
13	Right	10
14	Left	72
15	Right	25
16	Right	33
17	Right	29
18	Right	8
19	Right	32
20	Right	6
21	Right	5
22	Right	67
23	Right	74
24	Right	38
25 (max queue of 4)	Right	25
26	Right	4
27	Right	3
28	Left	8
29	Left	12
30	Right	30
31	Right	18
32	Left	25
33	Left	8
33 observations	Average Turning Time	24.5 seconds
23 observations	Average for Right Turns	24.0 Seconds
10 observations	Average for Left turns	26.0 seconds

SECTION IX

SUMMARY AND CONCLUSIONS

This study was undertaken to determine the impact of developing a parcel on the southwest corner of Manchester Road and Old Ballwin Road to develop a new Dutch Bros coffee shop which is to include two drive-through lanes and no indoor seating. Existing traffic data was collected in April 2024 at the intersections near the site to determine the existing traffic patterns around the vacant parcel.

In the existing condition traffic model, it was noted that the signalized intersections on either side of the site performed at a Level of Service (LOS) C or better during the AM and LOS D during the PM peak hour of traffic. It was also noted that during the AM peak, the intersections under two-way stop control (TWSC) generally operated well for the right turn movements in the traffic model but had some significant modeled delays where left turns from the stop-controlled streets existed. These left turn movements caused the modeled intersections to operate at LOS F with delays estimated in the 3-to-4-minute range for the PM peak. It is understood that the traffic on Manchester Road is very high during the peak periods of traffic and that side street delays are common throughout the corridor for many businesses along the corridor.

New vehicle trips generated by the development were estimated using the Institute of Transportation Engineers (ITE) Trip Generation Manual. These trip estimates used the information provided on the proposed land use being considered for the site and used the Land Use Code for Coffee/Donut shop w/Drive-Thru Window and No Indoor Seating. This estimated the total trip in the AM peak to the proposed site at 89 total trips (45 entering and 44 exiting) and 30 trips in the PM peak (15 entering, 15 exiting).

The coffee shop land use features a large number of pass-by trips which are captured from vehicles already in the network on Manchester Road. Using the 90% am Peak and 97.5% PM peak averages for Pass-by trips results in very few trips being added to the roadway network which are not already using Manchester Road past the site. The total additional trips generated in the AM peak was eight (8) trips, while in the PM peak this total is zero (0).

The new trips were assigned to the network based on the existing traffic patterns in the network and where vehicles were likely to access the site. This information was then placed into the Synchro models for analysis and evaluation for Opening Day conditions.

The Opening Day scenario was considered with the development in place with the projected traffic added to the existing collected data. The overall intersection performance appears similar to the existing condition with the signalized intersections seeing little to no change in the average delay and LOS which is due to the very small change in additional new primary trips.

The models for the proposed entrance to the site show that the driveway access onto Old Ballwin Rd functions very well with LOS A and B for all movements and delays at most of about 10 seconds. The models for the Manchester driveway show much longer theoretical delays with AM delays of almost 4 minutes and PM delays of close to 9 minutes. These are theoretical modeled values based on the volumes and signal timings available for Manchester Road.

To evaluate these theoretical model values, TERRA observed the adjacent driveway at a McDonalds restaurant on the morning on May 1, 2024. These observations were generally completed from around 7:50 AM until 8:30 AM which falls during the AM peak. Video sampling of vehicles exiting the driveway were collected and analyzed for approximate waiting times before completing turns. This evaluation collected both left and right turning drivers and resulted in actual waiting times in the average range of 24.5 seconds for 33 total observations. It was noted that of the 10 vehicles making a left turn the average delay was only 26 seconds. There were at two vehicles waiting to make a left for over a minute for a gap in traffic, however others were able to pull up to the end of the driveway and exit within a few seconds which reduced the average. The right turns showed similar values and the maximum queue within the McDonald's driveway exit was four (4) vehicles.

Based on the observed values for average delay, it appears the Dutch Bros driveways will operate with similar characteristics to other businesses in the area and the expected actual delay will be much lower than the modeled numbers. While some vehicles may experience delays of a minute or more, it is expected that most vehicles will be able to exit onto Manchester Road during the gaps created by the platooning of vehicles created by the upstream and downstream traffic signals at New Ballwin Road and Holloway Road. It appears that the expected queues at the site will be easily contained within the project site and the new development should have little to no impact on the existing traffic flows on Manchester Road or Old Ballwin Road.

APPENDIX A
EXISTING TRAFFIC DATA

TERRA ENGINEERING LTD.

Terra Engineering
1804 Borman Circle Drive

Saint Louis, Missouri, United States 63146
314-395-9899 chutchinson@terraengineering.com

Count Name: Manchester Rd & Coral Terrace
Site Code:
Start Date: 04/24/2024
Page No: 1

Turning Movement Data

Start Time	Coral Terrace Southbound						Manchester Rd Westbound						driveway Northbound						Manchester Rd Eastbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:00 AM	0	0	2	0	1	2	0	184	2	0	0	186	0	0	1	0	0	1	0	284	1	0	0	285	474
7:15 AM	1	0	0	0	0	1	0	196	1	0	1	197	0	0	0	0	0	0	0	330	0	0	0	330	528
7:30 AM	4	0	1	0	1	5	0	220	1	0	0	221	1	0	0	0	0	1	0	349	4	0	0	353	580
7:45 AM	1	0	2	0	0	3	1	251	2	0	0	254	0	0	3	0	1	3	0	413	0	0	0	413	673
Hourly Total	6	0	5	0	2	11	1	851	6	0	1	858	1	0	4	0	1	5	0	1376	5	0	0	1381	2255
8:00 AM	2	0	4	0	4	6	1	211	6	0	0	218	0	0	0	0	0	0	3	432	0	0	0	435	659
8:15 AM	1	0	3	0	0	4	2	219	0	1	0	222	0	0	0	0	0	0	3	394	0	0	0	397	623
8:30 AM	2	0	4	0	0	6	0	276	3	0	0	279	0	0	1	0	0	1	0	354	0	0	0	354	640
8:45 AM	2	0	1	0	0	3	0	240	1	0	0	241	0	0	1	0	0	1	2	332	0	0	0	334	579
Hourly Total	7	0	12	0	4	19	3	946	10	1	0	960	0	0	2	0	0	2	8	1512	0	0	0	1520	2501
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	2	0	1	0	2	3	0	343	2	0	0	345	0	0	0	0	0	0	0	372	0	0	0	372	720
3:15 PM	1	0	3	0	1	4	1	383	1	0	0	385	1	0	0	0	0	1	1	318	1	0	0	320	710
3:30 PM	1	0	1	0	1	2	3	392	1	1	0	397	0	0	0	0	0	0	0	325	2	0	0	327	726
3:45 PM	1	0	4	0	3	5	2	399	1	0	0	402	1	0	1	0	2	2	1	340	7	0	0	348	757
Hourly Total	5	0	9	0	7	14	6	1517	5	1	0	1529	2	0	1	0	2	3	2	1355	10	0	0	1367	2913
4:00 PM	1	0	1	0	0	2	3	393	4	0	0	400	3	0	1	0	0	4	1	342	1	0	0	344	750
4:15 PM	3	0	4	0	0	7	0	393	3	0	0	396	2	0	3	0	0	5	3	328	0	0	0	331	739
4:30 PM	2	0	3	0	0	5	2	361	4	0	0	367	2	0	0	0	0	2	1	341	0	0	0	342	716
4:45 PM	2	0	3	0	0	5	2	435	3	0	0	440	0	0	0	0	0	0	0	364	0	0	0	364	809
Hourly Total	8	0	11	0	0	19	7	1582	14	0	0	1603	7	0	4	0	0	11	5	1375	1	0	0	1381	3014
5:00 PM	1	0	9	0	0	10	0	384	5	0	0	389	1	0	0	0	0	1	2	339	0	0	0	341	741
5:15 PM	1	0	4	0	0	5	0	409	1	0	0	410	0	0	0	0	0	0	1	362	0	0	0	363	778
5:30 PM	3	1	2	0	1	6	1	396	1	0	0	398	1	0	1	0	0	2	2	336	0	0	0	338	744
5:45 PM	2	0	2	0	0	4	0	410	3	0	0	413	1	0	0	0	0	1	2	345	0	0	0	347	765
Hourly Total	7	1	17	0	1	25	1	1599	10	0	0	1610	3	0	1	0	0	4	7	1382	0	0	0	1389	3028
Grand Total	33	1	54	0	14	88	18	6495	45	2	1	6560	13	0	12	0	5	25	22	7000	16	0	0	7038	13711
Approach %	37.5	1.1	61.4	0.0	-	-	0.3	99.0	0.7	0.0		-	52.0	0.0	48.0	0.0	-	-	0.3	99.5	0.2	0.0		-	-
Total %	0.2	0.0	0.4	0.0		0.6	0.1	47.4	0.3	0.0		47.8	0.1	0.0	0.1	0.0		0.2	0.2	51.1	0.1	0.0		51.3	-
Lights	33	1	52	0	-	86	17	6384	45	2	-	6448	12	0	12	0		24	22	6866	14	0		6902	13460
% Lights	100.0	100.0	96.3	-	-	97.7	94.4	98.3	100.0	100.0		98.3	92.3	-	100.0	-	-	96.0	100.0	98.1	87.5	-		98.1	98.2
Mediums	0	0	2	0	-	2	1	95	0	0		96	1	0	0	0		1	0	117	2	0		119	218
% Mediums	0.0	0.0	3.7	-	-	2.3	5.6	1.5	0.0	0.0		1.5	7.7	-	0.0	-		4.0	0.0	1.7	12.5	-		1.7	1.6
Articulated Trucks	0	0	0	0	-	0	0	16	0	0		16	0	0	0	0		0	0	17	0	0		17	33
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.2	0.0	0.0		0.2	0.0	-	0.0	-		0.0	0.0	0.2	0.0	-		0.2	0.2

Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	14	-	-	-	-	-	1	-	-	-	-	-	5	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-

Terra Engineering
1804 Borman Circle Drive

Saint Louis, Missouri, United States 63146
314-395-9899 chutchinson@terraengineering.com

Count Name: Manchester Rd & Coral Terrace
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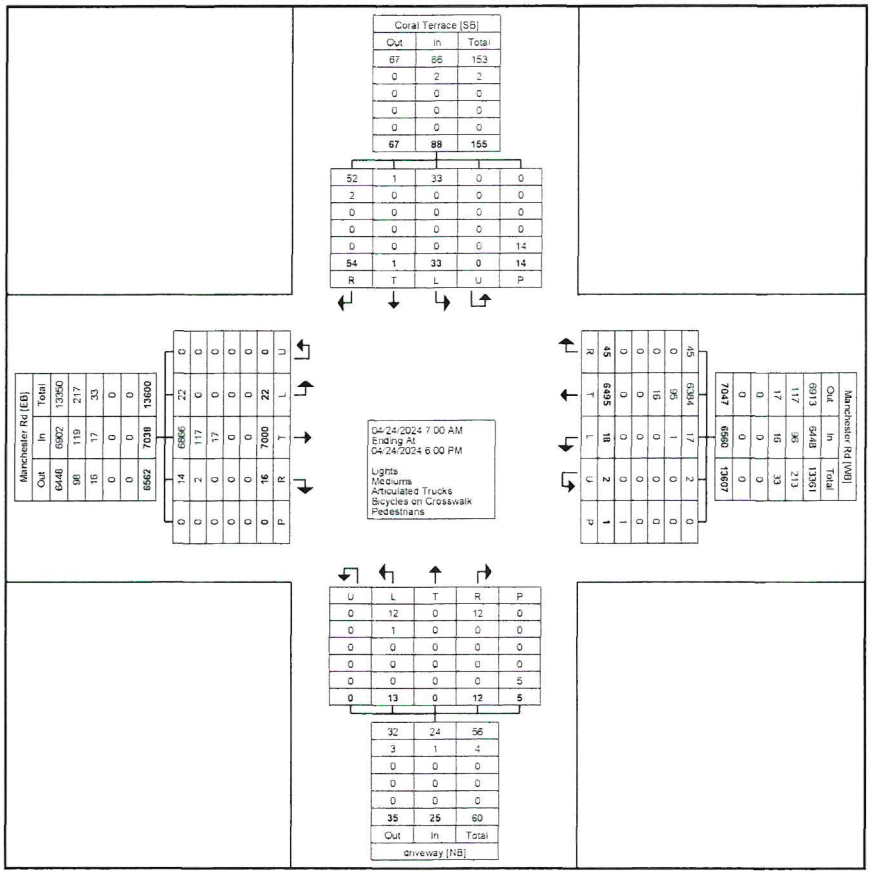
Start Date: 04/24/2024



Turning Movement Data Plot

Terra Engineering
1804 Borman Circle Drive

Saint Louis, Missouri, United States 63146
314-395-9899 chutchinson@terraengineering.com

Count Name: Manchester Rd & Coral Terrace
Site Code:
Start Date: 04/24/2024

Turning Movement Peak Hour Data (7:45 AM)

Start Time	Coral Terrace Southbound						Manchester Rd Westbound						driveway Northbound						Manchester Rd Eastbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:45 AM	1	0	2	0	0	3	1	251	2	0	0	254	0	0	3	0	1	3	0	413	0	0	0	413	673
8:00 AM	2	0	4	0	4	6	1	211	6	0	0	218	0	0	0	0	0	0	3	432	0	0	0	435	659
8:15 AM	1	0	3	0	0	4	2	219	0	1	0	222	0	0	0	0	0	0	3	394	0	0	0	397	623
8:30 AM	2	0	4	0	0	6	0	276	3	0	0	279	0	0	1	0	1	1	0	354	0	0	0	354	640
Total	6	0	13	0	4	19	4	957	11	1	0	973	0	0	4	0	2	4	6	1593	0	0	0	1599	2595
Approach %	31.6	0.0	68.4	0.0	-	-	0.4	98.4	1.1	0.1	-	-	0.0	0.0	100.0	0.0	-	-	0.4	99.6	0.0	0.0	-	-	-
Total %	0.2	0.0	0.5	0.0	-	0.7	0.2	36.9	0.4	0.0	-	37.5	0.0	0.0	0.2	0.0	-	0.2	0.2	61.4	0.0	0.0	-	61.6	-
PHF	0.750	0.000	0.813	0.000	-	0.792	0.500	0.867	0.458	0.250	-	0.872	0.000	0.000	0.333	0.000	-	0.333	0.500	0.922	0.000	0.000	-	0.919	0.964
Lights	6	0	13	0	-	19	4	918	11	1	-	934	0	0	4	0	-	4	6	1538	0	0	-	1544	2501
% Lights	100.0	-	100.0	-	-	100.0	100.0	95.9	100.0	100.0	-	96.0	-	-	100.0	-	-	100.0	100.0	96.5	-	-	-	96.6	96.4
Mediums	0	0	0	0	-	0	0	34	0	0	-	34	0	0	0	0	-	0	0	48	0	0	-	48	82
% Mediums	0.0	-	0.0	-	-	0.0	0.0	3.6	0.0	0.0	-	3.5	-	-	0.0	-	-	0.0	0.0	3.0	-	-	-	3.0	3.2
Articulated Trucks	0	0	0	0	-	0	0	5	0	0	-	5	0	0	0	0	-	0	0	7	0	0	-	7	12
% Articulated Trucks	0.0	-	0.0	-	-	0.0	0.0	0.5	0.0	0.0	-	0.5	-	-	0.0	-	-	0.0	0.0	0.4	-	-	-	0.4	0.5
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	4	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-

Terra Engineering
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Count Name: Manchester Rd & Coral Terrace
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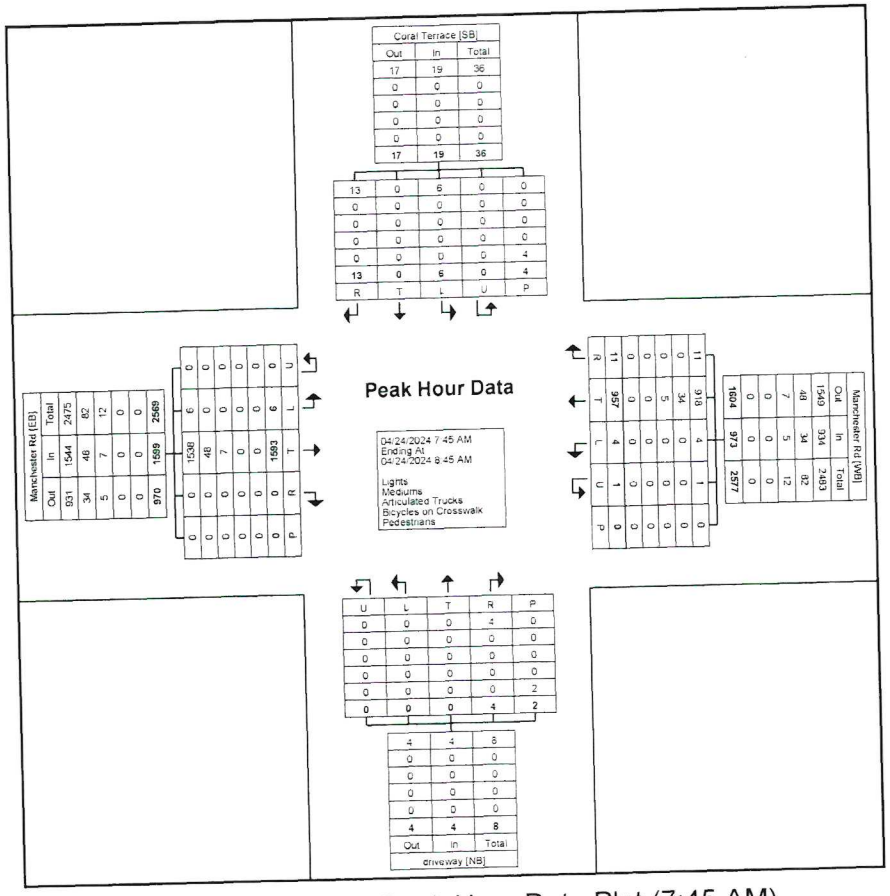

Turning Movement Peak Hour Data Plot (7:45 AM)

Terra Engineering
1804 Borman Circle Drive

Saint Louis, Missouri, United States 63146
314-395-9899 chutchinson@terraengineering.com

Count Name: Manchester Rd & Coral Terrace
Site Code:
Start Date: 04/24/2024

Turning Movement Peak Hour Data (4:45 PM)

Start Time	Coral Terrace Southbound						Manchester Rd Westbound						driveway Northbound						Manchester Rd Eastbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:45 PM	2	0	3	0	0	5	2	435	3	0	0	440	0	0	0	0	0	0	0	364	0	0	0	364	809
5:00 PM	1	0	9	0	0	10	0	384	5	0	0	389	1	0	0	0	0	1	2	339	0	0	0	341	741
5:15 PM	1	0	4	0	0	5	0	409	1	0	0	410	0	0	0	0	0	0	1	362	0	0	0	363	778
5:30 PM	3	1	2	0	1	6	1	396	1	0	0	398	1	0	1	0	0	2	2	336	0	0	0	338	744
Total	7	1	18	0	1	26	3	1624	10	0	0	1637	2	0	1	0	0	3	5	1401	0	0	0	1406	3072
Approach %	26.9	3.8	69.2	0.0	-	-	0.2	99.2	0.6	0.0	-	-	66.7	0.0	33.3	0.0	-	-	0.4	99.6	0.0	0.0	-	-	-
Total %	0.2	0.0	0.6	0.0	-	0.8	0.1	52.9	0.3	0.0	-	53.3	0.1	0.0	0.0	0.0	-	0.1	0.2	45.6	0.0	0.0	-	45.8	-
PHF	0.583	0.250	0.500	0.000	-	0.650	0.375	0.933	0.500	0.000	-	0.930	0.500	0.000	0.250	0.000	-	0.375	0.625	0.962	0.000	0.000	-	0.966	0.949
Lights	7	1	18	0	-	26	2	1617	10	0	-	1629	1	0	1	0	-	2	5	1387	0	0	-	1392	3049
% Lights	100.0	100.0	100.0	-	-	100.0	66.7	99.6	100.0	-	-	99.5	50.0	-	100.0	-	-	66.7	100.0	99.0	-	-	-	99.0	99.3
Mediums	0	0	0	0	-	0	1	5	0	0	-	6	1	0	0	0	-	1	0	10	0	0	-	10	17
% Mediums	0.0	0.0	0.0	-	-	0.0	33.3	0.3	0.0	-	-	0.4	50.0	-	0.0	-	-	33.3	0.0	0.7	-	-	-	0.7	0.6
Articulated Trucks	0	0	0	0	-	0	0	2	0	0	-	2	0	0	0	0	-	0	0	4	0	0	-	4	6
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.1	0.0	-	-	0.1	0.0	-	0.0	-	-	0.0	0.0	0.3	-	-	-	0.3	0.2
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Terra Engineering
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Saint Louis, Missouri, United States 63146
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Count Name: Manchester Rd & Coral Terrace
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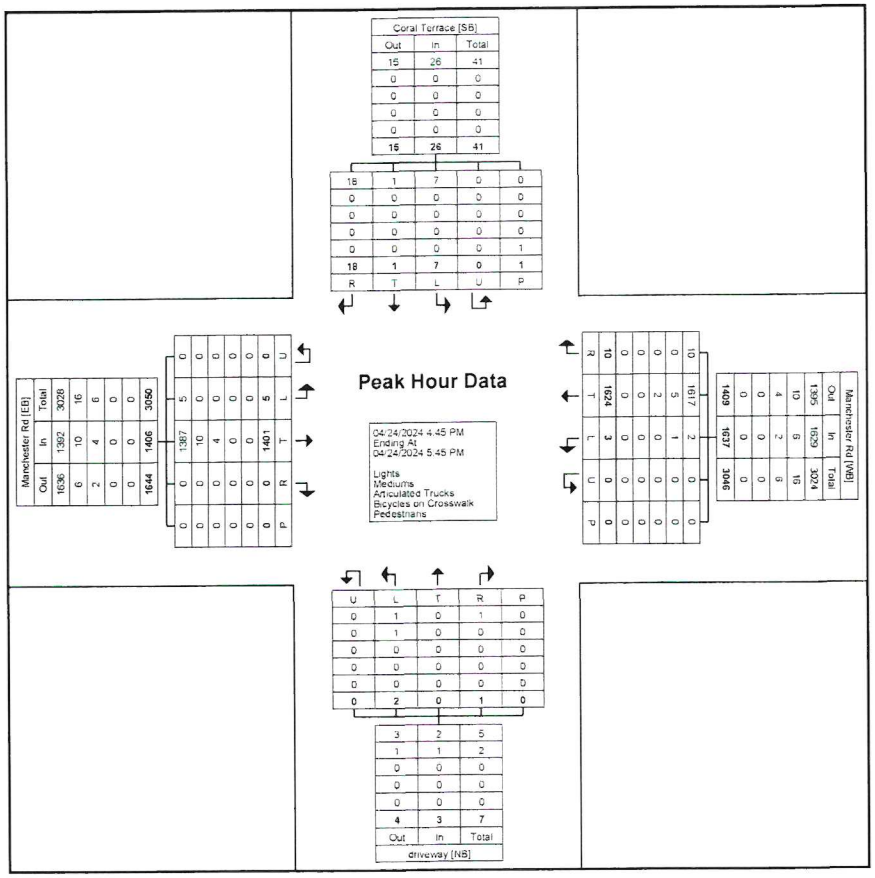
Start Date: 04/24/2024



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

Terra Engineering
1804 Borman Circle Drive

Saint Louis, Missouri, United States 63146
314-395-9899 chutchinson@terraengineering.com

Count Name: Manchester Rd & Holloway Rd
Site Code:
Start Date: 04/24/2024
Page No: 1

Turning Movement Data

Start Time	Holloway Rd Southbound					Manchester Rd Westbound					Manchester Rd Eastbound					Int. Total
	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	
7:00 AM	21	19	3	0	43	169	28	0	0	197	55	262	0	0	317	557
7:15 AM	26	29	0	0	55	200	26	0	0	226	72	306	0	0	378	659
7:30 AM	46	30	0	0	76	207	32	0	0	239	96	307	0	0	403	718
7:45 AM	44	21	0	1	65	216	45	0	0	261	113	323	0	2	436	762
Hourly Total	137	99	3	1	239	792	131	0	0	923	336	1198	0	2	1534	2696
8:00 AM	46	24	0	0	70	215	51	0	0	266	111	308	0	0	419	755
8:15 AM	60	24	0	1	84	215	44	0	0	259	82	330	0	0	412	755
8:30 AM	59	43	0	0	102	254	46	0	0	300	56	289	0	0	345	747
8:45 AM	54	32	0	0	86	239	46	0	0	285	58	271	0	0	329	700
Hourly Total	219	123	0	1	342	923	187	0	0	1110	307	1198	0	0	1505	2957
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	63	50	0	1	113	285	39	0	0	324	52	311	0	0	363	800
3:15 PM	82	73	0	0	155	350	37	0	0	387	45	280	0	2	325	867
3:30 PM	84	70	0	0	154	327	39	0	0	366	50	252	0	0	302	822
3:45 PM	73	90	0	0	163	322	38	0	0	360	59	260	0	0	319	842
Hourly Total	302	283	0	1	585	1284	153	0	0	1437	206	1103	0	2	1309	3331
4:00 PM	83	88	0	0	171	334	39	1	0	374	51	261	0	0	312	857
4:15 PM	98	116	0	0	214	286	42	0	0	328	51	276	0	0	327	869
4:30 PM	106	88	0	0	194	352	34	0	0	386	49	282	0	0	331	911
4:45 PM	96	123	0	0	219	311	36	0	0	347	57	262	0	0	319	885
Hourly Total	383	415	0	0	798	1283	151	1	0	1435	208	1081	0	0	1289	3522
5:00 PM	97	111	0	0	208	331	38	0	0	369	54	287	0	0	341	918
5:15 PM	103	108	0	0	211	329	40	0	0	369	42	282	0	1	324	904
5:30 PM	125	107	0	1	232	306	32	0	0	338	51	274	0	0	325	895
5:45 PM	70	111	0	0	181	345	36	0	0	381	51	271	0	2	322	884
Hourly Total	395	437	0	1	832	1311	146	0	0	1457	198	1114	0	3	1312	3601
Grand Total	1436	1357	3	4	2796	5593	768	1	0	6362	1255	5694	0	7	6949	16107
Approach %	51.4	48.5	0.1	-	-	87.9	12.1	0.0	-	-	18.1	81.9	0.0	-	-	-
Total %	8.9	8.4	0.0	-	17.4	34.7	4.8	0.0	-	39.5	7.8	35.4	0.0	-	43.1	-
Lights	1419	1347	3	-	2769	5483	748	1	-	6232	1238	5589	0	-	6827	15828
% Lights	98.8	99.3	100.0	-	99.0	98.0	97.4	100.0	-	98.0	98.6	98.2	-	-	98.2	98.3
Mediums	15	9	0	-	24	94	17	0	-	111	15	92	0	-	107	242
% Mediums	1.0	0.7	0.0	-	0.9	1.7	2.2	0.0	-	1.7	1.2	1.6	-	-	1.5	1.5
Articulated Trucks	2	1	0	-	3	16	3	0	-	19	2	13	0	-	15	37
% Articulated Trucks	0.1	0.1	0.0	-	0.1	0.3	0.4	0.0	-	0.3	0.2	0.2	-	-	0.2	0.2
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-	-

% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	-	-	-	-	-	14.3	-	-	-	-
Pedestrians	-	-	-	4	-	-	-	-	0	-	-	-	-	6	-	-	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	-	-	-	-	-	85.7	-	-	-	-

Terra Engineering
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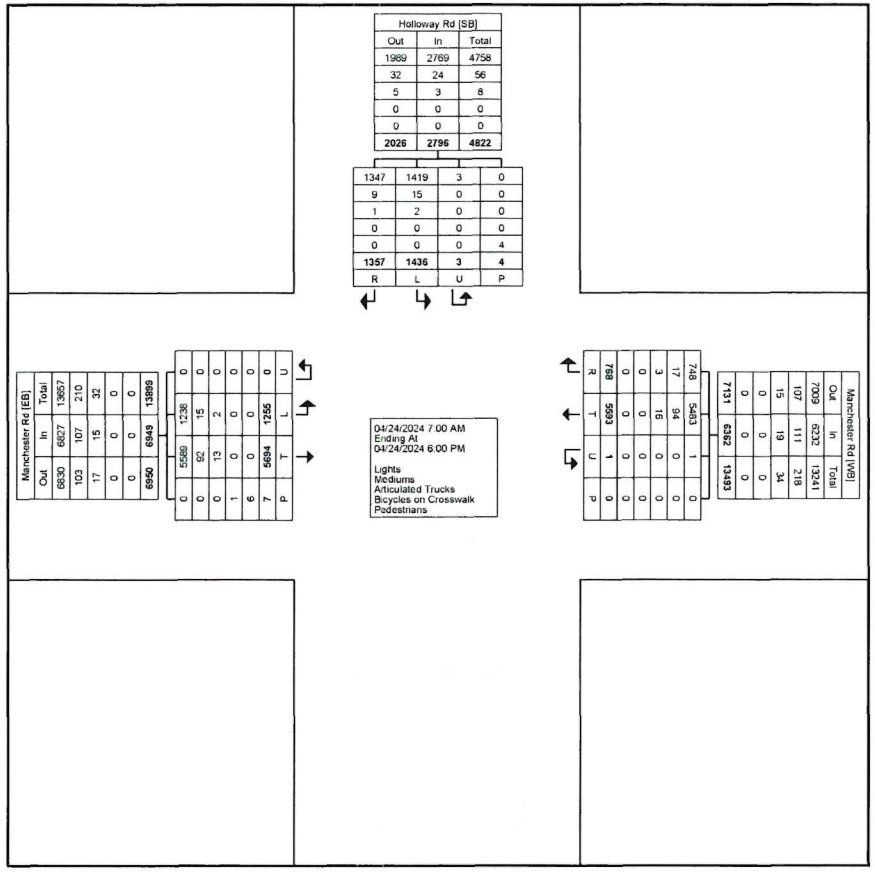
Count Name: Manchester Rd & Holloway Rd
Site Code:
Start Date: 04/24/2024



Turning Movement Data Plot

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Count Name: Manchester Rd & Holloway Rd
Site Code:
Start Date: 04/24/2024

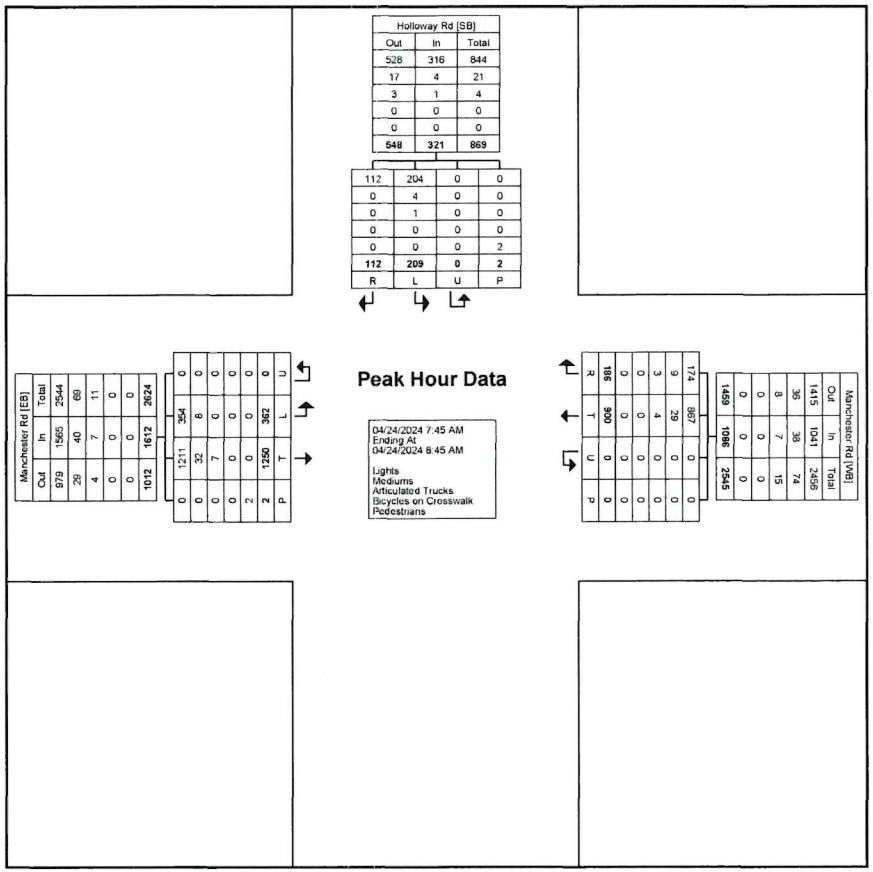
Turning Movement Peak Hour Data (7:45 AM)

Start Time	Holloway Rd Southbound					Manchester Rd Westbound					Manchester Rd Eastbound					Int. Total
	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	
7:45 AM	44	21	0	1	65	216	45	0	0	261	113	323	0	0	436	762
8:00 AM	46	24	0	0	70	215	51	0	0	266	111	308	0	0	419	755
8:15 AM	60	24	0	1	84	215	44	0	0	259	82	330	0	0	412	755
8:30 AM	59	43	0	0	102	254	46	0	0	300	56	289	0	0	345	747
Total	209	112	0	2	321	900	186	0	0	1086	362	1250	0	2	1612	3019
Approach %	65.1	34.9	0.0	-	-	82.9	17.1	0.0	-	-	22.5	77.5	0.0		-	-
Total %	6.9	3.7	0.0	-	10.6	29.8	6.2	0.0	-	36.0	12.0	41.4	0.0		53.4	-
PHF	0.871	0.651	0.000	-	0.787	0.886	0.912	0.000	-	0.905	0.801	0.947	0.000		0.924	0.990
Lights	204	112	0	-	316	867	174	0	-	1041	354	1211	0		1565	2922
% Lights	97.6	100.0	-	-	98.4	96.3	93.5	-	-	95.9	97.8	96.9	-		97.1	96.8
Mediums	4	0	0	-	4	29	9	0	-	38	8	32	0		40	82
% Mediums	1.9	0.0	-	-	1.2	3.2	4.8	-	-	3.5	2.2	2.6	-		2.5	2.7
Articulated Trucks	1	0	0	-	1	4	3	0	-	7	0	7	0		7	15
% Articulated Trucks	0.5	0.0	-	-	0.3	0.4	1.6	-	-	0.6	0.0	0.6	-		0.4	0.5
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	2	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	-	-	-	-	-	100.0	-	-

Terra Engineering
1804 Borman Circle Drive

Saint Louis, Missouri, United States 63146
314-395-9899 chutchinson@terraengineering.com

Count Name: Manchester Rd & Holloway Rd
Site Code:
Start Date: 04/24/2024



Turning Movement Peak Hour Data Plot (7:45 AM)

Terra Engineering
1804 Borman Circle Drive

Saint Louis, Missouri, United States 63146
314-395-9899 chutchinson@terraengineering.com

Count Name: Manchester Rd & Holloway Rd
Site Code:
Start Date: 04/24/2024

Turning Movement Peak Hour Data (4:30 PM)

Start Time	Holloway Rd Southbound					Manchester Rd Westbound					Manchester Rd Eastbound					Int. Total
	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	
4:30 PM	106	88	0	0	194	352	34	0	0	386	49	282	0	0	331	911
4:45 PM	96	123	0	0	219	311	36	0	0	347	57	262	0	0	319	885
5:00 PM	97	111	0	0	208	331	38	0	0	369	54	287	0	0	341	918
5:15 PM	103	108	0	0	211	329	40	0	0	369	42	282	0	0	324	904
Total	402	430	0	0	832	1323	148	0	0	1471	202	1113	0	0	1315	3618
Approach %	48.3	51.7	0.0	-	-	89.9	10.1	0.0	-	-	15.4	84.6	0.0	-	-	-
Total %	11.1	11.9	0.0	-	23.0	36.6	4.1	0.0	-	40.7	5.6	30.8	0.0	-	36.3	-
PHF	0.948	0.874	0.000	-	0.950	0.940	0.925	0.000	-	0.953	0.886	0.970	0.000	-	0.964	0.985
Lights	398	428	0	-	826	1315	147	0	-	1462	200	1102	0	-	1302	3590
% Lights	99.0	99.5	-	-	99.3	99.4	99.3	-	-	99.4	99.0	99.0	-	-	99.0	99.2
Mediums	3	1	0	-	4	4	1	0	-	5	1	9	0	-	10	19
% Mediums	0.7	0.2	-	-	0.5	0.3	0.7	-	-	0.3	0.5	0.8	-	-	0.8	0.5
Articulated Trucks	1	1	0	-	2	4	0	0	-	4	1	2	0	-	3	9
% Articulated Trucks	0.2	0.2	-	-	0.2	0.3	0.0	-	-	0.3	0.5	0.2	-	-	0.2	0.2
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-

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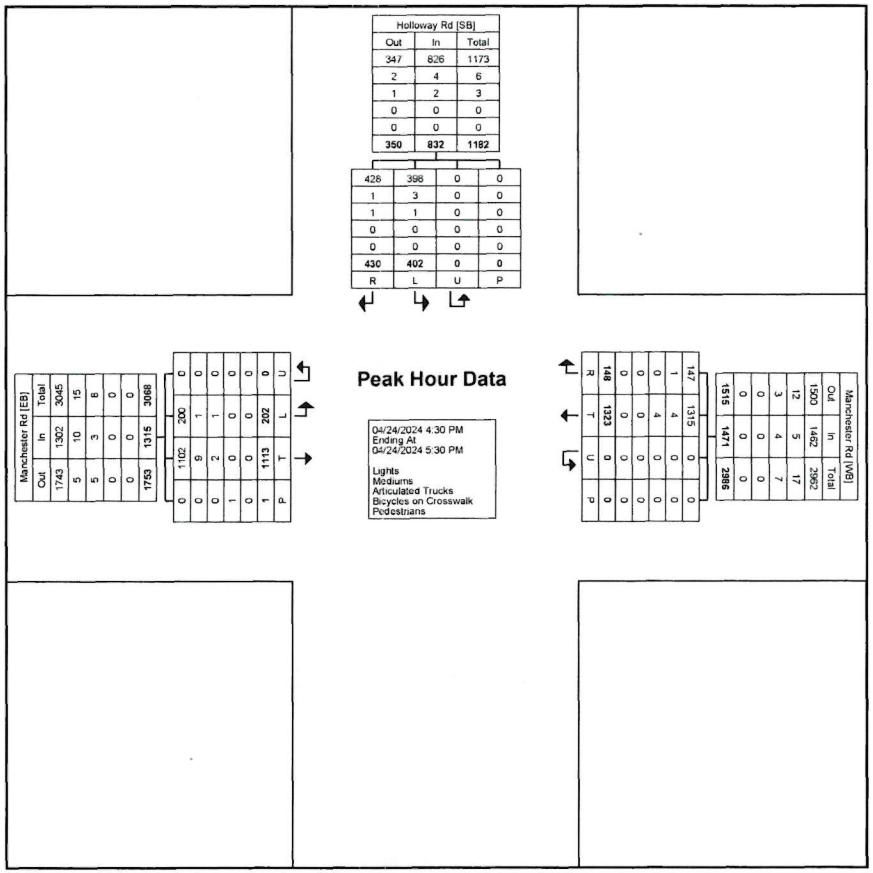
Count Name: Manchester Rd & Holloway Rd
Site Code:
Start Date: 04/24/2024
Page No: 7



Turning Movement Peak Hour Data Plot (4:30 PM)

Terra Engineering
1804 Borman Circle Drive

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Count Name: Manchester Rd & Old Ballwin Rd
Site Code:
Start Date: 04/24/2024
Page No: 1

Turning Movement Data

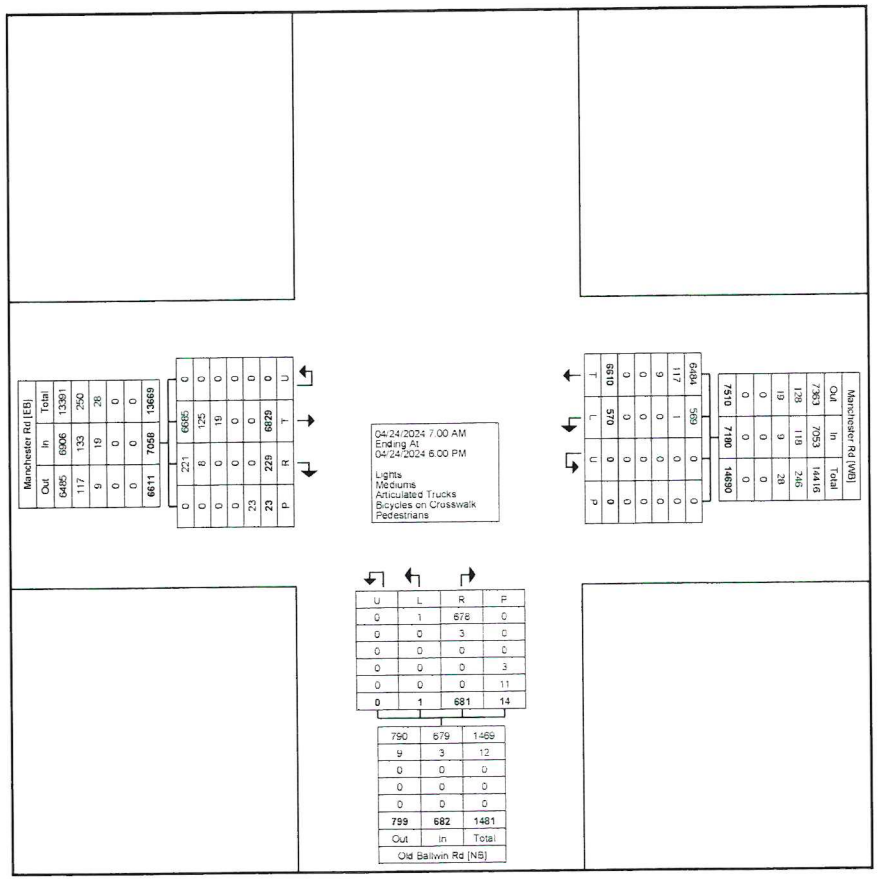
Start Time	Manchester Rd Westbound					Old Ballwin Rd Northbound					Manchester Rd Eastbound					Int. Total
	Left	Thru	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	
7:00 AM	13	188	0	0	201	0	32	0	0	32	279	6	0	0	285	518
7:15 AM	20	202	0	0	222	0	50	0	2	50	317	10	0	2	327	599
7:30 AM	19	224	0	0	243	0	86	0	0	86	340	11	0	0	351	680
7:45 AM	13	253	0	0	266	0	63	0	0	63	415	7	0	0	422	751
Hourly Total	65	867	0	0	932	0	231	0	2	231	1351	34	0	3	1385	2548
8:00 AM	28	217	0	0	245	1	39	0	0	40	427	10	0	0	437	722
8:15 AM	15	224	0	0	239	0	26	0	0	26	388	10	0	0	398	663
8:30 AM	20	281	0	0	301	0	33	0	0	33	344	12	0	0	356	690
8:45 AM	18	243	0	0	261	0	27	0	0	27	325	11	0	0	336	624
Hourly Total	81	965	0	0	1046	1	125	0	0	126	1484	43	0	0	1527	2699
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	11	345	0	0	356	0	47	0	1	47	374	5	0	0	379	782
3:15 PM	33	388	0	0	421	0	23	0	2	23	308	8	0	0	316	760
3:30 PM	29	398	0	0	427	0	23	0	0	23	303	17	0	0	320	770
3:45 PM	40	406	0	0	446	0	28	0	2	28	332	17	0	0	349	823
Hourly Total	113	1537	0	0	1650	0	121	0	5	121	1317	47	0	0	1364	3135
4:00 PM	30	401	0	0	431	0	36	0	0	36	329	12	0	0	341	808
4:15 PM	35	399	0	0	434	0	32	0	0	32	331	11	0	0	342	808
4:30 PM	44	377	0	0	421	0	24	0	0	24	324	18	0	0	342	787
4:45 PM	26	444	0	0	470	0	25	0	0	25	358	16	0	0	374	869
Hourly Total	135	1621	0	0	1756	0	117	0	0	117	1342	57	0	0	1399	3272
5:00 PM	53	392	0	0	445	0	20	0	0	20	329	8	0	0	337	802
5:15 PM	46	410	0	0	456	0	19	0	0	19	351	14	0	0	365	840
5:30 PM	35	402	0	0	437	0	25	0	0	25	329	12	0	0	341	803
5:45 PM	42	416	0	0	458	0	23	0	0	23	326	14	0	0	340	821
Hourly Total	176	1620	0	0	1796	0	87	0	0	87	1335	48	0	0	1383	3266
Grand Total	570	6610	0	0	7180	1	681	0	14	682	6829	229	0	0	7058	14920
Approach %	7.9	92.1	0.0	-	-	0.1	99.9	0.0	-	-	96.8	3.2	0.0	-	-	-
Total %	3.8	44.3	0.0	-	48.1	0.0	4.6	0.0	-	4.6	45.8	1.5	0.0	-	47.3	-
Lights	569	6484	0	-	7053	1	678	0	-	679	6685	221	0	-	6906	14638
% Lights	99.8	98.1	-	-	98.2	100.0	99.6	-	-	99.6	97.9	96.5	-	-	97.8	98.1
Mediums	1	117	0	-	118	0	3	0	-	3	125	8	0	-	133	254
% Mediums	0.2	1.8	-	-	1.6	0.0	0.4	-	-	0.4	1.8	3.5	-	-	1.9	1.7
Articulated Trucks	0	9	0	-	9	0	0	0	-	0	19	0	0	-	19	28
% Articulated Trucks	0.0	0.1	-	-	0.1	0.0	0.0	-	-	0.0	0.3	0.0	-	-	0.3	0.2
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	3	-	-	-	-	0	-	-

% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	21.4	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	11	-	-	-	-	23	-	-
% Pedestrians	-	-	-	-	-	-	-	-	78.6	-	-	-	-	100.0	-	-

Terra Engineering
1804 Borman Circle Drive

Saint Louis, Missouri, United States 63146
314-395-9899 chutchinson@terraengineering.com

Count Name: Manchester Rd & Old Ballwin Rd
Site Code:
Start Date: 04/24/2024



Turning Movement Data Plot

Terra Engineering
1804 Borman Circle Drive

Saint Louis, Missouri, United States 63146
314-395-9899 chutchinson@terraengineering.com

Count Name: Manchester Rd & Old Ballwin Rd
Site Code:
Start Date: 04/24/2024

Turning Movement Peak Hour Data (7:45 AM)

Start Time	Manchester Rd Westbound					Old Ballwin Rd Northbound					Manchester Rd Eastbound					
	Left	Thru	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Int. Total
7:45 AM	13	253	0	0	266	0	63	0	0	63	415	7	0	1	422	751
8:00 AM	28	217	0	0	245	1	39	0	0	40	427	10	0	1	437	722
8:15 AM	15	224	0	0	239	0	26	0	0	26	388	10	0	1	398	663
8:30 AM	20	281	0	0	301	0	33	0	0	33	344	12	0	1	356	690
Total	76	975	0	0	1051	1	161	0	0	162	1574	39	0	4	1613	2826
Approach %	7.2	92.8	0.0	-	-	0.6	99.4	0.0	-	-	97.6	2.4	0.0	-	-	-
Total %	2.7	34.5	0.0	-	37.2	0.0	5.7	0.0	-	5.7	55.7	1.4	0.0	-	57.1	-
PHF	0.679	0.867	0.000	-	0.873	0.250	0.639	0.000	-	0.643	0.922	0.813	0.000	-	0.923	0.941
Lights	76	933	0	-	1009	1	160	0	-	161	1516	34	0	-	1550	2720
% Lights	100.0	95.7	-	-	96.0	100.0	99.4	-	-	99.4	96.3	87.2	-	-	96.1	96.2
Mediums	0	36	0	-	36	0	1	0	-	1	50	5	0	-	55	92
% Mediums	0.0	3.7	-	-	3.4	0.0	0.6	-	-	0.6	3.2	12.8	-	-	3.4	3.3
Articulated Trucks	0	6	0	-	6	0	0	0	-	0	8	0	0	-	8	14
% Articulated Trucks	0.0	0.6	-	-	0.6	0.0	0.0	-	-	0.0	0.5	0.0	-	-	0.5	0.5
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	4	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

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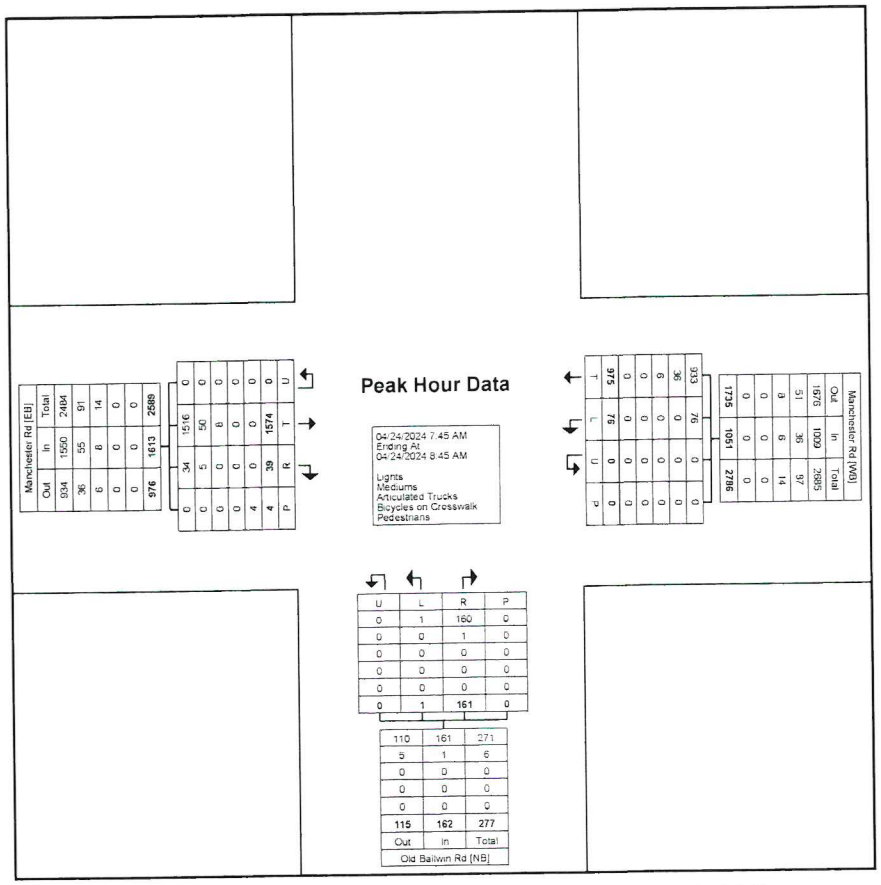
Count Name: Manchester Rd & Old Ballwin Rd
Site Code:
Start Date: 04/24/2024
Page No: 5



Turning Movement Peak Hour Data Plot (7:45 AM)

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1804 Borman Circle Drive

Saint Louis, Missouri, United States 63146
314-395-9899 chutchinson@terraengineering.com

Count Name: Manchester Rd & Old Ballwin Rd
Site Code:
Start Date: 04/24/2024

Turning Movement Peak Hour Data (4:45 PM)

Start Time	Manchester Rd Westbound					Old Ballwin Rd Northbound					Manchester Rd Eastbound					Int. Total
	Left	Thru	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	
4:45 PM	26	444	0	0	470	0	25	0	2	25	358	16	0	1	374	869
5:00 PM	53	392	0	0	445	0	20	0	0	20	329	8	0	0	337	802
5:15 PM	46	410	0	0	456	0	19	0	1	19	351	14	0	1	365	840
5:30 PM	35	402	0	0	437	0	25	0	1	25	329	12	0	3	341	803
Total	160	1648	0	0	1808	0	89	0	4	89	1367	50	0	5	1417	3314
Approach %	8.8	91.2	0.0	-	-	0.0	100.0	0.0	-	-	96.5	3.5	0.0	-	-	-
Total %	4.8	49.7	0.0	-	54.6	0.0	2.7	0.0	-	2.7	41.2	1.5	0.0	-	42.8	-
PHF	0.755	0.928	0.000	-	0.962	0.000	0.890	0.000	-	0.890	0.955	0.781	0.000	-	0.947	0.953
Lights	160	1640	0	-	1800	0	89	0	-	89	1352	49	0	-	1401	3290
% Lights	100.0	99.5	-	-	99.6	-	100.0	-	-	100.0	98.9	98.0	-	-	98.9	99.3
Mediums	0	7	0	-	7	0	0	0	-	0	12	1	0	-	13	20
% Mediums	0.0	0.4	-	-	0.4	-	0.0	-	-	0.0	0.9	2.0	-	-	0.9	0.6
Articulated Trucks	0	1	0	-	1	0	0	0	-	0	3	0	0	-	3	4
% Articulated Trucks	0.0	0.1	-	-	0.1	-	0.0	-	-	0.0	0.2	0.0	-	-	0.2	0.1
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	2	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	50.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	2	-	-	-	-	5	-	-
% Pedestrians	-	-	-	-	-	-	-	-	50.0	-	-	-	-	100.0	-	-

