MAPS

Location

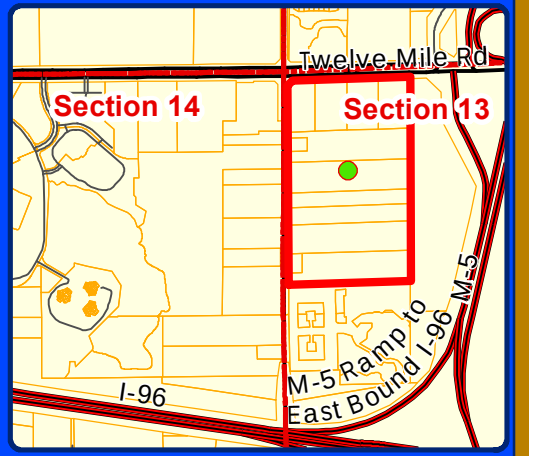
Zoning

Future Land Use

Natural Features

JZ24-31 THE GROVE

LOCATION



Legend

Subject Area

City of Novi

Dept. of Community Development
City Hall / Civic Center
45175 W Ten Mile Rd
Novi, MI 48375
cityofnovi.org

Map Author: Lindsay Bell
Date: 9/9/24
Project: THE GROVE
Version #: 1

Feet
0 120 240 480 720

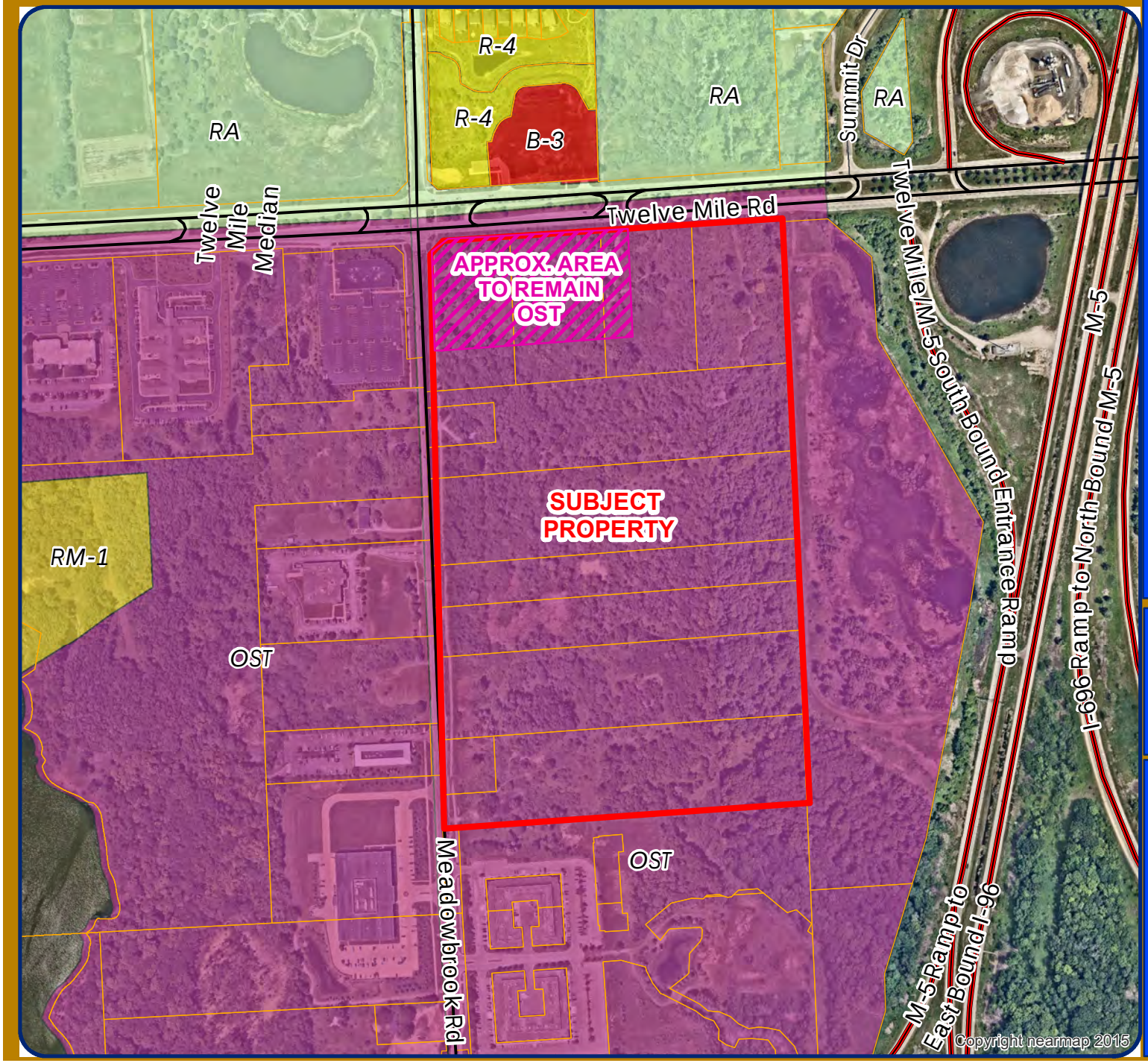
1 inch = 542 feet

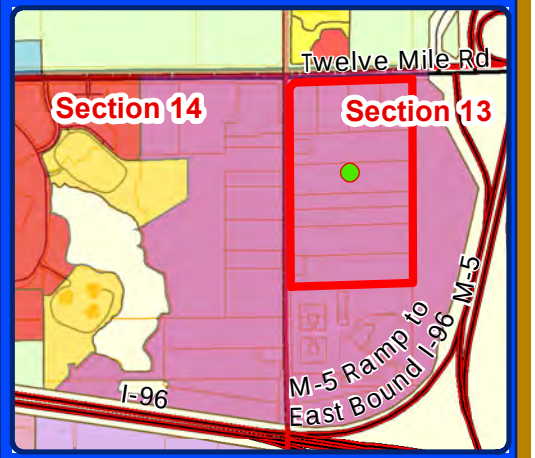
MAP INTERPRETATION NOTICE

Map information depicted is not intended to replace or substitute for any official or primary source. This map was intended to meet National Map Accuracy Standards and use the most recent, accurate sources available to the people of the City of Novi. Boundary measurements and area calculations are approximate and should not be construed as survey measurements performed by a licensed Michigan Surveyor as defined in Michigan Public Act 132 of 1970 as amended. Please contact the City GIS Manager to confirm source and accuracy information related to this map.

JZ24-31 THE GROVE

ZONING





Legend

- R-A: Residential Acreage
- R-4: One-Family Residential District
- RM-1: Low-Density Multiple Family
- B-3: General Business District
- I-1: Light Industrial District
- OS-1: Office Service District
- OSC: Office Service Commercial
- OST: Office Service Technology
- RC: Regional Center District
- Subject Area

City of Novi
Dept. of Community Development
City Hall / Civic Center
45175 W Ten Mile Rd
Novi, MI 48375
cityofnovi.org

Map Author: Lindsay Bell
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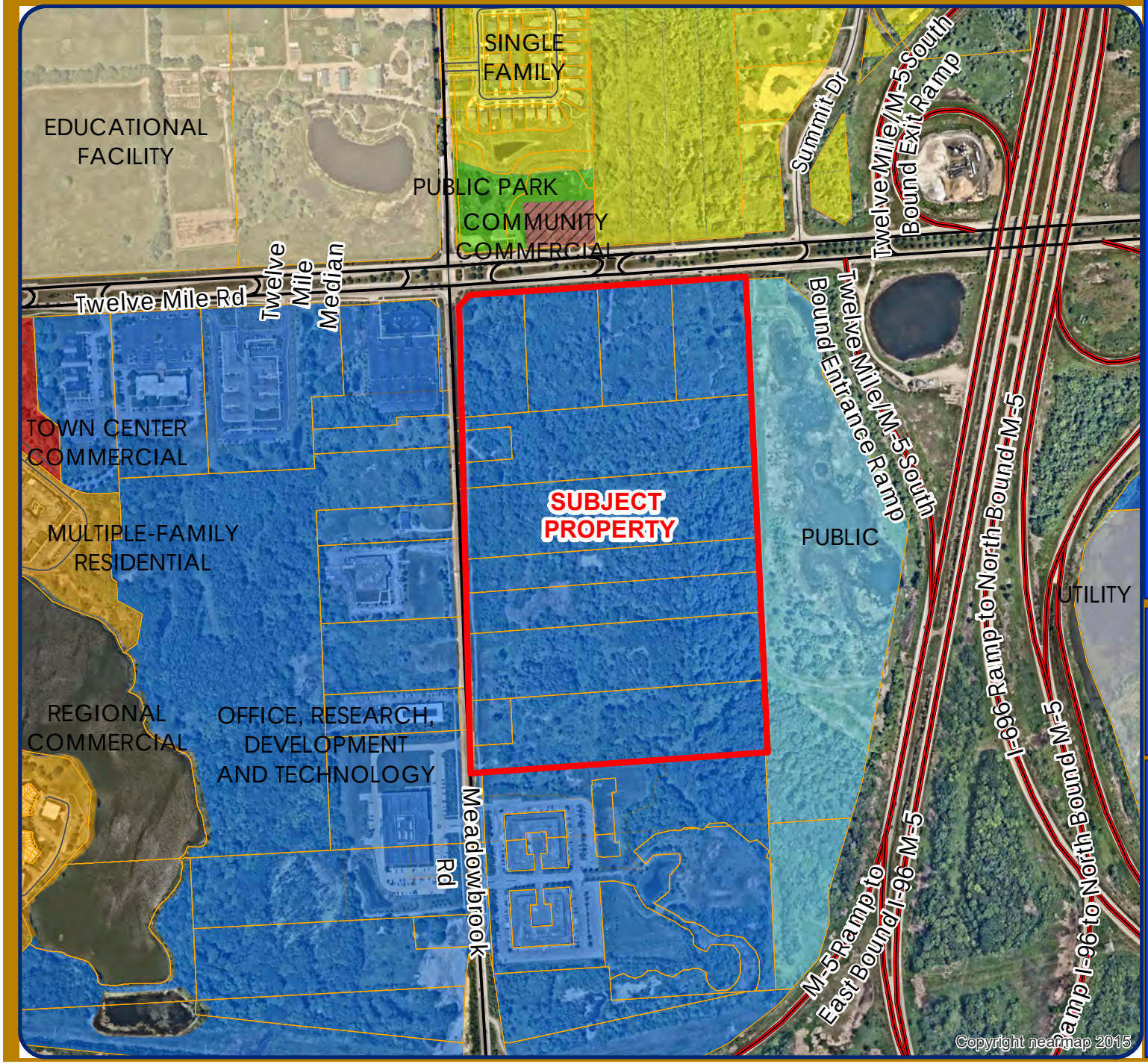
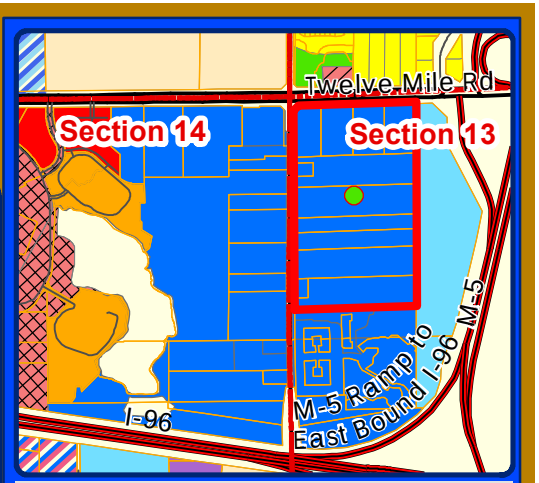
JZ24-31 THE GROVE

FUTURE LAND USE





Legend

- Single Family
- Multiple-Family Residential
- Community Office
- Office, Research, Development and Technology
- Office Commercial
- Industrial, Research, Development and Technology
- Community Commercial
- Regional Commercial
- Town Center Commercial
- Educational Facility
- Public
- Public Park
- Subject Area

City of Novi
Dept. of Community Development
City Hall / Civic Center
45175 W Ten Mile Rd
Novi, MI 48375
cityofnovi.org

Map Author: Lindsay Bell
Date: 9/9/24
Project: THE GROVE
Version #: 1

Feet
0 145 290 580 870

1 inch = 667 feet

MAP INTERPRETATION NOTICE

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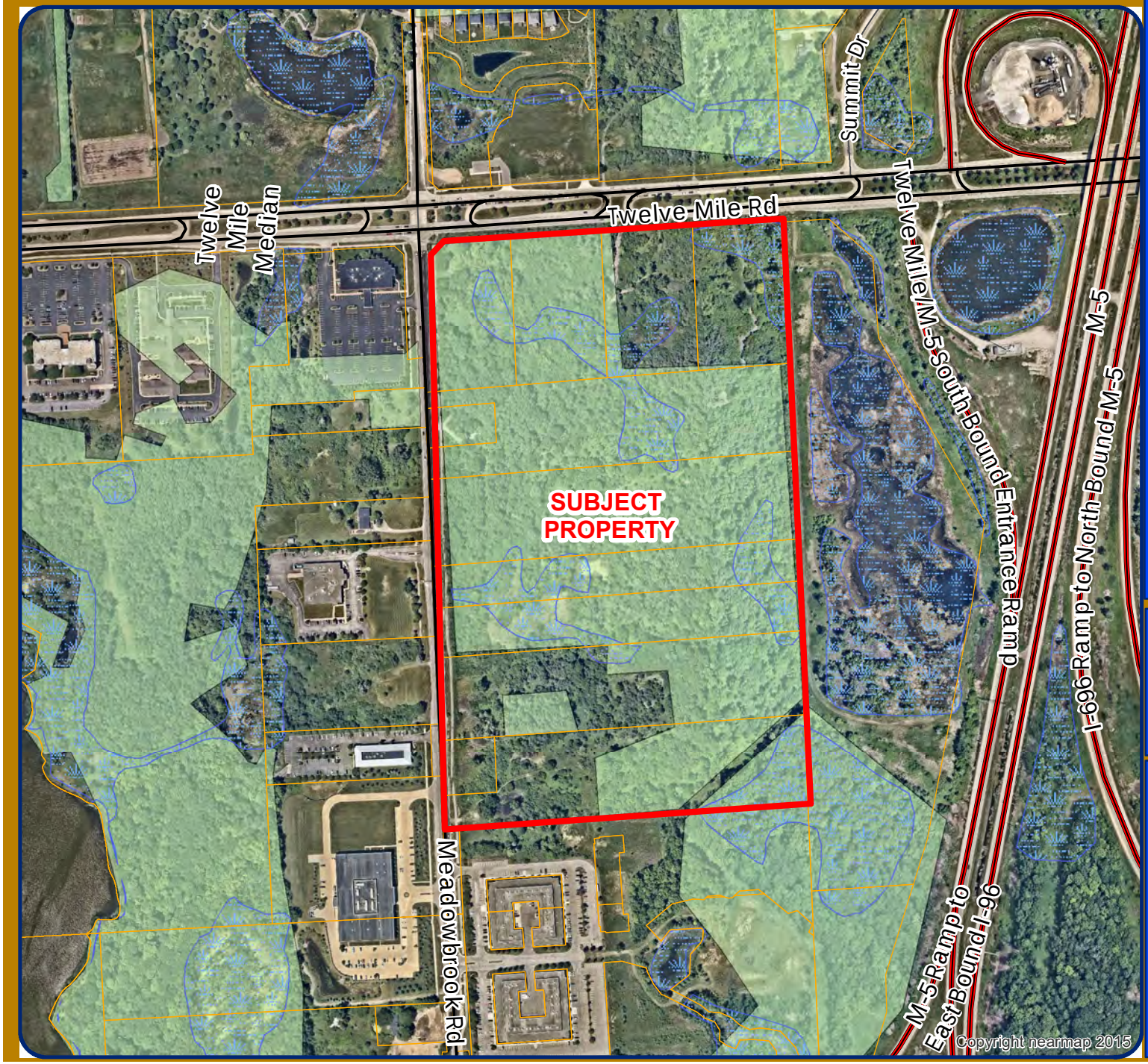
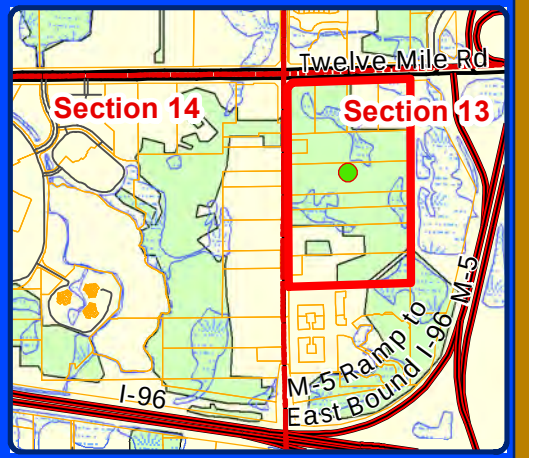
JZ24-31 THE GROVE

NATURAL FEATURES





Legend

- WETLANDS
- WOODLANDS
- Subject Area

City of Novi
Dept. of Community Development
City Hall / Civic Center
45175 W Ten Mile Rd
Novi, MI 48375
cityofnovi.org

Map Author: Lindsay Bell
Date: 9/9/24
Project: THE GROVE
Version #: 1

Feet
0 120 240 480 720

1 inch = 542 feet

MAP INTERPRETATION NOTICE

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INITIAL PRO CONCEPT PLAN

PLANNED REZONING OVERLAY (PRO) PLAN

THE GROVE

NOVI, MICHIGAN

DEVELOPER:
IVANHOE COMPANIES
6689 ORCHARD LAKE ROAD, SUITE 314
WEST BLOOMFIELD, MI 48322
(248) 626-6114
GARY SHAPIRO

CIVIL ENGINEER:
ZEIMET-WOZNIAK AND ASSOCIATES, INC.
55800 GRAND RIVER AVE, SUITE 100
NEW HUDSON, MICHIGAN 48165
P: (248) 437-5099 www.zeimerwozniak.com
ANDY WOZNIAK

LANDSCAPE ARCHITECT:
ALLEN DESIGN
557 CARPENTER
NORTHVILLE, MICHIGAN 48167
P: (248) 467-4668
JIM ALLEN, RLA

WETLAND/WOODLAND CONSULTANT:
BARR ENGINEERING
3005 BOARDWALK DR. SUITE 100
ANN ARBOR, MICHIGAN 48108
P: (734) 922-4400
WOODY HELD

ARCHITECT:
HOBBS+BLACK ARCHITECTS
100 N. STATE STREET
ANN ARBOR, MI 48104
(734) 663-4189
STEVE DYKSTRA

PLANNER:
CINCAR CONSULTING GROUP, LLC
17199 N. LAUREL PARK DRIVE, SUITE 204
LIVONIA, MI 48152
(248) 467-8942
BRAD STRADER

LOCATION MAP
NOT TO SCALE

SCALE: 1" = 150'
0 75' 150' 300'

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NOTE:

THESE PLANS ARE THE PROPERTY OF ZEIMET-WOZNIAK & ASSOCIATES, INC. NO CONSTRUCTION STAKING OR CONSTRUCTION INSPECTION OR CONSTRUCTIVE USE OF THESE PLANS SHALL BE MADE BY ANYONE WITHOUT THE WRITTEN AUTHORIZATION BELOW.

AUTHORIZATION BY:_____

ZEIMET-WOZNIAK & ASSOCIATES, INC. SHALL NOT BE RESPONSIBLE FOR MEANS, METHODS, PROCEDURES, TECHNIQUES, OR SEQUENCES OF CONSTRUCTION, NOR FOR SAFETY ON THE JOB SITE, NOR SHALL ZEIMET-WOZNIAK & ASSOCIATES, INC. BE RESPONSIBLE FOR THE CONTRACTOR'S FAILURE TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

THE CONTRACTOR SHALL INDEMNIFY AND SAVE HARMLESS THE OWNER AND ENGINEER FROM ALL LIABILITIES FOR INJURY TO PERSONS, OR DAMAGE TO OR LOSS OF PROPERTY, OR ANY OTHER LOSS, COST OR EXPENSE, AS A RESULT OF THE ACTIONS OF THE CONTRACTOR, HIS EMPLOYEES, AGENTS, OR SUBCONTRACTORS.

ALL CONTRACTORS SHALL NAME ZEIMET-WOZNIAK & ASSOCIATES, INC. AS ADDITIONALLY INSURED ON ALL INSURANCE POLICIES.

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITY CROSSINGS IN THE FIELD PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE APPARENT OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

FIRE DEPARTMENT NOTES:

1. WATER MAINS AND FIRE HYDRANTS SHALL BE INSTALLED AND OPERATIONAL PRIOR TO ANY COMBUSTIBLE MATERIAL IS BROUGHT ON-SITE (IFC 2015 3312.1)
2. ALL NEW MULTI-FAMILY RESIDENTIAL BUILDINGS SHALL BE NUMBERED WITH A MINIMUM 10" HIGH BY 1" WIDE NUMBERS A MINIMUM 15 FEET ABOVE THE GROUND ON THE BUILDING WHERE READILY VISIBLE FROM THE STREET SIDE.
3. FIRE APPARATUS DRIVES TO AND FROM BUILDINGS THROUGH PARKING LOTS SHALL HAVE A MINIMUM 50 (50) FOOT OUTSIDE TURING RADIUS AND DESIGNED TO SUPPORT A MINIMUM OF THIRTY-FIVE (35) TONS.
4. IMMEDIATE ACCESS TO FIRE DEPARTMENT CONNECTIONS SHALL BE MAINTAINED AT ALL TIMES AND WITHOUT OBSTRUCTION BY FENCES, BUSHES, TREE, WALLS, OR ANY OTHER OBJECT FOR A MINIMUM OF 3-FEET.
5. FIRE LANES SHALL BE DESIGNATED BY THE FIRE CHIEF. THE MINIMUM WIDTH OF A POSTED FIRE LANE IS 20' AND THE MINIMUM CLEAR HEIGHT OF THE FIRE LANE IS 14'.
6. PROPOSED BUILDINGS DO NOT HAVE FIRE SUPPRESSION SYSTEMS.

GENERAL SITE NOTES:

1. ALL WORK SHALL CONFORM TO THE CITY OF NOVI'S CURRENT STANDARDS AND SPECIFICATIONS.
2. CALL MISS DIG (1-800-647-7344 / 1-800-MISS DIG) A MINIMUM OF 72 HOURS PRIOR TO THE START OF CONSTRUCTION.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY AND ALL DAMAGE TO EXISTING UNDERGROUND UTILITIES CAUSED BY HIS OPERATIONS.
4. TRENCHES UNDER OR WITHIN 3 FT. OF EXISTING OR PROPOSED PAVEMENTS, DRIVEWAYS, AND/OR SIDEWALKS SHALL BE BACKFILLED AND COMPACTED WITH MDOT CLASS II SAND.
5. WHERE UTILITIES CROSS, PROVIDE POROUS BACKFILL TAMPED IN 12" LAYERS TO THE UNDERSIDE OF THE HIGHER UTILITY. A 6" MIN. SAND CUSHION SHALL BE PROVIDED BETWEEN UTILITIES.
6. ALL SEWER CONSTRUCTION SHALL HAVE MDOT CLASS II BEDDING UNLESS OTHERWISE SPECIFIED ON THE PROFILES.
7. ALL ELEVATIONS ARE BASED ON USGS NAVD88 DATUM.
8. ALL DISTURBED AREAS SHALL BE PROPERLY RESTORED BY THE CONTRACTOR.
9. ALL SOIL EROSION AND SILT MUST BE CONTAINED ON THE SITE.
10. THE CONTRACTOR SHALL AT ALL TIMES PROVIDE EMERGENCY ACCESS TO PROPERTY FOR THE POLICE, FIRE DEPARTMENT, AMBULANCES OR OTHER EMERGENCY VEHICLES TO PROTECT LIFE, HEALTH AND PROPERTY.
11. PAVED STREETS AND DRIVEWAYS MUST BE MAINTAINED IN A REASONABLE STATE OF CLEANLINESS AND THE CONTRACTOR SHALL REMOVE ACCUMULATIONS OF DEBRIS CAUSED BY CONSTRUCTION OPERATIONS.
12. CONTRACTOR SHALL PROVIDE ALL NECESSARY SHEETING, SHORING, DEWATERING, BRACING, TRENCH BOXES, ETC, TO PERFORM WORK SAFELY AND PROTECT EXISTING UTILITIES AND IMPROVEMENTS IN ACCORDANCE TO MICHIGAN OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (MIOSHA).
13. IF DEWATERING IS ANTICIPATED OR ENCOUNTERED DURING CONSTRUCTION, THEN A DEWATERING PLAN MUST BE PREPARED BY THE CONTRACTOR AND SUMBITTED TO THE CITY'S ENGINEERING DIVISION FOR REVIEW AND APPROVAL.
14. ALL CONTRACTOR MUST OBTAIN A PERMIT FROM THE CITY OF NOVI FOR ANY WORK WITHIN THE RIGHT-OF-WAY OF MEADOWBROOK ROAD.
15. ALL PAVEMENT MARKINGS, TRAFFIC CONTROL SIGNS, AND PARKING SIGNS SHALL COMPLY WITH THE DESIGN AND PLACEMENT REQUIREMENTS OF THE 2011 MICHIGAN MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.

ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE
SUBMITTAL	7/26/24								

ZEIMET WOZNIAK & ASSOCIATES
Consulting Civil Engineers

MISS DIG SYSTEM INC. 1-800-482-7171

PROJECT SPONSOR:
IVANHOE COMPANIES
6689 ORCHARD LAKE ROAD, SUITE 314
WEST BLOOMFIELD, MI 48322 (248) 626-6114

COVER SHEET
THE GROVE
NOVI, MICHIGAN

DATE 1/14/24 | SCALE HOR: 1" = 150' VER: 1" = N/A | DESIGNED BY DRB | JOB NO. 22149 | DRAWN BY DAB | SHEET SP-1

BENCHMARKS:

CITY BM #1231–
"X" ON NORTH RIM OF GATE VALVE LOCATED 8 FEET NORTH OF DRIVE INTO PRV, 45 FEET EAST OF CENTERLINE OF MEADOWBROOK ROAD, 700 FEET NORHT OF CENTERLINE OF 12 MILE ROAD
NORTHING: 365052.492
EASTING: 13368796.58
ELEV.: 922.9876

CITY BM #1312–
"X" ON NORTH RIM OF GAVE VALVE LOCATED 670 FEET EAST OF THE INTERSECTION OF MEADOWBROOK ROAD AND 12 MILE ROAD, SOUTH OF WEST BOUND 12 MILE ROAD INTERSECTION, 4 FEET SOUTH OF BACK OF CURB
NORTHING: 364317.6108
EASTING: 13369467.09
ELEV.: 917.5438
917.48 SHOT JOB #22149

LEGEND

	BOUNDARY LINE	F-TBAR	FOUND T-BAR
	PARCEL LINE	SCI	SET CAPPED IRON
	SECTION LINE	(M)	MEASURED
	EASEMENTS	(R)	RECORD
//—//—	FENCE LINE	CL	CENTERLINE
	SANITARY SEWER	R.O.W.	RIGHT OF WAY
	STORM SEWER		MANHOLE
	WATER MAIN		CATCH BASIN
	GAS MAIN		END SECTION
	ELECTRIC CABLE		GATE VALVE
	SECTION CORNER		HYDRANT
	FD MON, FCI, FIB, FIP, FCP		WATER SHUT-OFF
	F-TBAR, SCI		UTILITY POLE
FD MON	FOUND MONUMENT		GUY ANCHOR
FCI	FOUND CAPPED IRON		LIGHT POLE
FIB	FOUND IRON BAR		SIGN
FIP	FOUND IRON PIPE	P.O.C.	POINT OF COMMENCEMENT
FCP	FOUND CAPPED PIPE	SB#	SOIL BORING

SOILS LEGEND:
(PER USDA–NRCS WEB SOIL SURVEY FOR OAKLAND COUNTY 7/26/2024)

10B	Marlette sandy loam, 3 to 8 percent slopes
10C	Marlette sandy loam, 8 to 12 percent slopes
12	Brookston and Colwood loams
23B	Sisson fine sandy loam, 1 to 6 percent slopes
27	Houghton and Adrian mucks
31B	Metea loamy sand, 0 to 6 percent slopes
34B	Kibbie fine sandy loam, 0 to 6 percent slopes

N. 1/4 CORNER SECTION 13 T. 1 N., R. 8 E. CITY OF NOVI, OAKLAND CO., MI.

CENTER OF SECTION 13 T. 1 N., R. 8 E. CITY OF NOVI, OAKLAND CO., MI.