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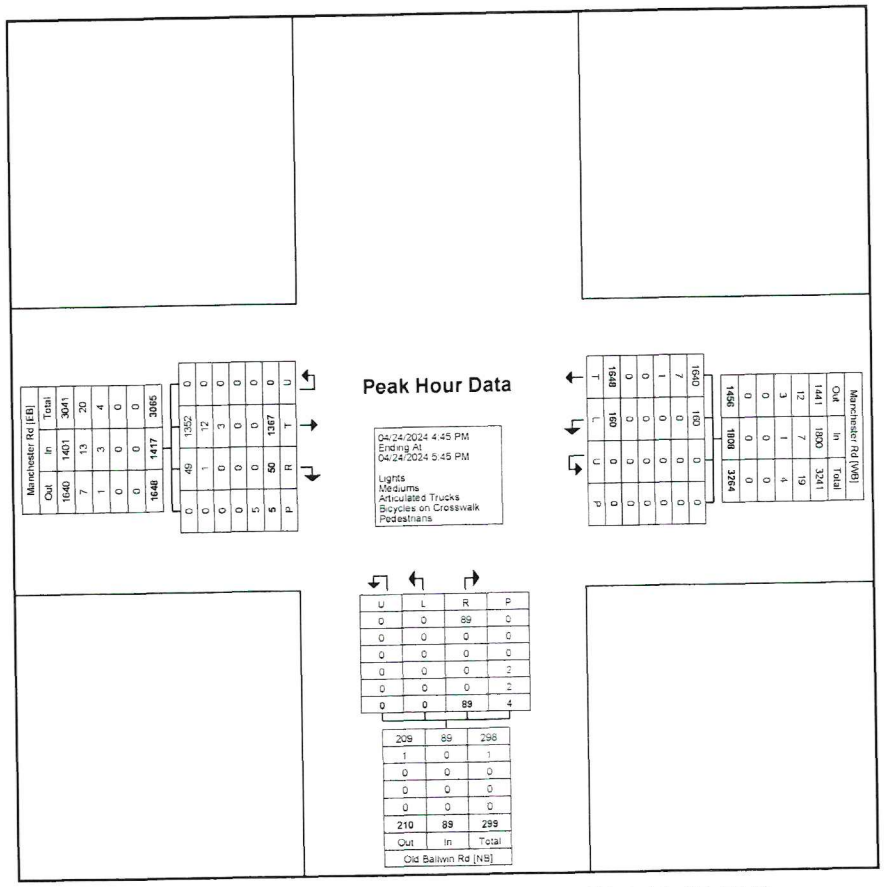
Count Name: Manchester Rd & Old Ballwin Rd
Site Code:
Start Date: 04/24/2024



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

Terra Engineering
1804 Borman Circle Drive

Saint Louis, Missouri, United States 63146
314-395-9899 song@terraengineering.com

Count Name: Manchester Rd & New Ballwin Rd
Site Code:
Start Date: 03/12/2024
Page No: 1

Turning Movement Data

Start Time	Central Plaza Southbound						Manchester Rd Westbound						New Ballwin Rd Northbound						Manchester Rd Eastbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:00 AM	0	1	0	0	0	1	15	141	0	0	0	156	50	0	53	0	0	103	0	189	37	0	0	226	486
7:15 AM	0	2	0	0	0	2	36	147	0	0	0	183	67	0	54	0	0	121	0	259	73	0	0	332	638
7:30 AM	3	2	1	0	0	6	44	170	2	0	0	216	74	0	59	0	0	133	2	238	72	0	0	312	667
7:45 AM	3	0	2	0	0	5	18	205	0	0	0	223	107	0	72	0	1	179	0	288	55	0	0	343	750
Hourly Total	6	5	3	0	0	14	113	663	2	0	0	778	298	0	238	0	1	536	2	974	237	0	0	1213	2541
8:00 AM	1	2	0	0	0	3	15	194	1	0	0	210	85	0	62	0	0	147	0	265	34	0	0	299	659
8:15 AM	3	2	0	0	1	5	24	196	5	0	0	225	58	0	57	0	0	115	0	284	34	0	1	318	663
8:30 AM	2	0	2	0	0	4	26	173	3	0	0	202	65	0	44	0	0	109	0	255	28	0	0	283	598
8:45 AM	2	0	1	0	0	3	20	203	4	0	0	227	62	0	48	0	0	110	0	238	34	0	0	272	612
Hourly Total	8	4	3	0	1	15	85	766	13	0	0	864	270	0	211	0	0	481	0	1042	130	0	1	1172	2532
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	25	19	12	0	0	56	27	302	20	0	0	349	101	12	48	0	0	161	1	241	46	0	0	288	854
3:15 PM	26	4	12	0	0	42	32	274	17	0	0	323	73	7	33	0	0	113	5	220	47	0	0	272	750
3:30 PM	16	10	4	0	0	30	44	360	16	0	3	420	53	4	19	0	0	76	4	305	89	0	0	398	924
3:45 PM	17	18	5	0	0	40	37	280	27	0	0	344	69	13	50	0	1	132	8	244	66	0	0	318	834
Hourly Total	84	51	33	0	0	168	140	1216	80	0	3	1436	296	36	150	0	1	482	18	1010	248	0	0	1276	3362
4:00 PM	21	3	9	0	0	33	38	309	26	0	0	373	96	12	49	0	0	157	5	290	56	0	0	351	914
4:15 PM	18	13	9	0	1	40	63	289	19	0	0	371	81	9	49	0	0	139	4	281	63	0	0	348	898
4:30 PM	25	10	8	0	0	43	45	302	19	0	0	366	83	10	44	0	0	137	8	274	80	0	0	362	908
4:45 PM	21	11	8	0	0	40	48	302	23	0	0	373	82	7	41	0	0	130	9	279	69	0	0	357	900
Hourly Total	85	37	34	0	1	156	194	1202	87	0	0	1483	342	38	183	0	0	563	26	1124	268	0	0	1418	3620
5:00 PM	18	12	6	0	0	36	47	309	22	0	1	378	107	7	39	0	1	153	6	281	82	0	0	369	936
5:15 PM	23	10	7	0	2	40	53	307	19	0	1	379	82	12	34	0	1	128	6	280	74	0	0	360	907
5:30 PM	29	13	7	0	0	49	49	273	23	0	0	345	85	8	35	0	0	128	8	232	61	0	0	301	823
5:45 PM	22	13	5	0	0	40	49	298	23	0	6	370	66	15	38	0	0	119	6	258	69	0	0	333	862
Hourly Total	92	48	25	0	2	165	198	1187	87	0	8	1472	340	42	146	0	2	528	26	1051	286	0	0	1363	3528
Grand Total	275	145	98	0	4	518	730	5034	269	0	11	6033	1546	116	928	0	4	2590	72	5201	1169	0	1	6442	15583
Approach %	53.1	28.0	18.9	0.0	-	-	12.1	83.4	4.5	0.0	-	-	59.7	4.5	35.8	0.0	-	-	1.1	80.7	18.1	0.0	-	-	-
Total %	1.8	0.9	0.6	0.0	-	3.3	4.7	32.3	1.7	0.0	-	38.7	9.9	0.7	6.0	0.0	-	16.6	0.5	33.4	7.5	0.0	-	41.3	-
Lights	270	144	96	0	-	510	712	4952	266	0	-	5930	1523	116	907	0	-	2546	72	5111	1148	0	-	6331	15317
% Lights	98.2	99.3	98.0	-	-	98.5	97.5	98.4	98.9	-	-	98.3	98.5	100.0	97.7	-	-	98.3	100.0	98.3	98.2	-	-	98.3	98.3
Buses	2	1	0	0	-	3	14	27	0	0	-	41	20	0	13	0	-	33	0	20	12	0	-	32	109
% Buses	0.7	0.7	0.0	-	-	0.6	1.9	0.5	0.0	-	-	0.7	1.3	0.0	1.4	-	-	1.3	0.0	0.4	1.0	-	-	0.5	0.7
Single-Unit Trucks	3	0	2	0	-	5	2	42	3	0	-	47	2	0	7	0	-	9	0	48	9	0	-	57	118
% Single-Unit Trucks	1.1	0.0	2.0	-	-	1.0	0.3	0.8	1.1	-	-	0.8	0.1	0.0	0.8	-	-	0.3	0.0	0.9	0.8	-	-	0.9	0.8

Articulated Trucks	0	0	0	0	-	0	2	13	0	0	-	15	1	0	1	0	-	2	0	22	0	0	-	22	39
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.3	0.3	0.0	-	-	0.2	0.1	0.0	0.1	-	-	0.1	0.0	0.4	0.0	-	-	0.3	0.3
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	5	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	45.5	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	4	-	-	-	-	-	6	-	-	-	-	-	4	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	54.5	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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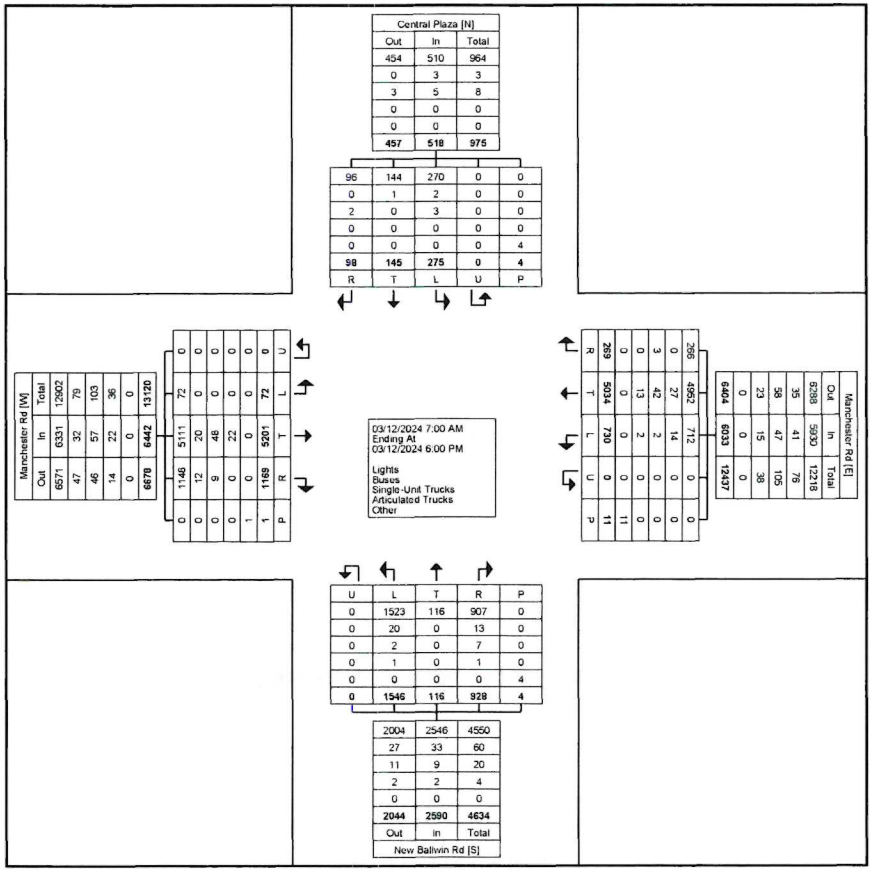

Turning Movement Data Plot

Terra Engineering
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Count Name: Manchester Rd & New Ballwin Rd
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Page No: 4

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Central Plaza Southbound						Manchester Rd Westbound						New Ballwin Rd Northbound						Manchester Rd Eastbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:30 AM	3	2	1	0	0	6	44	170	2	0	0	216	74	0	59	0	0	133	2	238	72	0	0	312	667
7:45 AM	3	0	2	0	0	5	18	205	0	0	0	223	107	0	72	0	0	179	0	288	55	0	0	343	750
8:00 AM	1	2	0	0	0	3	15	194	1	0	0	210	85	0	62	0	0	147	0	265	34	0	0	299	659
8:15 AM	3	2	0	0	0	5	24	196	5	0	0	225	58	0	57	0	0	115	0	284	34	0	0	318	663
Total	10	6	3	0	0	19	101	765	8	0	0	874	324	0	250	0	0	574	2	1075	195	0	0	1272	2739
Approach %	52.6	31.6	15.8	0.0	-	-	11.6	87.5	0.9	0.0	-	-	56.4	0.0	43.6	0.0	-	-	0.2	84.5	15.3	0.0	-	-	-
Total %	0.4	0.2	0.1	0.0	-	0.7	3.7	27.9	0.3	0.0	-	31.9	11.8	0.0	9.1	0.0	-	21.0	0.1	39.2	7.1	0.0	-	46.4	-
PHF	0.833	0.750	0.375	0.000	-	0.792	0.574	0.933	0.400	0.000	-	0.971	0.757	0.000	0.868	0.000	-	0.802	0.250	0.933	0.677	0.000	-	0.927	0.913
Lights	6	5	2	0	-	13	97	741	7	0	-	845	324	0	242	0	-	566	2	1046	188	0	-	1236	2660
% Lights	60.0	83.3	66.7	-	-	68.4	96.0	96.9	87.5	-	-	96.7	100.0	-	96.8	-	-	98.6	100.0	97.3	96.4	-	-	97.2	97.1
Buses	2	1	0	0	-	3	1	9	0	0	-	10	0	0	6	0	-	6	0	6	3	0	-	9	28
% Buses	20.0	16.7	0.0	-	-	15.8	1.0	1.2	0.0	-	-	1.1	0.0	-	2.4	-	-	1.0	0.0	0.6	1.5	-	-	0.7	1.0
Single-Unit Trucks	2	0	1	0	-	3	1	12	1	0	-	14	0	0	2	0	-	2	0	13	4	0	-	17	36
% Single-Unit Trucks	20.0	0.0	33.3	-	-	15.8	1.0	1.6	12.5	-	-	1.6	0.0	-	0.8	-	-	0.3	0.0	1.2	2.1	-	-	1.3	1.3
Articulated Trucks	0	0	0	0	-	0	2	3	0	0	-	5	0	0	0	0	-	0	0	10	0	0	-	10	15
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	2.0	0.4	0.0	-	-	0.6	0.0	-	0.0	-	-	0.0	0.0	0.9	0.0	-	-	0.8	0.5
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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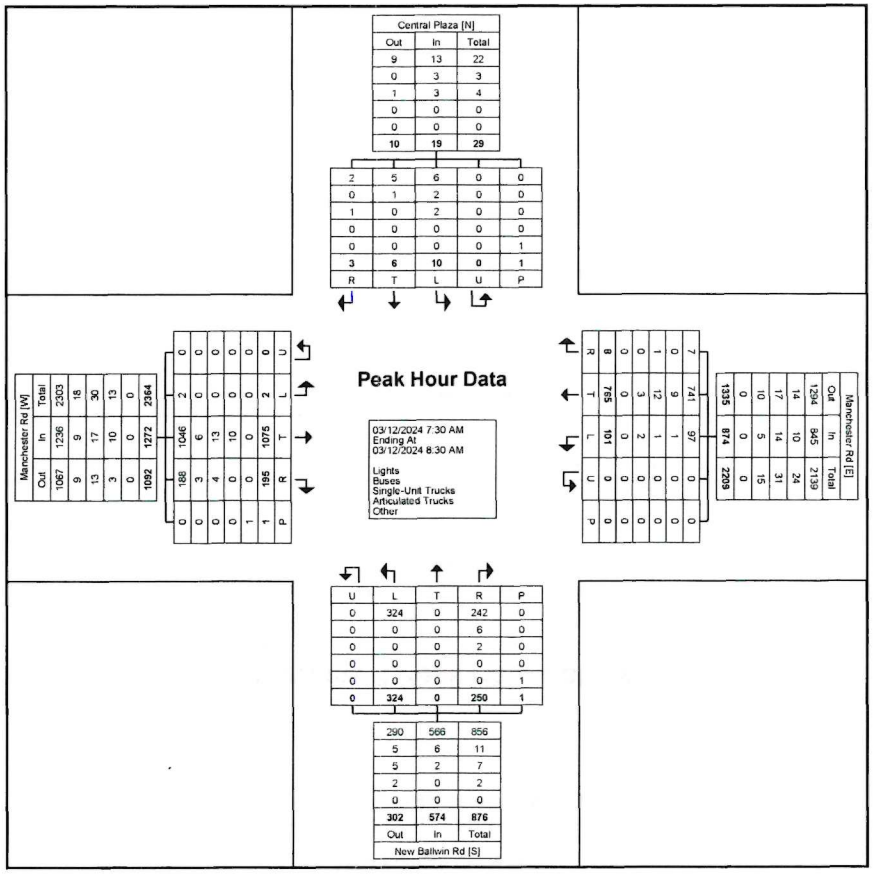

Turning Movement Peak Hour Data Plot (7:30 AM)

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Turning Movement Peak Hour Data (4:30 PM)

Start Time	Central Plaza Southbound						Manchester Rd Westbound						New Ballwin Rd Northbound						Manchester Rd Eastbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:30 PM	25	10	8	0	0	43	45	302	19	0	0	366	83	10	44	0	0	137	8	274	80	0	0	362	908
4:45 PM	21	11	8	0	0	40	48	302	23	0	0	373	82	7	41	0	0	130	9	279	69	0	0	357	900
5:00 PM	18	12	6	0	0	36	47	309	22	0	1	378	107	7	39	0	1	153	6	281	82	0	0	369	936
5:15 PM	23	10	7	0	2	40	53	307	19	0	1	379	82	12	34	0	1	128	6	280	74	0	0	360	907
Total	87	43	29	0	2	159	193	1220	83	0	2	1496	354	36	158	0	2	548	29	1114	305	0	0	1448	3651
Approach %	54.7	27.0	18.2	0.0	-	-	12.9	81.6	5.5	0.0	-	-	64.6	6.6	28.8	0.0	-	-	2.0	76.9	21.1	0.0	-	-	-
Total %	2.4	1.2	0.8	0.0	-	4.4	5.3	33.4	2.3	0.0	-	41.0	9.7	1.0	4.3	0.0	-	15.0	0.8	30.5	8.4	0.0	-	39.7	-
PHF	0.870	0.896	0.906	0.000	-	0.924	0.910	0.987	0.902	0.000	-	0.987	0.827	0.750	0.898	0.000	-	0.895	0.806	0.991	0.930	0.000	-	0.981	0.975
Lights	87	43	28	0	-	158	192	1213	82	0	-	1487	349	36	157	0	-	542	29	1101	304	0	-	1434	3621
% Lights	100.0	100.0	96.6	-	-	99.4	99.5	99.4	98.8	-	-	99.4	98.6	100.0	99.4	-	-	98.9	100.0	98.8	99.7	-	-	99.0	99.2
Buses	0	0	0	0	-	0	0	2	0	0	-	2	5	0	0	0	-	5	0	3	1	0	-	4	11
% Buses	0.0	0.0	0.0	-	-	0.0	0.0	0.2	0.0	-	-	0.1	1.4	0.0	0.0	-	-	0.9	0.0	0.3	0.3	-	-	0.3	0.3
Single-Unit Trucks	0	0	1	0	-	1	1	1	1	0	-	3	0	0	1	0	-	1	0	6	0	0	-	6	11
% Single-Unit Trucks	0.0	0.0	3.4	-	-	0.6	0.5	0.1	1.2	-	-	0.2	0.0	0.0	0.6	-	-	0.2	0.0	0.5	0.0	-	-	0.4	0.3
Articulated Trucks	0	0	0	0	-	0	0	4	0	0	-	4	0	0	0	0	-	0	0	4	0	0	-	4	8
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.3	0.0	-	-	0.3	0.0	0.0	0.0	-	-	0.0	0.0	0.4	0.0	-	-	0.3	0.2
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	2	-	-	-	-	-	2	-	-	-	-	-	2	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-

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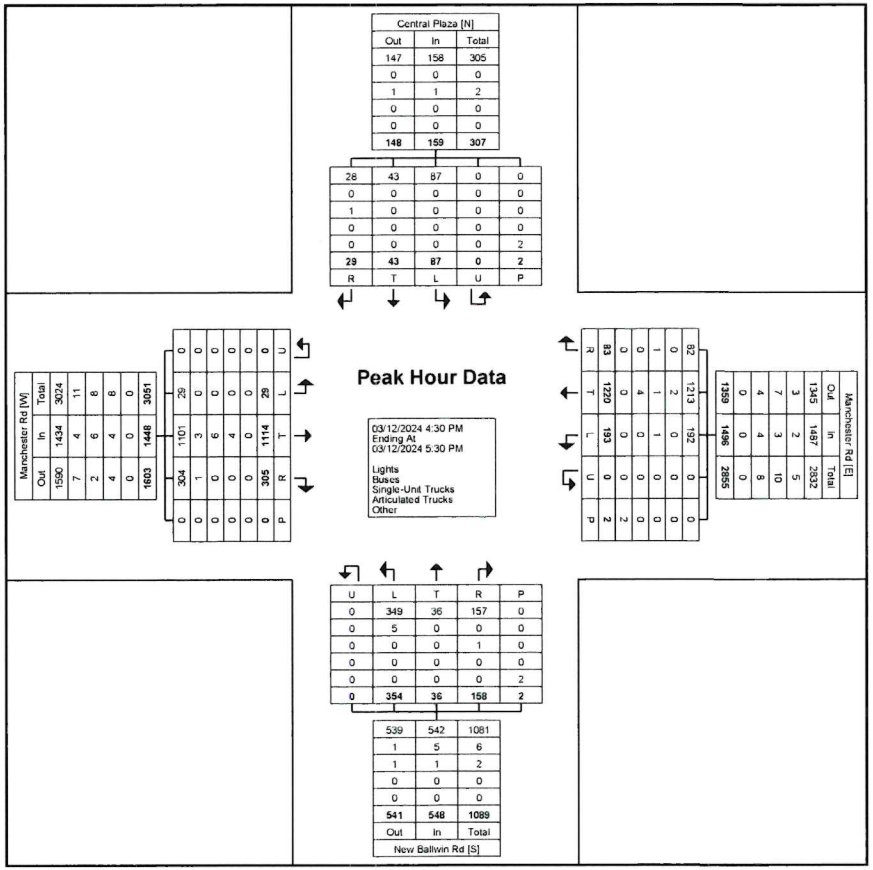


Turning Movement Peak Hour Data Plot (4:30 PM)

APPENDIX B
EXISTING SYNCHRO OUTPUT

TERRA ENGINEERING LTD.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	1075	195	101	765	8	324	0	250	10	6	3
Future Volume (vph)	2	1075	195	101	765	8	324	0	250	10	6	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	180		150	190		175	190		190	115		20
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950	0.950		0.950	0.989	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1681	1681	1583	1681	1750	1583
Flt Permitted	0.320			0.148			0.950	0.950		0.950	0.989	
Satd. Flow (perm)	596	3539	1583	276	3539	1583	1681	1681	1583	1681	1750	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			143			143			229			138
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1190			1201			2193			203	
Travel Time (s)		27.0			27.3			49.8			4.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	1168	212	110	832	9	352	0	272	11	7	3
Shared Lane Traffic (%)							50%			20%		
Lane Group Flow (vph)	2	1168	212	110	832	9	176	176	272	9	9	3
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane					Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases	6		6	2		2			4			3
Detector Phase	1	6	6	5	2	2	4	4	4	3	3	3
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	11.5	26.1	26.1	10.8	25.8	25.8	13.9	13.9	13.9	13.6	13.6	13.6
Total Split (s)	13.0	60.0	60.0	18.0	65.0	65.0	37.0	37.0	37.0	15.0	15.0	15.0
Total Split (%)	10.0%	46.2%	46.2%	13.8%	50.0%	50.0%	28.5%	28.5%	28.5%	11.5%	11.5%	11.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.5	2.1	2.1	1.8	1.8	1.8	2.9	2.9	2.9	2.6	2.6	2.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.1	6.1	5.8	5.8	5.8	6.9	6.9	6.9	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lag	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None	None	None	None	None
Act Effct Green (s)	79.1	73.9	73.9	88.8	86.3	86.3	20.2	20.2	20.2	7.1	7.1	7.1
Actuated g/C Ratio	0.61	0.57	0.57	0.68	0.66	0.66	0.16	0.16	0.16	0.05	0.05	0.05
v/c Ratio	0.00	0.58	0.22	0.38	0.35	0.01	0.67	0.67	0.62	0.10	0.09	0.01

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay (s/veh)	11.5	22.5	7.4	12.5	3.6	0.0	63.6	63.6	16.0	60.8	60.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	11.5	22.5	7.4	12.5	3.6	0.0	63.6	63.6	16.0	60.8	60.5	0.0
LOS	B	C	A	B	A	A	E	E	B	E	E	A
Approach Delay (s/veh)		20.2			4.6			42.9			52.0	
Approach LOS		C			A			D			D	
Stops (vph)	2	699	40	27	74	0	149	149	51	9	9	0
Fuel Used(gal)	0	19	2	1	8	0	6	6	5	0	0	0
CO Emissions (g/hr)	2	1312	162	95	568	5	398	398	375	11	11	0
NOx Emissions (g/hr)	0	255	32	18	111	1	77	77	73	2	2	0
VOC Emissions (g/hr)	1	304	38	22	132	1	92	92	87	3	3	0
Dilemma Vehicles (#)	0	0	0	0	0	0	0	0	0	0	0	0
Queue Length 50th (ft)	1	348	27	6	22	0	149	149	32	7	7	0
Queue Length 95th (ft)	5	528	88	53	88	m0	215	215	113	27	27	0
Internal Link Dist (ft)		1110			1121			2113			123	
Turn Bay Length (ft)	180		150	190		175	190		190	115		20
Base Capacity (vph)	425	2011	961	330	2350	1099	389	389	542	108	113	231
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.58	0.22	0.33	0.35	0.01	0.45	0.45	0.50	0.08	0.08	0.01

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 26 (20%), Referenced to phase 2:WBTL and 6:EBTL, Start of 1st Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.67
Intersection Signal Delay (s/veh): 20.2 Intersection LOS: C
Intersection Capacity Utilization 67.4% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: New Ballwin Rd/Central Plaza & Manchester Rd

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	362	1250	900	186	209	112
Future Volume (vph)	362	1250	900	186	209	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150			0	155	0
Storage Lanes	1			0	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	0.95	0.97	1.00
Frt			0.974			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3447	0	3433	1583
Flt Permitted	0.178				0.950	
Satd. Flow (perm)	332	3539	3447	0	3433	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			31			122
Link Speed (mph)		30	30		30	
Link Distance (ft)		1830	1002		984	
Travel Time (s)		41.6	22.8		22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	393	1359	978	202	227	122
Shared Lane Traffic (%)						
Lane Group Flow (vph)	393	1359	1180	0	227	122
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		24	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane		Yes	Yes			
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6					4
Detector Phase	1	6	2		4	4
Switch Phase						
Minimum Initial (s)	5.0	20.0	20.0		7.0	7.0
Minimum Split (s)	10.9	25.8	25.5		24.9	24.9
Total Split (s)	25.0	105.0	80.0		25.0	25.0
Total Split (%)	19.2%	80.8%	61.5%		19.2%	19.2%
Yellow Time (s)	4.0	4.0	4.1		4.0	4.0
All-Red Time (s)	1.9	1.8	1.4		2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.9	5.8	5.5		6.9	6.9
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None	C-Min	C-Min		None	None
Act Effct Green (s)	103.3	103.4	78.5		13.9	13.9
Actuated g/C Ratio	0.79	0.80	0.60		0.11	0.11
v/c Ratio	0.82	0.48	0.56		0.62	0.44

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Control Delay (s/veh)	34.5	2.1	18.0		62.9	13.9
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay (s/veh)	34.5	2.1	18.0		62.9	13.9
LOS	C	A	B		E	B
Approach Delay (s/veh)		9.4	18.0		45.8	
Approach LOS		A	B		D	
Stops (vph)	191	123	634		195	18
Fuel Used(gal)	9	19	16		5	1
CO Emissions (g/hr)	613	1332	1116		374	89
NOx Emissions (g/hr)	119	259	217		73	17
VOC Emissions (g/hr)	142	309	259		87	21
Dilemma Vehicles (#)	0	0	0		0	0
Queue Length 50th (ft)	135	60	294		95	0
Queue Length 95th (ft)	264	66	451		135	57
Internal Link Dist (ft)		1750	922		904	
Turn Bay Length (ft)	150				155	
Base Capacity (vph)	518	2816	2157		477	325
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.76	0.48	0.55		0.48	0.38

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 91 (70%), Referenced to phase 2:WBT and 6:EBTL, Start of 1st Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay (s/veh): 16.4 — Intersection LOS: B
Intersection Capacity Utilization 72.1% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 6: Manchester Rd

Intersection	
Int Delay, s/veh	2.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1574	39	76	975	0	161
Future Vol, veh/h	1574	39	76	975	0	161
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	-	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	1711	42	83	1060	0	175

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1753	0	-	877
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.14	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.22	-	-	3.32
Pot Cap-1 Maneuver	-	-	353	-	0	292
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	353	-	-	292
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	1.32	34.25
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	292	-	-	353	-
HCM Lane V/C Ratio	0.6	-	-	0.234	-
HCM Control Delay (s/veh)	34.2	-	-	18.3	-
HCM Lane LOS	D	-	-	C	-
HCM 95th %tile Q(veh)	3.6	-	-	0.9	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	1593	0	4	957	11	0	0	4	6	0	13
Future Vol, veh/h	6	1593	0	4	957	11	0	0	4	6	0	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	1732	0	4	1040	12	0	0	4	7	0	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1052	0	0	1732	0	0	2273	2805	866	1934	2799	526
Stage 1	-	-	-	-	-	-	1745	1745	-	1055	1055	-
Stage 2	-	-	-	-	-	-	529	1061	-	879	1745	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	657	-	-	360	-	-	22	18	297	40	18	496
Stage 1	-	-	-	-	-	-	90	139	-	241	301	-
Stage 2	-	-	-	-	-	-	501	299	-	309	139	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	657	-	-	360	-	-	21	18	297	38	18	496
Mov Cap-2 Maneuver	-	-	-	-	-	-	21	18	-	38	18	-
Stage 1	-	-	-	-	-	-	89	137	-	238	297	-
Stage 2	-	-	-	-	-	-	481	295	-	301	137	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.04	0.06	17.32	48.11
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	297	657	-	-	360	-	-	104
HCM Lane V/C Ratio	0.015	0.01	-	-	0.012	-	-	0.199
HCM Control Delay (s/veh)	17.3	10.5	-	-	15.1	-	-	48.1
HCM Lane LOS	C	B	-	-	C	-	-	E
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.7

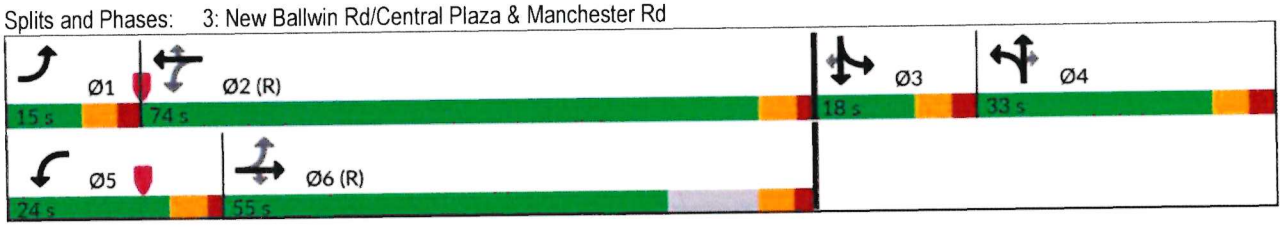
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	1114	305	193	1220	83	354	36	158	87	43	29
Future Volume (vph)	29	1114	305	193	1220	83	354	36	158	87	43	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	180		150	190		175	190		190	115		20
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950	0.961		0.950	0.983	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1681	1701	1583	1681	1740	1583
Flt Permitted	0.133			0.107			0.950	0.961		0.950	0.983	
Satd. Flow (perm)	248	3539	1583	199	3539	1583	1681	1701	1583	1681	1740	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			178			132			172			174
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1190			1211			2193			203	
Travel Time (s)		27.0			27.5			49.8			4.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	1211	332	210	1326	90	385	39	172	95	47	32
Shared Lane Traffic (%)							45%			26%		
Lane Group Flow (vph)	32	1211	332	210	1326	90	212	212	172	70	72	32
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane					Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases	6		6	2		2			4			3
Detector Phase	1	6	6	5	2	2	4	4	4	3	3	3
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	11.5	26.1	26.1	10.8	25.8	25.8	13.9	13.9	13.9	13.6	13.6	13.6
Total Split (s)	15.0	55.0	55.0	24.0	74.0	74.0	33.0	33.0	33.0	18.0	18.0	18.0
Total Split (%)	10.7%	39.3%	39.3%	17.1%	52.9%	52.9%	23.6%	23.6%	23.6%	12.9%	12.9%	12.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.5	2.1	2.1	1.8	1.8	1.8	2.9	2.9	2.9	2.6	2.6	2.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.1	6.1	5.8	5.8	5.8	6.9	6.9	6.9	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lag	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None	None	None	None	None
Act Effct Green (s)	73.6	67.5	67.5	88.3	80.2	80.2	22.3	22.3	22.3	10.1	10.1	10.1
Actuated g/C Ratio	0.53	0.48	0.48	0.63	0.57	0.57	0.16	0.16	0.16	0.07	0.07	0.07
v/c Ratio	0.16	0.71	0.39	0.72	0.65	0.09	0.79	0.79	0.43	0.58	0.58	0.12

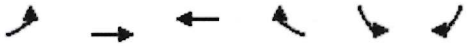
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay (s/veh)	14.5	33.3	13.0	37.3	31.7	6.2	77.3	76.2	10.2	81.8	80.8	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	14.5	33.3	13.0	37.3	31.7	6.2	77.3	76.2	10.2	81.8	80.8	0.9
LOS	B	C	B	D	C	A	E	E	B	F	F	A
Approach Delay (s/veh)		28.6			31.0			57.6			66.5	
Approach LOS		C			C			E			E	
Stops (vph)	15	875	96	137	775	12	185	184	19	60	63	0
Fuel Used(gal)	0	23	4	4	24	1	7	7	3	1	2	0
CO Emissions (g/hr)	31	1588	291	283	1655	67	519	516	219	105	108	4
NOx Emissions (g/hr)	6	309	57	55	322	13	101	100	43	20	21	1
VOC Emissions (g/hr)	7	368	68	66	384	15	120	119	51	24	25	1
Dilemma Vehicles (#)	0	0	0	0	0	0	0	0	0	0	0	0
Queue Length 50th (ft)	11	475	86	138	457	5	195	195	0	65	67	0
Queue Length 95th (ft)	27	599	176	m190	584	m15	288	287	64	122	125	0
Internal Link Dist (ft)		1110			1131			2113			123	
Turn Bay Length (ft)	180		150	190		175	190		190	115		20
Base Capacity (vph)	226	1705	855	329	2026	963	313	317	435	136	141	288
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.71	0.39	0.64	0.65	0.09	0.68	0.67	0.40	0.51	0.51	0.11

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 84 (60%), Referenced to phase 2:WBTL and 6:EBTL, Start of 1st Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay (s/veh): 35.6 Intersection LOS: D
Intersection Capacity Utilization 74.6% ICU Level of Service D
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: New Ballwin Rd/Central Plaza & Manchester Rd





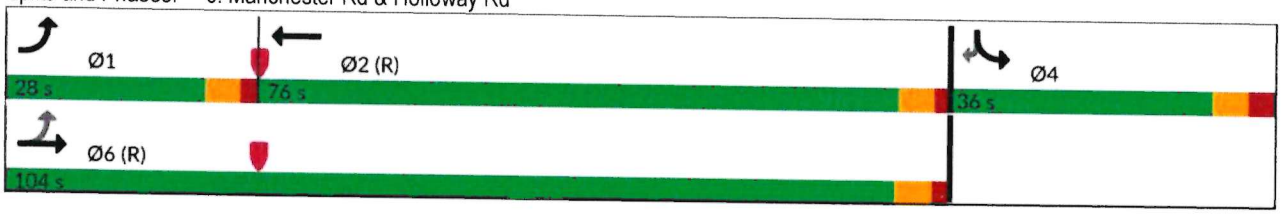
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	202	1113	1323	148	402	430
Future Volume (vph)	202	1113	1323	148	402	430
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150			0	155	0
Storage Lanes	1			0	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	0.95	0.97	1.00
Frt			0.985			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3486	0	3433	1583
Flt Permitted	0.057				0.950	
Satd. Flow (perm)	106	3539	3486	0	3433	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			12			278
Link Speed (mph)		30	30		30	
Link Distance (ft)		1830	1002		984	
Travel Time (s)		41.6	22.8		22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	220	1210	1438	161	437	467
Shared Lane Traffic (%)						
Lane Group Flow (vph)	220	1210	1599	0	437	467
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		24	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane		Yes	Yes			
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60			60	60	60
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6					4
Detector Phase	1	6	2		4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0
Minimum Split (s)	10.9	22.5	22.5		25.9	25.9
Total Split (s)	28.0	104.0	76.0		36.0	36.0
Total Split (%)	20.0%	74.3%	54.3%		25.7%	25.7%
Yellow Time (s)	4.0	4.0	4.1		4.0	4.0
All-Red Time (s)	1.9	1.8	1.4		2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.9	5.8	5.5		6.9	6.9
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None	C-Min	C-Min		None	None
Act Effct Green (s)	102.1	102.2	79.3		25.1	25.1
Actuated g/C Ratio	0.73	0.73	0.57		0.18	0.18
v/c Ratio	0.78	0.47	0.81		0.71	0.91

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Control Delay (s/veh)	45.6	6.9	29.8		60.4	45.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay (s/veh)	45.6	6.9	29.8		60.4	45.4
LOS	D	A	C		E	D
Approach Delay (s/veh)		12.8	29.8		52.7	
Approach LOS		B	C		D	
Stops (vph)	246	669	1132		369	180
Fuel Used(gal)	6	21	27		10	8
CO Emissions (g/hr)	427	1478	1865		704	578
NOx Emissions (g/hr)	83	287	363		137	112
VOC Emissions (g/hr)	99	342	432		163	134
Dilemma Vehicles (#)	0	0	0		0	0
Queue Length 50th (ft)	96	365	619		190	182
Queue Length 95th (ft)	m193	167	800		245	#368
Internal Link Dist (ft)		1750	922		904	
Turn Bay Length (ft)	150				155	
Base Capacity (vph)	339	2584	1979		713	549
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.65	0.47	0.81		0.61	0.85

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 61 (44%), Referenced to phase 2:WBT and 6:EBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.91
Intersection Signal Delay (s/veh): 28.9 Intersection LOS: C
Intersection Capacity Utilization 79.2% ICU Level of Service D
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Manchester Rd & Holloway Rd



Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1367	50	160	1648	0	89
Future Vol, veh/h	1367	50	160	1648	0	89
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	-	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	1486	54	174	1791	0	97

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1540	0	-	770
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.14	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.22	-	-	3.32
Pot Cap-1 Maneuver	-	-	427	-	0	343
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	427	-	-	343
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	1.69	19.56
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	343	-	-	427	-
HCM Lane V/C Ratio	0.282	-	-	0.407	-
HCM Control Delay (s/veh)	19.6	-	-	19.1	-
HCM Lane LOS	C	-	-	C	-
HCM 95th %tile Q(veh)	1.1	-	-	1.9	-

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	1401	0	3	1624	10	2	0	1	7	1	18
Future Vol, veh/h	5	1401	0	3	1624	10	2	0	1	7	1	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	1523	0	3	1765	11	2	0	1	8	1	20

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1776	0	0	1523	0	0	2423	3316	761	2549	3311	888
Stage 1	-	-	-	-	-	-	1534	1534	-	1777	1777	-
Stage 2	-	-	-	-	-	-	890	1783	-	772	1534	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	346	-	-	434	-	-	17	8	348	13	8	287
Stage 1	-	-	-	-	-	-	122	177	-	85	134	-
Stage 2	-	-	-	-	-	-	304	133	-	358	177	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	346	-	-	434	-	-	13	8	348	13	8	287
Mov Cap-2 Maneuver	-	-	-	-	-	-	13	8	-	13	8	-
Stage 1	-	-	-	-	-	-	120	174	-	85	133	-
Stage 2	-	-	-	-	-	-	279	132	-	351	174	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.06	0.02	224.44	252.5
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	19	346	-	-	434	-	-	36
HCM Lane V/C Ratio	0.168	0.016	-	-	0.008	-	-	0.788
HCM Control Delay (s/veh)	224.4	15.6	-	-	13.4	-	-	252.5
HCM Lane LOS	F	C	-	-	B	-	-	F
HCM 95th %tile Q(veh)	0.5	0	-	-	0	-	-	2.8

APPENDIX C
TRIP GENERATION CALCULATIONS

TERRA ENGINEERING LTD.

APPENDIX D
OPENING DAY SYNCHRO OUTPUT

TERRA ENGINEERING LTD.

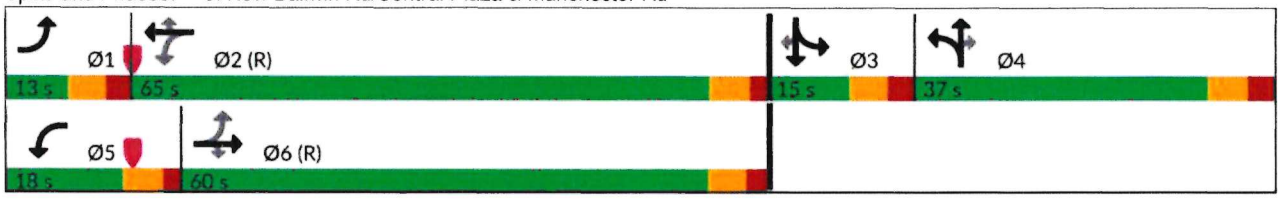
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	1083	196	102	770	9	326	0	252	11	7	4
Future Volume (vph)	3	1083	196	102	770	9	326	0	252	11	7	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	180		150	190		175	190		190	115		20
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950	0.950		0.950	0.990	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1681	1681	1583	1681	1752	1583
Flt Permitted	0.318			0.145			0.950	0.950		0.950	0.990	
Satd. Flow (perm)	592	3539	1583	270	3539	1583	1681	1681	1583	1681	1752	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			143			143			226			138
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1190			1201			2193			203	
Travel Time (s)		27.0			27.3			49.8			4.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	1177	213	111	837	10	354	0	274	12	8	4
Shared Lane Traffic (%)							50%			18%		
Lane Group Flow (vph)	3	1177	213	111	837	10	177	177	274	10	10	4
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane					Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases	6		6	2		2			4			3
Detector Phase	1	6	6	5	2	2	4	4	4	3	3	3
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	11.5	26.1	26.1	10.8	25.8	25.8	13.9	13.9	13.9	13.6	13.6	13.6
Total Split (s)	13.0	60.0	60.0	18.0	65.0	65.0	37.0	37.0	37.0	15.0	15.0	15.0
Total Split (%)	10.0%	46.2%	46.2%	13.8%	50.0%	50.0%	28.5%	28.5%	28.5%	11.5%	11.5%	11.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.5	2.1	2.1	1.8	1.8	1.8	2.9	2.9	2.9	2.6	2.6	2.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.1	6.1	5.8	5.8	5.8	6.9	6.9	6.9	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lag	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None	None	None	None	None
Act Effct Green (s)	78.9	73.7	73.7	88.7	86.2	86.2	20.3	20.3	20.3	7.2	7.2	7.2
Actuated g/C Ratio	0.61	0.57	0.57	0.68	0.66	0.66	0.16	0.16	0.16	0.06	0.06	0.06
v/c Ratio	0.01	0.59	0.22	0.39	0.36	0.01	0.68	0.68	0.63	0.11	0.10	0.02

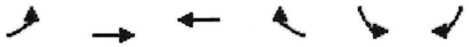
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay (s/veh)	11.7	22.8	7.5	13.4	3.8	0.0	63.7	63.7	16.8	61.0	60.8	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	11.7	22.8	7.5	13.4	3.8	0.0	63.7	63.7	16.8	61.0	60.8	0.3
LOS	B	C	A	B	A	A	E	E	B	E	E	A
Approach Delay (s/veh)		20.4			4.9			43.2			50.8	
Approach LOS		C			A			D			D	
Stops (vph)	2	711	40	28	80	0	150	150	54	11	11	0
Fuel Used(gal)	0	19	2	1	8	0	6	6	5	0	0	0
CO Emissions (g/hr)	3	1328	163	97	577	6	400	400	382	13	13	0
NOx Emissions (g/hr)	1	258	32	19	112	1	78	78	74	3	3	0
VOC Emissions (g/hr)	1	308	38	22	134	1	93	93	89	3	3	0
Dilemma Vehicles (#)	0	0	0	0	0	0	0	0	0	0	0	0
Queue Length 50th (ft)	1	353	28	6	25	0	150	150	36	8	8	0
Queue Length 95th (ft)	6	537	89	58	95	m0	216	216	117	28	28	0
Internal Link Dist (ft)		1110			1121			2113			123	
Turn Bay Length (ft)	180		150	190		175	190		190	115		20
Base Capacity (vph)	422	2006	959	326	2346	1097	389	389	540	108	113	231
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.59	0.22	0.34	0.36	0.01	0.46	0.46	0.51	0.09	0.09	0.02

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 26 (20%), Referenced to phase 2:WBTL and 6:EBTL, Start of 1st Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay (s/veh): 20.5 Intersection LOS: C
Intersection Capacity Utilization 67.7% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: New Ballwin Rd/Central Plaza & Manchester Rd





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	364	1259	906	187	211	113
Future Volume (vph)	364	1259	906	187	211	113
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150			0	155	0
Storage Lanes	1			0	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	0.95	0.97	1.00
Frt			0.974			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3447	0	3433	1583
Flt Permitted	0.174				0.950	
Satd. Flow (perm)	324	3539	3447	0	3433	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			31			123
Link Speed (mph)		30	30		30	
Link Distance (ft)		1830	1002		984	
Travel Time (s)		41.6	22.8		22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	396	1368	985	203	229	123
Shared Lane Traffic (%)						
Lane Group Flow (vph)	396	1368	1188	0	229	123
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		24	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane		Yes	Yes			
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6					4
Detector Phase	1	6	2		4	4
Switch Phase						
Minimum Initial (s)	5.0	20.0	20.0		7.0	7.0
Minimum Split (s)	10.9	25.8	25.5		24.9	24.9
Total Split (s)	25.0	105.0	80.0		25.0	25.0
Total Split (%)	19.2%	80.8%	61.5%		19.2%	19.2%
Yellow Time (s)	4.0	4.0	4.1		4.0	4.0
All-Red Time (s)	1.9	1.8	1.4		2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.9	5.8	5.5		6.9	6.9
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None	C-Min	C-Min		None	None
Act Effct Green (s)	103.3	103.4	77.8		13.9	13.9
Actuated g/C Ratio	0.79	0.80	0.60		0.11	0.11
v/c Ratio	0.83	0.49	0.57		0.62	0.44

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Control Delay (s/veh)	36.2	2.2	18.5		62.8	13.8
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay (s/veh)	36.2	2.2	18.5		62.8	13.8
LOS	D	A	B		E	B
Approach Delay (s/veh)		9.8	18.5		45.7	
Approach LOS		A	B		D	
Stops (vph)	201	129	649		199	18
Fuel Used(gal)	9	19	16		5	1
CO Emissions (g/hr)	628	1345	1135		379	90
NOx Emissions (g/hr)	122	262	221		74	17
VOC Emissions (g/hr)	146	312	263		88	21
Dilemma Vehicles (#)	0	0	0		0	0
Queue Length 50th (ft)	146	64	303		96	0
Queue Length 95th (ft)	270	68	457		136	57
Internal Link Dist (ft)		1750	922		904	
Turn Bay Length (ft)	150				155	
Base Capacity (vph)	515	2813	2143		477	326
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.77	0.49	0.55		0.48	0.38

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 91 (70%), Referenced to phase 2:WBT and 6:EBTL, Start of 1st Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay (s/veh): 16.8 Intersection LOS: B
Intersection Capacity Utilization 72.4% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 6: Manchester Rd

Intersection	
Int Delay, s/veh	3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1590	46	86	980	0	176
Future Vol, veh/h	1590	46	86	980	0	176
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	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	1728	50	93	1065	0	191

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1778	0	2472	889
Stage 1	-	-	-	-	1753	-
Stage 2	-	-	-	-	719	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	346	-	25	286
Stage 1	-	-	-	-	124	-
Stage 2	-	-	-	-	444	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	346	-	18	286
Mov Cap-2 Maneuver	-	-	-	-	88	-
Stage 1	-	-	-	-	124	-
Stage 2	-	-	-	-	325	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	1.5	39.7
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	286	-	-	346	-
HCM Lane V/C Ratio	0.669	-	-	0.27	-
HCM Control Delay (s/veh)	39.7	-	-	19.2	-
HCM Lane LOS	E	-	-	C	-
HCM 95th %tile Q (veh)	4.4	-	-	1.1	-

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	1588	19	12	955	12	14	0	18	7	0	14
Future Vol, veh/h	7	1588	19	12	955	12	14	0	18	7	0	14
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	8	1726	21	13	1038	13	15	0	20	8	0	15

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1051	0	0	1747	0	0	2298	2830	874	1950	2834	526
Stage 1	-	-	-	-	-	-	1753	1753	-	1071	1071	-
Stage 2	-	-	-	-	-	-	545	1077	-	879	1763	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	658	-	-	355	-	-	21	17	293	39	17	496
Stage 1	-	-	-	-	-	-	89	138	-	236	295	-
Stage 2	-	-	-	-	-	-	490	293	-	309	136	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	658	-	-	355	-	-	20	16	293	35	16	496
Mov Cap-2 Maneuver	-	-	-	-	-	-	20	16	-	35	16	-
Stage 1	-	-	-	-	-	-	88	136	-	233	284	-
Stage 2	-	-	-	-	-	-	458	282	-	285	134	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0	0.2	234.9	56.6
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	42	658	-	-	355	-	-	92
HCM Lane V/C Ratio	0.828	0.012	-	-	0.037	-	-	0.248
HCM Control Delay (s/veh)	234.9	10.5	-	-	15.5	-	-	56.6
HCM Lane LOS	F	B	-	-	C	-	-	F
HCM 95th %tile Q (veh)	3.2	0	-	-	0.1	-	-	0.9

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	14	2	1	163	116	15
Future Vol, veh/h	14	2	1	163	116	15
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	2	1	177	126	16

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	313	134	142	0	-	0
Stage 1	134	-	-	-	-	-
Stage 2	179	-	-	-	-	-
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	680	915	1441	-	-	-
Stage 1	892	-	-	-	-	-
Stage 2	852	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	679	915	1441	-	-	-
Mov Cap-2 Maneuver	679	-	-	-	-	-
Stage 1	891	-	-	-	-	-
Stage 2	852	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s/v	10.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1441	-	702	-	-
HCM Lane V/C Ratio	0.001	-	0.025	-	-
HCM Control Delay (s/veh)	7.5	0	10.3	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q (veh)	0	-	0.1	-	-