SCALE: 1" = 100'
0 50' 100' 200'

STATE OF MICHIGAN MDOT
22-13-100-019

TWELVE MILE ROAD
WIDTH VARIES (PUBLIC)

EXISTING SOUTHERLY TWELVE MILE ROAD RIGHT-OF-WAY

CITY BM #1312

43' WIDE EXISTING MEADOWBROOK ROAD EASTERLY RIGHT-OF-WAY

C/L MEADOWBROOK ROAD
WIDTH VARIES (PUBLIC)

P.O.C.
NW. CORNER
SECTION 13
T. 1 N., R. 8 E.
CITY OF NOVI,
OAKLAND CO., MI.

MEADOWBROOK CORPORATE CONDOMINIUM PLAN NO. 1 L. 38256, P.

W. 1/4 CORNER SECTION 13 T. 1 N., R. 8 E. CITY OF NOVI, OAKLAND CO., MI.

STRUCTURE TABLE:

POINT	DESCRIPTION	RIM	PIPE SIZE	DIRECTION	INVERT
1002	SANITARY	910.22	12"	N	886.56
			12"	S	886.62
1003	SANITARY	901.29	12"	N	884.29
			12"	S	884.29
1004	SANITARY	902.52	12"	N	882.00
			12"	S	881.96
1007	SANITARY	889.42	12"	N	876.72
			21"	SW	876.17
			18"	SE	876.44
1027	SANITARY	888.34	21"	NE	875.28
			21"	SW	875.20
1363	CATCH BASIN	911.94	15"	N	910.04
1375	SANITARY	891.35	21"	SE	874.21
			21"	NE	874.31
			6"	W	875.20
1377	SANITARY	908.06	8"	N	894.64
			8"	S	894.54
1378	GATE VALVE	909.90	T/PIPE	FULL OF WATER	904.40
1379	SANITARY	906.58	21"	N	879.44
			21"	S	879.44
1486	GATE VALVE	912.74	T/PIPE	FULL OF WATER	907.26
1515	CATCH BASIN	912.92	12"	NW	909.63
				S	909.41
				E	909.39
1547	GATE VALVE	911.45	T/PIPE	FULL OF WATER	902.79
1592	GATE VALVE	907.93	T/PIPE	FULL OF WATER	901.76
1651	CATCH BASIN	906.68	12"	N	903.61
			12"	S	904.01
			15"	E	903.85
			15"	W	903.88
6454	GATE VALVE	923.36	T/PIPE	S	913.96
6455	SANITARY	924.09	8"	W	903.75
			8"	NE	903.63
1365	CATCH BASIN	916.89	15"	N	912.87
6116	GATE VALVE	907.03	T/PIPE	FULL OF WATER	901.08
6074	GATE VALVE	907.82	T/PIPE	FULL OF WATER	901.27
6086	GATE VALVE	908.21	T/PIPE	FULL OF WATER	901.86
6473	SANITARY	922.64	8"	SW	903.43
			8"	N	903.32
6475	CATCH BASIN	921.45	12"	N	915.95
6595	CATCH BASIN	918.84	15"	N	912.48
			15"	S	912.70
6699	CATCH BASIN	916.74	15"	N	909.02
			15"	S	909.32
6727	CATCH BASIN	914.88	15"	NE	908.21
			15"	S	908.23
6752	CATCH BASIN	910.70	15"	N	908.60
			12"	E	909.08
6789	CATCH BASIN	910.06	15"	N	907.90
			12"	E	908.42
6790	CATCH BASIN	912.78	15"	N	907.38
			15"	S	907.38
6880	SANITARY	915.59	8"	T/DIRT N	898.39
			8"	T/DIRT S	898.39
			8"	T/DIRT E	898.39
6881	MH	917.50	---	N	895.73
				S	895.63

THE SURVEYED PROPERTY IS IN A FEDERALLY DESIGNATED FLOOD ZONE X, FIRM MAP No. 26125C0627F, EFFECTIVE DATE 9-29-2006. THE ABOVE FLOOD PLAIN DESIGNATION IS FOR INFORMATION ONLY AND IS BASED ON THE FIRM MAP LISTED ABOVE AVAILABLE ELECTRONICALLY FROM FEMA ON THE DATE OF THIS SURVEY. THIS SURVEYOR ASSUMES NO LIABILITY FOR THE CORRECTNESS OF THE CITED MAP(S). IN ADDITION, THE ABOVE STATEMENT DOES NOT REPRESENT THIS SURVEYOR'S OPINION OF THE PROBABILITY OF FLOODING.

SEE SHEETS SP-7–SP-7.3 FOR SITE BOUNDARY INFORMATION.

SEE SHEETS SP-9–SP-9.8 FOR SITE TOPOGRAPHY AND TREE INFORMATION.

SEE SHEET SP-8 FOR WETLAND SURVEY.

SEE SHEETS SP-9.9–SP-9.10 FOR SOIL BORING INFORMATION.

ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE
SUBMITTAL	7/26/24								

ZEIMET WOZNIAK & ASSOCIATES
Consulting Civil Engineers
55800 GRAND RIVER AVE., SUITE 100
NEW HUDSON, MICHIGAN 48165
P: (248) 437-5099 F: (248) 437-3222 www.zeimetwozniak.com

MISS DIG SYSTEM, INC. 1-800-482-7171
THREE FULL WORKING DAYS BEFORE YOU DIG, CALL THE MISS DIG SYSTEM

PROJECT SPONSOR:
IVANHOE COMPANIES
6689 ORCHARD LAKE ROAD, SUITE 314
WEST BLOOMFIELD, MI 48322 (248) 626-6114

OVERALL EXISITNG CONDITIONS
THE GROVE
NOVI, MICHIGAN

FIELD BOOK
DATE 7/14/24
DESIGNED BY SRB
DRAWN BY PTG
SCALE HOR: 1" = 100' VER: 1" = N/A
JOB NO. 22149
SHEET SP-2

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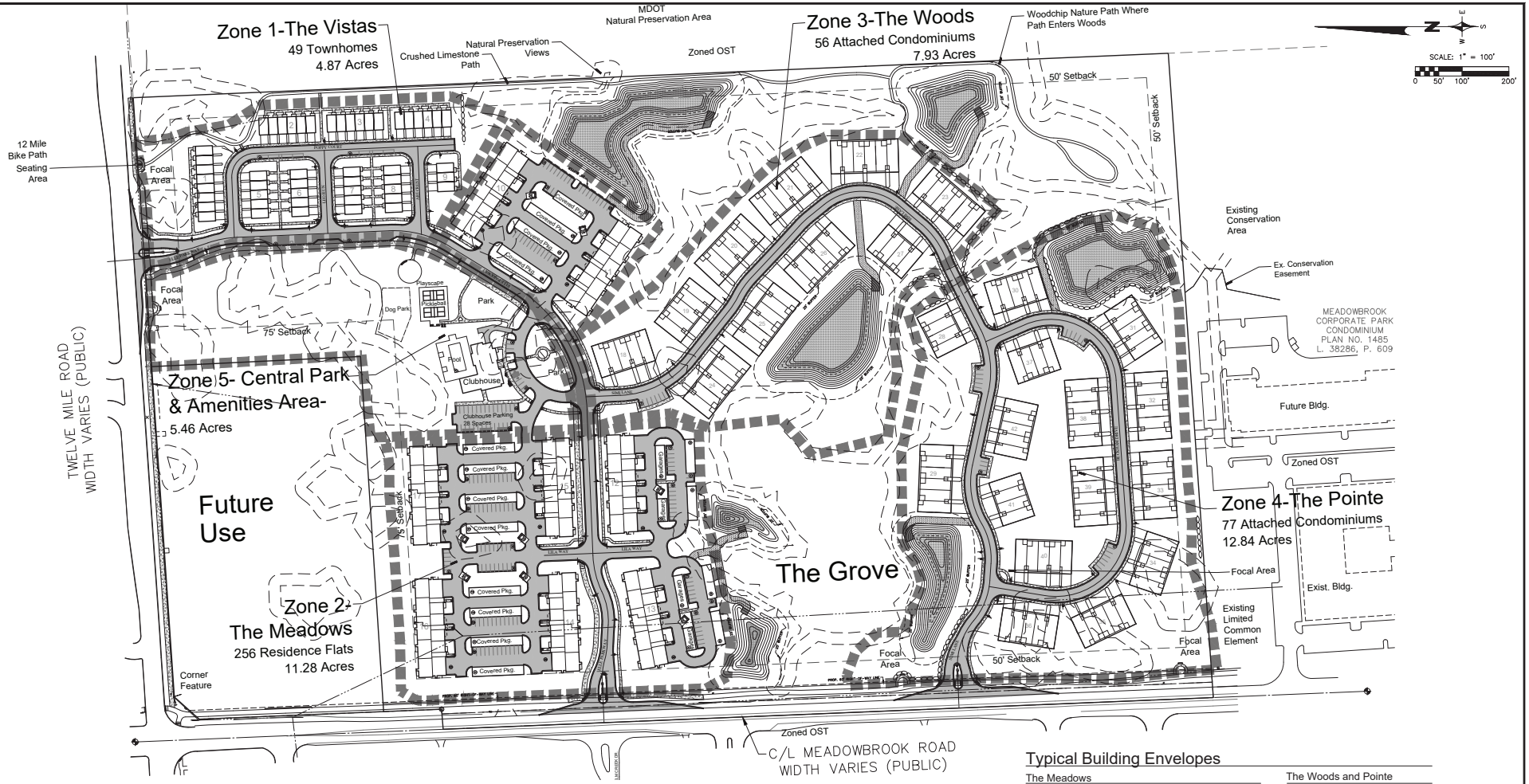


Site Summary

Existing Zoning	OST				
Proposed Zoning	PRO RM-2				
Gross Site Area	69.66 Acres				
Less ROW	2.48 Ac				
Net Site Area	67.18 Acres				
Parcel Breakdown					
Future Use					
Site Area	7.8 Acres				
Less ROW	0.16 Acres				
Net Site Area	7.64 Acres				
The Grove					
Site Area	61.86 Acres				
Less Wetlands 2 ac+	4.69 Acres				
Less ROW	2.32 Acres				
Net Site Area	54.85 Acres				

Unit Breakdown				
The Meadows	256 Units	(3.32 du/ac.)		
The Vistas	49 Units	(0.43 du/ac)		
The Woods	56 Units	(1.45 du/ac)		
The Pointe	77 Units	(2.77 du/ac.)		
Total	438 Units			
Gross Density	7.08 Du/Ac (438 Units / 61.86 Acres)			
Net Density	7.97 Du/ac (438 Units / 54.85 Acres)			
The Meadows Unit Breakdown	Bldgs 10-14	Bldgs 15-17	Total	
Studio	2 Units	3 Units	21 Units (4.79% of total units)	
1 Bedroom	12 Units	10 Units	86 Units (19.63% of total units)	
2 Bedroom	18 Units	19 Units	149 Units	
Total	32 Units	32 Units	256 Units	
Attached Garages	10	10	80	

Room Breakdown	
The Meadows	83 Rooms per Building
Studio (458 s.f. min.)	2 Rooms (42 Rooms)
1 Bedroom (658 s.f. min.)	2 Rooms (172 Rooms)
2 Bedroom (861 s.f. min.)	3 Rooms (447 Rooms)
The Vistas - 3 bdrm. (1,905 s.f.)	4 Rooms (196 Rooms)
The Woods - 3 bdrm. (1,958 s.f.)	4 Rooms (224 Rooms)
The Pointe - 3 bdrm.(1,958 s.f.)	4 Rooms (308 Rooms
Rooms Proposed	1,389
Rooms Allowed	1,195 Rooms (2,389,266 s.f. / 2,000)

Parking		
The Meadows		
Parking Required	512 Spaces (2 per 1 and 2 bedroom)	
Parking Provided	479 Spaces	
The Vistas		
Parking Required	123 Spaces (2.5 per Unit)	
Parking Provided	212 Spaces	
On-Street Spaces	16 Spaces	
Garage and Drives	196 Spaces	
The Woods and Pointe		
Parking Required	333 Spaces (2.5 per Unit)	
Parking Provided	562 Spaces	
Off-Street Parking	30 Spaces	
Garage and Drives	532 Spaces	
Clubhouse		
Parking Provided	36 Spaces	
Bicycle Parking		
Units		
Parking Required	88 Spaces	
Parking Provided	129 Spaces	
Clubhouse		
Parking Required	4 Space	
Parking Provided	4 Spaces	

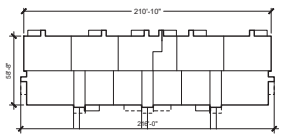
Open Space Summary		
Total Green Space Provided	38.92 Acres	(70.9%)
Usable Open Space Required	2.01 Acres	(3.8%: 438 units x 200 s.f.)
Usable Open Space Provided	11.0 Acres	(20.0%)
Additional Open Space Provided	7.36 Acres	(13.4%)
Total Open Space Provided	18.36 Acres	(33.4%)

Typical Minimum Setbacks Provided	
Front Yard Min.	25'
Side to Side	25'
Side to Rear	35'
Rear to Rear	50'

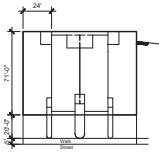
Building Lot Coverage	
Allowed	45%
Proposed 16%	382,398 s.f. / 2,389,266 s.f. (54.85 Acres)

Typical Building Envelopes

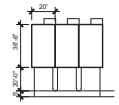
The Meadows



The Woods and Pointe



The Vistas



Clubhouse

Notes for all Residential Envelopes:
1. Building Envelopes will Accommodate Various Unit Widths, Depths and Options, Which are Subject to Change.
2. Decks are Located within the Building Envelope in the Woods and Pointe.
3. Decks are Located Outside of Building Envelopes in the Meadows and Vistas and May Extend a Maximum 10' into the Perimeter Setbacks.
4. Minimum Building Width is 20'.
5. Maximum Building Depth is 71'.
6. Minimum Driveway Length is 20' from Sidewalks.

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OVERALL SITE PLAN
THE GROVE
NOVI, MICHIGAN

FIELD BOOK
DATE 1/14/24
DESIGNED BY SRB
DRAWN BY DAB
SCALE HOR: 1" = 100' VER: 1" = N/A
JOB NO. 22149
SHEET SP-3

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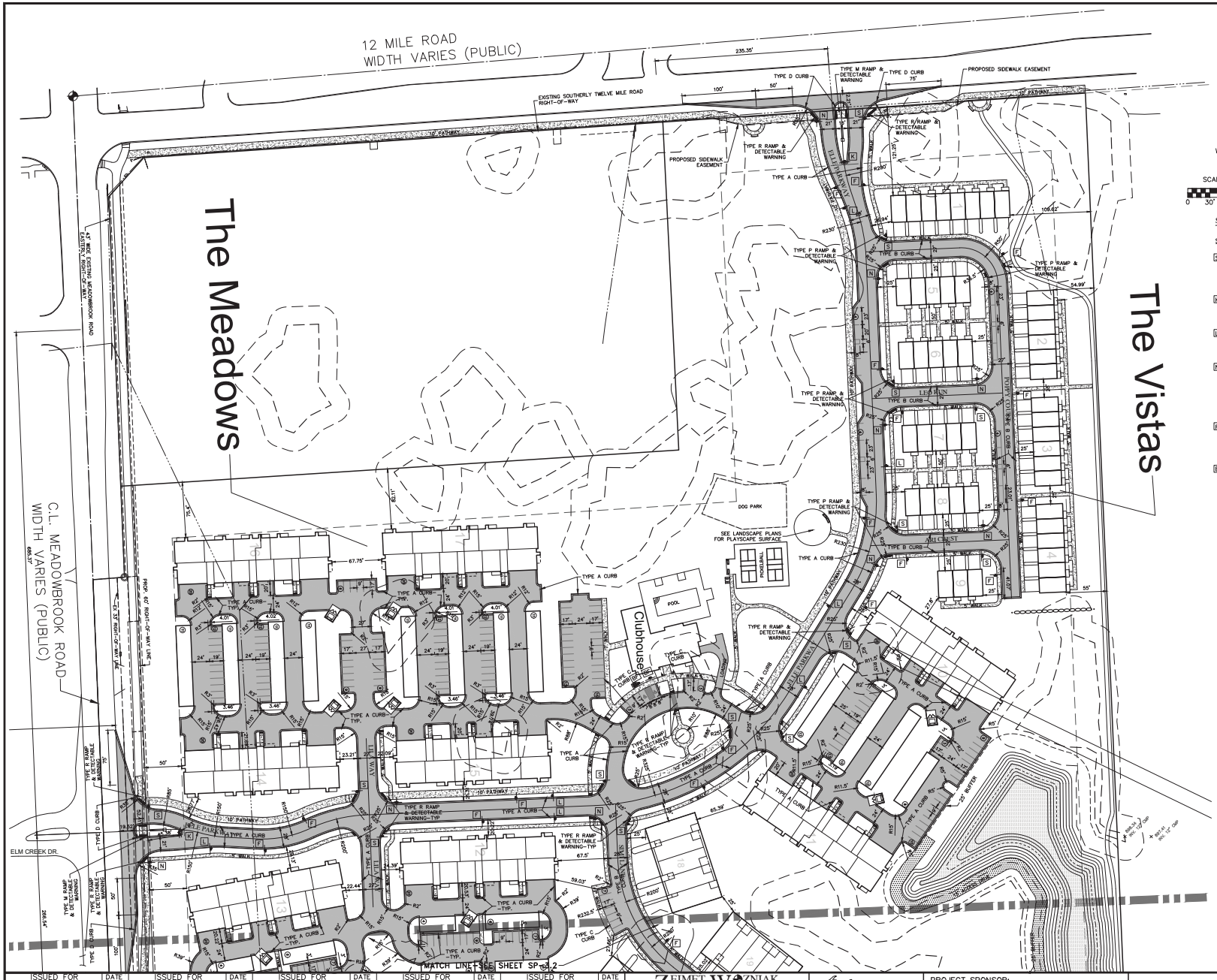

N
W E
S
SCALE: 1" = 60'
0 30' 60' 120'

PAVING LEGEND:
(SEE SPECIFICATIONS ON SHEET SP-3.3

- HMA PAVEMENT
- CONCRETE WALK
- GRAVEL ACCESS DRIVE

SIGNAGE TABLE:

SYMBOL	TYPE	MMUTCD CODE	DESCRIPTION	QUANTITY (TOTAL)
S	STOP SIGN	R1-1	30"X30" OCTAGON WITH WHITE LEGEND & BORDER ON RED BACKGROUND.	17
K	KEEP RIGHT	R4-7	24"X30" BLACK LEGEND & BORDER ON WHITE BACKGROUND.	3
L	SPEED LIMIT	R2-1(25)	24"X30" BLACK LEGEND & BORDER ON WHITE BACKGROUND.	17
N	STREET SIGN	D3-1	8" HIGH SIGN WITH 4.5" HIGH INITIAL UPPERCASE LETTERS & FOLLOWED W/LOWERCASE LETTERS & BORDERS ON GREEN BACKGROUND.	12
F	NO PARKING SIGN	R8-3	12"X12" BLACK LEGEND & BORDER WITH RED CIRCLE AND SLASH ON WHITE BACKGROUND.	27
RF	VAN ACCESSIBLE SIGN & PLAQUE	R7-8 & R7-8P	18"X12" GREEN LEGEND & BORDER ON WHITE BACKGROUND. 8"X12" GREEN LETTERS ON WHITE BACKGROUND.	2

SIGN NOTES:

1. ALL SIGNAGE SHALL COMPLY WITH THE LATEST EDITION OF MMUTCD.
2. POSTS SUPPORTING RIGHT OF WAY CONTROL (STOP OR YIELD) SIGNS END STREET NAME SIGNS SHALL BE LOCATED 4 FEET IN ADVANCE OF THE ACTUAL OR IMPLIED CROSSWALKS (IE, SIDEWALK STUBS).
3. ALL SIGNAGE SHALL COMPLY WITH THE CITY OF NOVI TRAFFIC CONTROL SIGN STANDARDS. THE FACE OF THE CURB TO THE NEAR EDGE OF THE SIGN.
4. SIGNS 12'' X 18'' OR SMALLER SHALL BE MOUNTED ON A GALVANIZED 2 LB. U-CHANNEL POST.
5. SIGNS GREATER THAN 12'' X 18'' SHALL BE MOUNTED ON A GALVANIZED 3 LB. OR GREATER U-CHANNEL POST.
6. SIGN BOTTOM HEIGHT SHALL BE 7' FROM FINAL GRADE.
7. SIGNING SHALL BE PLACED 2' FROM FACE/CURB OR SIDEWALK.
8. FHWA STANDARD ALPHABET SERIES USED FOR ALL SIGN LANGUAGE.
9. TRAFFIC CONTROL SIGNS SHALL HAVE HIGH INTENSITY PRISMATIC (HIP) SHEETING TO MEET FHWA RETRO-REFLECTIVITY REQUIREMENTS.

CURB AND GUTTER NOTES:

TYPE A	4''x18'' STRAIGHT FACE CONCRETE CURB AND GUTTER
TYPE B	4''x18'' MOUNTABLE CONCRETE CURB AND GUTTER
TYPE C	4'' HIGH INTEGRAL CONCRETE WALK-CURB
TYPE D	MDOT B-2 CONCRETE CURB AND GUTTER

TRASH COLLECTION NOTES:

1. TRASH RECEPTACLES (DUMPSTERS) ARE PROVIDED FOR THE MEADOWS.
2. TRASH COLLECTION SHALL BE CURBSIDE FOR THE VISTAS, THE POINTE, AND THE CLUBHOUSE.

PAVEMENT MARKING NOTES:

1. STANDARD PARKING SPACES SHALL BE STRIPED WITH FOUR (4) INCH WIDE WHITE STRIPES.
2. ACCESSIBLE PARKING SPACES AND ASSOCIATED AISLE SHALL BE STRIPED WITH FOUR (4) INCH WIDE BLUE STRIPES.
3. WHERE ADA SPACES ABUT NORMAL SPACE, BLUE STRIPES SHOULD ABUT WHITE STRIPES.

NOTE:
ALL DIMENSIONS ARE TO BACK OF CURB OR FACE OF WALK AS SHOWN EXCEPT PARKING STALLS WHICH ARE TO FACE OF CURB.

GENERAL NOTE:
ALL WORK SHALL CONFORM TO THE CURRENT CITY OF NOVI, ROAD COMMISSION FOR OAKLAND COUNTY, MDOT, OR ECLE STANDARDS AND SPECIFICATIONS HAVING JURISDICTION ON THE WORK.

TRAFFIC NOTE:
CONTRACTOR SHALL PROVIDE ALL MAINTAINING TRAFFIC CONTROL DEVICES AND WARNINGS FOR WORK WITHIN THE 12 MILE ROAD AND MEADOWBROOK ROAD RIGHTS-OF-WAY PER THE CURRENT EDITION OF THE MMUTCD, RCOC, AND MDOT.