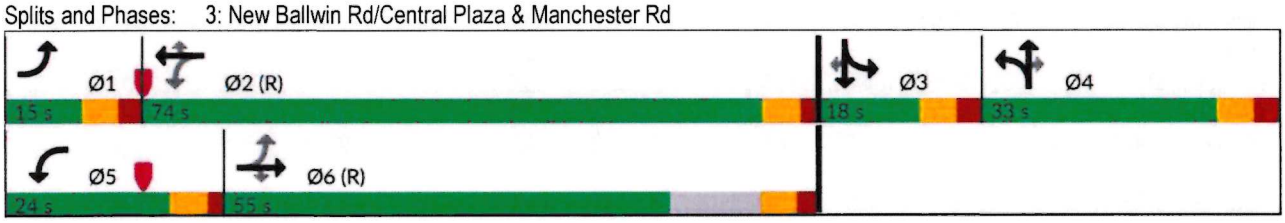
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	1120	307	194	1227	84	356	37	159	88	44	30
Future Volume (vph)	30	1120	307	194	1227	84	356	37	159	88	44	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	180		150	190		175	190		190	115		20
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950	0.961		0.950	0.983	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1681	1701	1583	1681	1740	1583
Flt Permitted	0.131			0.105			0.950	0.961		0.950	0.983	
Satd. Flow (perm)	244	3539	1583	196	3539	1583	1681	1701	1583	1681	1740	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			178			132			173			174
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1190			1211			2193			203	
Travel Time (s)		27.0			27.5			49.8			4.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	1217	334	211	1334	91	387	40	173	96	48	33
Shared Lane Traffic (%)							45%			26%		
Lane Group Flow (vph)	33	1217	334	211	1334	91	213	214	173	71	73	33
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane					Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases	6		6	2		2			4			3
Detector Phase	1	6	6	5	2	2	4	4	4	3	3	3
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	11.5	26.1	26.1	10.8	25.8	25.8	13.9	13.9	13.9	13.6	13.6	13.6
Total Split (s)	15.0	55.0	55.0	24.0	74.0	74.0	33.0	33.0	33.0	18.0	18.0	18.0
Total Split (%)	10.7%	39.3%	39.3%	17.1%	52.9%	52.9%	23.6%	23.6%	23.6%	12.9%	12.9%	12.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.5	2.1	2.1	1.8	1.8	1.8	2.9	2.9	2.9	2.6	2.6	2.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.1	6.1	5.8	5.8	5.8	6.9	6.9	6.9	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lag	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None	None	None	None	None
Act Effct Green (s)	73.5	67.3	67.3	88.3	80.1	80.1	22.3	22.3	22.3	10.1	10.1	10.1
Actuated g/C Ratio	0.53	0.48	0.48	0.63	0.57	0.57	0.16	0.16	0.16	0.07	0.07	0.07
v/c Ratio	0.17	0.72	0.39	0.73	0.66	0.09	0.79	0.79	0.44	0.59	0.58	0.12

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay (s/veh)	14.6	33.5	13.1	37.6	32.0	6.2	77.6	76.8	10.3	82.4	81.4	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	14.6	33.5	13.1	37.6	32.0	6.2	77.6	76.8	10.3	82.4	81.4	0.9
LOS	B	C	B	D	C	A	E	E	B	F	F	A
Approach Delay (s/veh)		28.8			31.3			57.9			66.8	
Approach LOS		C			C			E			E	
Stops (vph)	15	883	97	138	787	12	185	186	19	61	63	0
Fuel Used(gal)	0	23	4	4	24	1	7	7	3	2	2	0
CO Emissions (g/hr)	31	1601	294	285	1673	68	522	522	221	107	109	4
NOx Emissions (g/hr)	6	312	57	55	326	13	102	102	43	21	21	1
VOC Emissions (g/hr)	7	371	68	66	388	16	121	121	51	25	25	1
Dilemma Vehicles (#)	0	0	0	0	0	0	0	0	0	0	0	0
Queue Length 50th (ft)	11	480	88	140	467	5	196	197	0	66	68	0
Queue Length 95th (ft)	27	604	176	m190	589	m15	290	289	65	123	126	0
Internal Link Dist (ft)		1110			1131			2113			123	
Turn Bay Length (ft)	180		150	190		175	190		190	115		20
Base Capacity (vph)	223	1702	853	328	2025	962	313	317	435	136	141	288
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.72	0.39	0.64	0.66	0.09	0.68	0.68	0.40	0.52	0.52	0.11

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 84 (60%), Referenced to phase 2:WBTL and 6:EBTL, Start of 1st Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay (s/veh): 35.9 Intersection LOS: D
Intersection Capacity Utilization 74.9% ICU Level of Service D
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: New Ballwin Rd/Central Plaza & Manchester Rd



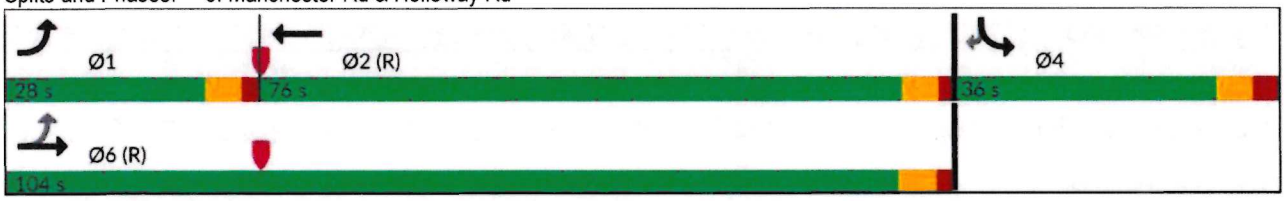
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	204	1119	1330	149	405	433
Future Volume (vph)	204	1119	1330	149	405	433
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150			0	155	0
Storage Lanes	1			0	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	0.95	0.97	1.00
Frt			0.985			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3486	0	3433	1583
Flt Permitted	0.055				0.950	
Satd. Flow (perm)	102	3539	3486	0	3433	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			12			278
Link Speed (mph)		30	30		30	
Link Distance (ft)		1830	1002		984	
Travel Time (s)		41.6	22.8		22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	222	1216	1446	162	440	471
Shared Lane Traffic (%)						
Lane Group Flow (vph)	222	1216	1608	0	440	471
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		24	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane		Yes	Yes			
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60			60	60	60
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6					4
Detector Phase	1	6	2		4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0
Minimum Split (s)	10.9	22.5	22.5		25.9	25.9
Total Split (s)	28.0	104.0	76.0		36.0	36.0
Total Split (%)	20.0%	74.3%	54.3%		25.7%	25.7%
Yellow Time (s)	4.0	4.0	4.1		4.0	4.0
All-Red Time (s)	1.9	1.8	1.4		2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.9	5.8	5.5		6.9	6.9
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None	C-Min	C-Min		None	None
Act Effct Green (s)	101.9	102.0	78.9		25.3	25.3
Actuated g/C Ratio	0.73	0.73	0.56		0.18	0.18
v/c Ratio	0.79	0.47	0.82		0.71	0.92

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Control Delay (s/veh)	47.4	7.1	30.4		60.2	46.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay (s/veh)	47.4	7.1	30.4		60.2	46.3
LOS	D	A	C		E	D
Approach Delay (s/veh)		13.3	30.4		53.0	
Approach LOS		B	C		D	
Stops (vph)	256	676	1147		371	185
Fuel Used(gal)	6	21	27		10	8
CO Emissions (g/hr)	440	1490	1890		707	589
NOx Emissions (g/hr)	86	290	368		138	115
VOC Emissions (g/hr)	102	345	438		164	136
Dilemma Vehicles (#)	0	0	0		0	0
Queue Length 50th (ft)	102	386	634		191	185
Queue Length 95th (ft)	m198	169	808		248	#377
Internal Link Dist (ft)		1750	922		904	
Turn Bay Length (ft)	150				155	
Base Capacity (vph)	337	2578	1970		713	549
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.66	0.47	0.82		0.62	0.86

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 61 (44%), Referenced to phase 2:WBT and 6:EBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay (s/veh): 29.4 Intersection LOS: C
Intersection Capacity Utilization 79.6% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Manchester Rd & Holloway Rd



Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1373	52	165	1656	0	93
Future Vol, veh/h	1373	52	165	1656	0	93
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	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	1492	57	179	1800	0	101

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1549	0	2779	774
Stage 1	-	-	-	-	1521	-
Stage 2	-	-	-	-	1259	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	424	-	15	341
Stage 1	-	-	-	-	167	-
Stage 2	-	-	-	-	231	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	424	-	9	341
Mov Cap-2 Maneuver	-	-	-	-	72	-
Stage 1	-	-	-	-	167	-
Stage 2	-	-	-	-	133	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	1.77	19.95
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	341	-	-	424	-
HCM Lane V/C Ratio	0.296	-	-	0.423	-
HCM Control Delay (s/veh)	19.9	-	-	19.6	-
HCM Lane LOS	C	-	-	C	-
HCM 95th %tile Q(veh)	1.2	-	-	2.1	-

Intersection	
Int Delay, s/veh	6.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	1405	5	7	1630	11	10	0	6	8	2	19
Future Vol, veh/h	6	1405	5	7	1630	11	10	0	6	8	2	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	1527	5	8	1772	12	11	0	7	9	2	21

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1784	0	0	1533	0	0	2445	3342	766	2570	3339	892
Stage 1	-	-	-	-	-	-	1543	1543	-	1793	1793	-
Stage 2	-	-	-	-	-	-	902	1799	-	777	1546	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	344	-	-	430	-	-	16	8	345	13	8	285
Stage 1	-	-	-	-	-	-	120	175	-	83	131	-
Stage 2	-	-	-	-	-	-	299	130	-	356	174	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	344	-	-	430	-	-	~ 10	8	345	12	8	285
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 10	8	-	12	8	-
Stage 1	-	-	-	-	-	-	118	171	-	82	129	-
Stage 2	-	-	-	-	-	-	268	128	-	343	171	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.07	0.06	$ 565.45	$ 386.9
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	16	344	-	-	430	-	-	29
HCM Lane V/C Ratio	1.065	0.019	-	-	0.018	-	-	1.071
HCM Control Delay (s/veh)	$ 565.4	15.7	-	-	13.5	-	-	$ 386.9
HCM Lane LOS	F	C	-	-	B	-	-	F
HCM 95th %tile Q(veh)	2.6	0.1	-	-	0.1	-	-	3.6

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

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	3	1	1	89	211	5
Future Vol, veh/h	3	1	1	89	211	5
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	3	1	1	97	229	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	331	232	235	0	-	0
Stage 1	232	-	-	-	-	-
Stage 2	99	-	-	-	-	-
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	664	807	1333	-	-	-
Stage 1	806	-	-	-	-	-
Stage 2	925	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	663	807	1333	-	-	-
Mov Cap-2 Maneuver	663	-	-	-	-	-
Stage 1	806	-	-	-	-	-
Stage 2	925	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s/v	10.22	0.09	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	20	-	694	-	-
HCM Lane V/C Ratio	0.001	-	0.006	-	-
HCM Control Delay (s/veh)	7.7	0	10.2	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Eric Allmon

From: JOHN "JAY JAY" BRADEN <John.Braden@modot.mo.gov>
Sent: Monday, February 26, 2024 1:32 PM
To: Eric Allmon
Subject: 2024-02-26 - Dutch Bros Ballwin - MoDOT comments

Eric,

After review of the plans for The subjected development we find the proposal to be feasible. Final approval will be in the form of a permit issued from this office. MoDOT has the following comments;

- Any work in MoDOT right of way requires a permit
    - Lane closures require further approval from MoDOT's work zone coordinator after the permit is issued
        - The form at the link below will need to be completed and submitted at least two business days prior to the proposed closure date for MoDOT's review for approval
        - https://www.modot.org/form/lane-closure-request-form
- MoDOT requires all attempts to tap water from other mains not under MoDOT pavement before we will give approval to cut the pavement of MO 100. If it is not feasible to get water access from another main other than what is under MoDOT pavement we will allow it but the cut will be subject to the following conditions;
    - The perimeter of the cut must be saw cut the full lane width by a minimum of 6 feet in length
    - The hole must be plated when not actively working on the tap
    - Place minimum of 4" of mechanically compacted base rock
    - The hole can be poured full depth concrete or replaced in like and kind matching existing pavement
    - New concrete must be tied to existing using #5 epoxy coated tie bars on 30" centers
- Water tap permit will be separate from other permits and must be issued to the contractor/plumber doing the work
- MoDOT will require a cost estimate showing the cost of all work in MoDOT right of way
- MoDOT will require a request for permit form be completed listing the developer/ property owner as the Applicant
    - Permit request form can be found at https://www6.modot.mo.gov/ElectronicPermittingExternal/PermitRequest.aspx

If you have any questions, comments, or concerns feel free to contact me.

Jay-Jay Braden

Missouri Department of Transportation
Sr. Traffic Specialist - St. Louis County
601 Salt Mill Rd., Chesterfield MO 63017
Mobile: 636.628.5867 **Fax:** 573.522.6491

St. Louis Permits Home Page https://www.modot.org/st-louis-district-permit-specialist-map
Permit request form https://www6.modot.mo.gov/ElectronicPermittingExternal/PermitRequest.aspx
Lane Closure request form https://www.modot.org/form/lane-closure-request-form

From: Eric Allmon <eallmon@twm-inc.com>
Sent: Friday, February 23, 2024 1:48 PM
To: JOHN "JAY JAY" BRADEN <John.Braden@modot.mo.gov>
Subject: MO0401_Dutch Bros_Ballwin, MO _ 14200 Manchester Rd

JJ,

Per our conversations, please take a look at the attached plans and let me know if you have any comments.

The City requested that we close the access points closest to the intersection on both Manchester Rd. and Old Ballwin Rd. and provide a cross access easement to serve both properties along Manchester Rd. I have also attached a copy of the proposed Lot Split for your reference. Let me know if you have any questions, comments, or concerns.

Regards,

Eric L. Allmon, PE
TWM Branch Manager – St. Charles
636.724.8300 (o) or 314.566.1112 (c)
400 North Fifth Street, Suite 101
St. Charles, MO 63301
www.twm-inc.com

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ENGINEERING & GEOSPATIAL SERVICES

EXTERIOR FINISH AREA CALCULATIONS

BUILDING ELEVATION	EIFS	FIBER CEMENT PANEL	STOREFRONT	SPLIT FACE CMU	TOTAL FACADE AREA
1 - NORTH	227.5 SF (39.2%)	224.0 SF (38.7%)	56.7 SF (9.8%)	70.9 SF (12.2%)	579.1 SF
2 - WEST	805.2 SF (75%)	52.3 SF (4.9%)	70.5 SF (6.6%)	144.1 SF (13.4%)	1,072.1 SF
3 - SOUTH	366.6 SF (73.8%)	109.3 SF (22%)	0.0 SF (0%)	21.0 SF (4.2%)	496.9 SF
4 - EAST	694.0 SF (67.4%)	224.0 SF (21.7%)	24.0 SF (2.3%)	88.1 SF (8.5%)	1,030.1 SF

EXTERIOR FINISH SCHEDULE - PROTOTYPICAL w/ CANOPY

ID TAG	MATERIAL	MANUFACTURER	MODEL	REMARKS
ZONE 1 (BODY)				
1A	EIFS	DRYVIT	OUTSULATION EIF SYSTEM	COLOR: BLDG DB DARK GRAY
1B	EIFS	DRYVIT	OUTSULATION EIF SYSTEM	COLOR: BLDG DB LIGHT GRAY
ZONE 2 (TOWER)				
2	FIBER CEMENT SIDEING	NICHIHA	ILLUMINATION. AWP 1818 W/ MATCHING PANEL CORNERS	COLOR: BLDG DB BLUE
ZONE 3 (BASE)				
3	CMU VENEER	BASALITE	4x8x16, SPLIT FACE	COLOR: CHARCOAL - REVIEW FINAL COLOR SELECTION W/ DBC
	SILL	BASALITE	12x6x16, BEVELED CMU CAP	COLOR: CHARCOAL - RIPPED TO SIZE
ZONE 4 (FRAMED CANOPY)				
4	FASCIA	WESTERM STATES METAL ROOFING	T-GROOVE, 10"	3 SIDES; COLOR: BLDG DB DARK GRAY
5	SOFFIT	HEWN ELEMENTS	NATURAL NORTHWESTERN SPRUCE	1x6, T&G, 1/8" REVEAL, SEALED
6	COLUMNS	BASALITE	4x8x16, SPLIT FACE	COLOR: CHARCOAL - REVIEW FINAL COLOR SELECTION W/ DB

NOTE: GC TO PROVIDE 3"x2" SMOOTH DOWNSPOUTS, AND ALL NECESSARY ADAPTORS, AT AWNING AND CANOPY LOCATIONS; COLOR: BLDG DB DARK GRAY

(1A) OUTSULATION EIF SYSTEM - COLOR: BLDG DB DARK GRAY

(1B) OUTSULATION EIF SYSTEM - COLOR: BLDG DB LIGHT GRAY

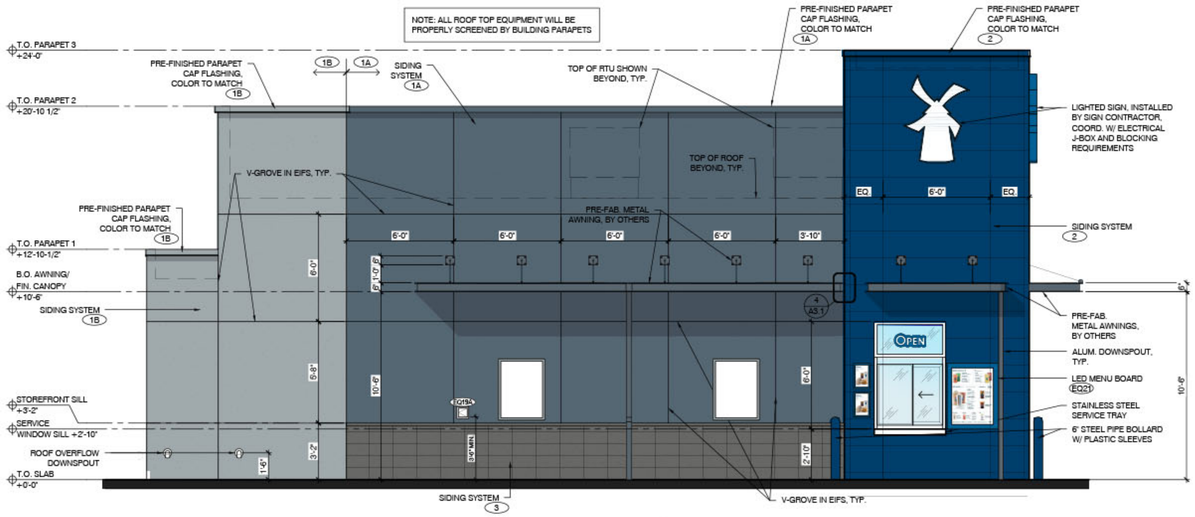
(2) FIBER CEMENT SIDING - COLOR: DUTCH BROS BLUE

(3) CMU VENEER - COLOR: CHARCOAL (REVIEW FINAL COLOR SELECTION W/ DBC)

(4) METAL TRIM- FASCIA, SHEET METAL CAPS/ PAINT DUTCH BROS DARK GRAY

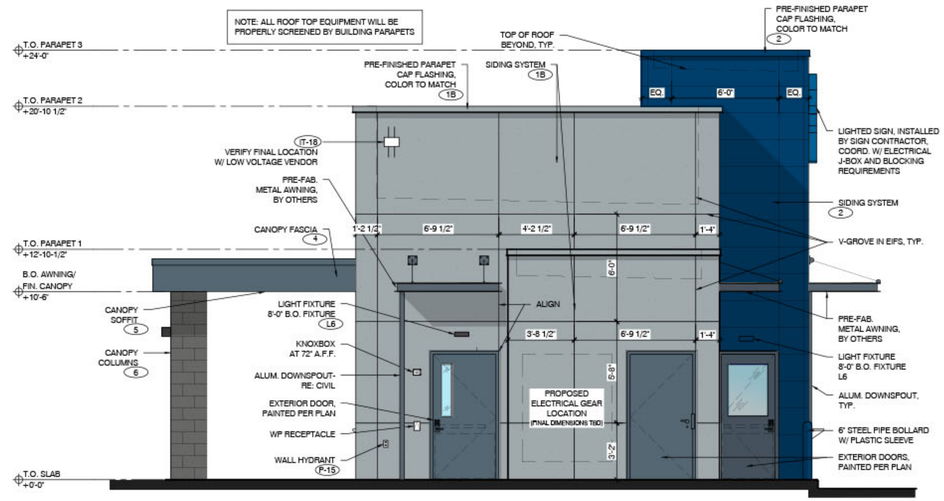
PREFINISHED CLEAR ANODIZED ALUM. STOREFRONT

(HEWN) SOFFIT MATERIAL UNDER THE LARGE CANOPY



4 EAST ELEVATION - DRIVE-THRU WINDOW

SCALE: 1/4" = 1'-0"

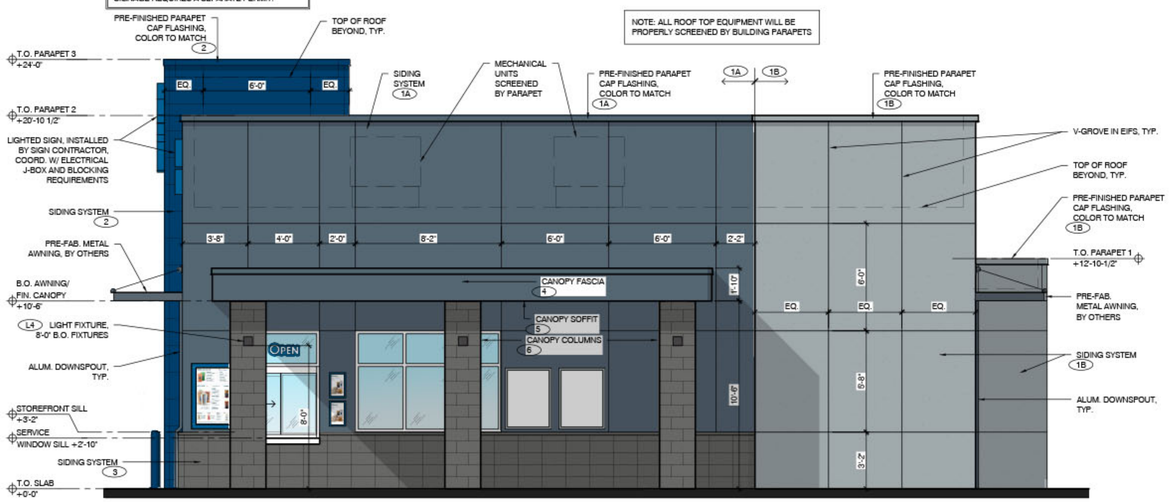


3 SOUTH ELEVATION

SCALE: 1/4" = 1'-0"

NOTE: ALL SIGNAGE WILL BE PERMITTED BY OTHERS UNDER A SEPARATE PERMIT SUBMITTAL SIGNS SHOWN ON THESE ELEVATIONS ARE FOR REFERENCE ONLY. WE ACKNOWLEDGE THAT ALL SIGNAGE REQUIRES A SEPARATE PERMIT.

NOTE: ALL ROOF TOP EQUIPMENT WILL BE PROPERLY SCREENED BY BUILDING PARAPETS

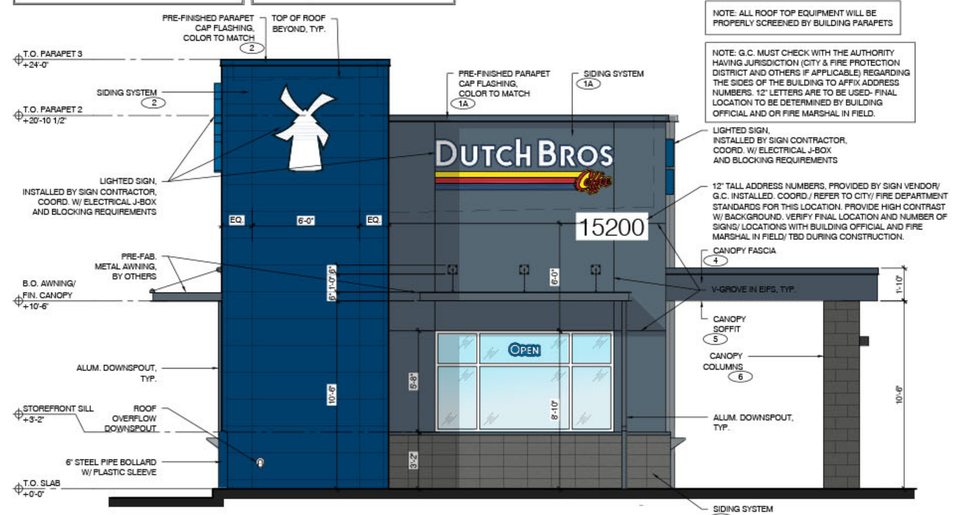


2 WEST ELEVATION - WALK-UP WINDOW

SCALE: 1/4" = 1'-0"

NOTE: ALL EIFS TO COME WITH INTEGRAL COLOR (DB DARK/ LIGHT GRAY)- REFER TO ELEVATIONS FOR LOCATION. CONTRACTOR TO PROVIDE AN ALTERNATE BID TO ADD AN ADDITIONAL COAT OF EXTERIOR SHERWIN WILLIAMS PAINT FINISH ON ALL EIFS SURFACES.

NOTE: ALL SIGNAGE WILL BE PERMITTED BY OTHERS UNDER A SEPARATE PERMIT SUBMITTAL SIGNS SHOWN ON THESE ELEVATIONS ARE FOR REFERENCE ONLY. WE ACKNOWLEDGE THAT ALL SIGNAGE REQUIRES A SEPARATE PERMIT.