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SITE PLAN
THE GROVE
NOVI, MICHIGAN

FIELD BOOK NO.
DATE 7/14/24
DESIGNED BY SRB
DRAWN BY DAB
SCALE HOR: 1" = 60' VER: 1" = N/A
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SHEET SP-3.1

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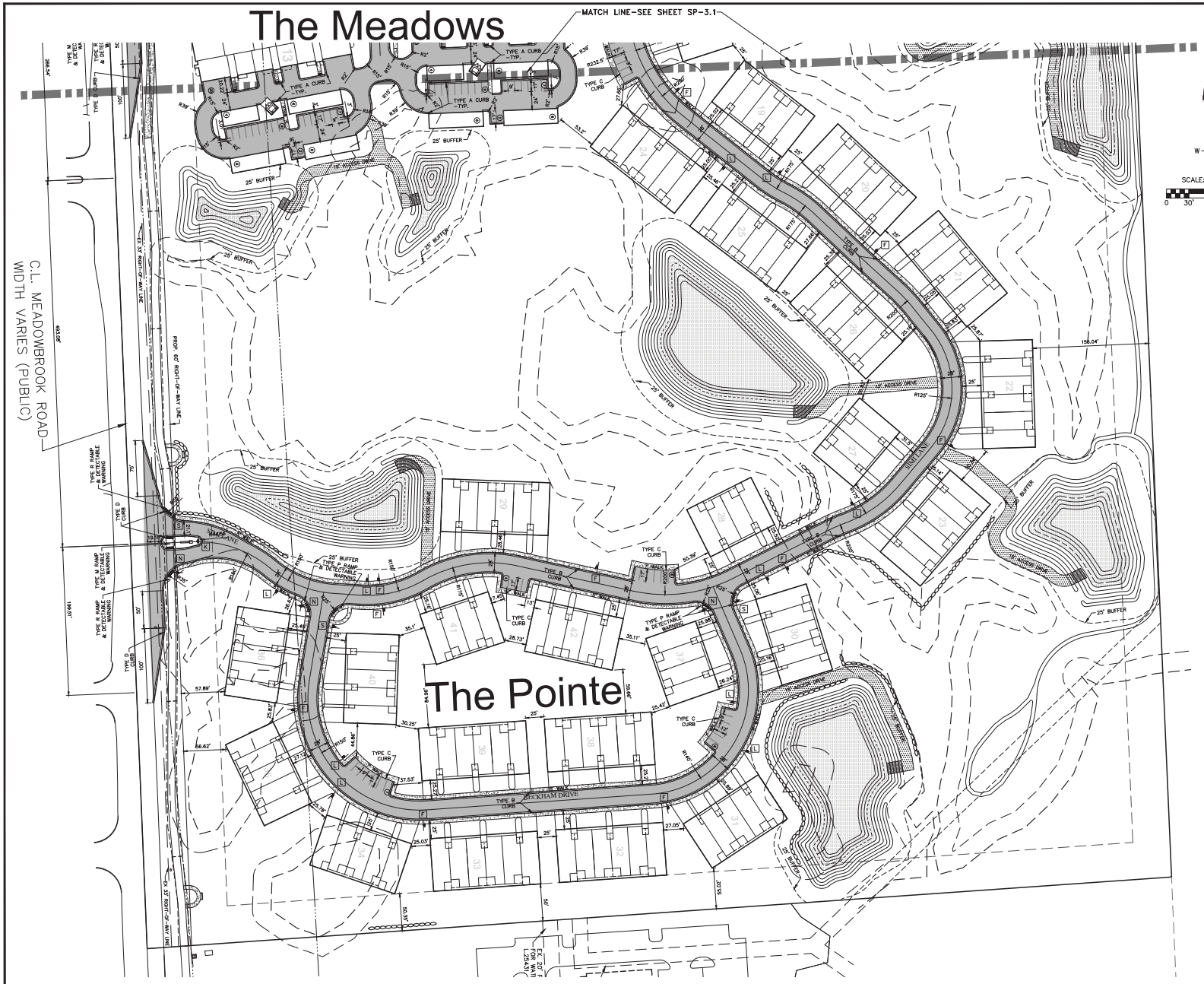

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(SEE DETAILS ON SHEET SP-3.3)

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SITE PLAN
THE GROVE
NOVI, MICHIGAN

FIELD BOOK
DATE 7/14/24
DESIGNED BY SRS
DRAWN BY DAB
SCALE HOR: 1" = 60' VER: 1" = N/A
JOB NO. 22149
SHEET SP-3.2

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Open Space Summary

Total Green Space Provided	38.92 Acres - 70.9%
Usable Open Space Required	2.01 Acres - 3.8% (438 Units x 200 s.f.)
Usable Open Space Provided	11.0 Acres - 20.0%
Additional Open Space Provided	7.36 Acres - 13.4%
Total Open Space Provided	18.36 Acres - 33.4%

ALLENDESIGN
LAND PLANNING / LANDSCAPE ARCHITECTURE
557 Carpenter
Northville, Michigan 48167
e. jca@wideopenwest.com
t. 248.467.4668

THE GROVE

Seal:

Title:
Open Space Plan

Project:
The Grove
Novi, Michigan

Prepared for:

Revision:	Issued:
Review Submittal	March 28, 2024 July 26, 2024

Job Number:
21-054

Drawn By:	Checked By:
jca	jca

0' 25' 50' 100'
NORTH
1"=100'

Sheet No.
SP- 3.4

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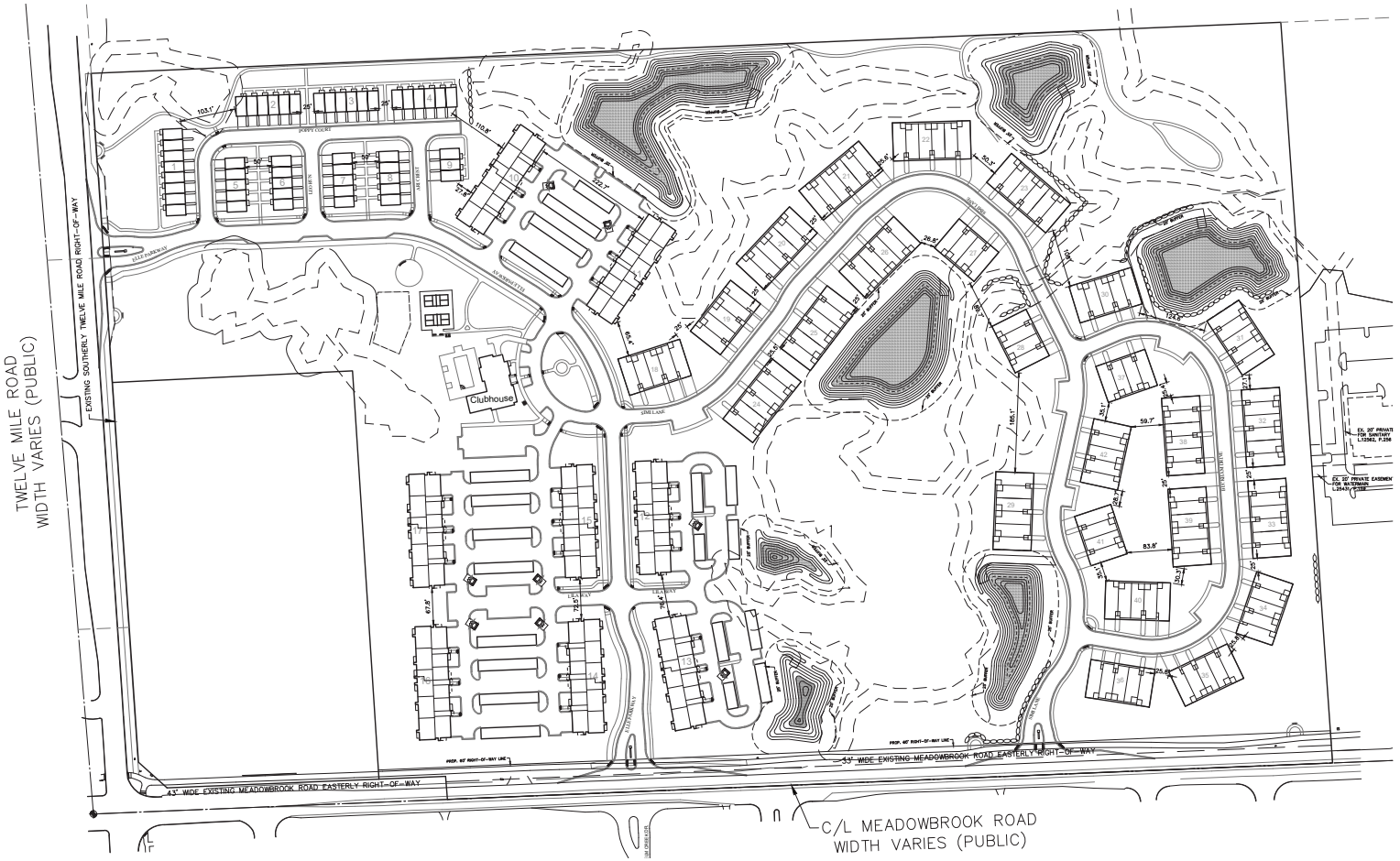

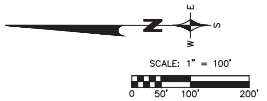

CITY BUILDING SEPARATION TABLE

SPACE BETWEEN BUILDINGS	Ha (FEET)	Hb (FEET)	La (FEET)	Lb (FEET)	REQUIRED SPACING (FEET)	PROPOSED SPACING (FEET)
1-2	33.58	33.58	CORNER	CORNER	34.6	103.1
2-3	33.58	33.58	36.5	36.5	34.8	25.0
3-4	33.58	33.58	36.5	36.5	34.6	25.0
4-10	33.58	40.58	138.5	90.4	62.9	110.8
5-6	33.58	33.58	100.4	100.4	55.9	50.0
7-8	33.58	33.58	100.4	100.4	55.9	50.0
9-10	33.58	40.58	80.4	70.2	46.5	27.8
11-18	40.58	27.2	48.2	120.7	50.7	65.4
12-13	40.58	40.58	34.3	46.4	40.5	76.4
14-15	40.58	40.58	58.7	58.7	46.6	72.5
16-17	40.58	40.58	58.7	58.7	46.6	67.8
18-19	27.2	27.2	50.7	52.8	36.4	25.0
19-20	27.2	27.2	59.8	57.7	37.7	25.0
20-21	27.2	27.2	63.4	59.6	38.7	25.0
21-22	27.2	27.2	55.8	39	33.9	25.6
22-23	27.2	27.2	8	52.7	28.3	50.3
23-30	27.2	27.2	56.7	64.4	38.3	106.0
24-25	27.2	27.2	70.3	69.9	41.5	25.5
25-26	27.2	27.2	68.5	70.2	41.3	25.0
26-27	27.2	27.2	CORNER	CORNER	41.3	26.8
27-28	27.2	27.2	68.3	24.8	33.7	89.7
28-29	27.2	27.2	CORNER	47.8	41.3	185.1
30-31	27.2	27.2	CORNER	CORNER	41.3	124.6
31-32	27.2	27.2	71	51.7	38.6	27.1
32-33	27.2	27.2	71	71	41.8	25.0
33-34	27.2	27.2	85.5	51	37.6	25.0
34-35	27.2	27.2	40.6	36.7	31.4	25.8
35-36	27.2	27.2	43.4	58.6	35.1	25.8
37-38	27.2	27.2	39.1	1	24.8	25.4
38-39	27.2	27.2	71	71	41.8	25.0
39-40	27.2	27.2	CORNER	19.6	41.8	30.3
40-41	27.2	27.2	38.2	53.7	33.5	35.1
41-42	27.2	27.2	40.8	61.1	38.1	28.7
42-37	27.2	27.2	71	97.2	46.2	35.1
36-42	27.2	27.2	116.7	170.9	65.9	56.7
39-41	27.2	27.2	111.2	167.7	64.6	83.8

* THE MAXIMUM REQUIRED SPACING FOR 2 BUILDINGS ACROSS THE PRIVATE ROAD FROM EACH OTHER WOULD REQUIRE A SEPARATION 55.8' (VISTAS), 65.7' (MEADOWS), AND 66.4' (WOODS POINTE) PER THE ORDINANCE CALCULATION.
** THE BUILDINGS ACROSS FROM EACH OTHER ALONG THE PRIVATE ROADS HAVE A MINIMUM SEPARATION OF 77.0' (VISTAS), 68.3' (MEADOWS), AND 78.3' (WOODS POINTE).

ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE
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BUILDING SEPARATION PLAN
THE GROVE
NOVI, MICHIGAN

FIELD BOOK
DATE 1/14/24
DESIGNED BY SRB
DRAWN BY DAB
SCALE HOR: 1" = 100' VER: 1" = N/A
JOB NO. 22149
SHEET SP-3.5

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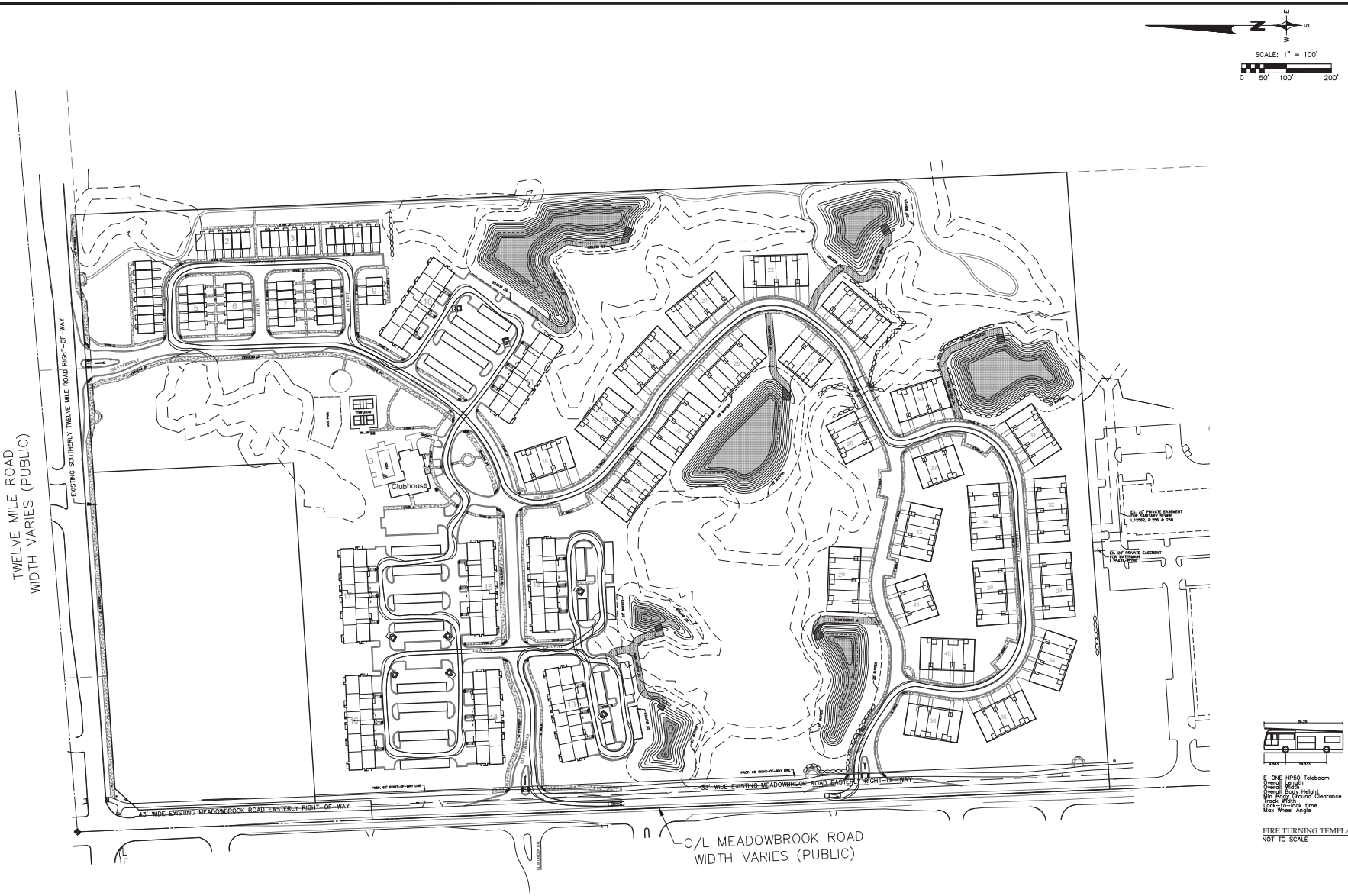

FIRE TURNING TEMPLATE
NOT TO SCALE

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SHEET SP-3.6

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LEGEND

EXISTING		PROPOSED	
○	MANHOLE	●	MANHOLE
□	CATCH BASIN	■	CATCH BASIN
☑	INLET	◪	INLET
◉	CLEANOUT	◉	CLEANOUT
◁	END SECTION	◀	END SECTION
◇	ROOF DRAIN	◆	ROOF DRAIN
⊗	GATE VALVE	⊗	GATE VALVE
	HYDRANT		HYDRANT
	WATER SHUT-OFF		WATER SHUT-OFF
	UTILITY POLE		TREE REMOVAL
	GUY ANCHOR		SANITARY SEWER
	LIGHT POLE		STORM SEWER
	SIGN		WATER MAIN
	TREE		℄ DITCH
	TREE LINE		CONTOUR MAJOR
	SANITARY SEWER		CONTOUR MINOR
	STORM SEWER	x99.0	PROPOSED GRADE
	WATER MAIN	T/C =	TOP OF CURB
	GAS MAIN	T/W =	TOP OF WALK
	ELECTRIC CABLE	T/P =	TOP OF PAVEMENT
	CONTOUR MAJOR	T/B =	TOP OF BANK
	CONTOUR MINOR	G =	GROUND
+100.00	SPOT ELEVATION	D =	DITCH
		GU =	GUTTER
		FG =	FINISH GRADE
		FF =	FINISH FLOOR
		BF =	BASEMENT FLOOR
		BL =	BRICK LEDGE

ALL PROPOSED GRADES IN PAVEMENT ARE TOP OF PAVEMENT OR GUTTER.

WETLAND LEGEND

WETLAND MITIGATION AREA

NOTES:

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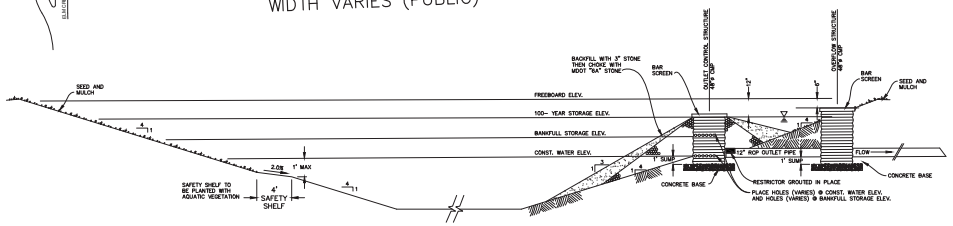

DETENTION BASIN OUTLET DETAIL
N.T.S.

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WEST BLOOMFIELD, MI 48322 (248) 626-6114

OVERALL GRADING PLAN
THE GROVE
NOVI, MICHIGAN

FIELD BOOK
DATE 1/14/24
DESIGNED BY SRB
DRAWN BY DAB
SCALE HOR: 1" = 100' VER: 1" = N/A
JOB NO. 22149
SHEET SP-4

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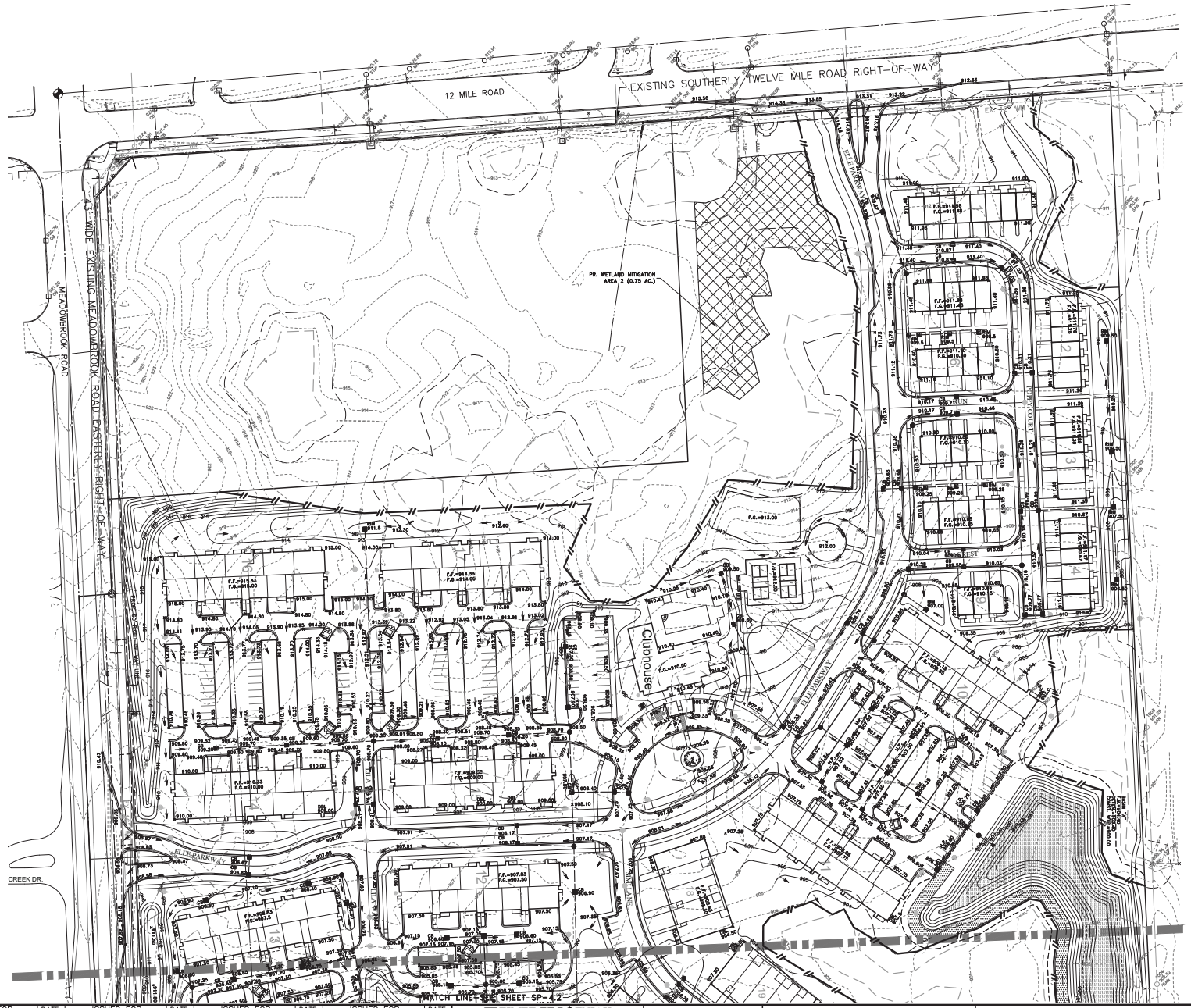

N

W E

S

SCALE: 1" = 60'

0 30' 60' 120'

LEGEND

EXISTING

- MANHOLE
- CATCH BASIN
- INLET
- CLEANOUT
- END SECTION
- ROOF DRAIN
- GATE VALVE
- HYDRANT
- WATER SHUT-OFF
- UTILITY POLE
- GUY ANCHOR
- LIGHT POLE
- SIGN
- TREE
- TREE LINE
- SANITARY SEWER
- STORM SEWER
- WATER MAIN
- GAS MAIN
- ELECTRIC CABLE
- CONTOUR MAJOR
- CONTOUR MINOR
- +100.00 SPOT ELEVATION

PROPOSED

- MANHOLE
- CATCH BASIN
- INLET
- CLEANOUT
- END SECTION
- ROOF DRAIN
- GATE VALVE
- HYDRANT
- WATER SHUT-OFF
- TREE REMOVAL
- SANITARY SEWER
- STORM SEWER
- WATER MAIN
- ℄ DITCH
- CONTOUR MAJOR
- CONTOUR MINOR
- ×99.0 PROPOSED GRADE
- T/C = TOP OF CURB
- T/W = TOP OF WALK
- T/P = TOP OF PAVEMENT
- T/B = TOP OF BANK
- G = GROUND
- D = DITCH
- GU = GUTTER
- FG = FINISH GRADE
- FF = FINISH FLOOR
- BF = BASEMENT FLOOR
- BL = BRICK LEDGE

ALL PROPOSED GRADES IN PAVEMENT ARE TOP OF PAVEMENT OR GUTTER.

WETLAND LEGEND

WETLAND MITIGATION AREA

NOTES:

1. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AS DISCLOSED BY AVAILABLE UTILITY COMPANY RECORDS AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE COMPANY. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES. THE CONTRACTOR SHALL NOTIFY THE DESIGN ENGINEER IMMEDIATELY IF A CONFLICT IS APPARENT.
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GRADING PLAN
THE GROVE
NOVI, MICHIGAN

FIELD BOOK NO.

DATE 7/14/24 | SCALE HOR: 1" = 60' VER: 1" = N/A
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LEGEND

EXISTING

- MANHOLE
- CATCH BASIN
- INLET
- CLEANOUT
- END SECTION
- ROOF DRAIN
- GATE VALVE
- HYDRANT
- WATER SHUT-OFF
- UTILITY POLE
- GUY ANCHOR
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PROPOSED

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WETLAND LEGEND

WETLAND MITIGATION AREA

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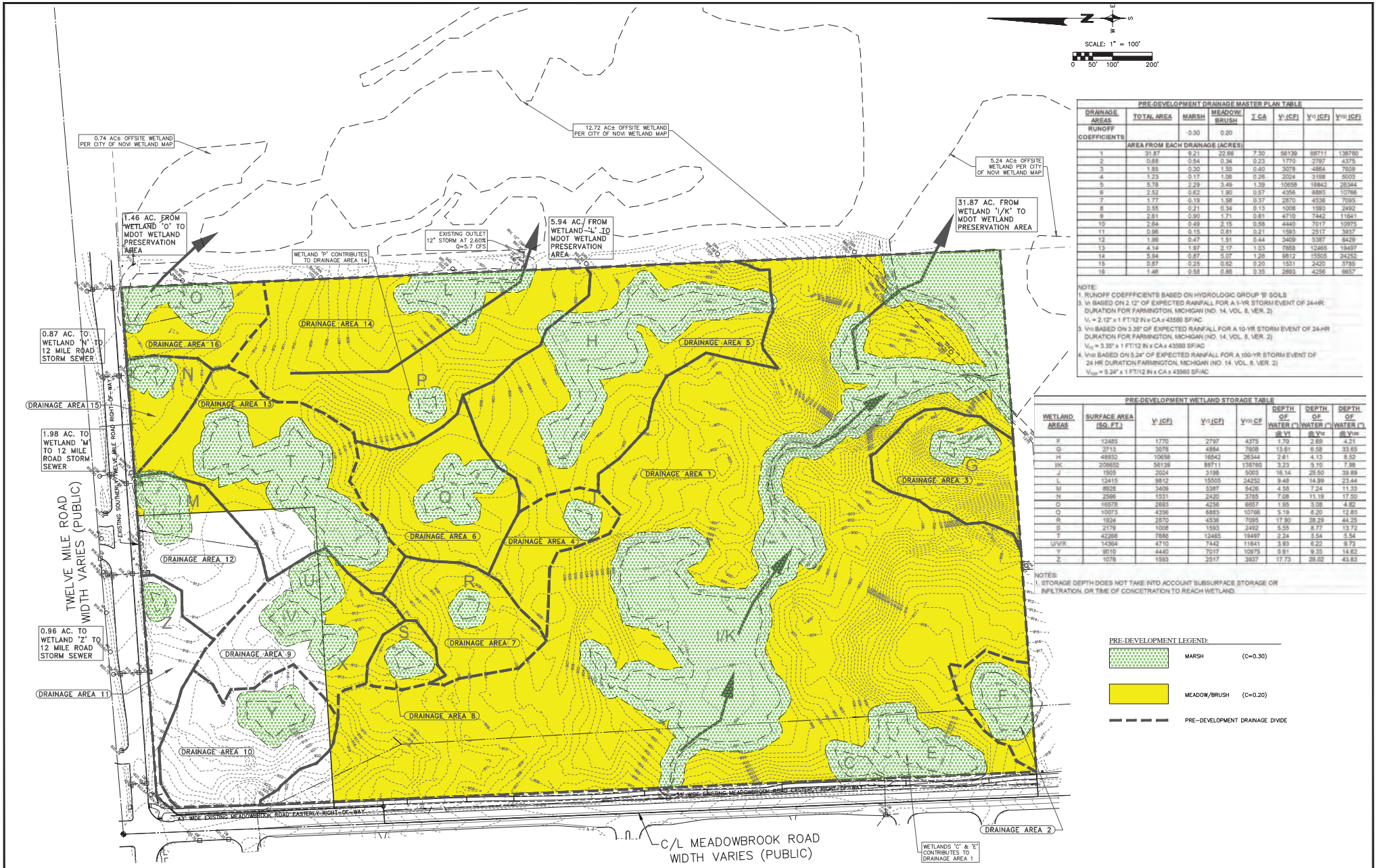

PRE-DEVELOPMENT DRAINAGE MASTER PLAN TABLE

DRAINAGE AREAS	TOTAL AREA	MARSH	MEADOW/ BRUSH	T CA	V_1 (CF)	V_{10} (CF)	V_{100} (CF)
RUNOFF COEFFICIENTS		0.30	0.20				
	AREA FROM EACH DRAINAGE (ACRES)						
1	31.87	9.21	22.66	7.30	56139	88711	138760
2	0.86	0.54	0.34	0.23	1770	2797	4375
3	1.85	0.30	1.55	0.40	3078	4864	7608
4	1.23	0.17	1.06	0.26	2024	3198	5003
5	5.78	2.29	3.49	1.39	10658	16842	26344
6	2.52	0.62	1.90	0.57	4356	6883	10766
7	1.77	0.19	1.58	0.37	2870	4536	7095
8	0.55	0.21	0.34	0.13	1008	1593	2492
9	2.61	0.90	1.71	0.81	4710	7442	11641
10	2.64	0.49	2.15	0.58	4440	7017	10975
11	0.96	0.15	0.81	0.21	1593	2517	3937
12	1.98	0.47	1.51	0.44	3409	5387	8426
13	4.14	1.97	2.17	1.03	7888	12465	19497
14	5.94	0.87	5.07	1.28	9812	15505	24252
15	0.87	0.25	0.62	0.20	1531	2420	3785
16	1.46	0.58	0.88	0.35	2693	4256	6657

NOTE:
1. RUNOFF COEFFFICIENTS BASED ON HYDROLOGIC GROUP 'B' SOILS
3. V_1 BASED ON 2.12" OF EXPECTED RAINFALL FOR A 1-YR STORM EVENT OF 24-HR DURATION FOR FARMINGTON, MICHIGAN (NO. 14, VOL. 8, VER. 2)
   V_1 = 2.12" x 1 FT/12 IN x CA x 43560 SF/AC
3. V_{10} BASED ON 3.35" OF EXPECTED RAINFALL FOR A 10-YR STORM EVENT OF 24-HR DURATION FOR FARMINGTON, MICHIGAN (NO. 14, VOL. 8, VER. 2)
   V_{10} = 3.35" x 1 FT/12 IN x CA x 43560 SF/AC
4. V_{100} BASED ON 5.24" OF EXPECTED RAINFALL FOR A 100-YR STORM EVENT OF 24 HR DURATION FARMINGTON, MICHIGAN (NO. 14, VOL. 8, VER. 2)
   V_{100} = 5.24" x 1 FT/12 IN x CA x 43560 SF/AC

PRE-DEVELOPMENT WETLAND STORAGE TABLE

WETLAND AREAS	SURFACE AREA (SQ. FT.)	V_1 (CF)	V_{10} (CF)	V_{100} CF	DEPTH OF WATER (") @ V_1	DEPTH OF WATER (") @ V_{10}	DEPTH OF WATER (") @ V_{100}
F	12485	1770	2797	4375	1.70	2.69	4.21
G	2713	3078	4864	7608	13.61	6.58	33.65
H	48932	10658	16842	26344	2.61	4.13	6.52
I/K	209650	56139	88711	138760	3.23	5.10	7.98
J	1505	2024	3198	5003	16.14	25.50	39.89
L	12415	9812	15505	24252	9.48	14.99	23.44
M	8928	3409	5387	8426	4.58	7.24	11.33
N	2586	1531	2420	3785	7.08	11.19	17.50
O	16578	2693	4256	6657	1.95	3.08	4.82
Q	10073	4356	6883	10766	5.19	8.20	12.83
R	1924	2870	4536	7095	17.90	28.29	44.25
S	2179	1008	1593	2492	5.55	8.77	13.72
T	42268	7888	12465	19497	2.24	3.54	5.54
U/V/X	14364	4710	7442	11641	3.93	6.22	9.73
Y	9010	4440	7017	10975	5.91	9.35	14.62
Z	1078	1593	2517	3937	17.73	28.02	43.83

NOTES:
1. STORAGE DEPTH DOES NOT TAKE INTO ACCOUNT SUBSURFACE STORAGE OR INFILTRATION, OR TIME OF CONCETRATION TO REACH WETLAND.