1 NORTH ELEVATION

SCALE: 1/4" = 1'-0"

DUTCH BROS Coffee

CORALIC ARCHITECTURE

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MEP ENGINEER
Case Engineering
MATT CASE
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FENTON, MO 63026
T. 636.349.1600 F. 636.349.1730
mcase@caseengineeringinc.com

EDIN CORALIC ARCHITECT
A-2013031004 - EXP. 12-31-2025

STATE OF MISSOURI
EDIN CORALIC
NUMBER A-2013031004
ARCHITECT

3.8.2024

MISSOURI CERTIFICATE OF AUTHORITY NO. 2013041393

Project No: MO0401

Dutch Bros Coffee
New Freestanding Store
15200 MANCHESTER RD.
BALLWIN, MO 63011
for: Dutch Bros Coffee
110 SW 4th St, Grants Pass, OR 97526

ISSUED FOR PERMIT :
3.08.24

REV:	DATE:	DESCRIPTION:

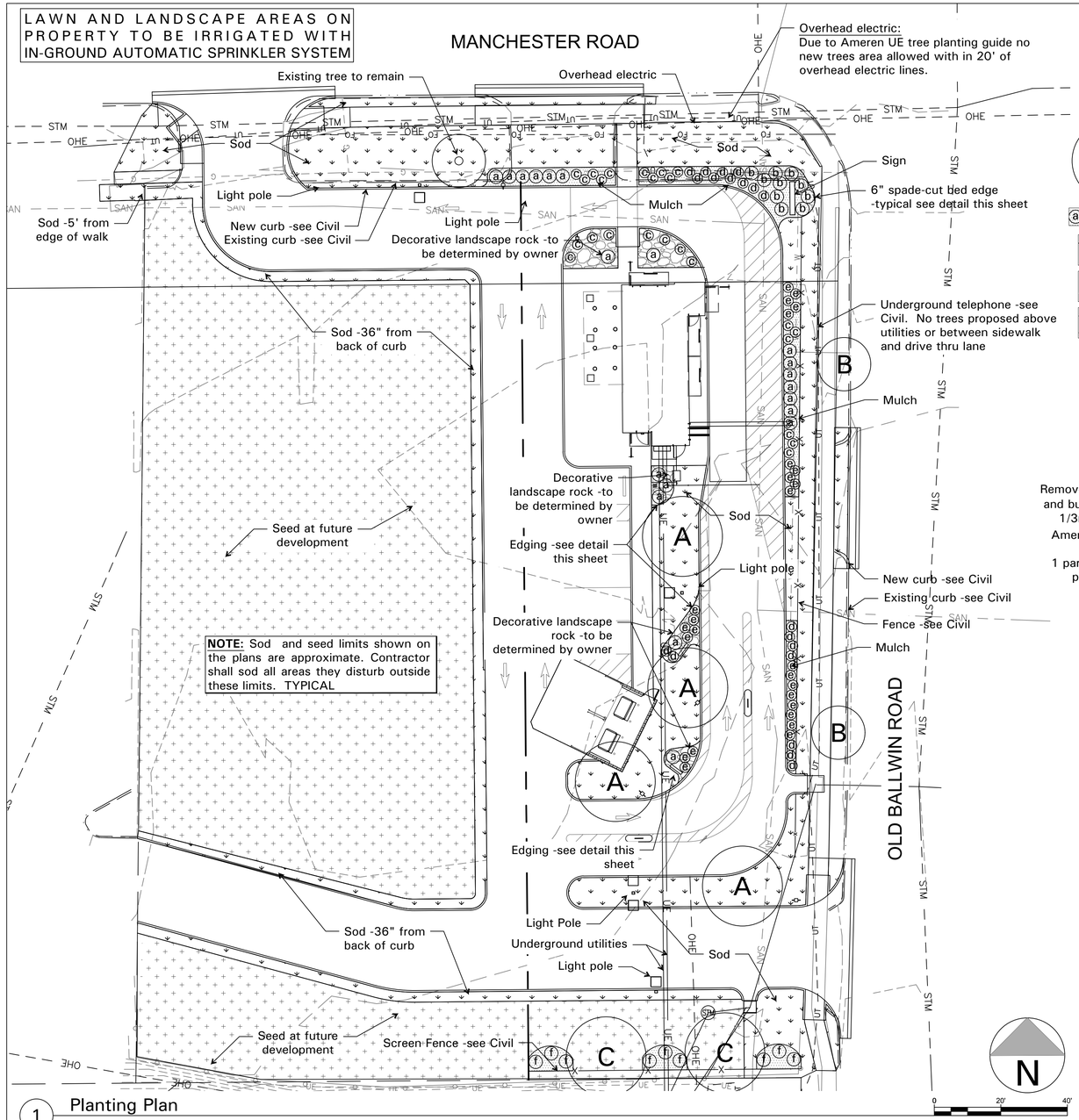
SHEET NAME:

BUILDING ELEVATIONS

SHEET NUMBER:

A6.1

LAWN AND LANDSCAPE AREAS ON PROPERTY TO BE IRRIGATED WITH IN-GROUND AUTOMATIC SPRINKLER SYSTEM

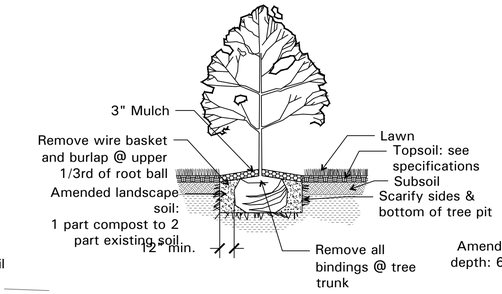


Scale: 1:20

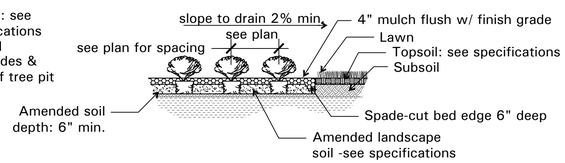
1 Planting Plan

LEGEND:

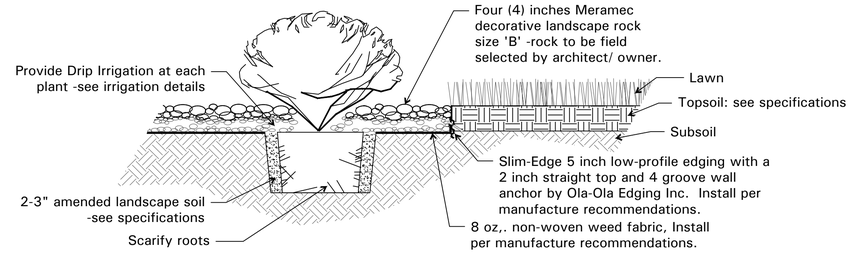
Symbol	Description
○	Existing tree to remain
A	Proposed tree -see schedule this sheet
aaa ccc	Proposed shrubs at 4" double ground landscape mulch -see schedule this sheet
a c	Proposed shrubs at decorative landscape rock with weed fabric -see schedule this sheet
	Proposed -see schedule this sheet
	Proposed seed -see schedule this sheet



SHADE TREE PLANTING DETAIL



SHRUB/ PERENNIAL PLANTING DETAIL



LANDSCAPE BED WITH DECORATIVE LANDSCAPE ROCK

Planting Schedule

Key	Qty	Common Name	Botanical Name	Size	Comment
A	4	Honey Locust	Gleditsia triacanthos f. inermis 'Skycole'	2" cal.	Ball & Burlap
B	2	Redbud	Cersis canadensis	2" Cal.	Ball & Burlap
C	2	Sugar Maple	Acer saccharum 'Fall Fiesta'	2" Cal.	Ball & Burlap
a	20	Gold Tip Juniper	Juniperus × pfitzeriana 'Saybrook Gold'	5 Gal.	
b	10	Ground Cover Juniper	J. procumbens 'Greenmound'	3 Gal.	
c	24	Sawara Cypress	Chamaecyparis pisifera 'Lemonthread'	3 Gal.	
d	20	Muhly Grass	Muhlenbergia reverchonii 'Undaunted'	2 Gal.	
e	25	Feather Reed Grass	Calamagrostis x acutiflora 'Eldorado'	2 Gal.	
f	9	Viburnum	Viburnum x rhytidophylloides 'Allegheny'	5 Gal.	
600		+/- Sq. Ft. Decorative Landscape Rock -see detail this sheet			
96		+/- Lin. Ft. Plastic Edge -see detail this sheet			
1,400		+/- Sq. Ft. Double Ground Hardwood Bark Mulch			
8,900		+/- Sq. Ft. Fescue Sod			
23,000		+/- Sq. Ft. Fescue Seed mix with straw matting -see Civil for erosion control			

GENERAL NOTES:

1. Landscape quantities shown for reference and bid comparison only, contractor to furnish and install plant quantities shown on plan. Notify Owner/ Landscape Architect of any discrepancies.
2. CONTRACTOR SHALL WATER AND MAINTAIN ALL PLANTINGS AND SOD BEGINNING AT INSTALLATION AND ENDING 30 DAYS AFTER OWNER APPROVAL AND ACCEPTANCE OF PLANTINGS.
3. Contractor to review and field verify existing and proposed conditions prior to
4. Contractor to coordinate and cooperate with other trades.
5. Contractor to adjust plantings as field directed by owner and or as unforeseen field conditions require. All field changes to be documented and provided to owner prior to initial acceptance.
6. No trees shall be planted within ten (10) foot of private or public utilities unless approved by owner.
7. Proposed plant material to be approved by owner/ landscape architect -see specifications.
8. Contractor is responsible for installing all plant material, sod, topsoil and mulch as shown on plan and in specifications.
9. Plan(s) do not constitute contractor means and methods. Job site safety and project coordination is responsibility of contractor(s).
10. See all specifications for full requirements.

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DERMODY & ASSOCIATES
-
Uisce beatha
LANDSCAPE ARCHITECTS
ph# 314.205.8871
Missouri Certificate of Authority # 2009020208

Surveyor/ Civil Engineer:
TWM
400 North Fifth Street,
Suite 101
St. Charles, MO 63301

Landscape Development Plan for:
Dutch Bros Coffee
15200 Manchester Rd.
Ballwin, MO

Drawing prepared for:
Coralic, LLC
9700 Mackenzie Road, Suite 222
St. Louis, MO 63123

Revisions:

No.	Description	Date:
1	City comment	3/22/24
2	City comment	4/19/24
3	City comment	4/30/24
4	City comment	5/1/24

5/1/24
STATE OF MISSOURI
Edward M. Dermody
NUMBER LA-2001006236
LANDSCAPE ARCHITECT
Edward M. Dermody
Landscape Architect
LA-2001006236

Issue Date: 2/20/2024
Drawn by: EMD
Checked By:EMD
Sheet Title

Planting Plan

Project Number: 797.001

L1.0

KEYED NOTES

1. LOCATION OF UTILITY METER DISCONNET SWITCH AND CT CABINET. REFER TO "RISER DIAGRAM" ON SHEET E3.01.
2. PROVIDE 120V ELECTRICAL CONNECTION WITH (2)#8 & (1)#8G. IN 2" PVC ROUTED BELOW GRADE FOR DRIVE-THRU BACKLIT MENU BOARD PER MANUFACTURER'S INSTRUCTIONS. CONDUIT SHALL COME UP IN CENTER OF POST. SIGN COMPANY REPRESENTATIVE TO GIVE EXACT LOCATIONS/DIMENSIONS FOR GC TO MATCH. CONTRACTOR SHALL REPAIR EXISTING PARKING SURFACES FROM TRENCHING TO MATCH PREVIOUS CONDITIONS.
3. PROVIDE 120V ELECTRICAL CONNECTION WITH (2)#8 & (1)#8G. IN 2" PVC ROUTED BELOW GRADE FOR NEW MONUMENT SIGN PER REPRESENTATIVE PRIOR TO ROUGH-IN. CONTRACTOR SHALL REPAIR EXISTING PARKING SURFACES FROM TRENCHING TO MATCH PREVIOUS CONDITIONS.
4. PARKING LOT FIXTURES TO DIM TO 40% WHILE NOT OCCUPIED AND SET TO FULL BRIGHTNESS WHILE IN USE.
5. LOCATION OF CABLE INTERNET DEMARC
6. PROVIDE 2" CONDUIT W/ PULL STRING 24" BEHIND MENU BOARD TO CHRISTY BOX FOR FUTURE DIGITAL MENU BOARD UPGRADE . COORDINATE W/ SIGN MANUFACTURER.

SITE NOTES

WATER LINES, CONDUITS FOR ELECTRICAL, OR OTHER UTILITIES SHALL BE LOCATED SO AS TO NOT CONFLICT WITH REQUIRED TREE LOCATIONS FOR STREETS AND PARKING LOTS.

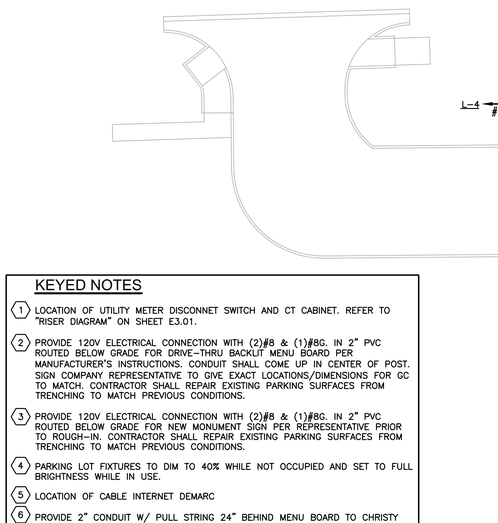
COORDINATE ELECTRICAL WORK WITH LANDSCAPING INSTALLER.

MIN. DUTCH BROS REQUIREMENTS:
- 5FTC AT BUILDING
- 3FTC AT SITE/PARKING
- 5FTC AT TRASH ENCLOSURE

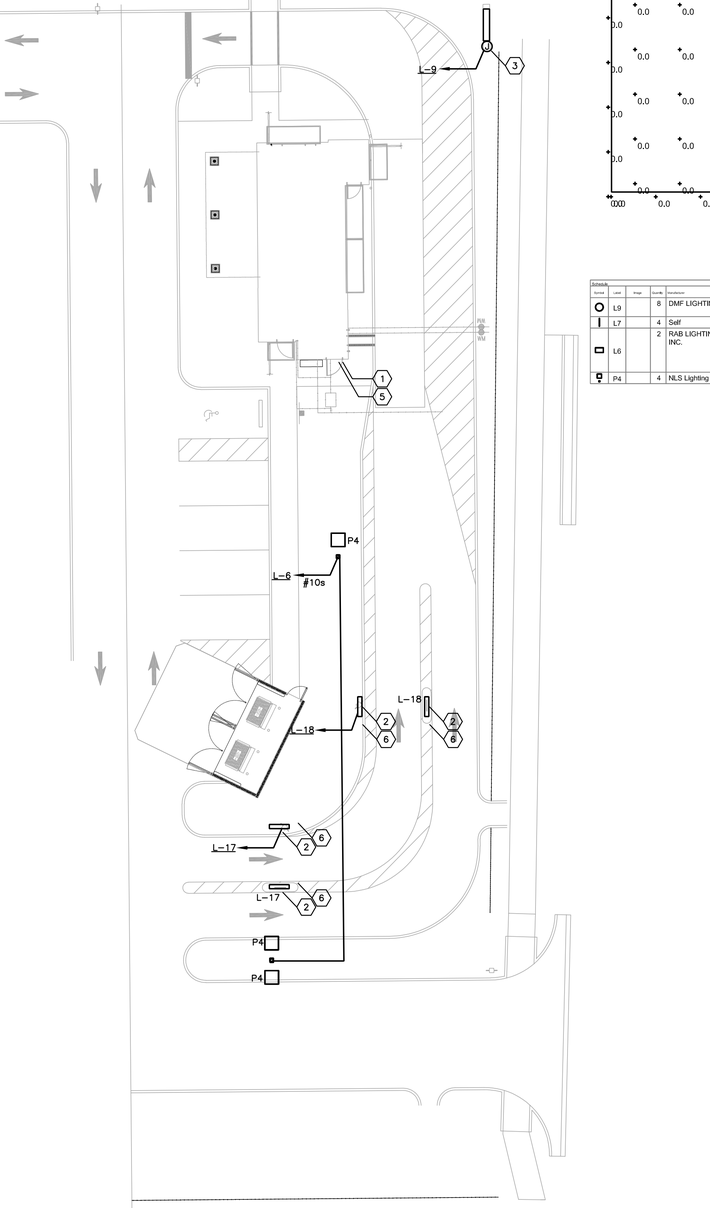
SEE S1.3 FOR POLE BASE DETAIL

GENERAL NOTES

1. FOR UTILITY TRANSFORMER, TELEPHONE SERVICE, GAS, WATER, AND SANITARY SEWER LOCATIONS; SEE CIVIL SITE PLAN.
2. THE ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR COORDINATION AND COMPLIANCE WITH ALL UTILITY COMPANIES REQUIREMENTS. INCOMING POWER AND TELEPHONE SERVICES IS EXISTING TO REMAIN. VERIFY REQUIREMENTS WITH UTILITIES PRIOR TO INSTALLATION.



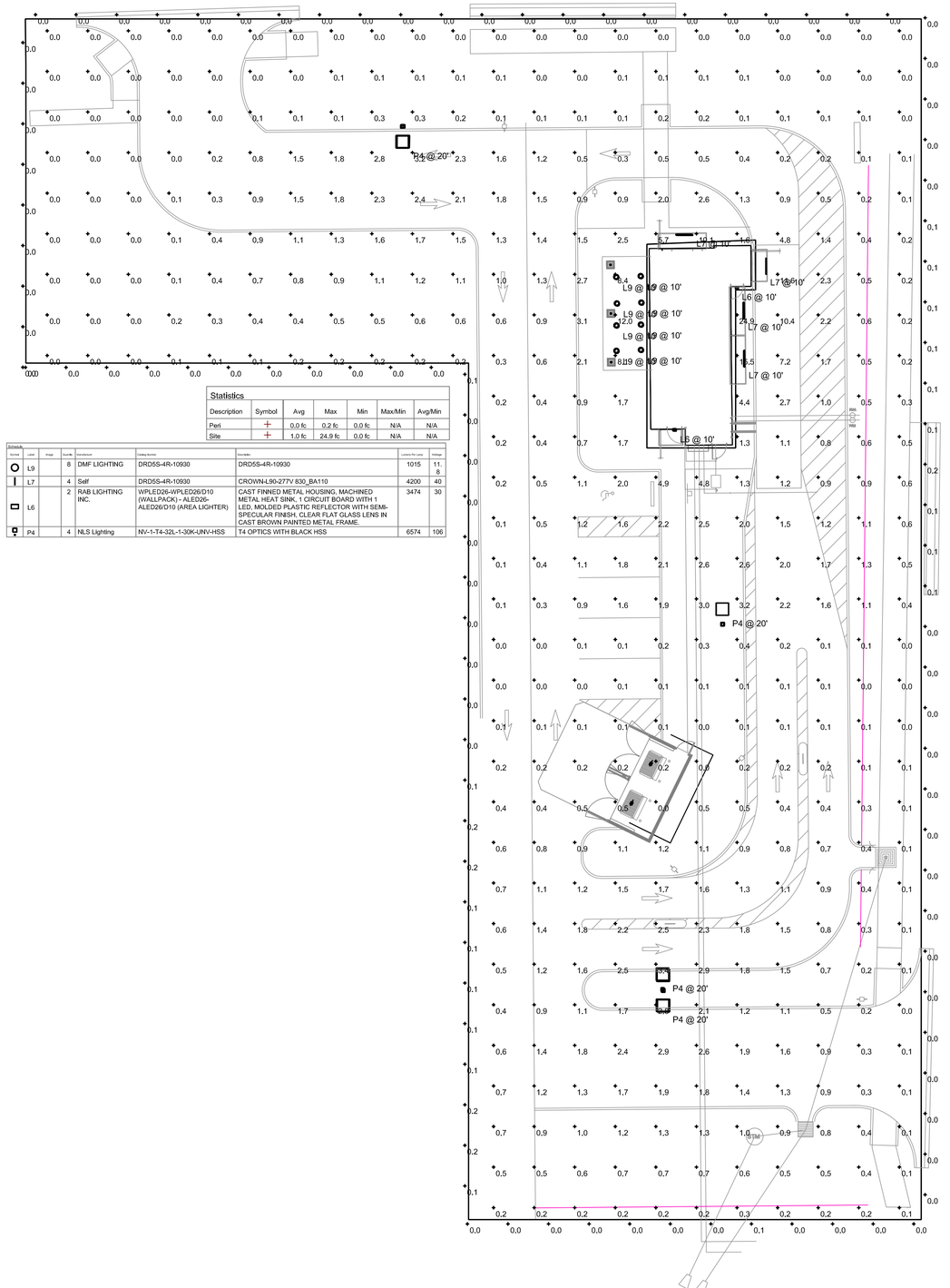
3 TRENCHING DETAIL
N.T.S.



PLAN NORTH

1 ELECTRICAL SITE PLAN
1/16" = 1'-0"

0 8' 16' 32'



Statistics

Description	Symbol	Avg	Max	Min	Max/Min	Avg/Min
Perl	+	0.0 fc	0.2 fc	0.0 fc	N/A	N/A
Site	+	1.0 fc	24.9 fc	0.0 fc	N/A	N/A

Symbol	Label	Image	Quantity	Manufacturer	Catalog Number	Description	Lumens Per Lamp	Wattage
○	L9		8	DMF LIGHTING	DRDSS-4R-10930	DRDSS-4R-10930	1015	11.6
|	L7		4	Self	DRDSS-4R-10930	CROWN-L90-277V 830_BA110	4200	40
▭	L6		2	RAB LIGHTING INC.	WPLED26-WPLED26/D10 (WALLPACK) - ALED26-ALED26/D10 (AREA LIGHTER)	CAST FINNED METAL HOUSING, MACHINED METAL HEAT SINK, 1 CIRCUIT BOARD WITH 1 LED, MOLDED PLASTIC REFLECTOR WITH SEMI-SPECULAR FINISH, CLEAR FLAT GLASS LENS IN CAST BROWN PAINTED METAL FRAME.	3474	30
▭	P4		4	NLS Lighting	NV-1-T4-32L-1-30K-UNV-HSS	T4 OPTICS WITH BLACK HSS	6574	106

PLAN NORTH

2 SITE PHOTOMETRIC
1/16" = 1'-0"

0 8' 16' 32'

DUTCH BROS Coffee

CORALIC ARCHITECTURE

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edin@coralicarchitecture.com

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MEP ENGINEER
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mcase@caseengineeringinc.com

05/01/2024

STATE OF MISSOURI · MATTHEW R. CASE · NUMBER PE-2017000282 · PROFESSIONAL ENGINEER

Project No: MO0401

Dutch Bros Coffee
New Freestanding Store
15200 MANCHESTER RD.
BALLWIN, MO 63011
for: Dutch Bros Coffee
110 SW 4th St. Grants Pass, OR 97526

ISSUED FOR PLANNING :
05.01.2024

REV:	DATE:	DESCRIPTION:

SHEET NAME:

ELECTRICAL
SITE & PHOTOMETRIC
PLAN

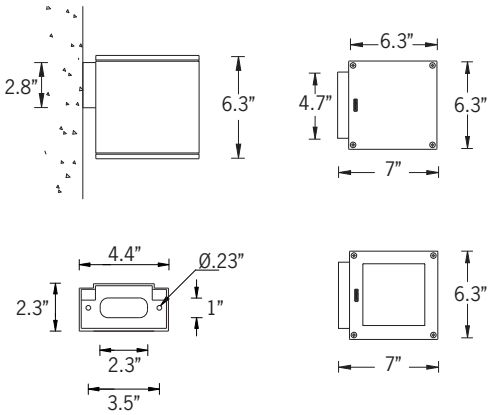
SHEET NUMBER:

E0.01

UMT-31426
Matrix 4 Surface

LIGMAN LIGHTING USA

14w COB 1128 Lumens
IP65 • Suitable For Wet Locations
IK07 • Impact Resistant
Weight 5 lbs



Mounting Detail

Construction

Aluminum
Less than 0.1% copper content – Marine Grade 6060 extruded & LM6 Aluminum High Pressure die casting provides excellent mechanical strength , clean detailed product lines and excellent heat dissipation.

Pre paint
8 step degrease and phosphate process that includes deoxidizing and etching as well as a zinc and nickel phosphate process before product painting.

Memory Retentive -Silicon Gasket
Provided with special injection molded “fit for purpose” long life high temperature memory retentive silicon gaskets. Maintains the gaskets exact profile and seal over years of use and compression.

Thermal management
LM6 Aluminum is used for its excellent mechanical strength and thermal dissipation properties in low and high ambient temperatures. The superior thermal heat sink design by Ligman used in conjunction with the driver, controls thermals below critical temperature range to ensure maximum luminous flux output, as well as providing long LED service life and ensuring less than 10% lumen depreciation at 50,000 hours.

Surge Suppression
Standard 10kv surge suppressor provided with all fixtures.

BUG Rating
B1 - U1 - G0

Finishing
All Ligman products go through an extensive finishing process that includes fettling to improve paint adherence.

Paint
UV Stabilized 4.9Mil thick powder coat paint and baked at 200 Deg C. This process ensures that Ligman products can withstand harsh environments. Rated for use in natatoriums.

Inspired by Nature Finishes
The Inspired by nature Finishing is a unique system of decorative powder coating. Our metal decoration process can easily transform the appearance of metal or aluminum product into a wood grain finish.

This patented technology enables the simulation of wood grain, and even marble or granite finish through the use of decorative powder coating.

The wood grain finish is so realistic that it’s almost undistinguishable from real wood, even from a close visual inspection. The system of coating permeates the entire thickness of the coat and as a result, the coating cannot be removed by normal rubbing, chipping, or scratching.

The Coating Process
After pre-treatment the prepared parts are powder coated with a specially formulated polyurethane powder. This powder provides protection against wear, abrasion, impact and corrosion and acts as the relief base color for the finalized metal decoration.

The component is then wrapped with a sheet of non-porous film with the selected decoration pattern printed on it using special high temperature inks.

This printed film transfer is vacuum-sealed to the surface for a complete thermo print and then transferred into a customized oven. The oven transforms the ink into different forms within the paint layer before it becomes solid. Finally, the film is removed, and a vivid timber look on aluminum remains.

Wood grain coating can create beautiful wood-looking products of any sort. There are over 300 combinations of designs currently in use. Wood grains can be made with different colors, designs, etc.

Our powder coatings are certified for indoor and outdoor applications and are backed by a comprehensive warranty. These coatings rise to the highest conceivable standard of performance excellence and design innovation.

Added Benefits
• Resistance to salt-acid room, accelerated aging
• Boiling water, lime and condensed water resistant
• Anti-Graffiti, Anti-Slip, Anti-Microbial, Anti-Scratch
• Super durable (UV resistant)
• TGIC free (non-toxic)

Hardware
Provided Hardware is Marine grade 316 Stainless steel.

Anti Seize Screw Holes
Tapped holes are infused with a special anti seize compound designed to prevent seizure of threaded connections, due to electrolysis from heat, corrosive atmospheres and moisture.

Crystal Clear Low Iron Glass Lens
Provided with tempered, impact resistant crystal clear low iron glass ensuring no green glass tinge.

Optics & LED
Precise optic design provides exceptional light control and precise distribution of light. LED CRI > 80

Lumen - Maintenance Life
L80 /B10 at 50,000 hours (This means that at least 90% of the LED still achieve 80% of their original flux)

Square surface wall-mounted architectural lighting range. Family of lighting effects sanctioning imagination and inspiration to reign in designs.