PRE-DEVELOPMENT LEGEND:
- MARSH (C=0.30)
- MEADOW/BRUSH (C=0.20)
- PRE-DEVELOPMENT DRAINAGE DIVIDE

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PRE-DEVELOPMENT DRAINAGE PLAN
THE GROVE
NOVI, MICHIGAN

FIELD BOOK —
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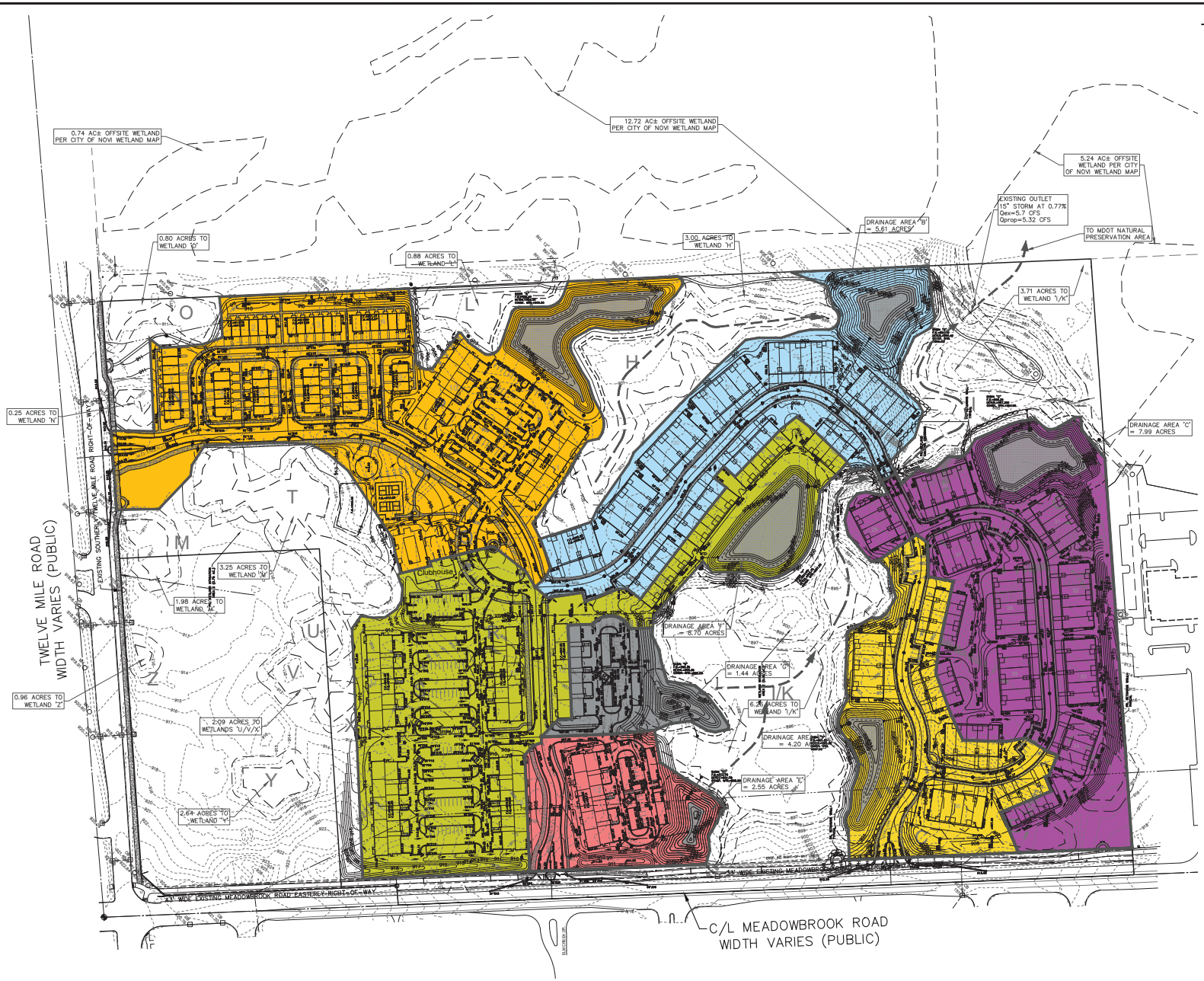

POST-DEVELOPMENT DRAINAGE MASTER PLAN TABLE (6-18-2024)

IMPACTS TO WETLANDS 'M' AND 'I/K'

STORMWATER OFFSITE OUTLET ANALYSIS

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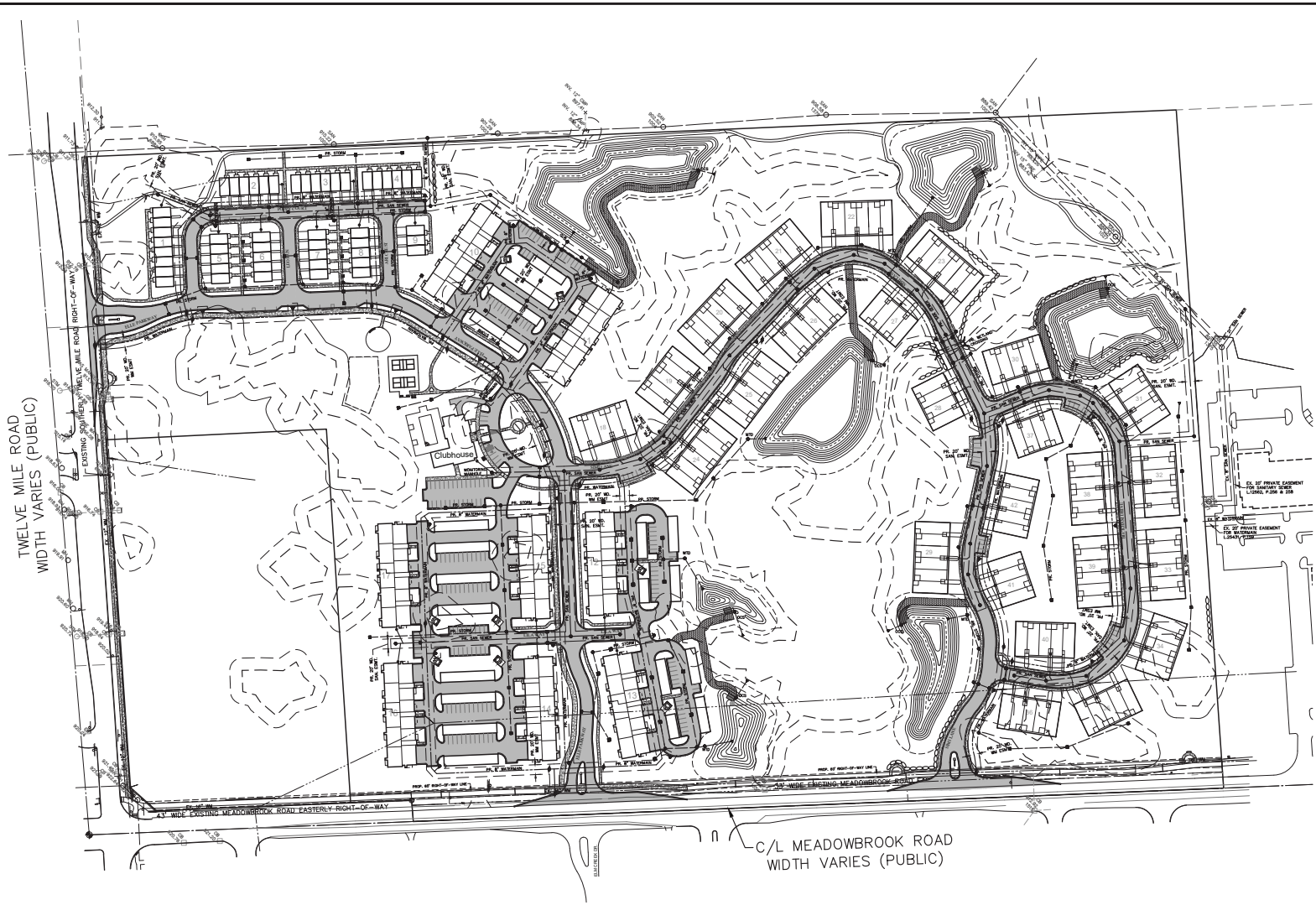

SCALE: 1" = 100'

0 50' 100' 200'

UTILITY LEGEND

EXISTING	PROPOSED
MANHOLE	MANHOLE
CATCH BASIN	CATCH BASIN
INLET	INLET
CLEANOUT	CLEANOUT
END SECTION	END SECTION
ROOF DRAIN	ROOF DRAIN
GATE VALVE	GATE VALVE
HYDRANT	HYDRANT
WATER SHUT-OFF	WATER SHUT-OFF
UTILITY POLE	TREE REMOVAL
GUY ANCHOR	SANITARY SEWER
LIGHT POLE	STORM SEWER
SIGN	WATER MAIN
TREE	DITCH
TREE LINE	
SANITARY SEWER	
STORM SEWER	
WATER MAIN	
GAS MAIN	
ELECTRIC CABLE	

SANITARY SEWER NOTES:

1. PROVIDE A TESTING BULKHEAD IMMEDIATELY UPSTREAM OF THE SANITARY CONNECTION POINT. ADDITIONALLY, PROVIDE A TEMPORARY 1-FOOT-DEEP SUMP IN THE FIRST SANITARY STRUCTURE PROPOSED UPSTREAM OF THE CONNECTION POINT, AND PROVIDE A SECONDARY WATERTIGHT BULKHEAD IN THE DOWNSTREAM SIDE OF THIS STRUCTURE.
2. TWO 6-GAUGE SOLID OR STRANDED ANNEALED OR HARD COPPER TRACER WIRES WITH GREEN 45 MIL-THICK INSULATION (HWYPE) SHALL BE ATTACHED TO THE SEWER PIPE IN ACCORDANCE WITH CURRENT WRC SPECIFICATIONS. SPLICES SHALL BE MADE IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS. SPLICE SHALL THEN BE ATTACHED TO PIPE WITH TIES AND HEAT SHRINK-WRAPPED IN PLACE TO RE-ESTABLISH INSULATION ACROSS SPLICED LENGTH. ALL SPLICES SHALL REQUIRE TESTING OF THE ENTIRE LENGTH OF WIRE FOR CONTINUITY FROM STRUCTURE TO STRUCTURE. A MINIMUM LENGTH OF 6 FEET OF TRACER WIRE SHALL BE COILED AND LEFT ACCESSIBLE UNDER THE COVER OF ALL MANHOLES, SERVICE VALVE BOXES AND OTHER STRUCTURES AS DIRECTED BY THE ENGINEER. THE TRACER WIRE SHALL BE ATTACHED TO THE OUTSIDE OF THE MANHOLE DIRECTLY ABOVE THE PIPE AND SHALL ENTER THE MANHOLE BETWEEN THE MANHOLE. CONTRACTOR IS RESPONSIBLE FOR TESTING CONTINUITY OF TRACER WIRE FROM STRUCTURE TO STRUCTURE USING EQUIPMENT COMPATIBLE WITH OAKLAND COUNTY WATER RESOURCES COMMISSIONERS OFFICE OR LOCAL CITY/VILLAGE/TOWNSHIP MISS DIG LOCATING DEVICES. AT LEAST ONE OF THE TWO WIRES SHALL BE REQUIRED TO HAVE PASSED THE CONTINUITY TESTING REQUIREMENT.

SANITARY SEWER REU'S:

EXISTING ZONING: OST
- BUILDING AREA= 1,216,590 SF ("CONCEPTUAL OST SITE PLAN")
- REU = 0.40/1,000 SF (OCWRC GENERAL OFFICE)
- REU = 0.40/1,000 SF x 1,216,590 SF = 486.6 REU'S

PROPOSED ZONING: PRO (USING RM-2 ZONING)
- RESIDENTIAL DWELLING UNITS: VISTAS = 49, WOODS = 56, POINTE = 77, MEADOWS = 256, 438 UNITS
- REU = 0.60/UNIT (OCWRC MULTIPLE FAMILY)
- REU = 0.60/UNIT x 438 UNITS = 262.8 REU'S

CLUBHOUSE:
- BLDG. AREA = 5,884 SF
- REU = 0.40/1,000 SF (OCWRC GENERAL OFFICE)
- REU = 0.40/1,000 SF x 5,884 SF = 2.3 REU

POOL:
- AREA = 1,500 SF
- REU = 3.0/1,000 SF
- REU = 3.0/1,000 SF x 1,500 SF = 4.5 REU

TOTAL REU = 262.8 + 2.3 + 4.5 = 269.6 REU'S

THE PROPOSED REU IS LESS THAN THE POSSIBLE EXISTING ZONING REU.

WATERMAIN NOTES:

1. BACTERIOLOGICAL SAMPLING SHALL BE IN ACCORDANCE WITH R325.11110 OF THE ADMINISTRATIVE RULES PROMULGATED UNDER MICHIGAN SAFE DRINKING WATER ACT, 1976 PA 399, AS AMENDED. TWO CONSECUTIVE BACTERIOLOGICAL SAMPLES SHALL BE COLLECTED 24 HOURS APART AT EACH SAMPLING SITE. SAMPLING SITE SHALL BE IN ACCORDANCE WITH THE LATEST VERSION OF AWWA STANDARD C651.
2. FOR THE PROPOSED DUCTILE IRON WATER MAINS, EACH PIPE, HYDRANTS, VALVES, AND OTHER APPURTENANCE MATERIAL THAT COMES IN CONTACT WITH POTABLE WATER MUST BE CERTIFIED TO MEET THE ANSI/NSF STANDARD 61 AND THE CERTIFICATION SHOULD BE STAMPED ON THE EXTERIOR WALL OF THE PIPE OR APPURTENANCE.

WATERMAIN CROSSING NOTE:

PER THE TEN STATES STANDARDS ARTICLE 8.8.3, ONE FULL 20-FOOT PIPE LENGTH OF WATER MAIN SHALL BE USED WHENEVER STORM SEWER OR SANITARY SEWER IS CROSSED, AND THE PIPE SHALL BE CENTERED ON THE CROSSING, IN ORDER TO ENSURE 10-FOOT SEPARATION BETWEEN WATER MAIN AND SEWERS.

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MISS DIG SYSTEM, INC. 1-800-482-7171
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PROJECT SPONSOR:
IVANHOE COMPANIES
6689 ORCHARD LAKE ROAD, SUITE 314
WEST BLOOMFIELD, MI 48322 (248) 626-6114

OVERALL UTILITY PLAN
THE GROVE
NOVI, MICHIGAN

FIELD BOOK NO.
DATE 1/14/24
DESIGNED BY SRB
DRAWN BY DAB
SCALE HOR: 1" = 100' VER: 1" = N/A
JOB NO. 22149
SHEET SP-6

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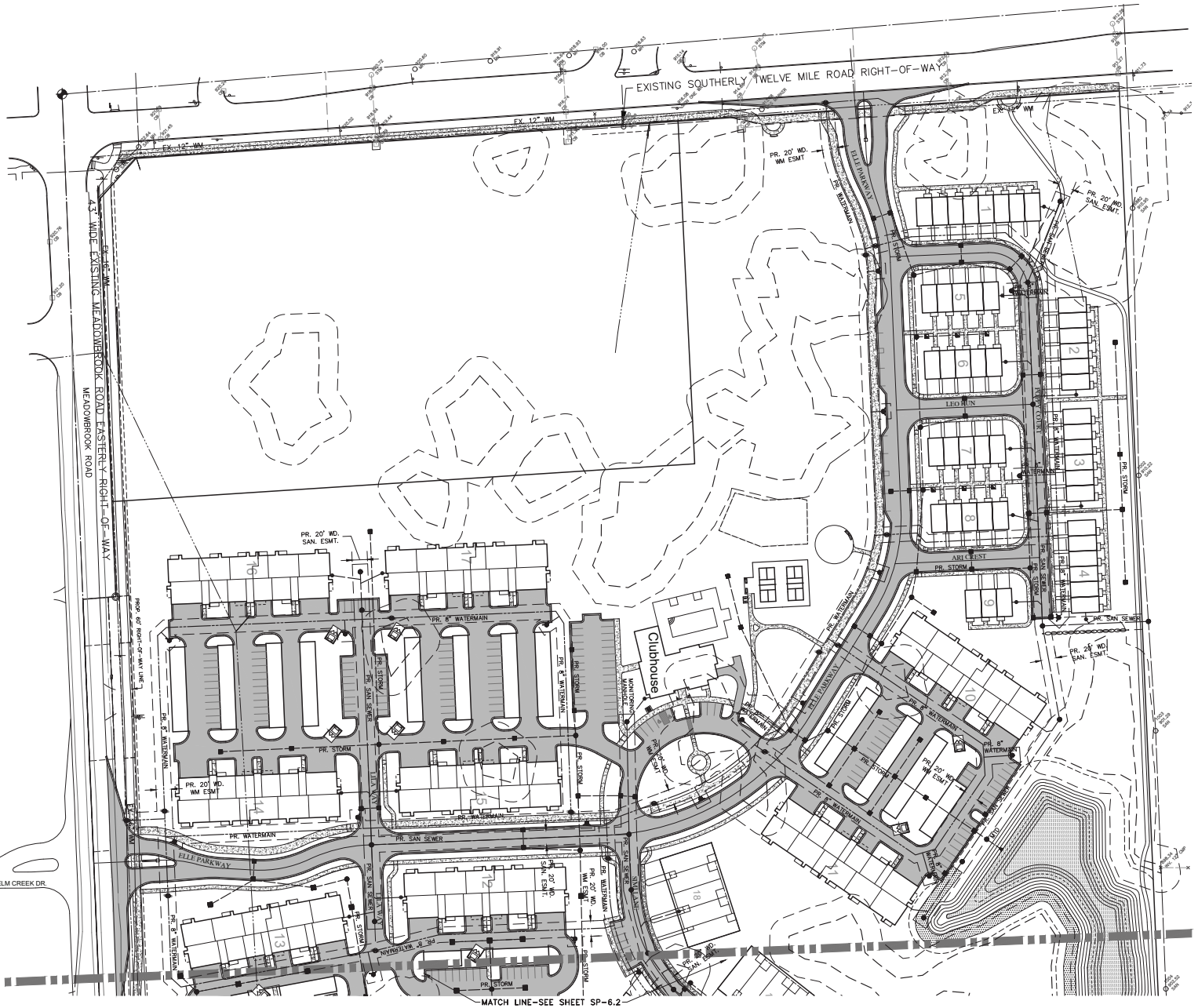

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W E
S

SCALE: 1" = 60'

0 30' 60' 120'

UTILITY LEGEND

EXISTING

- MANHOLE
- CATCH BASIN
- INLET
- CLEANOUT
- END SECTION
- ROOF DRAIN
- GATE VALVE
- HYDRANT
- WATER SHUT-OFF
- UTILITY POLE
- GUY ANCHOR
- LIGHT POLE
- SIGN
- TREE
- TREE LINE
- SANITARY SEWER
- STORM SEWER
- WATER MAIN
- GAS MAIN
- ELECTRIC CABLE

PROPOSED

- MANHOLE
- CATCH BASIN
- INLET
- CLEANOUT
- END SECTION
- ROOF DRAIN
- GATE VALVE
- HYDRANT
- WATER SHUT-OFF
- TREE REMOVAL
- SANITARY SEWER
- STORM SEWER
- WATER MAIN
- ℄ DITCH

NOTES:

1. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AS DISCLOSED BY AVAILABLE UTILITY COMPANY RECORDS AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE COMPANY. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES. THE CONTRACTOR SHALL NOTIFY THE DESIGN ENGINEER IMMEDIATELY IF A CONFLICT IS APPARENT.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADJUSTMENT OF ALL STRUCTURES, KNOWN OR UNKNOWN, SHOWN OR UNSHOWN, LOCATED WITHIN THE LIMITS OF CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE OWNER OR OWNER'S REPRESENTATIVE IF ANY SUCH STRUCTURES ARE IDENTIFIED. ALL COSTS ASSOCIATED WITH LOCATING AND ADJUSTING THESE STRUCTURES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
3. DESIGN PROFESSIONAL AND CLIENT WARRANT THAT IN TRANSMITTING INSTRUMENTS OF SERVICE, OR ANY OTHER INFORMATION, THE TRANSMITTING PARTY IS THE COPYRIGHT OWNER OF SUCH INFORMATION OR HAS PERMISSION FROM THE COPYRIGHT OWNER TO TRANSIT SUCH INFORMATION FOR ITS USE ON THE PROJECT. IF THE CLIENT AND DESIGN PROFESSIONAL INTEND TO TRANSMIT INSTRUMENTS OF SERVICE OR ANY OTHER INFORMATION OR DOCUMENTATION IN DIGITAL FORM, THEY SHALL ENDEAVOR TO ESTABLISH NECESSARY PROTOCOLS GOVERNING SUCH TRANSMISSIONS.

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UTILITY PLAN
THE GROVE
NOVI, MICHIGAN

FIELD BOOK

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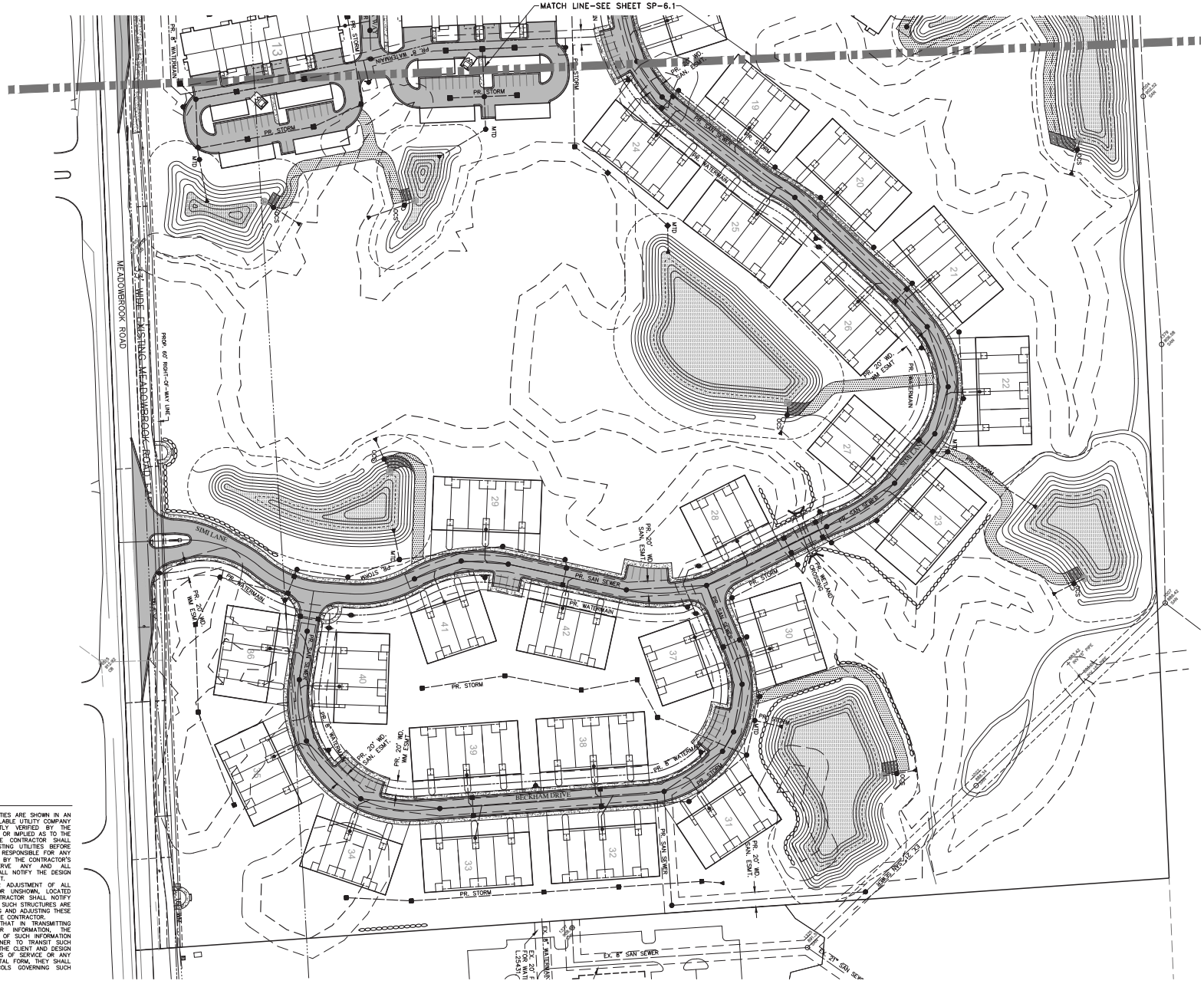
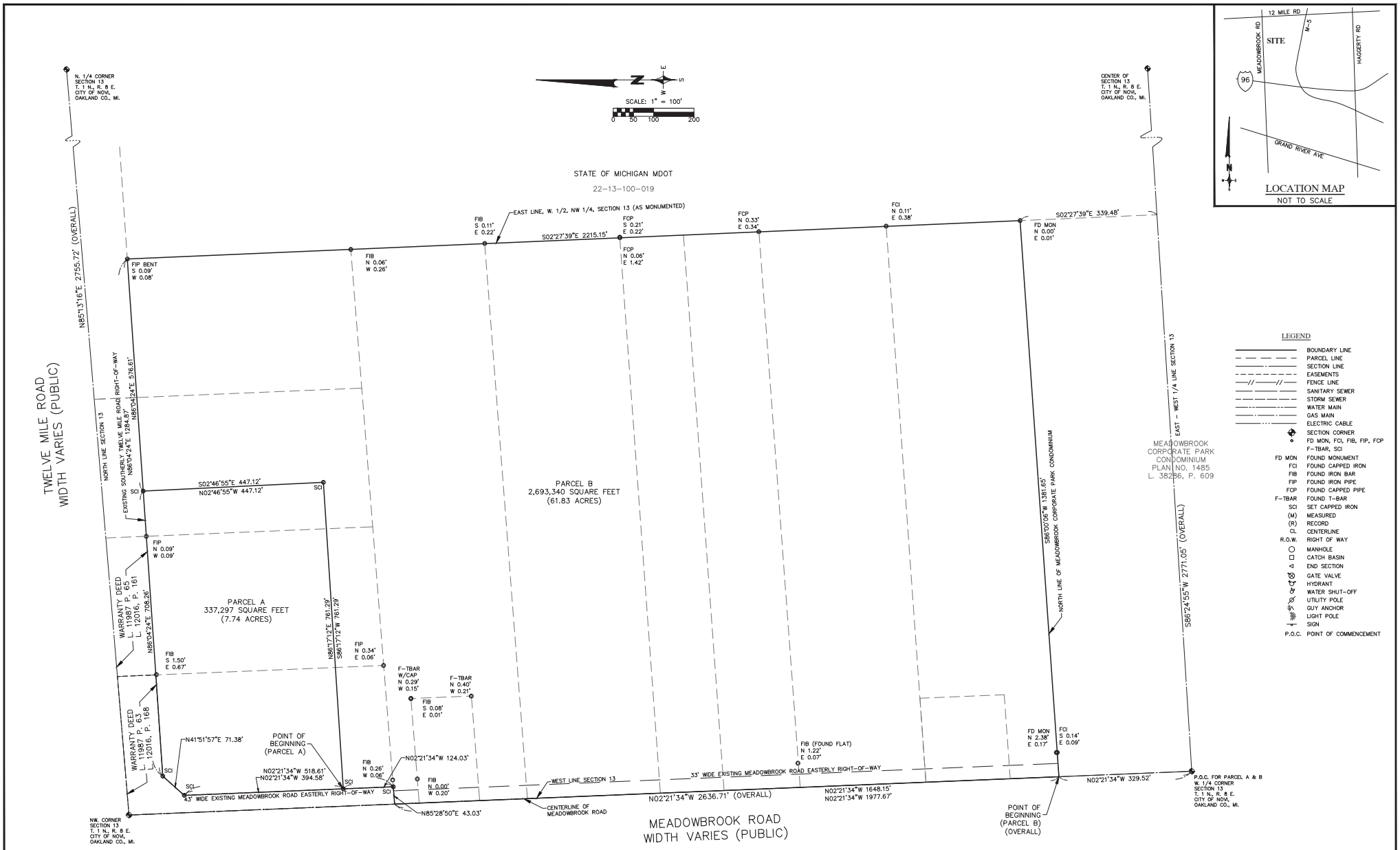

MATCH LINE-SEE SHEET SP-6.1
MEADOWBROOK ROAD
60' WIDE ARTERIAL
PROP. 20' ROW
SIMI LANE
BEC KHAM DRIVE
PR. STORM
PR. WATERMAIN
PR. SAN SEWER
PR. 20' WD. SAN. ESMT.
PR. 20' WD. WM ESMT.
PR. 8" WATERMAIN
PR. 12" WATERMAIN
PR. 6" WATERMAIN
PR. SAN SEWER
PR. 8" SAN SEWER
PR. 20' WD. WATERMAIN ESMT.
WETLAND CROSSING
EX. 8" SAN SEWER
EX. 8" WATERMAIN
EX. 20' WD. WATERMAIN ESMT. FOR L=25.43'
EX. 20' WD. SAN. ESMT.
EX. 24" SAN SEWER
EX. 12" WATERMAIN
EX. 8" WATERMAIN
EX. 12" WATERMAIN
EX. 8" WATERMAIN
EX. 8" WATERMAIN
EX. 8



NOTES:
SEE SHEET SP-7.1 FOR BOUNDARY SURVEY PER TITLE WORK.
SEE SHEET SP-7.2 FOR EXISTING EASEMENTS.
SEE SHEET SP-7.3 FOR LEGAL DESCRIPTIONS.