A small profile wall mounted compact cubic luminaire with up and downward light distributions. The Matrix is designed with five light distribution options, namely narrow, medium, wide, very wide and spike.

The Matrix uses high efficiency, long life LEDs and is designed to illuminate the wall and surfaces in front of the wall, as well as light accents on vertical and horizontal surfaces. The Matrix is suitable for indoor and outdoor applications.

This luminaire is available with decorative spikes and can be used with various combinations of light distribution optics.

This luminaire can be mounted at different angles to produce interesting decorative lighting effects on the side of the building facade.
The standard Matrix is designed to mount over a 3” octagonal j-box, a 4“ j-box cover plate is available upon request.

To meet International Dark Sky criteria, 3000k or warmer LEDs must be selected and luminaire fix mounted (+/- 15˚ allowable to permit leveling).

UMT-31426
Matrix 4 Surface

LIGMAN LIGHTING USA

PROJECT		DATE	
QUANTITY		TYPE		NOTE	

ORDERING EXAMPLE || UMT - 31426 - 14w - N - W30 - 02 - 120/277v - Options

UMT-31426	LAMP	BEAM	LED COLOR	FINISH COLOR	VOLTAGE
	14w COB 1128 Lumens	N - Narrow 20˚ M - Medium 25˚ W - Wide 36˚ VW - Very Wide 74˚	W27 - 2700K W30 - 3000K W35 - 3500K W40 - 4000K	01 - BLACK RAL 9011 02 - DARK GREY RAL 7043 03 - WHITE RAL 9003 04 - METALLIC SILVER RAL 9006 05 - MATTE SILVER RAL 9006 06 - LIGMAN BRONZE 07 - CUSTOM RAL	120/277v Other - Specify

INSPIRED BY NATURE FINISHES

- SW01 - OAK FINISH
- SW02 - WALNUT FINISH
- SW03- PINE FINISH
- DF - DOUGLAS FIR FINISH
- CW - CHERRY WOOD FINISH
- NW - NATIONAL WALNUT FINISH
- SU01 - CONCRETE FINISH
- SU02 - SOFTSCAPE FINISH
- SU03 - STONE FINISH
- SU04 - CORTEN FINISH

THERE IS AN ADDITIONAL COST FOR THESE FINISHES

ADDITIONAL OPTIONS

NAT - Natatorium Rated
F - Frosted Lens
4J - Mounting Plate for 4" Junction Box
DIM - 0-10v Dimming

COLORED DICHROIC FILTERS
RD - Red Lens
BL - Blue Lens
GR - Green Lens
AM - Amber Lens
[Specify Other Color]

More Custom Finishes Available Upon Request

Consult factory for pricing and lead times

Oak | Cherry | Beech | Carbon
Walnut | Chestnut | Bamboo | Galvanized
Pine | Mahogany | Birch | Steel

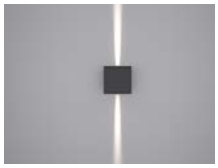
Example: Inspired by Nature Finish

Intertek

Matrix Product Family

Matrix 1

- UMT-31396-7/14w-90/1128lm



Matrix 2

- UMT-31406-7/7w-90/90lm

Matrix 3

- UMT-31416-29w-2256lm

Matrix 4

- UMT-31426-14w-1128lm

Matrix 5

- UMT-31427-7w-90lm

Matrix 6

- UMT-31397-5/7w-80/90lm

Matrix 7

- UMT-31398-19w-1247lm

Matrix 8

- UMT-31407-10w-238lm

Matrix 9

- UMT-31428-5w-119lm

WPLED26/E/PCS

Color: Bronze

Weight: 7.2 lbs

Project:	**Type:**
Prepared By:	**Date:**

Driver Info

Type	Constant Current
120V	0.22A
208V	0.13A
240V	0.11A
277V	0.10A
Input Watts	28.7W

LED Info

Watts	26W
Color Temp	5000K (Cool)
Color Accuracy	70 CRI
L70 Lifespan	100,000 Hours
Lumens	3,851 lm
Efficacy	134.2 lm/W

Technical Specifications

Electrical

Driver:

Constant Current, Class 2, 120-277V, 50/60Hz, 120V: 0.22A, 208V: 0.13A, 240V: 0.11A, 277V 0.10A

Dimming Driver:

Driver includes dimming control wiring for 0-10V dimming systems. Requires separate 0-10V DC dimming circuit. Dims down to 10%.

THD:

10.68% at 120V, 10.68% at 277V

Power Factor:

95.4% at 120V, 95.4% at 277V

Battery Backup:

Minimum starting temperature is 0°C/32°F

Photocell:

120V Swivel photocell included. Photocell is only compatible with 120V.

Battery Backup Light Loss Factor:

0.39

Battery Mode:

Light output use LLD of.76 to simulate light output during battery mode operation.

Compliance

UL Listed:

Suitable for Wet Locations as downlight. Wall Mount Only. Battery Backup UL 924 Listed Emergency Lighting Power Supply.

DLC Listed:

This product is listed by Design Lights Consortium (DLC) as an ultra-efficient premium product that qualifies for the highest tier of rebates from DLC Member Utilities. Designed to meet DLC 5.1 requirements.
DLC Product Code: P0000170I

Performance

Lifespan:

100,000-Hour LED lifespan based on IES LM-80 results and TM-21 calculations

Wattage Equivalency:

Equivalent to 150W Metal Halide

LED Characteristics

LED:

Two (2) 13W high-output, long-life LEDs

Color Consistency:

7-step MacAdam Ellipse binning to achieve consistent fixture-to-fixture color

Technical Specifications (continued)

LED Characteristics

Color Stability:

LED color temperature is warrantied to shift no more than 200K in color temperature over a 5-year period

Color Uniformity:

RAB's range of Correlated Color Temperature follows the guidelines of the American National Standard for Specifications for the Chromaticity of Solid State Lighting (SSL) Products, ANSI C78.377-2017.

Construction

Ambient Temperature:

Suitable for use in up to 35°C (95°F)

Thermal Management:

Optimized using computational fluid dynamics software to ensure long LED and driver lifespan

Gaskets:

High-temperature silicone

Housing:

Precision die-cast aluminum housing, lens frame and mounting arm

Finish:

Formulated for high durability and long-lasting color

Green Technology:

Mercury and UV free. RoHS-compliant components.

Other

Patents:

The WPLED26 design is protected by U.S. Patent D634878 and Patents pending in the U.S., Canada, China, Taiwan and Mexico.

Buy American Act Compliance:

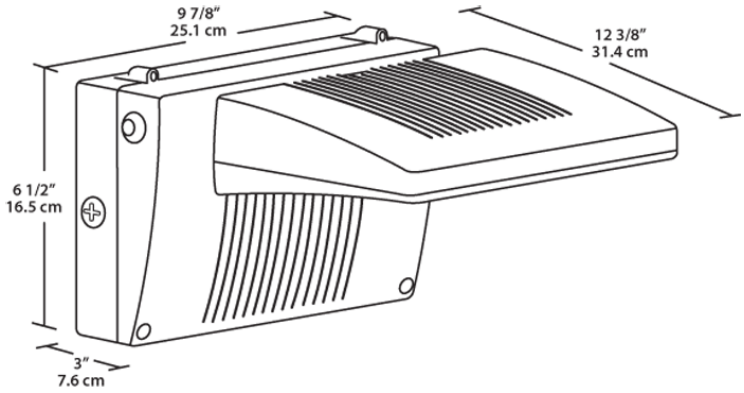
RAB values USA manufacturing! Upon request, RAB may be able to manufacture this product to be compliant with the Buy American Act (BAA). Please contact customer service to request a quote for the product to be made BAA compliant.

Optical

BUG Rating:

B1 U0 G0

Dimensions



Features

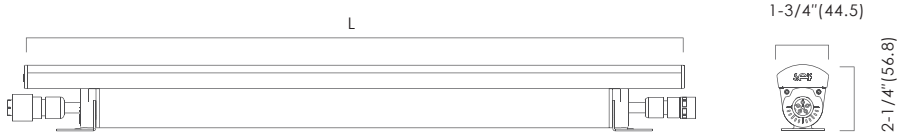
- Maintains 70% of initial lumens at 100,000-hours
- Weatherproof high temperature silicone gaskets
- Superior heat sinking with die cast aluminum housing and external fins
- 100 up to 277 Volts
- 5-Year, No-Compromise Warranty

Outdoor Cove Lighting
CROWN

Outdoor Cove Lighting
CROWN

- Quick connection
- Dimmable, 1-10V dimming to 10%-100%
- Linkable, max. linkable length: 72' @120VAC, 156' @277VAC
- Lockable, precision aiming adjustment: ±85°vertical rotation
- IP rating: IP66 (for wet locations)
- Lifetime: 50,000hrs (ta=95°F, 35°C)
- Ta: -13°F~122°F (-25°C～50°C)
- 10W/ft, 1050lm/ft
- Material: Aluminum alloy
- Other color temp available

Dimensions: (inches/mm)



How to order using our catalog numbers
Example: CROWN-1230K110SS

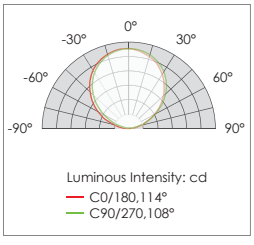
Series	Length	CCT (K)	Beam Angle	Finish	Installation
CROWN	**12** - 11.8"(300mm) **47** - 47"(1120mm) **70** - 70"(1778mm)	**30K** - 3000K **40K** - 4000K	**110** - 110°	**S** - Silver	**S** - Screw Mounting

Specifications

Catalog No.	Model	Rated Input (VAC)	Ra	Power (W)	Luminous flux (TYP@4000K)lm
CROWN-1230K110SS CROWN-1240K110SS	CROWN-L24-277V	120-277	85	10	1050
CROWN-4730K110SS CROWN-4740K110SS	CROWN-L90-277V	120-277	85	40	4200
CROWN-7030K110SS CROWN-7040K110SS	CROWN-L144-277V	120-277	85	60	6300

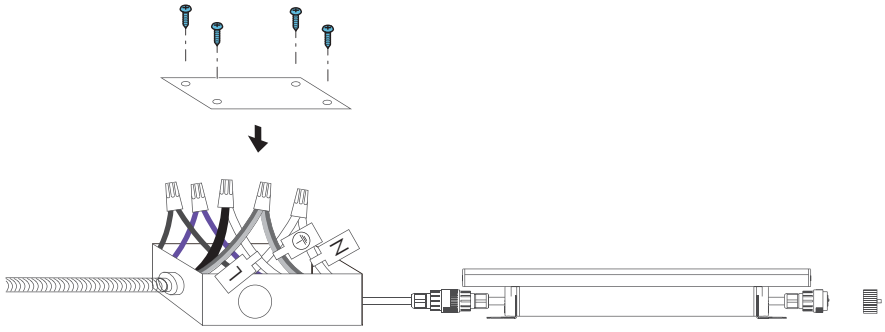
* Included: 1 pc LED fixture, 2pcs screws, 1pc cable end cap.

Photometrics



CROWN/CROWN NARROW

Wiring Diagram

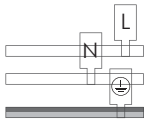


AC connection :

Black: " L "

White: " N "

Yellow/green: "⏚"

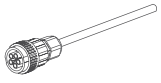


Dimming connection :

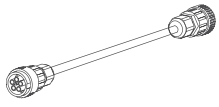
Violet: " + "

Gray: " - "

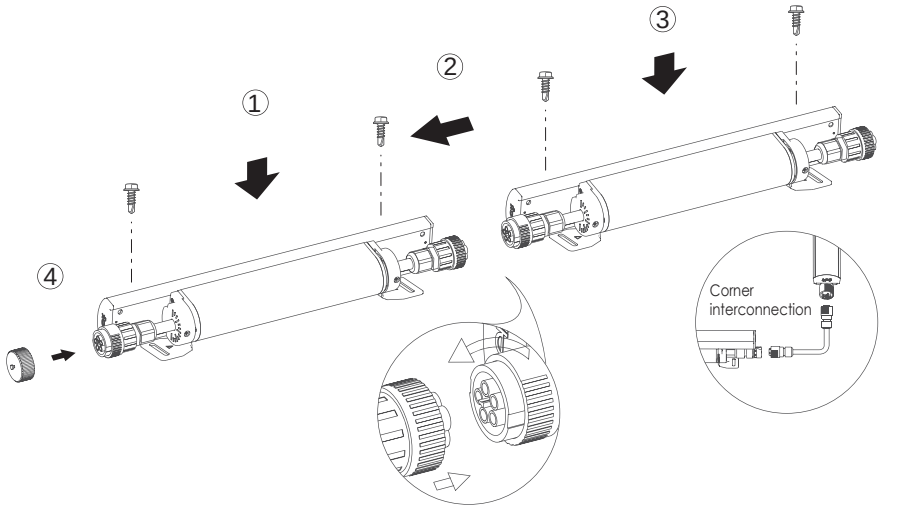
Accessories

Catalog No.	Description	Length (inch)
IC-CROWN-59	 Input cable	59"

Accessories(optional)

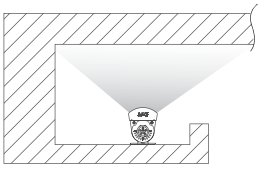
Catalog No.	Description	Length (inch)
SC-CROWN-12	 Soft connector	12"

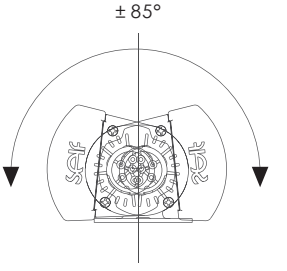
Installation



Application

1





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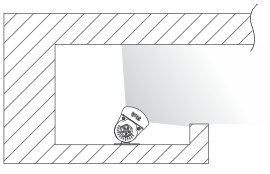

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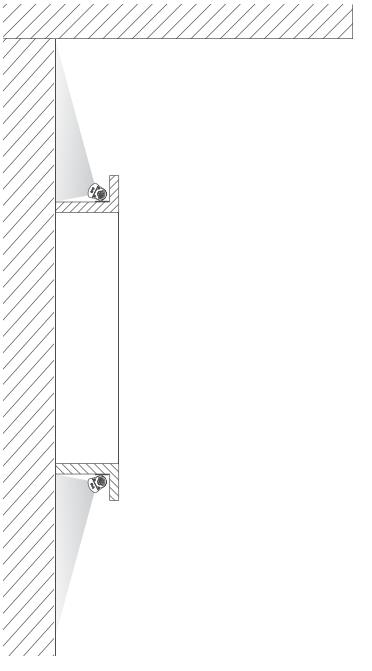
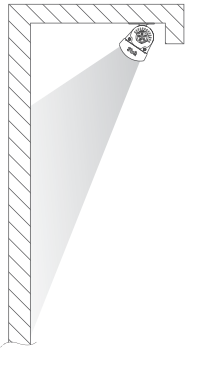


3



DRD5S & SurfaceFrame

Surface Mount LED Downlight

New Construction

DRDHNJO Octagonal Junction Box

Project:	Type:
Product Code:	Date:

Spec Sheet V- 01.10.22

- Thinnest-in-class DRD5S delivers the pure, smooth light and the elegant look of a high-end recessed downlight
- Features multiple ratings to meet the demands of a wide range of situations
- Ultra-low profile allows it to install in as little as 2" of ceiling space when 5/8" drywall is used

Application
New Construction

Aperture
4" Octagonal Junction Box

Delivered Lumens
750 lm (9.0W), 1000 lm (12.0W)

Color Quality
90+ CRI, < 3-step SDCM

Color Temperature
2700K 3000K 3500K

Optics
General

Input Voltage
120V only (TRIAC/ELV), 120/277V (0-10V)

Dimming
TRIAC/ELV 5%
0-10V 1%

Emergency Lighting
Optional Emergency LED Driver with integrated Test Switch for lighting up to 90 minutes in event of power failure

Shape
Round, Square

Finish
White

Module Ratings
UL Closet Rating Compliant *(750 lm only)*
UL Listed for Wet Location

Housing Ratings
Code compliant for use in appropriate fire-rated assemblies up to a maximum of 2-hours
STC/IIC Sound Rated
ASTM E283 Certified Air Tight
IC (Insulation Contact) Rated

Standards
JA8 TITLE 24 · ENERGY STAR · c UL us LISTED

Guarantee
50,000 hrs | 5 years

Additional Options
Non-Conductive Dead Front

PRODUCT BUILDER

HOUSING

PRODUCT CODE		APPLICATION		APERTURE		OPTION	
DRDH	Housing	N	New Construction	JO	SurfaceFrame Octagonal Junction Box	[Blank]	Integrated Driver
						7OSEM	EM Driver[1], 0-10V, 750 lm
						10OSEM	EM Driver[1], 0-10V, 1000 lm

LED MODULE

PRODUCT CODE		APERTURE		SHAPE		LUMENS		CRI		CCT		DRIVER	
DRD5S	Module	4	4" Aperture	R	Round	07	750 lm	9	90+ CRI	27	2700K	T	Integrated TRIAC/ELV, 120V only
				S	Square	10	1000 lm			30	3000K	O	Integrated 0-10V, 120/277V
										35	3500K	TDF	Integrated TRIAC/ELV, 120V only, Non-Conductive[1]
												ODF	Integrated 0-10V, 120/277V, Non-Conductive[1]
												EM	Emergency[1] w/ Test Switch

[1] EM option (housing) and Emergency driver (module) must be selected together
[2] Only available for Round shape, 750 lm, 2700K or 3000K CCT

HOUSING

SurfaceFrame

New Construction Octagonal Junction Box
DRDHNJO

SUMMARY

JUNCTION BOX: Equipped with (4) ½" trade size knockouts (two side, two top) to allow straight conduit runs. Approved for 6 (three in, three out) #12 AWG 70°C through wiring conductors.

MOUNTING: Pre-installed mounting brackets allow vertical adjustment of bar hangers up to 1"

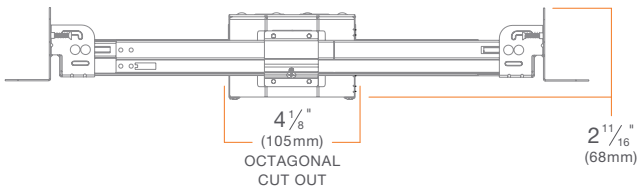
CEILING: ½" up to 1 ¾"

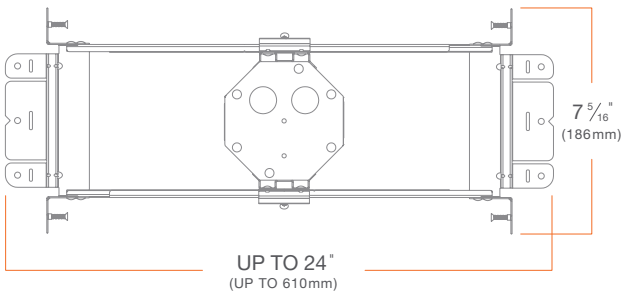
CUTOUT: 4 ⅛" (105mm) octagonal opening

LISTINGS: Metallic outlet box certified UL514A, code compliant for use in appropriate fire-rated assemblies for up to 2-hours, STC/IIC Sound Rated, ASTM E283 certified Air Tight, IC (Insulation Contact) rated

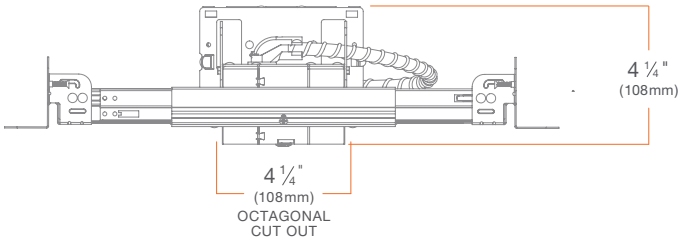
WARRANTY: 5 year limited warranty

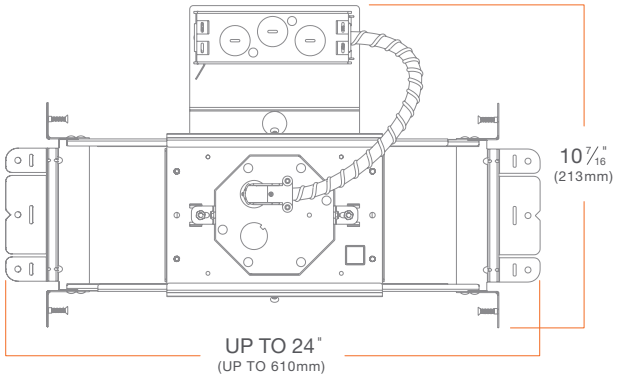
SurfaceFrame
DRDHNJO





SurfaceFrame w/ Emergency Lighting
DRDHNJO EM





DRD5S

Surface Mount LED Module

DRD5S

SUMMARY

LED: Optimized LED array

SHAPE: 4" Round, 4" Square

MODULE LUMENS: 750 lm (9.0W), 1000 lm (12.0W)

COLOR QUALITY: 90+ CRI, less than 3-step SDCM

CCT: 2700K, 3000K, 3500K

INPUT VOLTAGE: 120V only (TRIAC/ELV), 120/277V (0-10V)

DIMMING: Down to less than 5% for TRIAC/ELV at 120V, 1% for 0-10V at 120/277V

MAX INPUT CURRENT (120V): 0.075 amps, 0.1047 amps

MAX INPUT CURRENT (277V): 0.034 amps, 0.047 amps

POWER FACTOR: Greater than 0.9

TOTAL HARMONIC DISTORTION: Less than 20%

AMBIENT OPERATING TEMPERATURE: -20°C to 40°C

EMERGENCY LIGHTING: Optional Emergency LED Driver with Integrated Test Switch for lighting up to 90 minutes in event of power failure

PHOTOMETRIC TESTING: Tested in accordance to IESNA LM-79-2008

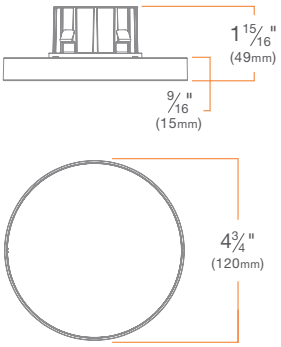
LISTINGS: ENERGY STAR® qualified, California Title 24 2019 JA8 compliant, UL Listed for Wet Location, UL Closet Rating compliant (750 lm only), cULus Listed

LIFETIME: 50,000 hours at 70% lumen maintenance

WARRANTY: 5 year limited warranty

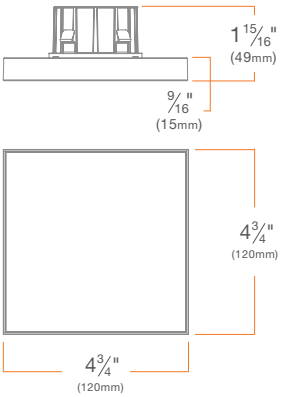
4" Round

DRD5S4R



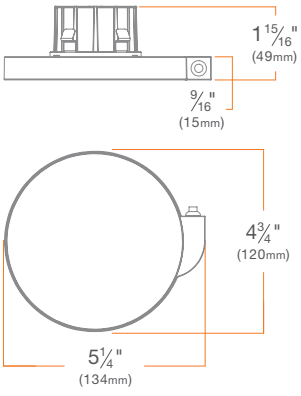
4" Square

DRD5S4S



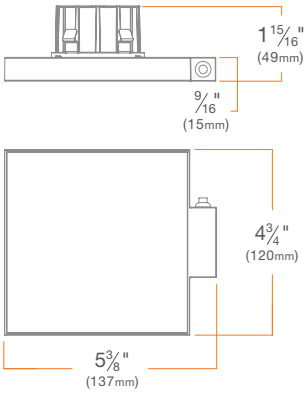
4" Round w/ EM Test Switch

DRD5S4R EM



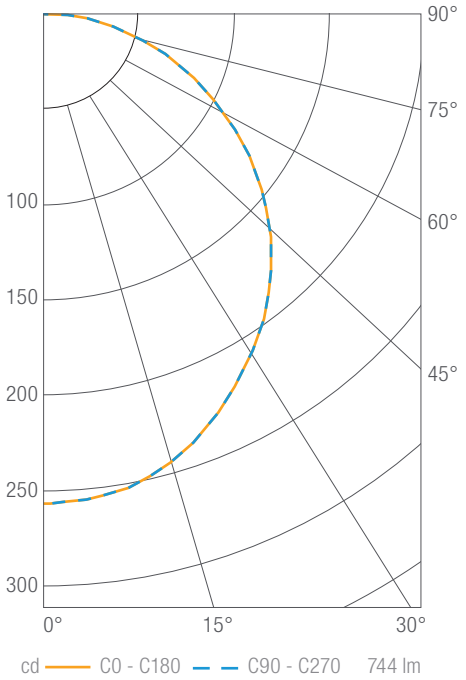
4" Square w/ EM Test Switch

DRD5S4S EM



PHOTOMETRY

DRD5S 4" Round, 750 lm, 90 CRI, 3000K DRD5S4R07930



Luminous Intensity

Gamma	C 0˚
0º	258
5º	256
10º	253
15º	247
20º	237
25º	226
30º	213
35º	200
40º	185
45º	169
50º	151
55º	132
60º	113
65º	93
70º	73
75º	54
80º	35
85º	18
90º	6

Values in candela

Zonal Lumen Summary

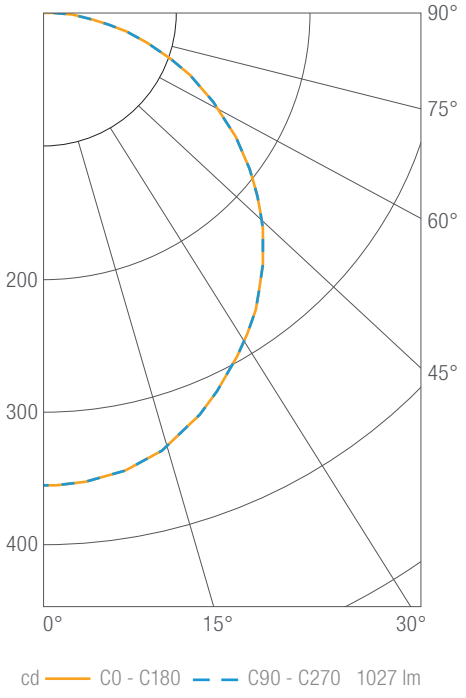
Zone	Lumens	Luminaire %
0-30	199	27
0-40	324	44
0-60	573	77
0-90	744	100
0-180	744	100

Illuminance Chart

Distance from LED	Foot Candles	Diameter
3.0'	29	8.8'
6.0'	7	17.7'
9.0'	3	26.5'
12.0'	2	35.3'

Beam Angle: 70°

DRD5S 4" Round, 1000 lm, 90 CRI, 3000K DRD5S4R10930



Luminous Intensity

Gamma	C 0˚
0º	356
5º	354
10º	349
15º	340
20º	327
25º	312
30º	294
35º	276
40º	255
45º	233
50º	209
55º	183
60º	155
65º	128
70º	101
75º	74
80º	48
85º	25
90º	9

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	274	27
0-40	447	44
0-60	790	77
0-90	1027	100
0-180	1027	100

Illuminance Chart

Distance from LED	Foot Candles	Diameter
3.0'	40	8.8'
6.0'	10	17.7'
9.0'	4	26.5'
12.0'	2	35.3'

Beam Angle: 63°

DIMMER COMPATIBILITY

Recommended Phase-control Dimmers (Dims down to 5% nominal measured light output)

Brand	Series	Model Number	Max Load 750lm DRD5S4R07	Max Load 1000lm DRD5S4R10
Cooper	Aspire	9573	29	23
Leviton	Vizia	VPE06	64	48
Lutron	CL Series	AYCL-253, DVCL-253	26	20
	Grafik Eye 3000	QSGR-3P, QSGR-6P	31	24
	Grafik Sys / Homeworks	RPM-4U	44	35
	Maestro CL	MACL-153M, MSCL-OP153M, MSCL-VP153M	16	12

Compatible Phase-control Dimmers[1] (Dims down to 20% nominal measured light output)

Brand	Series	Model Number	Max Load 750lm DRD5S4R07	Max Load 1000lm DRD5S4R10
Cooper	Decorator	DLC03P, DAL06P	29	23
Legrand	Adorne	ADTP703	48	38
	Digital Light Management	LMRC-221	250	195
Leviton	IllumaTech	IPE04	32	25
	Vizia	VPE04	42	32
Lutron	CL Series	AYCL-153, CTCL-153, DVCL-153, LGCL-513, SCL-153, TGCL-513	15	11
	Maestro Wireless	MRF2-6ELV, MRF2-6CL	15	12
	Radio RA	RRD-6NA, RRD-6CL, RRD-6D	15	12
	Skylark Contour CL	CTCL-153P	15	12

[1] Dimmer compatibility reflects performance compatibility only. Please reference your local codes for application.