OVERALL BOUNDARY ONLY

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BOUNDARY SURVEY
THE GROVE
NOVI, MICHIGAN

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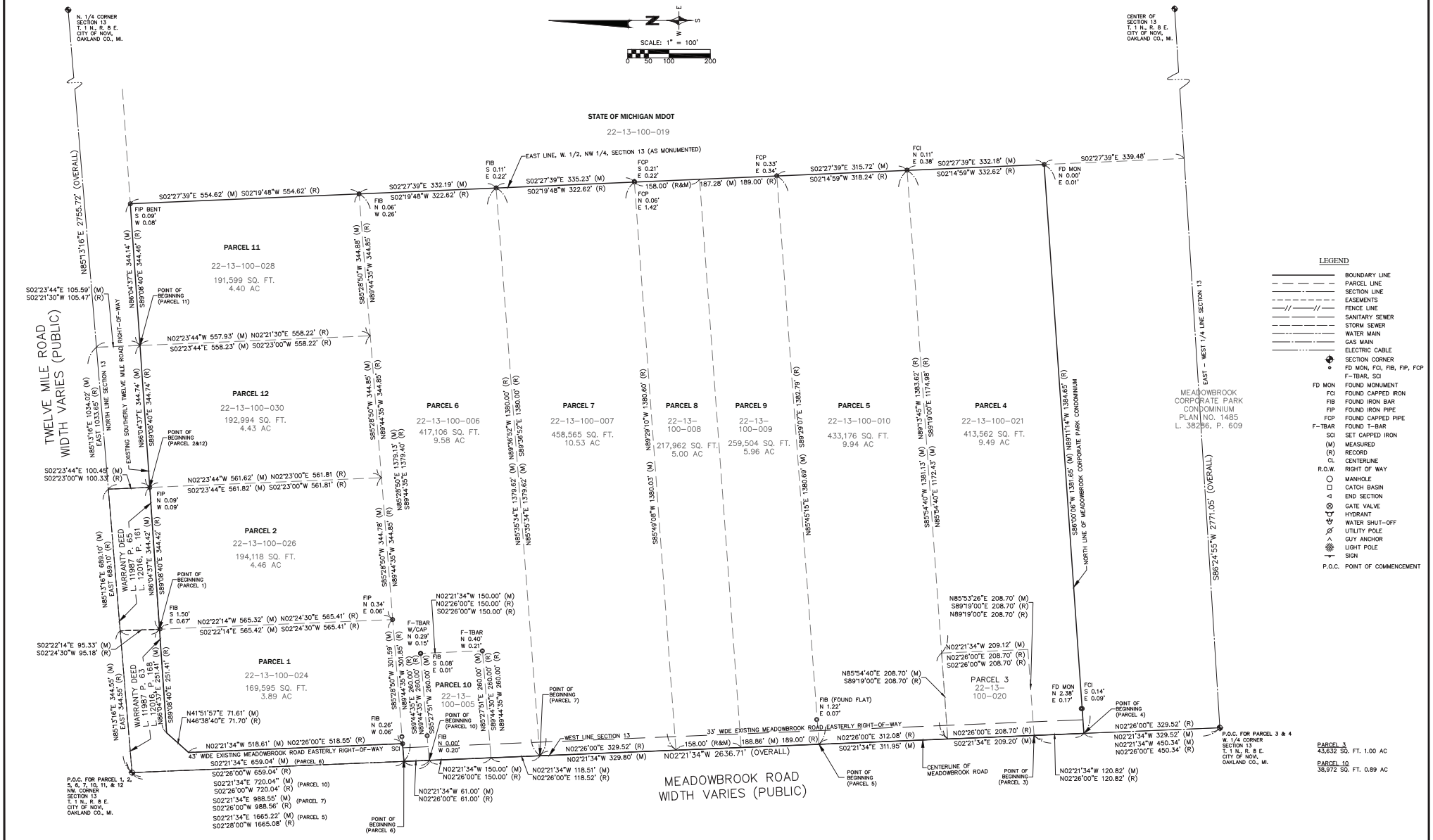

PARCEL BOUNDARY (PER TITLE COMMITMENT) ONLY

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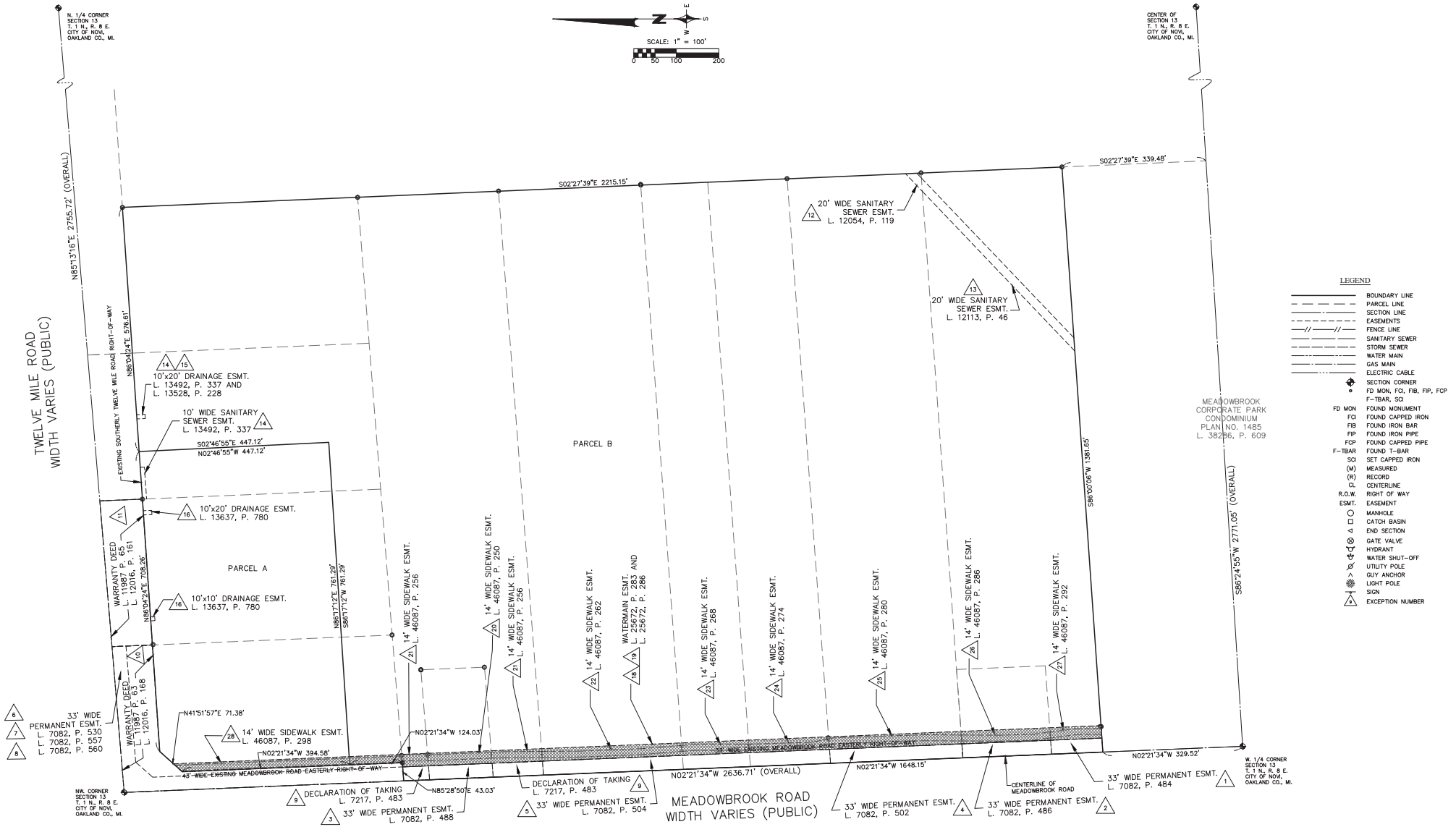

EASEMENTS ONLY

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BOUNDARY SURVEY
THE GROVE
NOVI, MICHIGAN

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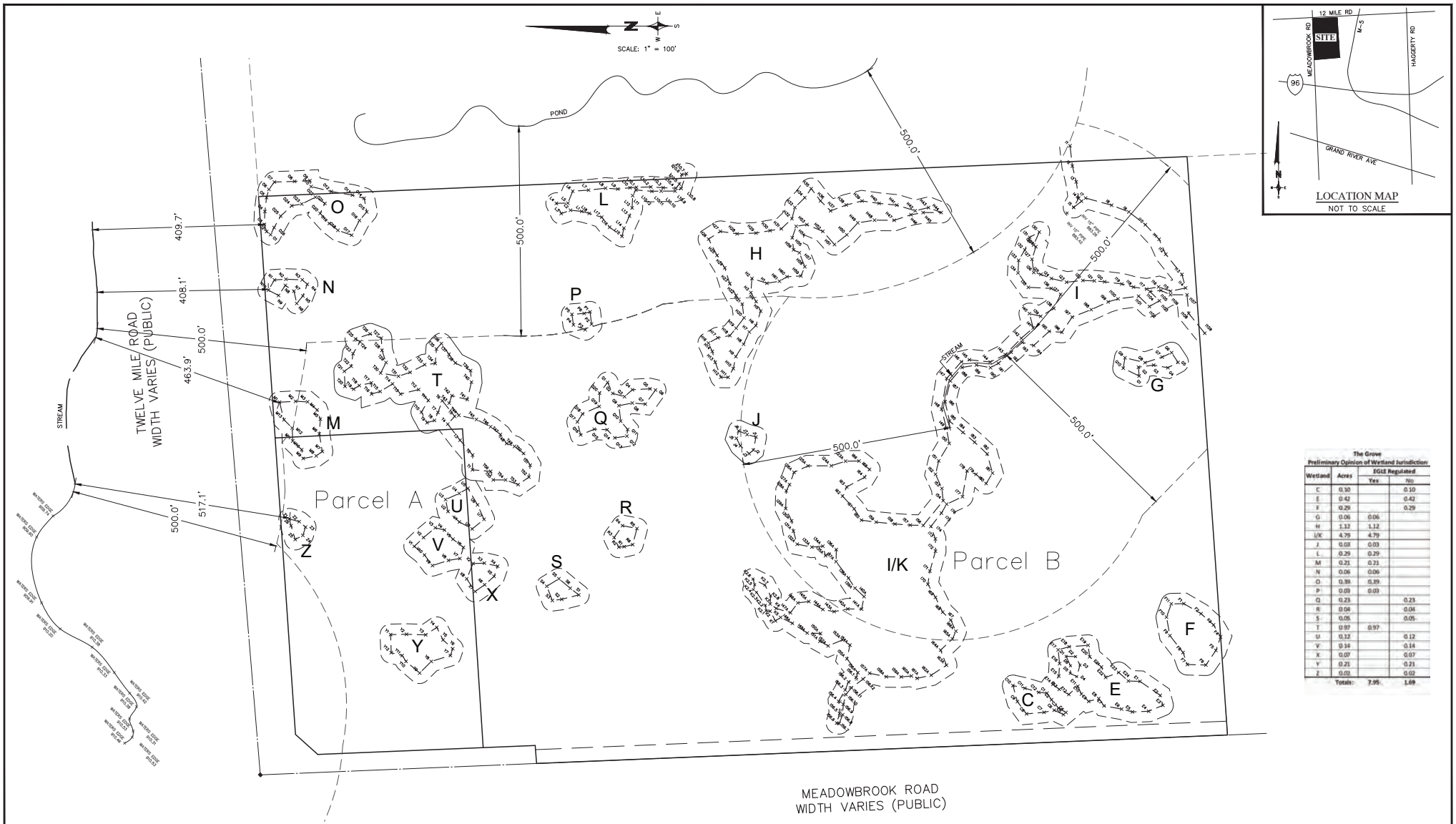

LOCATION MAP
NOT TO SCALE

The Grove
Preliminary Opinion of Wetland Jurisdiction

Wetland	Acres	EGLE Regulated	
		Yes	No
C	0.10		0.10
E	0.42		0.42
F	0.29		0.29
G	0.06	0.06	
H	1.12	1.12	
I/K	4.79	4.79	
J	0.03	0.03	
L	0.29	0.29	
M	0.21	0.21	
N	0.06	0.06	
O	0.39	0.39	
P	0.03	0.03	
Q	0.23		0.23
R	0.04		0.04
S	0.05		0.05
T	0.97	0.97	
U	0.12		0.12
V	0.14		0.14
X	0.07		0.07
Y	0.21		0.21
Z	0.02		0.02
	Totals:	7.95	1.69

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WETLAND SURVEY
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WETLAND IMPACTS

WETLAND	ACRES (AC)	NOVI REGULATED	EGLE REGULATED	WETLAND TYPE	IMPACT (AC)	VOLUME (CY)	MITIGATION RATIO	MITIGATION (AC)
C	0.10	NO		PEM	0.100	525		
E	0.42	YES		OEM	0.330	400	1.5:1	0.50
F	0.28	YES		PEM/PFO	0.210	0	1.5:1	0.32
G	0.05	YES	YES	PFO	0.060	0	2:1	0.12
H	1.12	YES	YES	PFO	0.000	0		
I/K	4.75	YES	YES	PFO/PSS/PEM	0.114	601	2:1	0.23
J	0.07	YES	YES	PFO/PSS	0.034	68	2:1	0.07
L	0.29	YES	YES	PSS	0.000	0		
M	0.21	YES	YES	PEM/PFO	0.060	0	2:1	0.12
N	0.06	YES	YES	PEM/PSS	0.000	0		
O	0.89	YES	YES	PFO/PSS	0.000	0		
P	0.03	YES	YES	PSS	0.030	130	2:1	0.05
Q	0.23	NO		PFO	0.230	805		
R	0.04	NO		PEM/PSS	0.040	152		
S	0.05	NO		PFO	0.050	175		
T	0.07	YES	YES	PEM/PSS	0.002	1.9	1.5:1	0.003
U	0.12	NO		PFO	0.070	0		
V	0.14	NO		PFO	0.140	0		
X	0.01	NO		PSS	0.010	0		
Y	0.21	NO		PEM	0.210	0		
Z	0.02	NO		PSS	0.020	0		
TOTALS	9.64				1.71			1.09

TOTAL NOVI REGULATED WETLAND= 8.71
TOTAL EGLE REGULATED WETLAND= 7.86
TOTAL NON-REGULATED WETLAND = 0.98

TOTAL NOVI WETLAND IMPACT= 0.54
TOTAL EGLE WETLAND IMPACT= 0.30
TOTAL NOVI ONLY IMPACT = 0.25 AC = 0.54

NOTE: IMPACT TO WETLAND M IS BASED ON POSSIBLE FUTURE DEVELOPMENT OF THE OUTLOT PARCEL WITH MITIGATION BEING PROVIDED WITHIN THE GROVE DEVELOPMENT.

MITIGATION REQUIRED= 1.09
MITIGATION PROVIDED= 1.40

NOTE: PEM= PALUSTRINE EMERGENT, PSS=PALUSTRINE SCRUB-SHRUB, PFO=PALUSTRINE FORESTED.

BUFFER IMPACTS

WETLAND	BUFFER AREA (AC)	PERMANENT IMPACT (AC)	TEMPORARY IMPACT (AC)	TOTAL IMPACT (AC)
E	0.32	0.240	0.000	0.240
F	0.29	0.140	0.040	0.180
G	0.23	0.230	0.000	0.230
H	1.17	0.110	0.035	0.145
I/K	5.35	0.330	0.455	0.740
J	0.14	0.140	0.000	0.140
L	0.5	0.026	0.050	0.076
M	0.27	0.000	0.000	0.000
N	0.2	0.020	0.000	0.020
O	0.47	0.074	0.000	0.074
P	0.13	0.130	0.000	0.130
T	1	0.040	0.019	0.059
TOTALS	9.43	1.480	0.554	2.034

WETLAND LEGEND
- WETLAND IMPACT
- BUFFER IMPACT (PERMANENT)
- BUFFER IMPACT (TEMPORARY)
- WETLAND MITIGATION AREA

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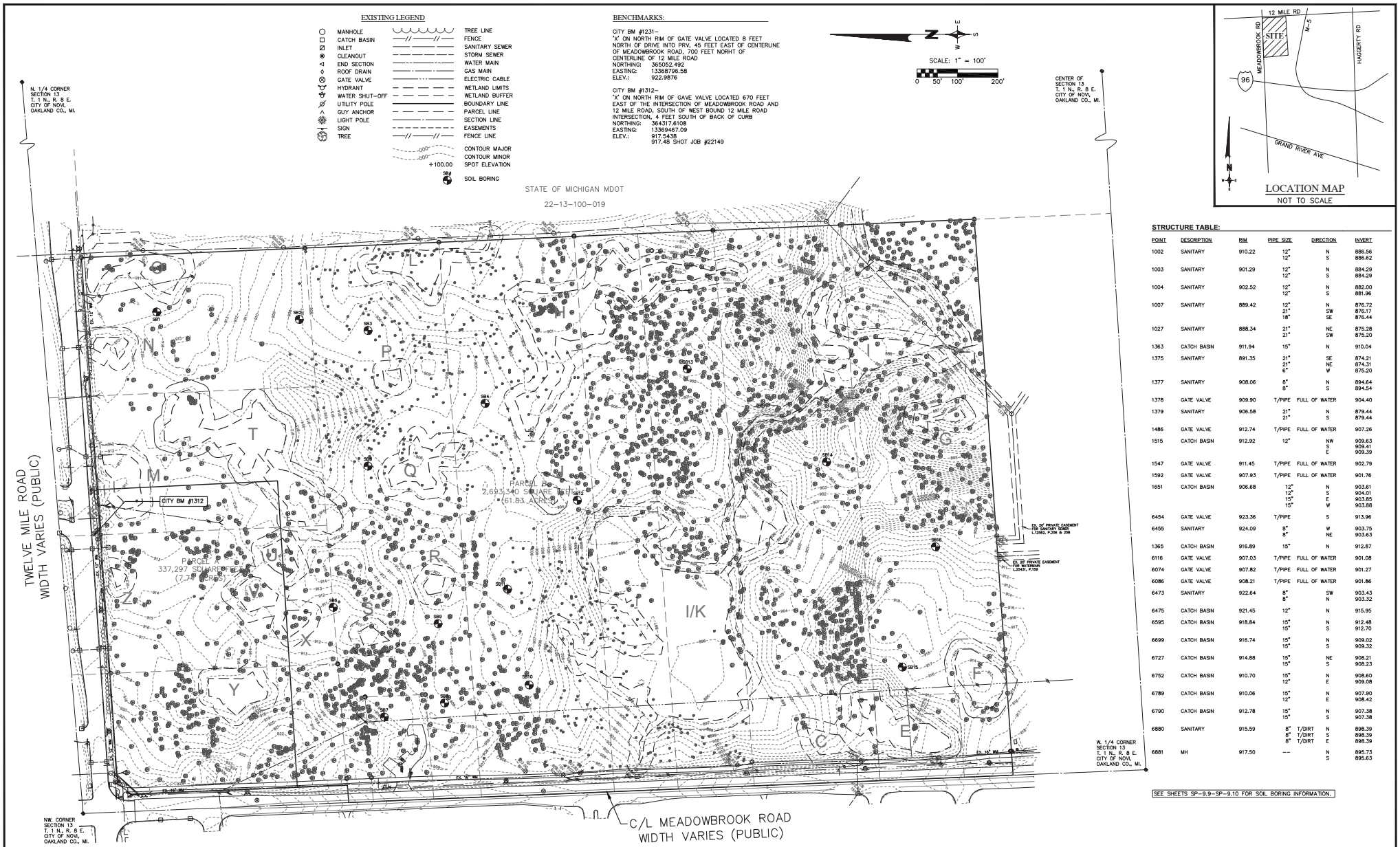
WETLAND IMPACT PLAN
THE GROVE
NOVI, MICHIGAN

DATE 1/14/24 | SCALE HOR: 1" = 100' VER: 1" = N/A | DESIGNED BY DRB | JOB NO. 22149 | DRAWN BY DAB | SHEET SP-8.1



STRUCTURE TABLE:

POINT	DESCRIPTION	RIM	PIPE SIZE	DIRECTION	INVERT
1002	SANITARY	910.22	12"	N	886.56
			12"	S	886.62
1003	SANITARY	901.29	12"	N	884.29
			12"	S	884.29
1004	SANITARY	902.52	12"	N	882.00
			12"	S	881.96
1007	SANITARY	889.42	12"	N	876.72
			21"	SW	876.17
			18"	SE	876.44
1027	SANITARY	888.34	21"	NE	875.28
			21"	SW	875.20
1363	CATCH BASIN	911.94	15"	N	910.04
1375	SANITARY	891.35	21"	SE	874.21
			21"	NE	874.31
			6"	W	875.20
1377	SANITARY	908.06	8"	N	894.64
			8"	S	894.54
1378	GATE VALVE	909.90	T/PIPE	FULL OF WATER	904.40
1379	SANITARY	906.58	21"	N	879.44
			21"	S	879.44
1486	GATE VALVE	912.74	T/PIPE	FULL OF WATER	907.26
1515	CATCH BASIN	912.92	12"	NW	909.63
				S	909.41
				E	909.39
1547	GATE VALVE	911.45	T/PIPE	FULL OF WATER	902.79
1592	GATE VALVE	907.93	T/PIPE	FULL OF WATER	901.76
1651	CATCH BASIN	906.68	12"	N	903.61
			12"	S	904.01
			15"	E	903.85
			15"	W	903.88
6454	GATE VALVE	923.36	T/PIPE	S	913.96
6455	SANITARY	924.09	8"	W	903.75
			8"	NE	903.63
1365	CATCH BASIN	916.89	15"	N	912.87
6116	GATE VALVE	907.03	T/PIPE	FULL OF WATER	901.08
6074	GATE VALVE	907.82	T/PIPE	FULL OF WATER	901.27
6086	GATE VALVE	908.21	T/PIPE	FULL OF WATER	901.86
6473	SANITARY	922.64	8"	SW	903.43
			8"	N	903.32
6475	CATCH BASIN	921.45	12"	N	915.95
6595	CATCH BASIN	918.84	15"	N	912.48
			15"	S	912.70
6699	CATCH BASIN	916.74	15"	N	909.02
			15"	S	909.32
6727	CATCH BASIN	914.88	15"	NE	908.21
			15"	S	908.23
6752	CATCH BASIN	910.70	15"	N	908.60
			12"	E	909.08
6789	CATCH BASIN	910.06	15"	N	907.90
			12"	E	908.42
6790	CATCH BASIN	912.78	15"	N	907.38
			15"	S	907.38
6880	SANITARY	915.59	8" T/DIRT	N	898.39
			8" T/DIRT	S	898.39
			8" T/DIRT	E	898.39
6881	MH	917.50	--	N	895.73
				S	895.63

SEE SHEETS SP-9.9–SP-9.10 FOR SOIL BORING INFORMATION.

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TOPOGRAPHIC & TREE SURVEY
THE GROVE
NOVI, MICHIGAN

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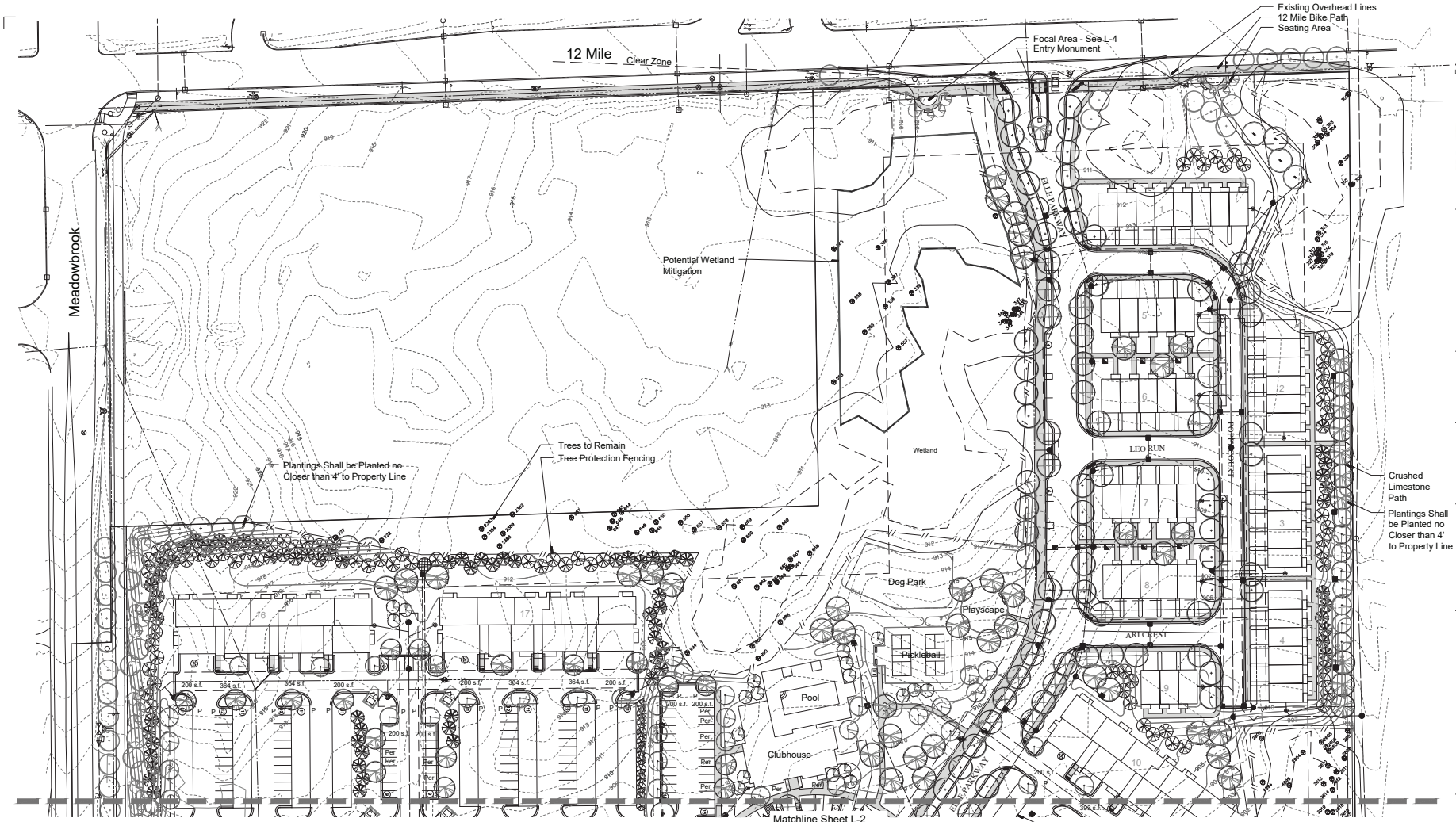
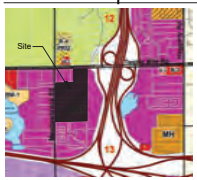


Location Map



North

Landscape Summary

Street Trees

Street Frontage		11,744 l.f.
Less Drives	3,444 l.f.	
Net Frontage		8,300 l.f.
Trees Required		237 Trees (8,300 / 35)
Trees Provided		237 Trees
Sheet L-1	78 Trees	
Sheet L-2	84 Trees	
Sheet L-3	75 Trees	

"Per"

Multi-Family Trees

Total Units		278 Units
The Meadows	96 Units	
The Vistas	49 Units	
The Woods	56 Units	
The Pointe	77 Units	
Trees Required		834 Trees (278 x 3)
Trees Provided		834 Trees
Sheet L-1	286 Trees	
Sheet L-2	267 Trees	
Sheet L-3	281 Trees	

"P"

Woodland Replacement

Replacement Required		3,254 Trees
Trees Provided		265 Trees
Sheet L-1	12 Trees	
Sheet L-2	141 Trees	
Sheet L-3	112 Trees	
Trees to be Paid into Fund		2,989 Trees

Parking Lot Landscaping

Parking Lot Perimeter - Visitor		403 l.f.
Trees Required		11.5 Trees (403 / 35)
Trees Provided		12 Trees
Sheet L-1	3 Trees	
Sheet L-2	2 Trees	
Sheet L-3	7 Trees	

"Per"

Parking Lot Landscaping - Buildings 10-17

Vehicular Use Area		53,028 s.f.
Landscape Area Required		3,750 s.f. (50,000 s.f. x 7.5%)
		3 s.f. (3,028 s.f. x 1%)
		3,753 s.f.
Landscape Area Provided		13,087 s.f.
Canopy Trees Required		18.8 Trees (3,753 / 200)
Canopy Trees Provided		19 Trees
Sheet L-1	17 Trees	
Sheet L-2	2 Trees	

Parking Lot Perimeter - Buildings 10-17

Perimeter		1,335 l.f.
Trees Required		38.1 Trees (1,335 l.f. / 35')
Trees Provided		39 Trees
Sheet L-1	11 Trees	
Sheet L-2	28 Trees	

"Per"

Parking Lot Landscaping - Clubhouse

Vehicular Use Area	12,034 s.f.
Landscape Area Required	903 s.f. (12,034 s.f. x 7.5%)
Landscape Area Provided	2,218 s.f.
Canopy Trees Required	4.5 Trees (903 / 200)
Canopy Trees Provided	5 Trees

Parking Lot Perimeter - Clubhouse

Perimeter	344 l.f.
Trees Required	9.8 Trees (344 l.f. / 35')
Trees Provided	10 Trees

Notes:

- Soils Information is Shown on SP-2.
- Trees Shall be Planted no Closer than 10' to Sanitary Sewer, Utility Structures Including Hydrants and 5' from Utility Lines. Trees Shall be Planted 4' from Curbs.
- Tree Shall not Be Planted within 4' of Property Lines.
- Snow Shall be Deposited Adjacent to Drives and within the Curb Lawn. Any Damaged Trees Shall be Replaced as Needed. If Walks are Adjacent to the Street, Snow will be Stored in Nearby Islands or Lawn Areas.
- All Utility Boxes Shall be Screen per Detail on Sheet L-11. Approximately 10 Shrubs will be Required per Box.
- Overhead Lines Exist Along the 12 Mile and Meadowbrook Frontages.
- Phragmites Exists in Wetland Areas (See Sheet L-2). Japanese Knotweed is not Present on this Site.
- An Irrigation Plan will be Provided for Stamping Sets.

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THE GROVE

Seal:

Title:

Landscape Plan

Project:

The Grove
Novi, Michigan

Prepared for:

Ivanhoe Companies
6689 Orchard Lake Road, Suite 314
West Bloomfield, Michigan 48322
248.626.6114

Revision:	Issued:
Review	March 28, 2024
Revised	July 26, 2024

Job Number:

21-054

Drawn By:	Checked By:
jca	jca

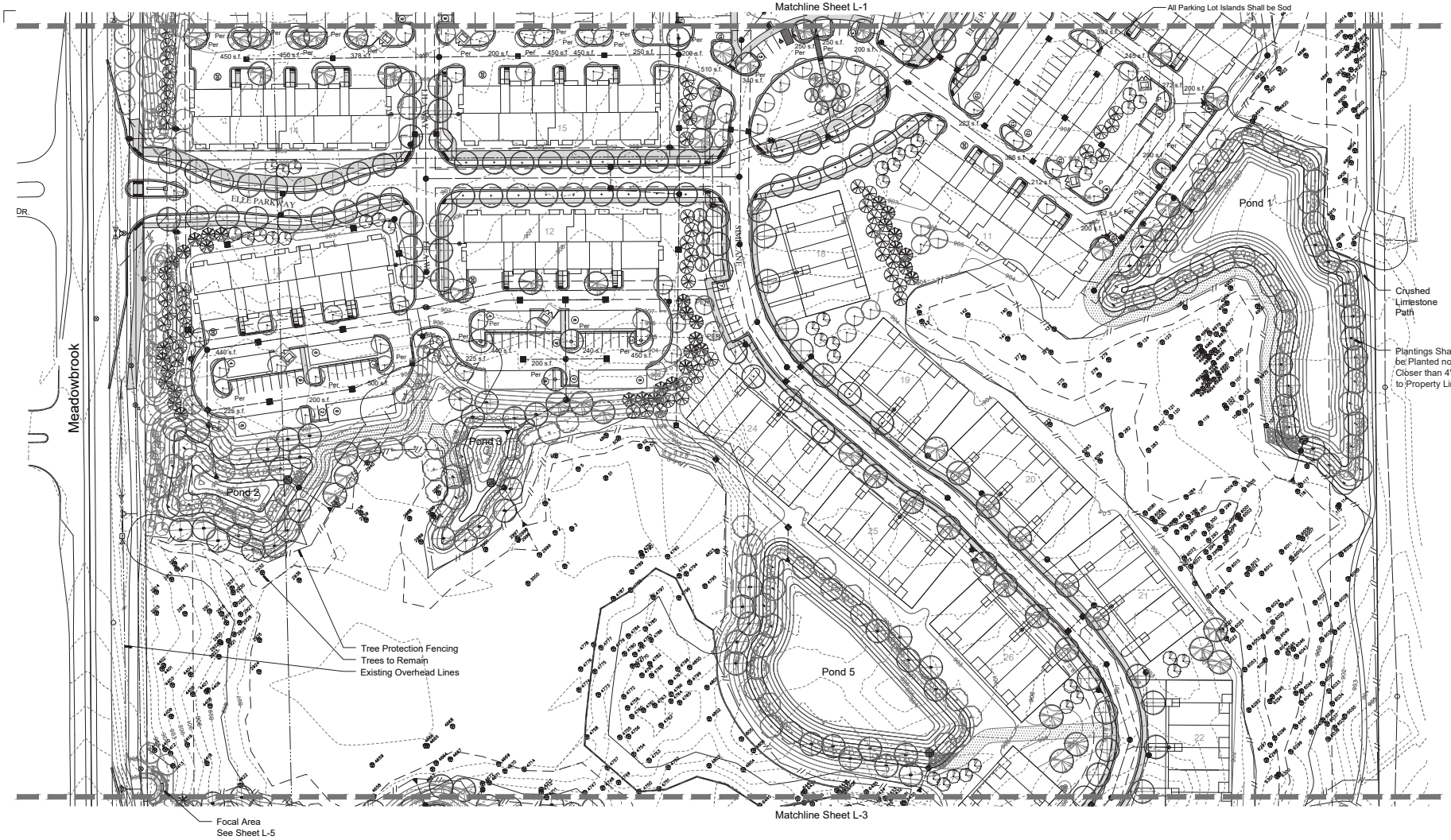
0' 25' 50'

NORTH
1"=50'

Sheet No.

L-1

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



Sequence of Removal for Phragmites

An MDEGLE Permit is Required for Treatment of Phragmites in Areas with Standing Water. A licensed Herbicide Applicator must Perform the Work.

1. Phragmites should be treated in early to late summer (June-Setpember) using glyphosate, or late summer (August- September) using glyphosate to achieve effective control.
2. Application of herbicides should be hand swiping for scattered plants and hand spraying for denser stands. The use of a licensed or certified applicator is required to minimize damage to native plant material.
3. After two weeks of herbicide application, the dead stalks should be cut and removed to encourage native plant material growth. If a mechanical method is used, equipment should be cleaned to prevent the spread of seed.

Second and Third Year Maintenance

1. A visual inspection will be made during June - July. If phragmites is present, steps 1-3 above will be repeated.

Notes:

- Trees Shall be Planted no Closer than 10' to Sanitary Sewer, Utility Structures Including Hydrants and 5' from Utility Lines. Trees Shall be Planted 4' from Curbs.
- Tree Shall not Be Planted within 4' of Property Lines.
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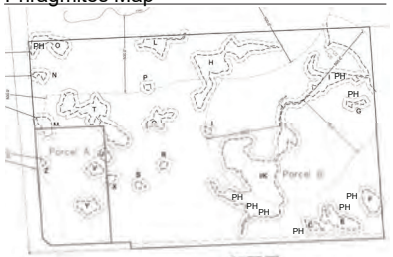
Phragmites Map



"PH" Denotes Phragmites

Landscape Key

Street Trees - 84 Trees Provided

Multi-Family Trees - 267 Trees Provided

"PER" Perimeter Parking Lot Landscaping - 30 Trees Provided
"P" Parking Lot Landscaping - 2 Trees Provided

Woodland Replacement - 141 Trees Provided

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Drawn By:	Checked By:
jca	jca

0' 25' 50'
NORTH
1"=50'

Sheet No.
L-2

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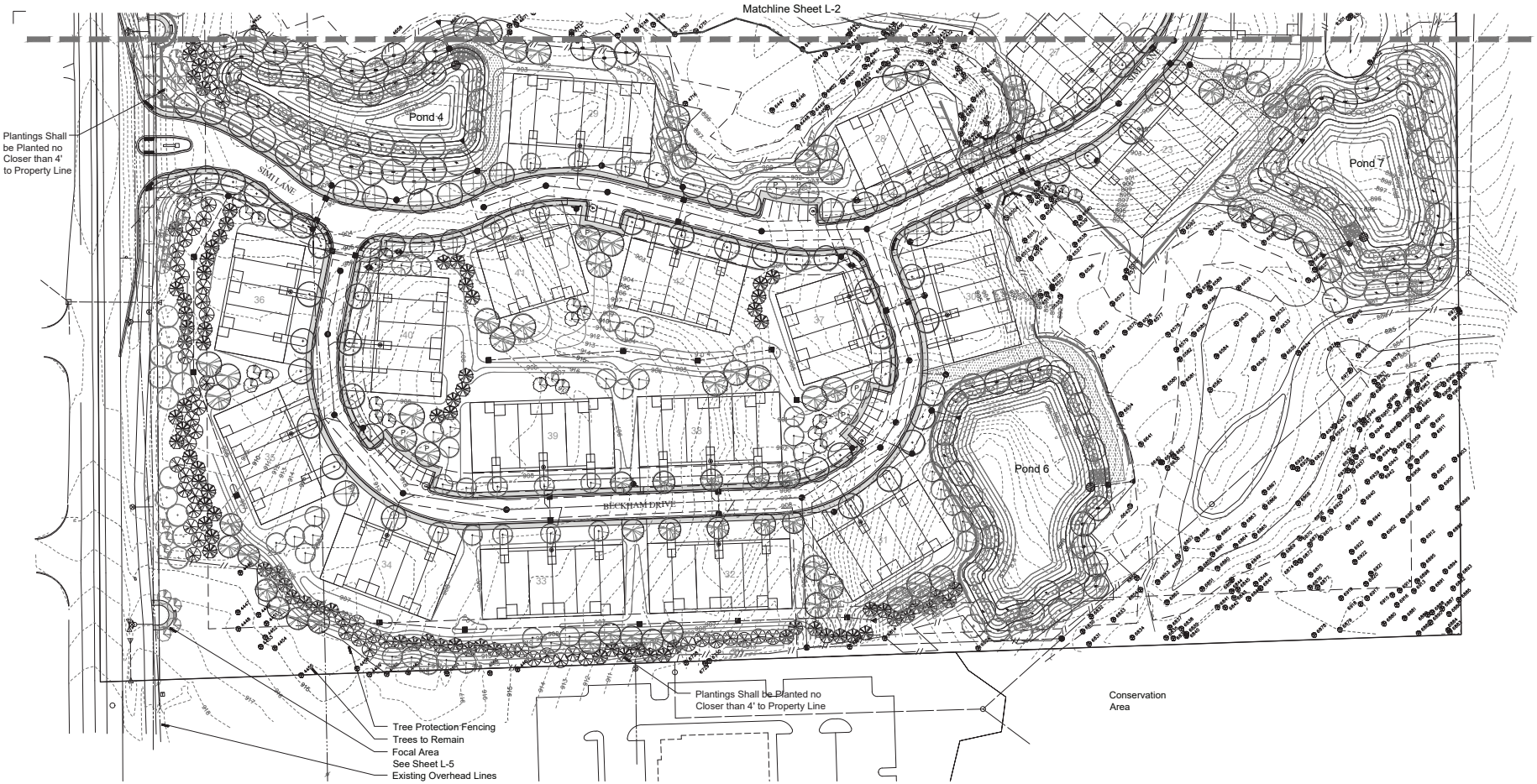

Landscape Key

Street Trees - 75 Trees Provided

Multi-Family Trees - 281 Trees Provided

"P" Parking Lot Landscaping - 7 Trees Provided

Woodland Replacement - 112 Trees Provided

Notes:

- Trees Shall be Planted no Closer than 10' to Sanitary Sewer, Utility Structures Including Hydrants and 5' from Utility Lines. Trees Shall be Planted 4' from Curbs.
- Tree Shall not Be Planted within 4' of Property Lines.
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jca	jca

0' 25' 50'
NORTH
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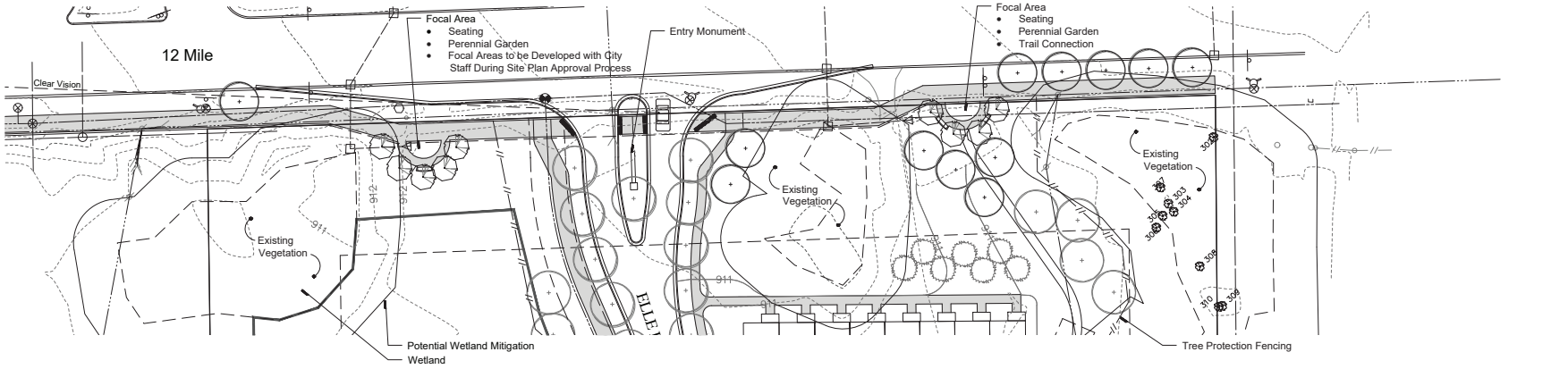
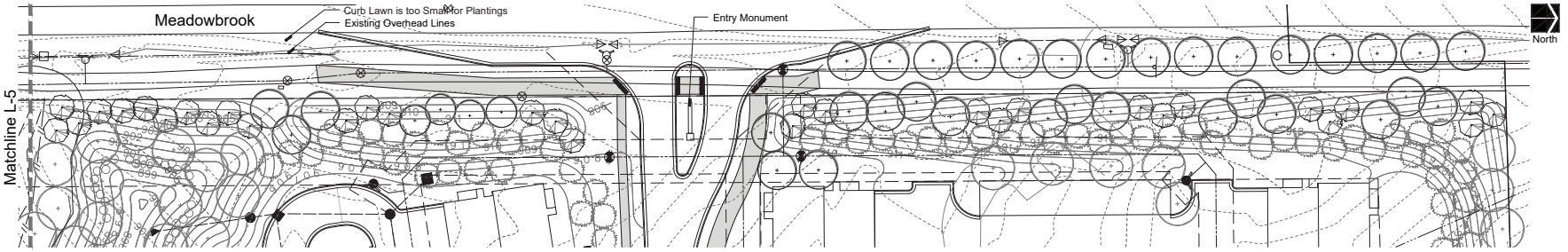
Sheet No.
L-3

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

12 Mile Greenbelt



Meadowbrook North Greenbelt



Landscape Summary - This Sheet

12 Mile Road	
Street Lawn	
Total Street Frontage	577 l.f.
Less Drive Opening	104 l.f.
Net Street Frontage	473 l.f.
Trees Required	13.5 Trees (473 / 35)
Trees Provided	6 Trees (Limited Planting Area Due to Street Lanes)
Greenbelt Plantings	
Total Street Frontage	577 l.f.
Less Preservation Area	290 l.f.
Drive Opening	60 l.f.
Net Street Frontage	227 l.f.
Canopy Trees Required	6 Trees (227 / 35)
Canopy Trees Provided	6 Trees
Sub-Canopy Trees Required	9 Trees (227 / 25)
Sub-Canopy Trees Provided	9 Trees
Meadowbrook Road	
Street Lawn	
Total Street Frontage	850 l.f.
Less Drive Opening	145 l.f.
Net Street Frontage	705 l.f.
Trees Required	20.1 Trees (705 / 35)
Trees Provided	15 Trees - Curb Lawn is too Small
Greenbelt Plantings	
Total Street Frontage	850 l.f.
Drive Opening	60 l.f.
Net Street Frontage	790 l.f.
Canopy Trees Required	22.6 Trees (790 / 35)
Canopy Trees Provided	23 Trees
Sub-Canopy Trees Required	31.6 Trees (790 / 25)
Sub-Canopy Trees Provided	32 Trees

Notes:
- Trees Shall be Planted no Closer than 10' to Sanitary Sewer, Utility Structures Including Hydrants and 5' from Utility Lines. Trees Shall be Planted 4' from Curbs.
- Tree Shall not Be Planted within 4' of Property Lines.
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THE GROVE

Seal:

Title:
Greenbelt and Entry

Project:
The Grove
Novi, Michigan

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248.626.6114

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Revised	July 26, 2024

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21-054

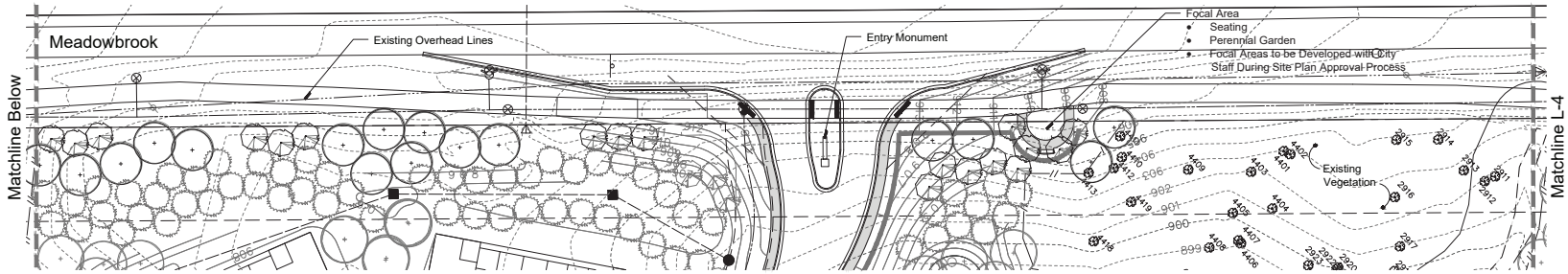
Drawn By:	Checked By:
jca	jca

0' 15' 30'
NORTH
1"=30'

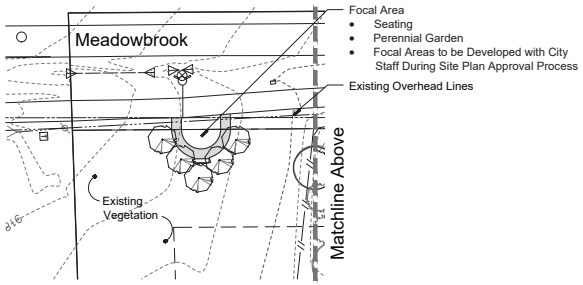
Sheet No.
L-4

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

Meadowbrook South Greenbelt



Meadowbrook South Greenbelt



Landscape Summary - This Sheet

Meadowbrook Road	
Street Lawn	
Total Street Frontage	921 l.f.
Less Drive Opening	104 l.f.
Net Street Frontage	817 l.f.
Trees Required	23.3 Trees (817 / 35)
Trees Provided	0 Trees - Curb Lawn is too Small
Greenbelt Plantings	
Total Street Frontage	921 l.f.
Less Preservation Area	292 l.f.
Drive Opening	60 l.f.
Net Street Frontage	637 l.f.
Canopy Trees Required	16.3 Trees (569 / 35)
Canopy Trees Provided	16 Trees
Sub-Canopy Trees Required	22.8 Trees (569 / 25)
Sub-Canopy Trees Provided	23 Trees

Notes:

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Project:
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21-054

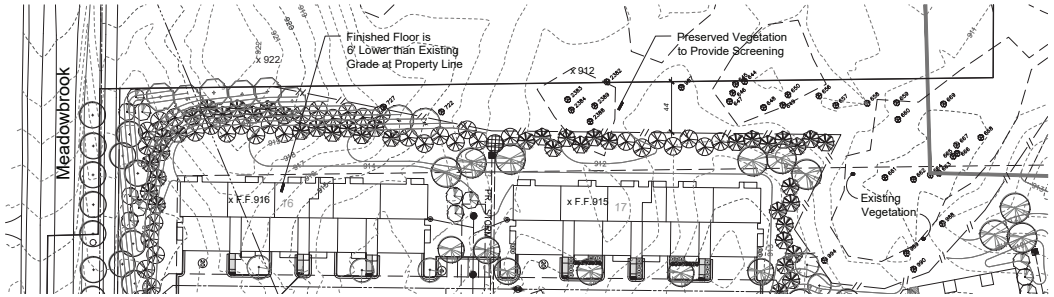
Drawn By:	Checked By:
jca	jca

0' 15' 30'
NORTH
1"=30'

Sheet No.
L-5

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

North Buffer



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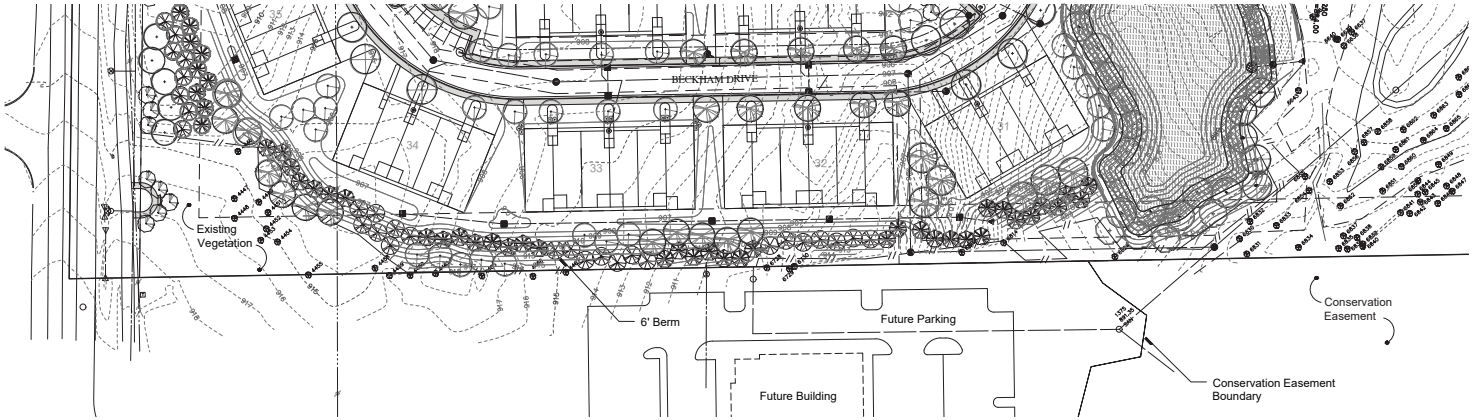
South Buffer



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THE GROVE

Seal:

Title:
Proposed Buffers

Project:
The Grove
Novi, Michigan

Prepared for:
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248.626.6114

Revision:	Issued:
Review	March 28, 2024
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21-054

Drawn By:	Checked By:
jca	jca

0' 25' 50'
NORTH
1"=50'

Sheet No.
L-6

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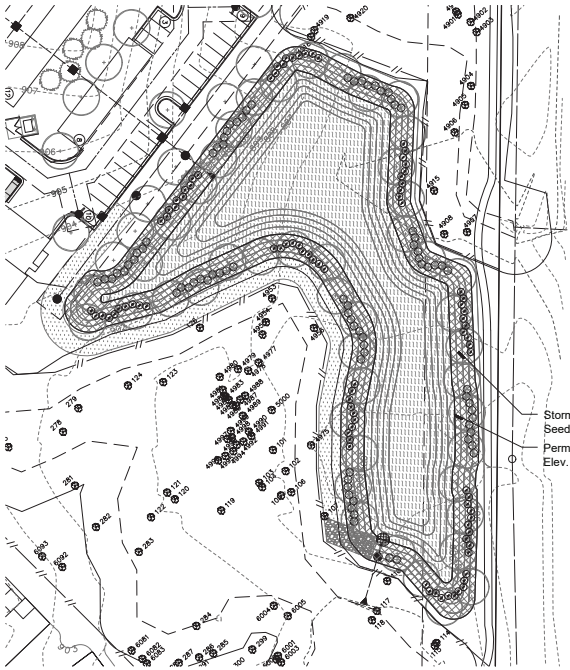
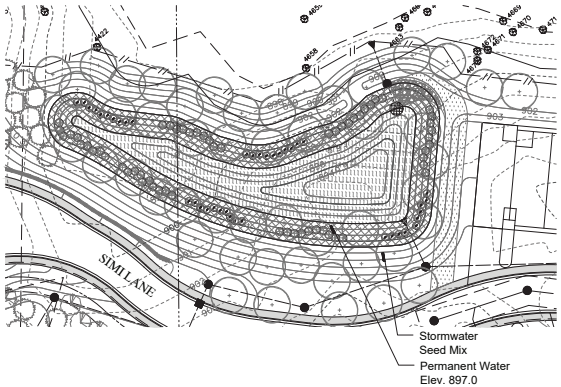
811 Know what's below. Call before you dig.