DIMMER COMPATIBILITY

Recommended 0-10V Dimmers (Dims down to 1% nominal measured light output)

Brand	Series	Model Number	Max Load 750lm DRD5S4R07	Max Load 1000lm DRD5S4R10
Legrand	Titan	CD4FB	200	150
Leviton	IllumaTech	IP710-DLZ	120	90
Lithonia	Synergy	ISD BC	120	90
Lutron	Diva	DVTV	100	75
	Nova	NFTV	200	150
	Nova	NTSTV-DV	100	75
	Vive-PowPak	RMJS-8T-DV-B	60	45
Watt Stopper	Micro-Decorator	DCLV1	60	45
	DLM	LMRC-211	100	75

SurfaceFrame Options

Shallow Recessed LED Downlight

DRD2 & SurfaceFrame
DRDHNJO Octagonal Junction Box

DRD2 & SurfaceFrame Alt/EM
Alternate Dimming and/or Emergency Lighting
DRDHNJO Octagonal Junction Box

Surface Mount LED Downlight

DRD5S & SurfaceFrame
DRDHNJO Octagonal Junction Box

NLS LIGHTING

NV-1

AREA LIGHTING

FORM AND FUNCTION

- Sleek, low profile housing
- Spec grade performance
- Engineered for optimum thermal management
- Low depreciation rate
- Reduces energy consumption and costs up to 65%
- Exceeds IES foot candle levels utilizing the least number of poles and fixtures per project
- Optical system designed for:
  - Parking Lots
  - Auto Dealerships
  - General Area Lighting

CONSTRUCTION

- Die Cast Aluminum
- External cooling fins, Finite Element Analysis (FEA) designed
- Corrosion resistant external hardware
- One-piece silicone gasket ensures IP-65 seal for electronics compartment
- One-piece Optics Plate™ mounting silicone Micro Optics
- Two-piece silicone Micro Optic system ensures IP-67 level seal around each PCB
- Grade 2 Clear Anodized Optics Plate™ standard

FINISH

- 3-5 mils electrostatic powder coat.
- NLS' standard high-quality finishes prevent corrosion protects against and extreme environmental conditions

WARRANTY

Five-year limited warranty for drivers and LEDs.

LISTINGS

- Certified to UL 1598
- UL 8750
- CSA C22.2 No. 250.0
- DesignLights Consortium® (DLC)
- DesignLights Consortium Premium® (DLCP)
- IP65/ IP67 Rated
- 3G Vibration Rated per ANSI C136.31-2010

LED WATTAGE CHART

	16L	32L	48L	64L
350 milliamps	18w	-	-	-
530 milliamps	28w	-	-	-
700 milliamps	36w	71w	104w	136w
1050 milliamps	56w	106w	156w	205w

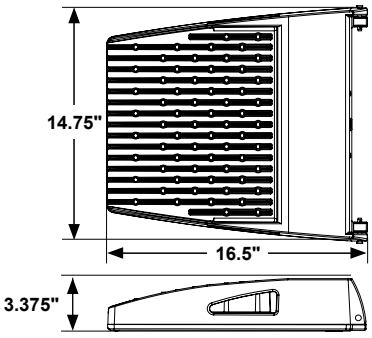
Project Name:

Type:

Cat #	Light Dist.	No. of LEDs	Milliamps	Kelvin	Volts	Mounting	Color	Options
NV Size 1 **(NV-1)**	Type 2 **(T2)** Type 3 **(T3)** Type 4 **(T4)** Type 5 **(T5)** Nema 3 30° Narrow Beam **(N3)**	16 **(16L)** 32 **(32L)** 48 **(48L)** 64 **(64L)**	350 **(35)** 530 **(53)** 700 **(7)** 1050 **(1)**	3000K **(30K)** 4000K **(40K)** 5000K **(50K)**	120-277 **(UNV)** 347-480 **(HV)**	**Direct Pole** Single, D180 3" **(DPS3)** D90, T90, T120, QD 7" **(DPS7)** Knuckle Mount **(KM)** Wall Mount **(WM)** Trunnion Mount **(TM)** **Standard finish is stainless steel. Can be painted to match fixture* Tennis Arm **(TA)** **See next page for Arm Configurations* **For Round Pole, please specify RPA4 or RPA5*	Bronze **(BRZ)** White **(WHT)** Silver **(SVR)** Black **(BLK)** Graphite **(GPH)** Grey **(GRY)** Custom **(CS)**	Bird Deterrant **(BD)** Marine Grade Finish **(MGF)** Optic Plate Painted to Match Fixture **(OPP)** Nema 7-Pin Receptacle **(PE7)** Photocell + Receptacle **(PCR)** Receptacle + Shorting Cap **(PER)** FSP-211 with Motion Sensor (UNV Voltage) **(FSP-20)** **9'-20" Heights* **(FSP-40)** **21'-40' Heights* Quick Mount Bracket **(QMB)** Retrofit Mount Bracket **(RQMB)** Round Pole Adaptor 3"- 4" Pole **(RPA4)** Round Pole Adaptor 5"- 6" Pole **(RPA5)** Rotated Optic Left **(ROL)** Rotated Optic Right **(ROR)** Automotive House Side Shield **(AHS)** House Side Shield **(HSS)** **HSS not applicable with N3 - NEMA 30° Optics*

ELECTRICAL

- 120-277 Volts (UNV) or 347-480 Volts (HV)
- 0-10V dimming driver by Philips Advance
- Driver power factor at maximum load is ≥ .95, THD maximum load is 15%
- All internal wiring UL certified for 600 VAC and 105°C
- All drivers, controls, and sensors housed in enclosed IP-65 compartment
- Lumileds Luxeon MX LED's
- CRI >70
- Color temperatures: 3000K, 4000K, 5000K
- Surge Protection: 20KVA supplies as standard.

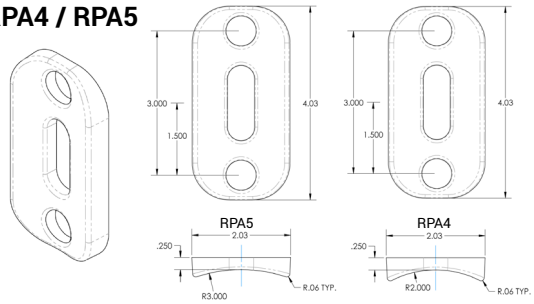


Weight: 24 lbs

OPTIONS

- **BIRD DETERRANT (BD)**—offers effective and humane deterrent for larger bird species and provides cost-effective long-term solution to nuisance bird infestations and protect your property.
- **MARINE GRADE FINISH (MGF)**—A multi-step process creating protective finishing coat against harsh environments.
  - Chemically washed in a 5 stage cleaning system.
  - Pre-baked
  - Powder coated 3-5 mils of Zinc Rich Super Durable Polyester Primer.
  - 1-2 feet inside pole coverage top and bottom.
  - Oven Baked.
  - Finished Powder Coating of Super Durable Polyester Powder Coat 3-5 mil thickness.
- **SHIELDS (HSS, AHS)**—House Side Shield (HSS) is designed for full property line cut-off. Automotive House Side Shield (AHS) is a single-sided shield allowing partial cut-off on either side or front of luminaire.
- **ROUND POLE ADAPTER (RPA)–** When using round poles, specify Round Pole Adapter (RPA). Specify RPA4 when installing on 3"-4" round poles, and RPA5 when installing on 5"-6" round poles.

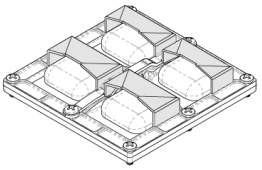
RPA4 / RPA5



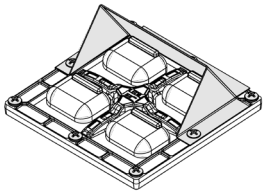
CONTROLS

- **FSP-211 (FSP-X)**—Passive infrared (PIR) sensor providing multi-level control based on motion/daylight contribution.
  - All control parameters adjustable via wireless configuration remote storing and transmitting sensor profiles.
  - FSP-20 mounting heights 9-20 feet
  - FSP-40 mounting heights 21-40 feet.
  - Includes 5 dimming event cycles, 0-10V dimming with motion sensing, reprogrammable in the field.
- **NEMA 7-PIN RECEPTACLE (PE7)**—An ANSI C136.41-2013 receptacle provides electrical and mechanical interconnection between photo control cell and luminaire. Dimming receptacle available two or four dimming contacts supports 0-10 VDC dimming methods or Digital Addressable Lighting Interface (DALI), providing reliable power interconnect.

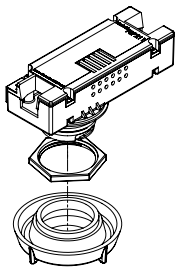
HOUSE SIDE SHIELD



AUTOMOTIVE HOUSE SIDE SHIELD



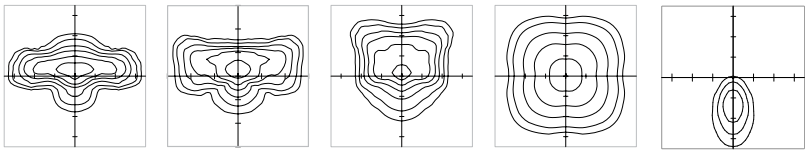
FSP-211



OPTICS

Silicone optics high photothermal stability and light output provides higher powered LEDs with minimized lumen depreciation LED life. UV and thermal stability with scratch resistance increases exterior application durability.

- IES Types



TYPE II (T2) TYPE III (T3) TYPE IV (T4) TYPE V (T5) NEMA 3 (N3)

NLS LIGHTING
701 Kingshill Place, Carson, CA 90746
Call Us Today (310) 341-2037
nlslighting.com

LUMENS

PART NUMBER	N3	LM/W	T2	LM/W	DLC	T3	LM/W	DLC	T3 HSS	LM/W	T4	LM/W	DLC	T4 AHS	LM/W	T4 HSS	LM/W	T5	LM/W	DLC	W
NV-1-16L-35-30K	2016	112	2106	117	P	2106	117	P	1134	63	2187	116	P	1296	72	1116	62	2231	118	P	18
NV-1-16L-35-40K	2088	116	2268	126	P	2286	127	P	1206	67	2250	125	P	1368	76	1188	66	2304	128	P	18
NV-1-16L-35-50K	2160	120	2376	132	P	2394	133	P	1278	71	2358	131	P	1440	80	1260	70	2412	134	P	18
NV-1-16L-53-30K	3136	112	3192	114	P	3220	115	P	1764	63	3119	113	P	2016	72	1736	62	3248	116	P	28
NV-1-16L-53-40K	3248	116	3472	124	P	3472	124	P	1876	67	3444	123	P	2128	76	1848	66	3500	125	P	28
NV-1-16L-53-50K	3360	120	3612	129	P	3640	130	P	1988	71	3584	128	P	2240	80	1960	70	3668	131	P	28
NV-1-16L-7-30K	4032	112	3960	110	P	3960	110	P	2268	63	3973	109	P	2592	72	2232	62	3996	111	P	36
NV-1-16L-7-40K	4176	116	4428	123	P	4284	119	P	2412	67	4212	117	P	2736	76	2376	66	4320	120	P	36
NV-1-16L-7-50K	4320	120	4644	129	P	4500	125	P	2556	71	4428	123	P	2880	80	2520	70	4500	125	P	36
NV-1-16L-1-30K	6272	112	6160	110	S	6384	114	P	3528	63	6232	112	P	4032	72	3472	62	6440	115	P	56
NV-1-16L-1-40K	6496	116	6832	122	P	6888	123	P	3752	67	6776	121	P	4256	76	3696	66	6944	124	P	56
NV-1-16L-1-50K	6720	120	7168	128	P	7224	129	P	3976	71	7112	127	P	4480	80	3920	70	7280	130	P	56
NV-1-32L-7-30K	7952	112	7810	110	S	7810	110	S	4473	63	7739	109	S	5112	72	4402	62	7881	111	S	71
NV-1-32L-7-40K	8236	116	9017	127	P	8449	119	P	4757	67	8307	117	P	5396	76	4686	66	8520	120	P	71
NV-1-32L-7-50K	8520	120	9159	129	P	8875	125	P	5041	71	8733	123	P	5680	80	4970	70	8946	126	P	71
NV-1-32L-1-30K	11872	112	11660	110	S	12084	114	S	6678	63	11820	112	S	7632	72	6572	62	12190	115	S	106
NV-1-32L-1-40K	12296	116	12932	122	P	13038	123	P	7102	67	12826	121	P	8056	76	6996	66	13144	124	P	106
NV-1-32L-1-50K	12720	120	13568	128	P	13674	129	P	7526	71	13462	127	P	8480	80	7420	70	13780	130	P	106
NV-1-48L-7-30K	11648	112	11440	110	S	11440	110	S	6552	63	11336	109	S	7488	72	6448	62	11544	111	S	104
NV-1-48L-7-40K	12064	116	13208	127	P	12376	119	P	6968	67	12168	117	P	7904	76	6864	66	12480	120	P	104
NV-1-48L-7-50K	12480	120	13520	130	P	13000	125	P	7384	71	12792	123	P	8320	80	7280	70	13104	126	P	104
NV-1-48L-1-30K	17472	112	17160	110	S	17784	114	S	9828	63	17472	112	S	11232	72	9672	62	17940	115	S	156
NV-1-48L-1-40K	18096	116	19032	122	P	19188	123	P	10452	67	18876	121	P	11856	76	10296	66	19344	124	P	156
NV-1-48L-1-50K	18720	120	19968	128	P	20124	129	P	11076	71	19812	127	P	12480	80	10920	70	20280	130	P	156
NV-1-64L-7-30K	15232	112	14960	110	S	14960	110	S	8568	63	14824	109	S	9792	72	8432	62	15096	111	S	136
NV-1-64L-7-40K	15776	116	17272	127	P	16184	119	P	9112	67	15912	117	P	10336	76	8976	66	16320	120	P	136
NV-1-64L-7-50K	16320	120	17680	130	P	17000	125	P	9656	71	16728	123	P	10880	80	9520	70	17136	126	P	136
NV-1-64L-1-30K	22960	112	22550	110	S	23370	114	S	12915	63	22960	112	S	14760	72	12710	62	23575	115	S	205
NV-1-64L-1-40K	23780	116	25010	122	P	25215	123	P	13735	67	24805	121	P	15580	76	13530	66	25420	124	P	205
NV-1-64L-1-50K	24600	120	26240	128	P	26445	129	P	14555	71	26035	127	P	16400	80	14350	70	26650	130	P	205

***DLC** *S= Standard* *P= Premium*

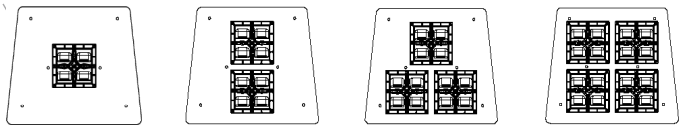
BUG RATINGS

PART NUMBER	T2	T3	T3 HSS	T4	T4 HSS	T5
NV-1-16L-35-30K	B1-U0-G1	B1-U0-G1	B0-U0-G0	B1-U0-G1	B0-U0-G0	B2-U0-G0
NV-1-16L-35-40K	B1-U0-G1	B1-U0-G1	B0-U0-G0	B1-U0-G1	B0-U0-G0	B2-U0-G0
NV-1-16L-35-50K	B1-U0-G1	B1-U0-G1	B0-U0-G0	B1-U0-G1	B0-U0-G0	B2-U0-G2
NV-1-16L-53-30K	B1-U0-G1	B1-U0-G1	B0-U0-G1	B1-U0-G1	B0-U0-G1	B2-U0-G1
NV-1-16L-53-40K	B1-U0-G1	B1-U0-G1	B0-U0-G1	B1-U0-G1	B0-U0-G1	B2-U0-G1
NV-1-16L-53-50K	B1-U0-G1	B1-U0-G1	B0-U0-G1	B1-U0-G1	B0-U0-G1	B2-U0-G1
NV-1-16L-7-30K	B1-U0-G1	B1-U0-G1	B0-U0-G1	B1-U0-G1	B0-U0-G1	B3-U0-G1
NV-1-16L-7-40K	B1-U0-G1	B1-U0-G1	B0-U0-G1	B1-U0-G1	B0-U0-G1	B3-U0-G1
NV-1-16L-7-50K	B1-U0-G1	B1-U0-G1	B0-U0-G1	B1-U0-G1	B0-U0-G1	B3-U0-G1
NV-1-16L-1-30K	B1-U0-G1	B1-U0-G1	B0-U0-G1	B1-U0-G1	B0-U0-G1	B3-U0-G1
NV-1-16L-1-40K	B1-U0-G1	B2-U0-G2	B0-U0-G1	B2-U0-G2	B0-U0-G1	B3-U0-G2
NV-1-16L-1-50K	B1-U0-G2	B2-U0-G2	B0-U0-G1	B2-U0-G2	B0-U0-G1	B3-U0-G2
NV-1-32L-7-30K	B1-U0-G2	B2-U0-G2	B0-U0-G1	B2-U0-G2	B0-U0-G1	B3-U0-G2
NV-1-32L-7-40K	B1-U0-G2	B2-U0-G2	B0-U0-G1	B2-U0-G2	B0-U0-G2	B3-U0-G2
NV-1-32L-7-50K	B2-U0-G2	B2-U0-G2	B0-U0-G2	B2-U0-G2	B0-U0-G2	B3-U0-G2
NV-1-32L-1-30K	B2-U0-G2	B2-U0-G2	B0-U0-G2	B2-U0-G2	B0-U0-G2	B4-U0-G2
NV-1-32L-1-40K	B2-U0-G2	B2-U0-G2	B0-U0-G2	B3-U0-G2	B0-U0-G2	B4-U0-G2
NV-1-32L-1-50K	B2-U0-G2	B3-U0-G3	B0-U0-G2	B3-U0-G3	B0-U0-G2	B4-U0-G2
NV-1-48L-7-30K	B2-U0-G2	B2-U0-G2	B0-U0-G2	B2-U0-G2	B0-U0-G2	B4-U0-G2
NV-1-48L-7-40K	B2-U0-G2	B2-U0-G2	B0-U0-G2	B2-U0-G2	B0-U0-G2	B4-U0-G2
NV-1-48L-7-50K	B2-U0-G2	B3-U0-G3	B0-U0-G2	B2-U0-G2	B0-U0-G2	B4-U0-G2
NV-1-48L-1-30K	B3-U0-G3	B3-U0-G3	B1-U0-G2	B3-U0-G3	B1-U0-G2	B4-U0-G2
NV-1-48L-1-40K	B3-U0-G3	B3-U0-G3	B1-U0-G2	B3-U0-G3	B1-U0-G2	B5-U0-G3
NV-1-48L-1-50K	B3-U0-G3	B3-U0-G3	B1-U0-G2	B3-U0-G3	B1-U0-G2	B5-U0-G3
NV-1-64L-7-30K	B2-U0-G2	B3-U0-G3	B0-U0-G2	B3-U0-G3	B1-U0-G2	B4-U0-G2
NV-1-64L-7-40K	B3-U0-G3	B3-U0-G3	B0-U0-G2	B3-U0-G3	B1-U0-G2	B4-U0-G2
NV-1-64L-7-50K	B3-U0-G3	B3-U0-G3	B1-U0-G2	B3-U0-G3	B1-U0-G2	B4-U0-G2
NV-1-64L-1-30K	B3-U0-G3	B3-U0-G3	B1-U0-G2	B3-U0-G3	B1-U0-G3	B5-U0-G3
NV-1-64L-1-40K	B3-U0-G3	B3-U0-G3	B1-U0-G3	B3-U0-G4	B1-U0-G3	B5-U0-G3
NV-1-64L-1-50K	B3-U0-G3	B3-U0-G3	B1-U0-G3	B3-U0-G4	B1-U0-G3	B5-U0-G3

OPTICAL CONFIGURATIONS

Rotatable Optics (ROR) Rotated Right, (ROL) Rotated Left options available. Optics field and factory rotatable.

(OPP)



NV-1 / 16L **NV-1 / 32L** **NV-1 / 48L** **NV-1 / 64L**

*** OPTIC PLATE PAINTED TO MATCH FIXTURE FINISH (OPP)**– Optic Plate standard clear anodized, Grade 2. When (OPP) specified, Optic Plate finish will match fixture finish.

EPA

EPA	SGL	D90	D180	T90	T120	QD
NV-1-DP	0.46	1.14	0.92	1.34	1.37	1.34
NV-1-KM	0.54	N/A	1.08	N/A	N/A	N/A
NV-1-ASA	0.75	1.29	1.50	1.99	2.05	1.99

L70/L90 DATA

TEMP.	NV-1	
	L70 (64L-1050mA)	L90 (64L-1050mA)
25°C	483,000	160,000

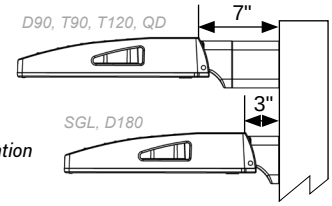
DPX ARM LENGTH

DPX ARM LENGTH	SGL	D90	D180	T90	T120	QD
NV-1	3"	7"	3"	7"	7"	7"

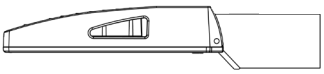
MOUNTING OPTIONS

DIRECT POLE (DP)

Standard mounting arm is extruded aluminum in lengths of 3" and 7".
**Arm lengths may vary depending on configuration*



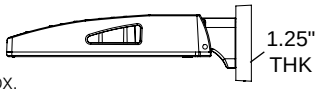
TENNIS ARM (TA)

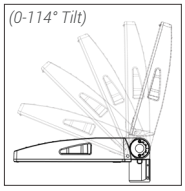


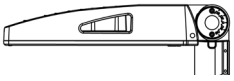
Steel fitter slips over 3.5" x 1.5" rectangular arm.
**See Tennis Arm Spec Sheet for details*

WALL MOUNT (WM)

Cast Aluminum Plate for direct wall mount. 3" extruded aluminum arm mounts directly to a cast wall mount box.







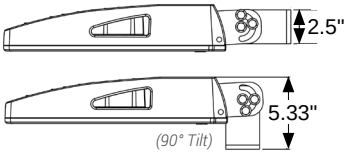
KNUCKLE MOUNT (KM)

Die Cast Knuckle great for adjustable installation on 2-3/8" OD vertical or horizontal tenon.

- Max Uptilt of 114 degrees
- Adjustable in 6 degree increments

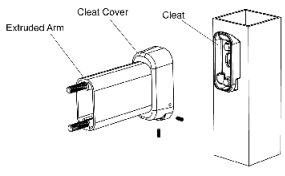
TRUNNION MOUNT (TM)

Steel, bolt-on-mounting for adjustable installation with a maximum uplift of 90 degrees.
**Unpainted stainless steel is standard*

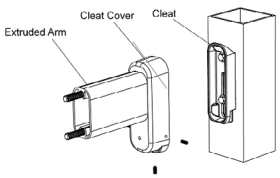


OPTIONAL

Optional Cast Aluminum Bracket, **Quick Mount Bracket (QMB)** and **Retrofit Quick Mount Bracket (RQMB)**, designed for quick mounting on Direct Square or Round Poles. Cleat mounts directly to pole for easily hung fixtures.



QMB



Longer slot to accommodate existing drill pattern.

RQMB

PLANNING AND ZONING COMMISSION
1 GOVERNMENT CTR, BALLWIN, MO 63011
MONDAY, MAY 6, 2024 AT 7:00 PM

PUBLIC HEARING

Notice is hereby given that on Monday, May 6, 2024 at 7:00 P.M. – A Public Hearing will be held by the Planning & Zoning Commission in the City Government Center Board Room at 1 Government Center, Ballwin, Missouri. The Commission will consider the following petitions:

SUB 24-01 – Petition for a Lot Split at 15200 Manchester Road

SUE 24-04 – Petition for a Special Use Exception (SUE) for a restaurant with a drive thru at 15200 Manchester Road

Additional information on this petition is at the City Government Center, or by calling 636-227-2243.

Planning & Zoning Commission

Eric Sterman, City Administrator