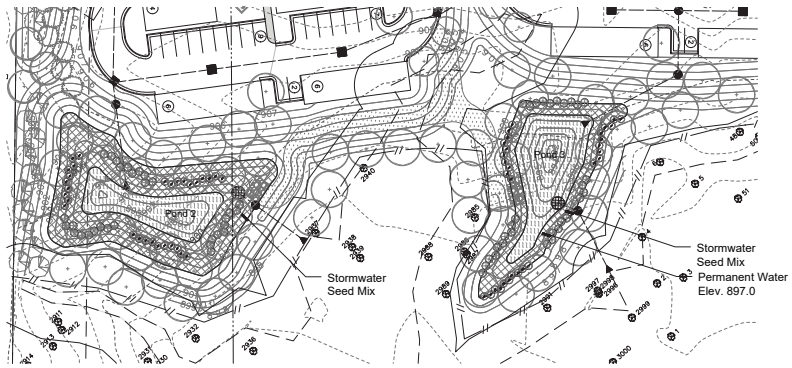
Pond 1



Pond 4



Ponds 2 and 3



Landscape Summary - This Sheet

Pond 1

Detention Pond Plantings	
High-Water Elevation	1,165 l.f.(Elev. 904.4)
Required Planting	816 l.f. (70%)
Planting to be Provided	816 l.f. (70%)
Pond Frontage for Trees	474'
Trees Required	13.5 Trees (474 / 35)
Trees Provided	20 Trees

Pond 2

Detention Pond Plantings	
High-Water Elevation	450 l.f.(Elev. 902.7)
Required Planting	315 l.f. (70%)
Planting to be Provided	336 l.f. (74%)
Pond Frontage for Trees	230'
Trees Required	6.5 Trees (230 / 35)
Trees Provided	9 Trees

Pond 3

Detention Pond Plantings	
High-Water Elevation	390 l.f.(Elev. 900.35)
Required Planting	273 l.f. (70%)
Planting to be Provided	290 l.f. (74%)
Pond Frontage for Trees	230'
Trees Required	6.6 Trees (230 / 35)
Trees Provided	10 Trees

Pond 4

Detention Pond Plantings	
High-Water Elevation	672 l.f.(Elev. 901.35)
Required Planting	470 l.f. (70%)
Planting to be Provided	480 l.f. (71%)
Pond Frontage for Trees	291'
Trees Required	8.3 Trees (291 / 35)
Trees Provided	13 Trees

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jca	jca

0' 10' 20' 40'
NORTH
1"=40'

Sheet No.
L-7

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

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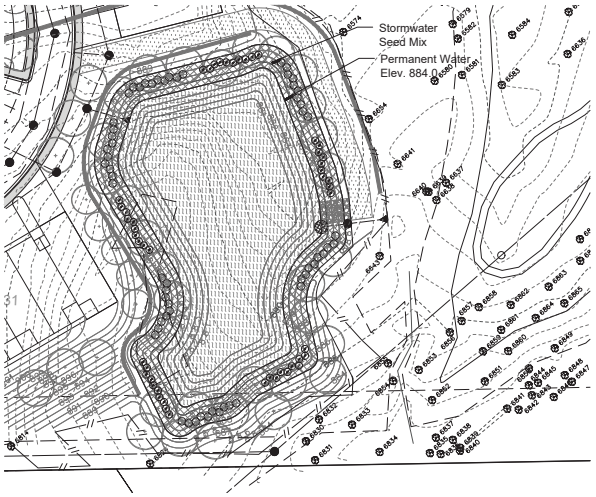
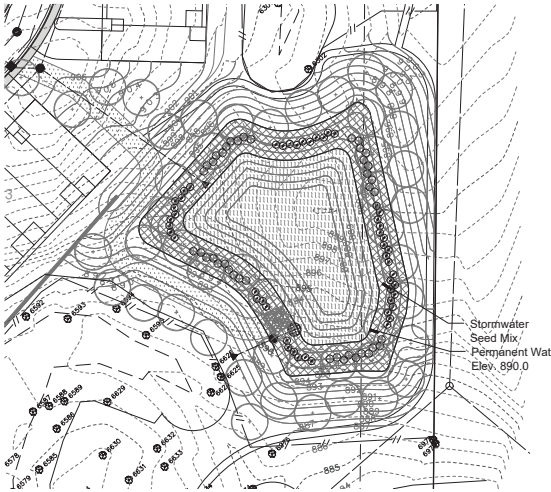
Pond 5

Pond 6



Pond 7



Landscape Summary - This Sheet

Pond 5

Detention Pond Plantings	
High-Water Elevation	748 l.f.(Elev. 901.75)
Required Planting	524 l.f. (70%)
Planting to be Provided	528 l.f. (70%)
Pond Frontage for Trees	428'
Trees Required	12.2 Trees (428 / 35)
Trees Provided	15 Trees

Pond 6

Detention Pond Plantings	
High-Water Elevation	728 l.f.(Elev. 888.25)
Required Planting	510 l.f. (70%)
Planting to be Provided	528 l.f. (73%)
Pond Frontage for Trees	451'
Trees Required	12.9 Trees (451 / 35)
Trees Provided	17 Trees

Pond 7

Detention Pond Plantings	
High-Water Elevation	641 l.f.(Elev. 894.4)
Required Planting	449 l.f. (70%)
Planting to be Provided	470 l.f. (73%)
Pond Frontage for Trees	251'
Trees Required	7.2 Trees (251 / 35)
Trees Provided	9 Trees

Notes:

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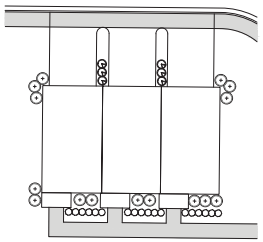
Drawn By:	Checked By:
jca	jca

0' 10' 20' 40'
NORTH
1"=40'

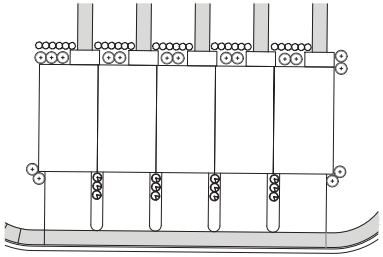
811 Know what's below. Call before you dig.

Sheet No.
L-8

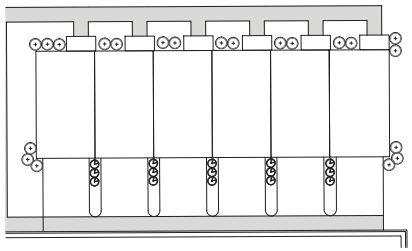
The Vistas - 3 Unit



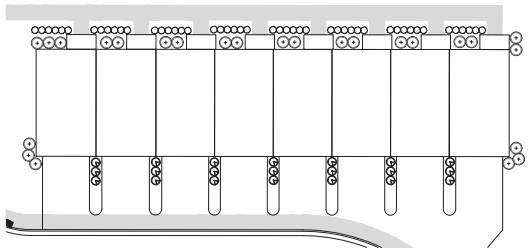
The Vistas - 5 Unit



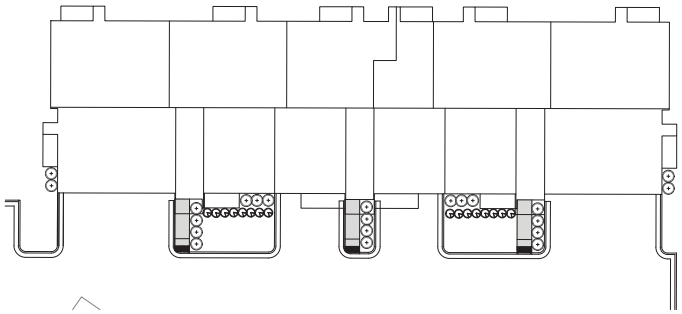
The Vistas - 6 Unit



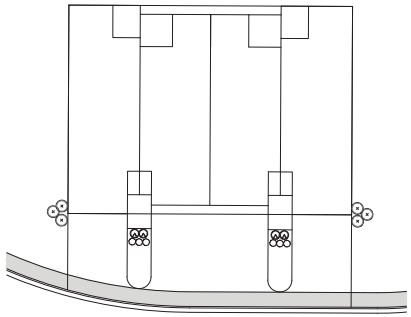
The Vistas - 8 Unit



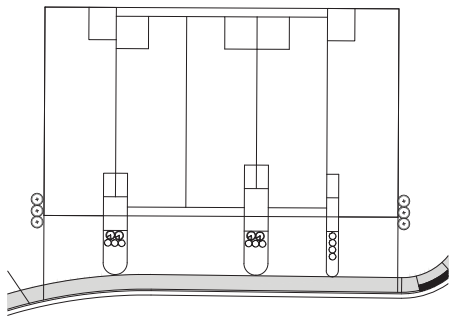
The Meadows



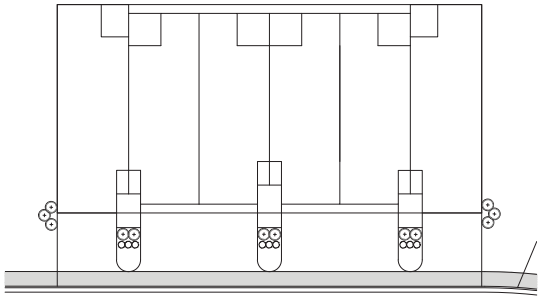
The Woods and Pointe 4 Unit



The Woods and Pointe 5 Unit



The Woods and Pointe 6 Unit



Unit Frontage Summary

Building Type	Building Length	Required Landscape (35%)	Landscape Provided	Waiver Required
The Vistas, 3 Unit	60.4'	21.1'	12.4'	8.7'
The Vistas, 5 Unit	100.4'	35.1'	20.4'	14.7'
The Vistas, 6 Unit	120.4'	42.1'	24.4'	17.7'
The Vistas, 8 Unit	160.4'	56.1'	32.4'	23.7'
The Meadows	206'	72.1'	65.4'	6.7'
The Woods and Pointe, 4 Unit	96.7'	33.8'	16.3'	17.5'
The Woods and Pointe, 5 Unit	120.7'	42.2'	20.3'	21.9'
The Woods and Pointe, 6 Unit	144.7'	50.6'	24.5'	26.1'

Notes:

- Trees Shall be Planted no Closer than 10' to Sanitary Sewer, Utility Structures Including Hydrants and 5' from Utility Lines. Trees Shall be Planted 4' from Curbs.
- Tree Shall not Be Planted within 4' of Property Lines.
- Snow Shall be Deposited Adjacent to Drives and within the Curb Lawn. Any Damaged Trees Shall be Replaced as Needed. If Walks are Adjacent to the Street, Snow will be Stored in Nearby Islands or Lawn Areas.

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Northville, Michigan 48167
e. jca@wideopenwest.com
t. 248.467.4668

THE GROVE

Seal:

Title:

Unit Typicals

Project:

The Grove
Novi, Michigan

Prepared for:

Ivanhoe Companies
6689 Orchard Lake Road, Suite 314
West Bloomfield, Michigan 48322
248.626.6114

Revision:	Issued:
Review	March 28, 2024
Revised	July 26, 2024

Job Number:

21-054

Drawn By: jca

Checked By: jca

0' 10' 20' 40'

1"=40'

Sheet No.

L-9

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

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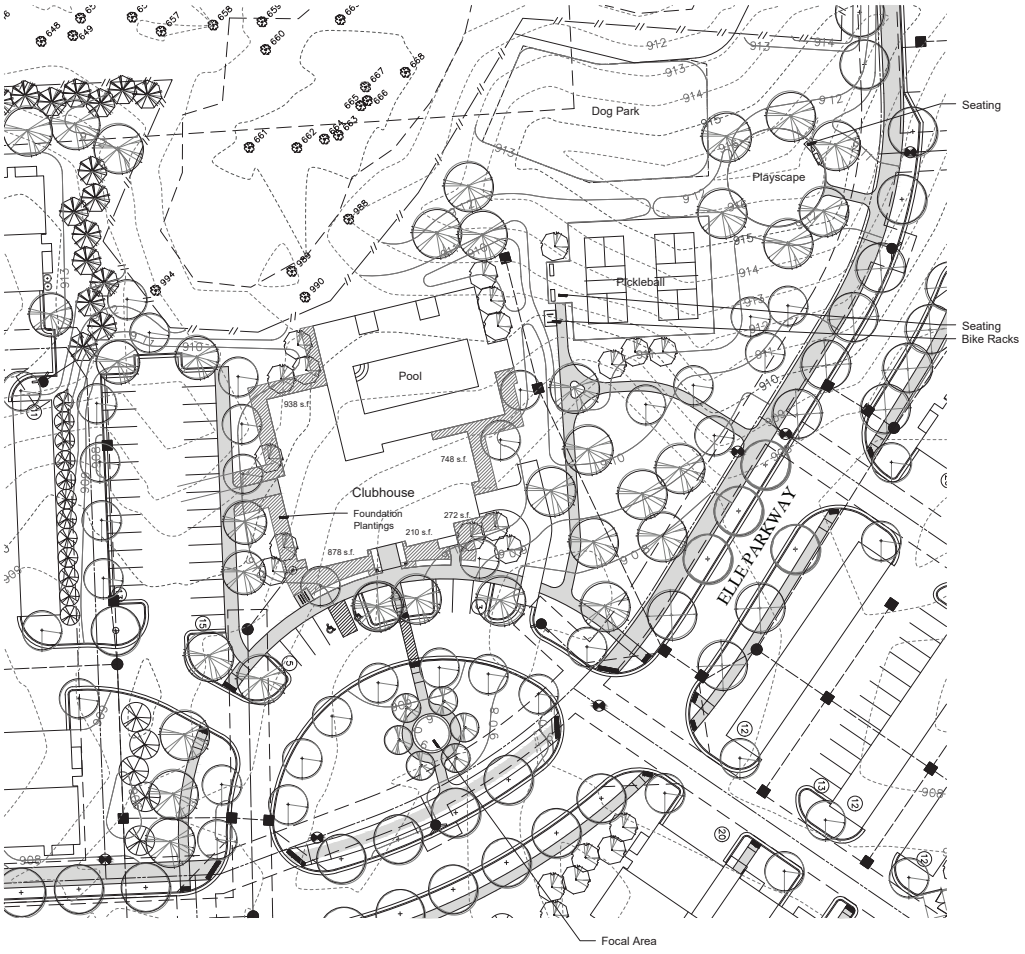

Landscape Summary

Foundation Landscaping	
Building Perimeter	393 l.f.
Less Doors	33 l.f.
Net Perimeter	360 l.f.
Landscape Area Required	2,880 s.f. (360 x 8)
Landscape Area Provided	3,046 s.f.

Notes:

- Trees Shall be Planted no Closer than 10' to Sanitary Sewer, Utility Structures Including Hydrants and 5' from Utility Lines. Trees Shall be Planted 4' from Curbs.
- Tree Shall not Be Planted within 4' of Property Lines.
- Snow Shall be Deposited Adjacent to Drives and within the Curb Lawn. Any Damaged Trees Shall be Replaced as Needed. If Walks are Adjacent to the Street, Snow will be Stored in Nearby Islands or Lawn Areas.

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THE GROVE

Seal:

Title:

Clubhouse Plan

Project:

The Grove
Novi, Michigan

Prepared for:

Ivanhoe Companies
6689 Orchard Lake Road, Suite 314
West Bloomfield, Michigan 48322
248.626.6114

Revision:	Issued:
Review	March 28, 2024
Revised	July 26, 2024

Job Number:

21-054

Drawn By:	Checked By:
jca	jca

0' 15' 30'

NORTH
1"=30'

Sheet No.

L-10

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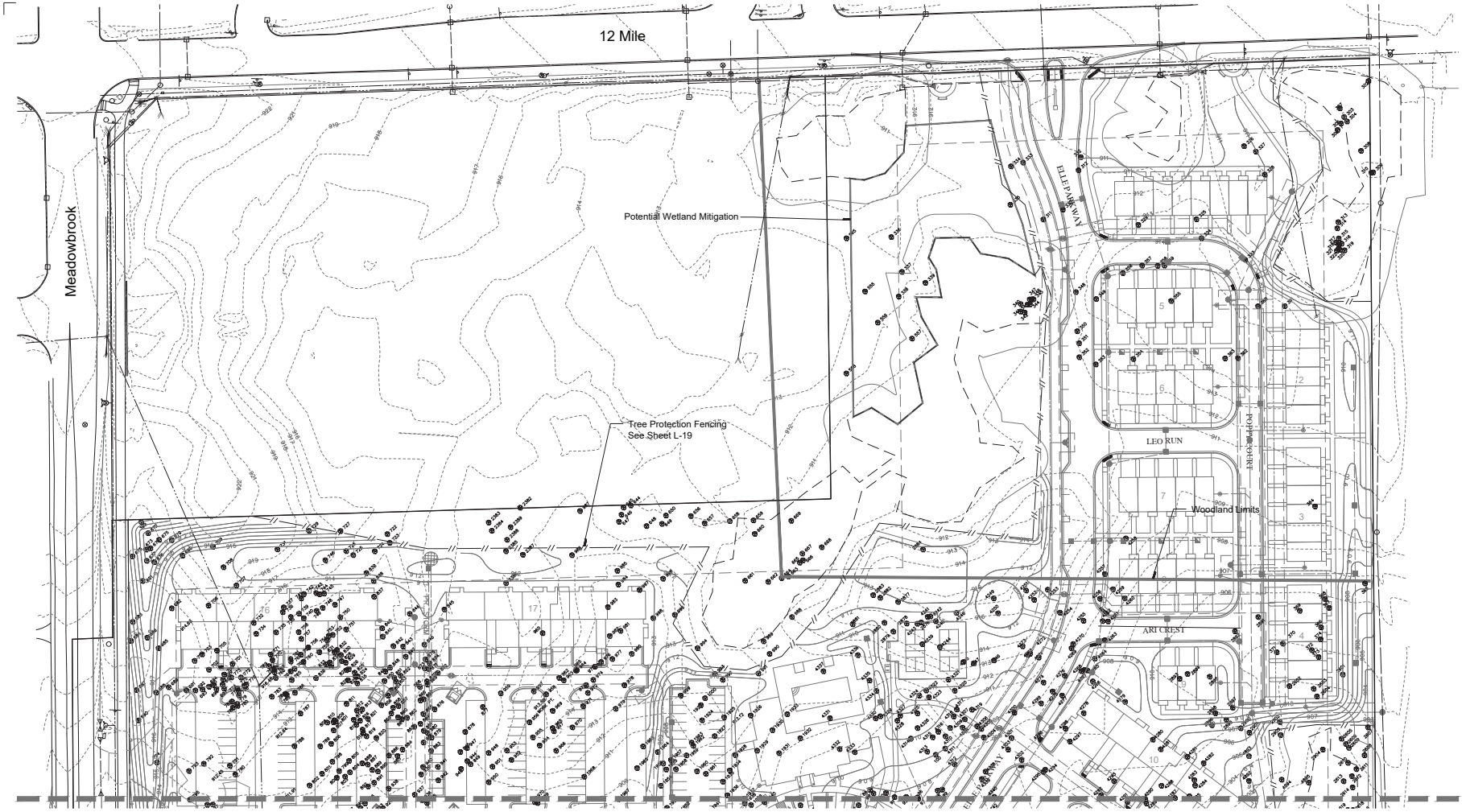

Key

Bold Trees to be Removed

See Sheet L-15 - L-19 for Tree List

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THE GROVE

Seal:

Title:
Woodland Plan

Project:
The Grove
Novi, Michigan

Prepared for:
Ivanhoe Companies
6689 Orchard Lake Road, Suite 314
West Bloomfield, Michigan 48322
248.626.6114

Revision:	Issued:
Review	March 28, 2024
Revised	July 26, 2024

Job Number:
21-054

Drawn By:	Checked By:
jca	jca

0' 25' 50'
NORTH
1"=50'

Sheet No.
L-12

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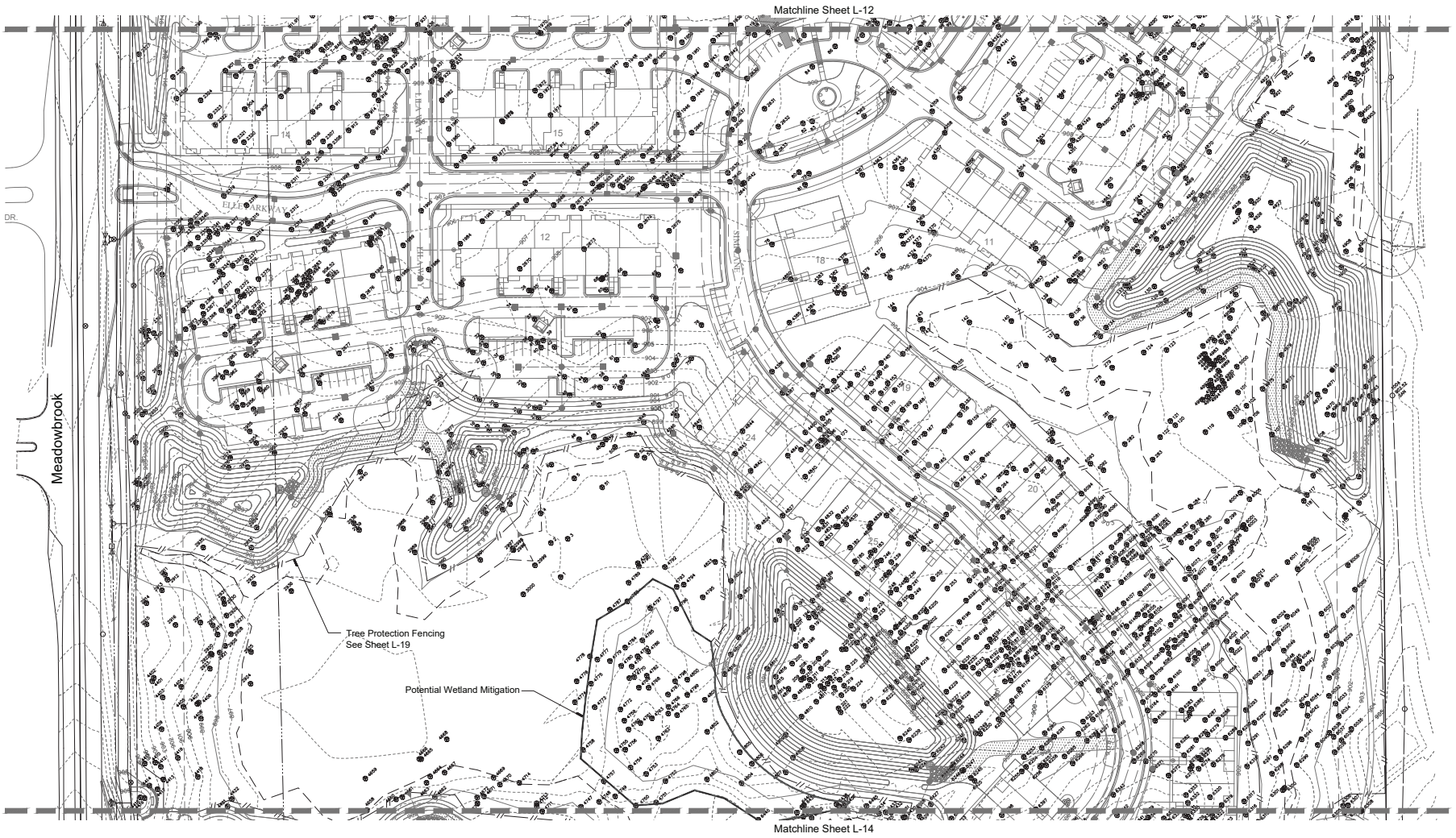

Key

Bold Trees to be Removed

See Sheet L-15 - L-19 for Tree List

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THE GROVE

Seal:

Title:

Woodland Plan

Project:

The Grove
Novi, Michigan

Prepared for:

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West Bloomfield, Michigan 48322
248.626.6114

Revision:	Issued:
Review	March 28, 2024
Revised	July 26, 2024

Job Number:

21-054

Drawn By:	Checked By:
jca	jca

0' 25' 50'

NORTH
1"=50'

Sheet No.

L-13

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

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Key

Bold Trees to be Removed

See Sheet L-15 - L-19 for Tree List

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THE GROVE

Seal:

Title:

Woodland Plan

Project:

The Grove
Novi, Michigan

Prepared for:

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West Bloomfield, Michigan 48322
248.626.6114

Revision:	Issued:
Review	March 28, 2024
Revised	July 26, 2024

Job Number:

21-054

Drawn By:	Checked By:
jca	jca

0' 25' 50'

NORTH
1"=50'

Sheet No.

L-14

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

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Tree List

Tag	Scientific Name	Common Name	Dia.	Condition	Status	Required Replacement	Multi-Stem Replacement	Potential Mitigation

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t. 248.467.4668

THE GROVE

Seal:

Title:

Tree List

Project:

The Grove
Novi, Michigan

Prepared for:

Ivanhoe Companies
6689 Orchard Lake Road, Suite 314
West Bloomfield, Michigan 48322
248.626.6114

Revision:	Issued:
Review	March 28, 2024
Revised	July 26, 2024

Job Number:

21-054

Drawn By:	Checked By:
jca	jca

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Sheet No.

L-15

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Tree List

Tag	Scientific Name	Common Name	Dia.	Condition	Status	Required Replacement	Multi-Stem Replacement	Potential Mitigation

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557 Carpenter
Northville, Michigan 48167
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t. 248.467.4668

THE GROVE

Seal:

Title:

Tree List

Project:

The Grove
Novi, Michigan

Prepared for:

Ivanhoe Companies
6689 Orchard Lake Road, Suite 314
West Bloomfield, Michigan 48322
248.626.6114

Revision:	Issued:
Review	March 28, 2024
Revised	July 26, 2024

Job Number:

21-054

Drawn By:	Checked By:
jca	jca

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Sheet No.

L-16

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Tree List

Tag	Scientific Name	Common Name	Dia.	Condition	Status	Required Replacement	Multi-Stem Replacement	Potential Mitigation

Tag	Scientific Name	Common Name	Dia.	Condition	Status	Required Replacement	Multi-Stem Replacement	Potential Mitigation

Tag	Scientific Name	Common Name	Dia.	Condition	Status	Required Replacement	Multi-Stem Replacement	Potential Mitigation

Tag	Scientific Name	Common Name	Dia.	Condition	Status	Required Replacement	Multi-Stem Replacement	Potential Mitigation

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THE GROVE

Seal:

Title:
Tree List

Project:
The Grove
Novi, Michigan

Prepared for:
Ivanhoe Companies
6689 Orchard Lake Road, Suite 314
West Bloomfield, Michigan 48322
248.626.6114

Revision:	Issued:
Review	March 28, 2024
Revised	July 26, 2024

Job Number:
21-054

Drawn By:	Checked By:
jca	jca

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Sheet No.
L-17

Tree List

Tag	Scientific Name	Common Name	Dia.	Condition	Status	Required Replacement	Multi-Stem Replacement	Potential Mitigation

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THE GROVE

Seal:

Title:

Tree List

Project:

The Grove
Novi, Michigan

Prepared for:

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West Bloomfield, Michigan 48322
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Revision:	Issued:
Review	March 28, 2024
Revised	July 26, 2024

Job Number:

21-054

Drawn By:	Checked By:
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Sheet No.

L-18

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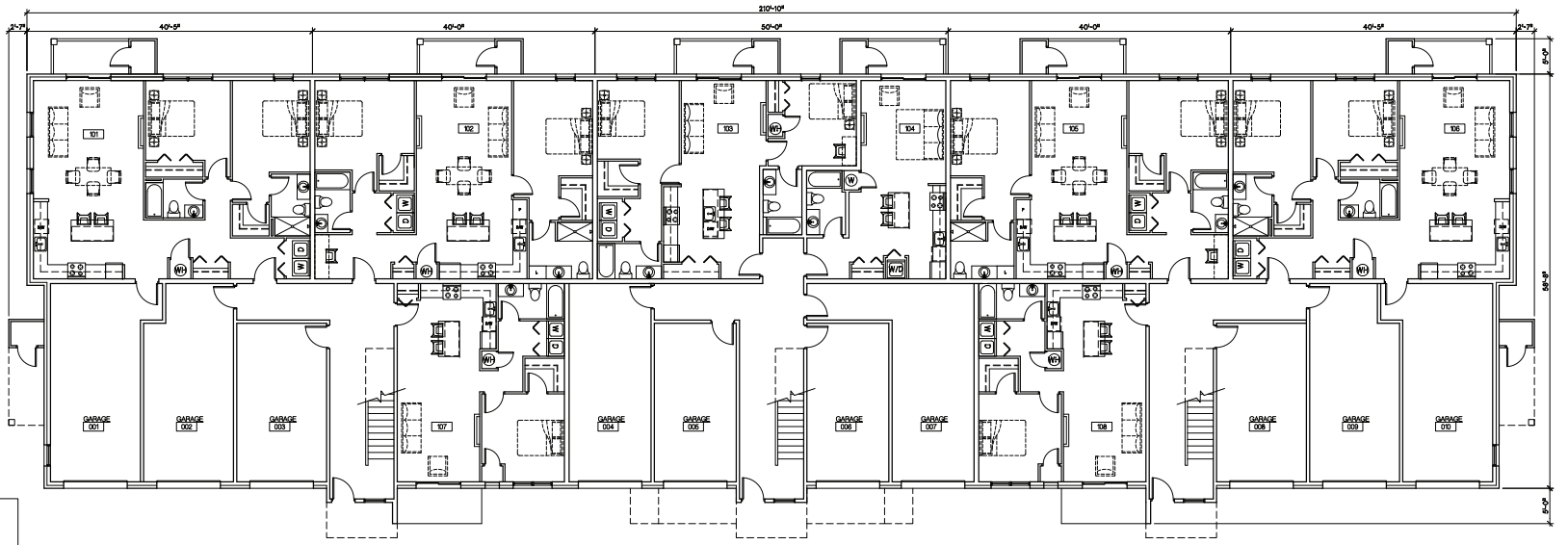
Tree List

Tag	Scientific Name	Common Name	Dia.	Condition	Status	Required Replacement	Multi-Stem Replacement	Potential Mitigation
1	Acer saccharum	Sugar Maple	12	Good	Save			
2	Acer saccharum	Sugar Maple	12	Good	Save			
3	Acer saccharum	Sugar Maple	12	Good	Save			



NOTE: BIKE RACK TO BE INSTALLED IN EACH ATTACHED GARAGE.

SIX (6) TYPE A ACCESSIBLE UNITS TO BE PROVIDED THROUGHOUT THE MEADOW SITE. SPECIFIC LOCATIONS TO BE DETERMINED. EACH ACCESSIBLE UNIT TO BE SERVED BY AN ACCESSIBLE PARKING SPACE, CARPORT, OR GARAGE.

A4 / A-100 **FIRST FLOOR PLAN**
SCALE - 1/8" = 1'-0"

UNIT SUMMARY

1 BEDROOM	10
2 BEDROOM	19
STUDIO	3
UNITS PER BLDG.	32
BEDROOM PER BLDG.	51

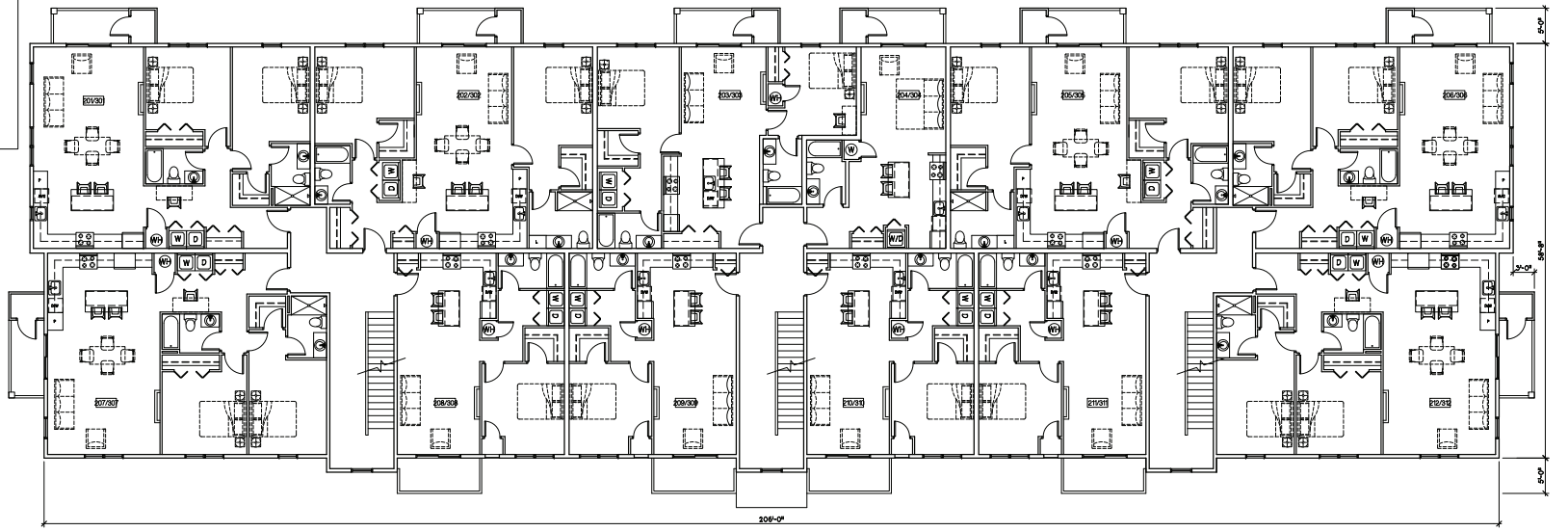
ALTERNATE PLAN

THREE BEDROOM UNITS IN PLACE OF ONE BEDROOM AND TWO BEDROOM AT 103/104, 203/204, AND 303/304. SEE SHEET A-101

SITE PLAN

(8 BUILDINGS)

256 UNITS
408 BEDROOMS



A1 / A-100 **SECOND AND THIRD FLOOR PLAN**
SCALE - 1/8" = 1'-0"

Sheet Size - 24x36

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SUBMITTAL	07/26/2024
REVISION	06/28/2024
REVISION	02/19/2024
REVIEW	02/13/2024

DATE ISSUED

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100 N. State St.
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P.734.663.4189

THE GROVE
NOVI, MI

PROJECT

CONSULTANT

THE MEADOWS RESIDENCE FLATS FLOOR PLANS

SHEET TITLE

23-804

PROJECT NUMBER

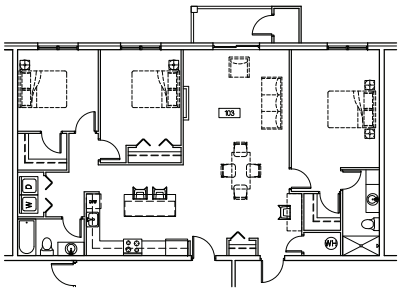
A-100

SHEET NUMBER

Drawing: P:\2023\23804\Dwg\SD\PP\PH1\A-100.dwg
Dates: Jul 31, 2024 - 11:16am Layout: A-100 Plotted by: esnave

THE GROVE RESIDENCE FLATS UNIT TYPES				
UNIT TYPE	NO. OF BEDROOMS	NET SQUARE FEET	UNIT NUMBERS	UNIT PER BUILDING
TYPE A	2 BR END UNIT	1089 SQFT + 372 SQFT GARAGE	101, 106	2
TYPE B	2 BEDROOM	1089 SQFT	102, 105	2
TYPE C	2 BEDROOM	861 SQFT	103, 203, 303	3
TYPE D	STUDIO	458 SQFT	104, 204, 304	3
TYPE E	1 BEDROOM	658 SQFT	107, 108, 201, 206, 208, 209, 210, 211, 301, 306, 308, 309, 310, 311	10
TYPE F	2 BR END UNIT	1,080 SQFT	104, 204, 304	4
TYPE G	2 BEDROOM	1,080 SQFT	202, 205, 302, 305	4
TYPE H	2 BR END UNIT	1,056 SQFT	207, 212, 301, 312	4
			TOTAL UNITS PER BUILDING	32
			8 BUILDINGS UNIT TOTAL	256
			BEDROOMS TOTAL	408

SEE SHEET A-100 FOR UNIT LOCATIONS



ALTERNATE UNIT FLOOR PLAN

SCALE - 1/8" = 1'-0"

SEE SHEET A-100 FOR UNIT LOCATIONS.

Sheet Size - 24x36

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SUBMITTAL 07/26/2024
REVISION 06/28/2024
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Ann Arbor, MI 48104
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THE GROVE
NOVI, MI

PROJECT

CONSULTANT

THE MEADOWS RESIDENCE FLATS FLOOR PLANS

SHEET TITLE

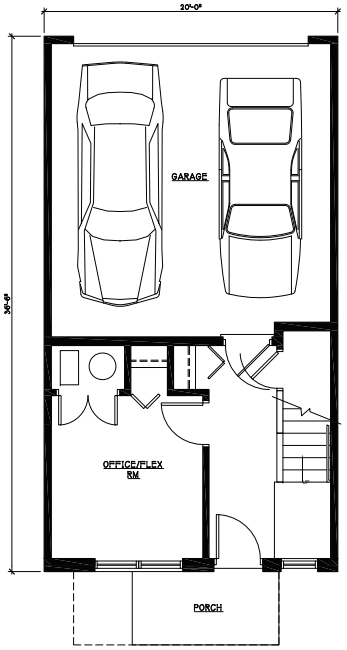
23-804

PROJECT NUMBER

A-101

SHEET NUMBER

Drawing: P:\2023\23804\Dwg\SD\WIP\PH1(1).dwg
Date: Jul 26, 2024, 4:12pm Layout: A-101 Plotted by: steveee



E1 A-102

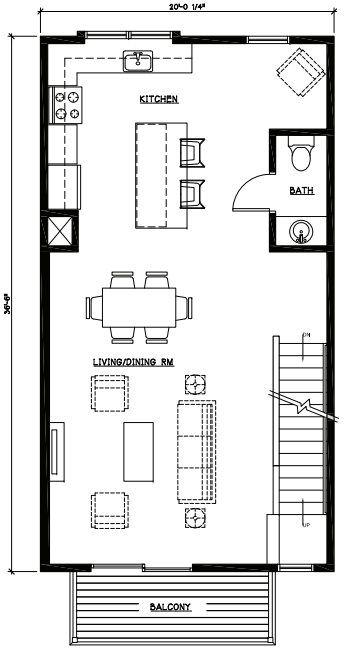
THE VISTAS TOWNHOMES - FIRST FLOOR PLAN

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

FILENAME: NFDWG01

1,905 GSF
1,525 NSF

NOTE: BIKE RACK TO BE INSTALLED IN EACH GARAGE

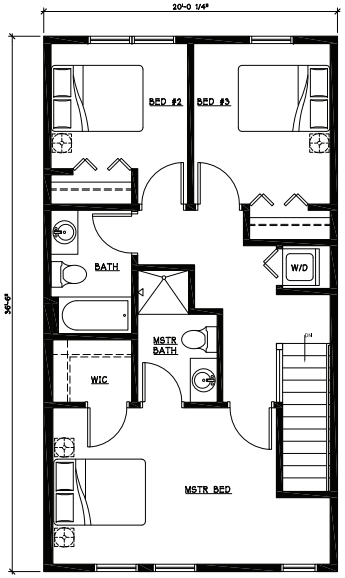


C1 A-102

THE VISTAS TOWNHOMES - SECOND FLOOR PLAN

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

FILENAME: NFDWG01



A1 A-102

THE VISTAS TOWNHOMES - THIRD FLOOR PLAN

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

FILENAME: NFDWG01

Sheet Size - 24x36

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THE GROVE
NOVI, MI

PROJECT

CONSULTANT

THE VISTAS
FLOOR PLANS

SHEET TITLE

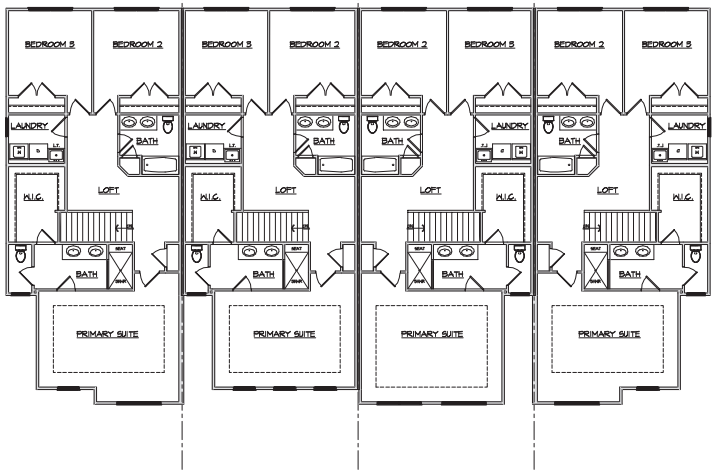
23-804

PROJECT NUMBER

A-102

SHEET NUMBER

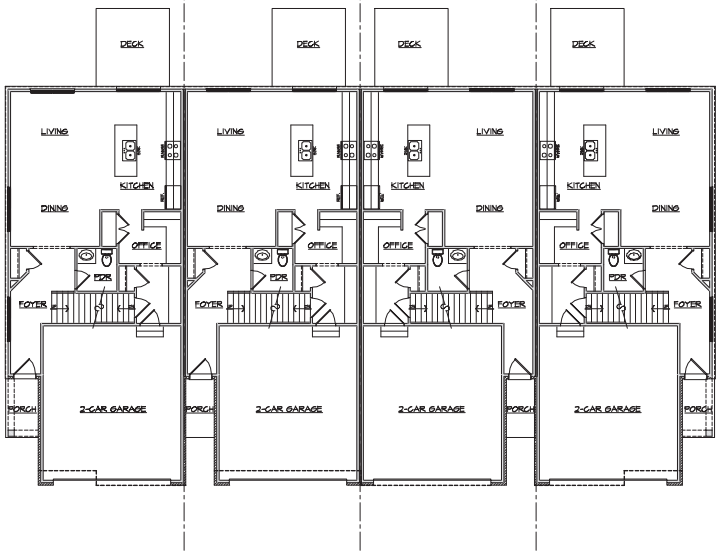
Drawing: P:\2023\23804\Dwg\SD\WFP\FH\102.dwg
Date: Jul 26, 2024, 4:12pm Layout: A-102 Plotted by: steveeb



4-PLEX SECOND FLOOR PLAN

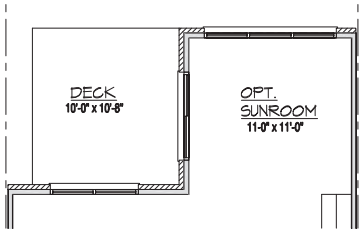
SCALE: 1/8" = 1'-0"

NOTE:
DOOR AND UNIT ORIENTATION ARE SUBJECT TO CHANGE BASED ON GRADING AND LANDSCAPE REQUIRED



4-PLEX FIRST FLOOR PLAN

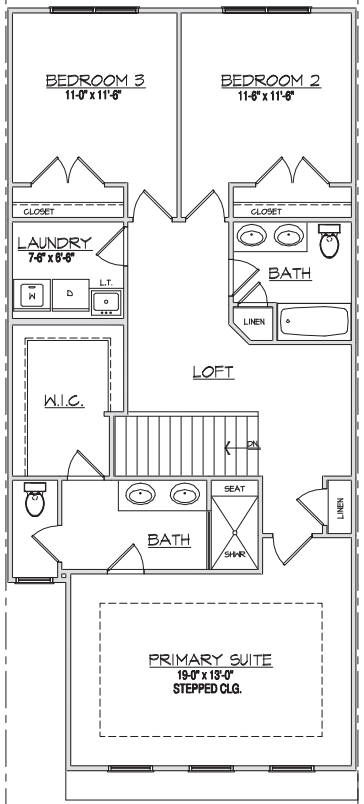
SCALE: 1/8" = 1'-0"



UNIT - OPTIONAL SUNROOM

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

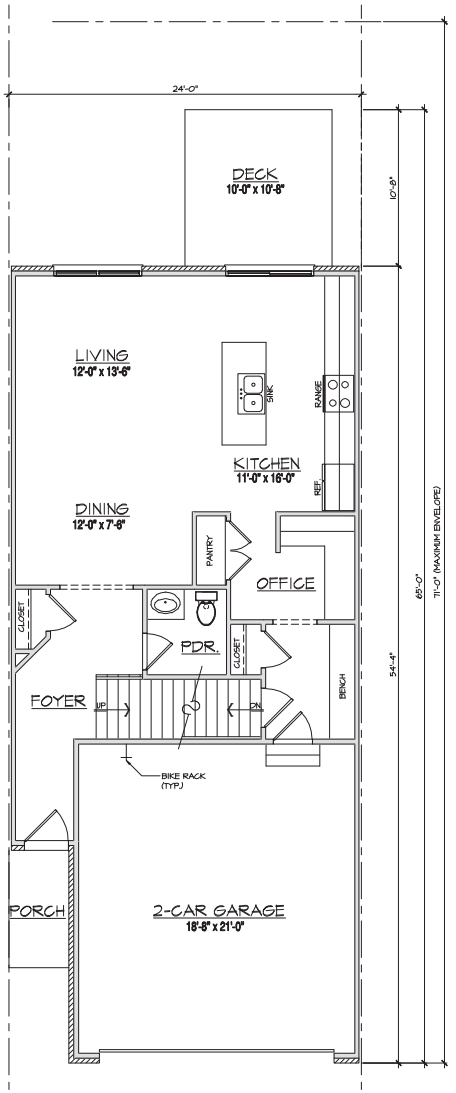
SQUARE FOOTAGE
1ST FLOOR = 816 SQUARE FEET
2ND FLOOR = 1142 SQUARE FEET
TOTAL = 1958 SQUARE FEET
OPT. SUN ROOM = 130 SQUARE FEET



UNIT - SECOND FLOOR PLAN

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

NOTE:
11'-0" DEEP BUILDING ENVELOPE TO ALLOW FLEXIBILITY FOR UNIT OPTIONS AND FUTURE PLAN DESIGN VARIATIONS.



UNIT - FIRST FLOOR PLAN

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

Ivanhoe Companies
The Grove - Novi, Michigan
The Woods and The Pointe

"THE" RESIDENTIAL DESIGN GROUP
6201 Adams Road, Suite 202 | Bloomfield Hills, MI 48304
(Office) 248-792-3388 | (Fax) 248-792-3389 | www.TR-DesignGroup.com

Drwn: B.H. | Chkd: J.R.

Review Set: 07/26/24 | Permit Set:
Final Set: NOT FOR CONSTRUCTION
Revisions:

23073
Job Number

A-103
Sheet

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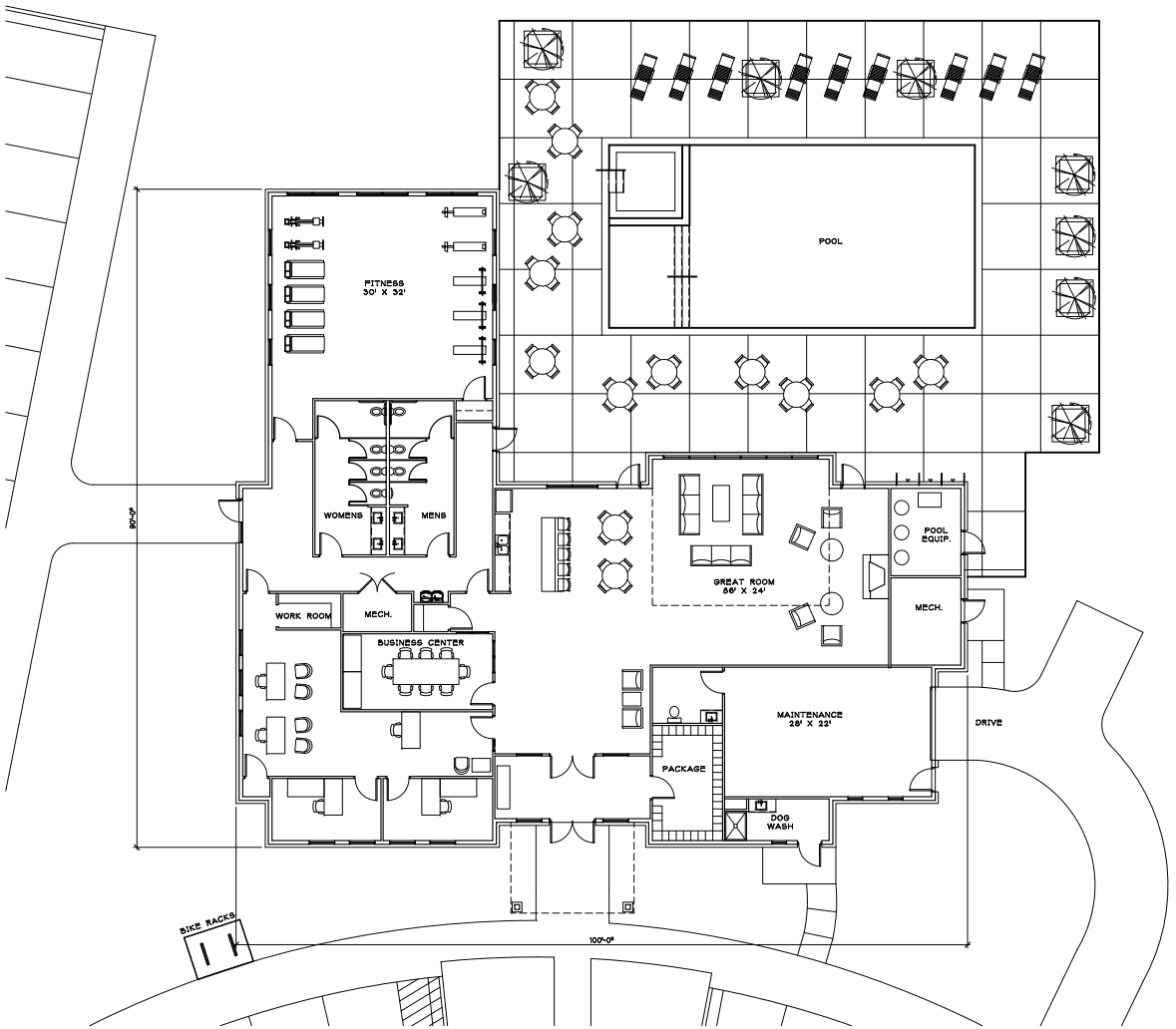

NORTH

CLUBHOUSE FLOOR PLAN

SCALE - 1/8 = 1'-0"

Sheet Size - 24x36

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DRAWN BY

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THE GROVE
NOVI, MI

PROJECT

CONSULTANT

CLUBHOUSE FLOOR PLAN

SHEET TITLE

23-804

PROJECT NUMBER

A-104

SHEET NUMBER

Drawing: P:\2023\23-804\Dwg\SD\WIP\PSH\ (04.dwg
Date: Jul 26, 2024 - 4:13pm Layout: A-104 Plotted by: steveee

G4 THE VISTAS TOWNHOMES LEFT ELEVATION
SCALE - 1/8" = 1'-0"

ELEVATION MATERIAL QUANTITY:	
±24%	BRICK
±60%	LUXURY VINYL SIDING

B4 THE VISTAS TOWNHOMES REAR ELEVATION
SCALE - 1/8" = 1'-0"

ELEVATION MATERIAL QUANTITY:	
±17%	BRICK
±54%	LUXURY VINYL SIDING
±8%	FAUX WOOD SIDING

G2 THE VISTAS TOWNHOMES RIGHT ELEVATION
SCALE - 1/8" = 1'-0"

ELEVATION MATERIAL QUANTITY:	
±24%	BRICK
±60%	LUXURY VINYL SIDING

B2 THE VISTAS TOWNHOMES FRONT ELEVATION
SCALE - 1/8" = 1'-0"

ELEVATION MATERIAL QUANTITY:	
±24%	BRICK
±54%	LUXURY VINYL SIDING
±8%	FAUX WOOD SIDING

NOTE: ALL RENDERINGS AND ELEVATIONS ARE ARTISTIC IN NATURE AND SUBJECT TO CHANGE - REFER TO CIVIL AND LANDSCAPE PLANS FOR BUILDING LAYOUT. MATERIAL COLORS ARE REPRESENTATIONAL OF MANUFACTURED PRODUCTS.

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SUBMITTAL 7/26/2024
BUILDING ELEVATIONS 7/1/2024
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Ann Arbor, MI 48104
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THE GROVE
NOVI, MI.
PROJECT

CONSULTANT

THE VISTAS BUILDING ELEVATIONS
SHEET TITLE

23-804
PROJECT NUMBER

A-200
SHEET NUMBER

Drawing: P:\2023\23804\Design\Sheets\23804_Oct-12_elevation2024_7726 THE GROVE - BUILDING ELEVATIONS.dwg
Date: Jul 25, 2024 - 2:11 pm Layout: A-200 Plotted by: jstolen

B4 - FLOOR1 **RESIDENCE FLATS REAR ELEVATION**

SCALE - 1/8" = 1'-0"

ELEVATION MATERIAL QUANTITY:	
±12%	BRICK
±43%	LUXURY VINYL SIDING

NOTE: ALL RENDERINGS AND ELEVATIONS ARE ARTISTIC IN NATURE AND SUBJECT TO CHANGE - REFER TO CIVIL AND LANDSCAPE PLANS FOR BUILDING LAYOUT. MATERIAL COLORS ARE REPRESENTATIONAL OF MANUFACTURED PRODUCTS.

B1 - FLOOR1 **RESIDENCE FLATS FRONT ELEVATION**

SCALE - 1/8" = 1'-0"

ELEVATION MATERIAL QUANTITY:	
±16%	BRICK
±57%	LUXURY VINYL SIDING

Sheet Size - 24x36

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BUILDING ELEVATIONS	7/1/2024

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THE GROVE
NOVI MI

PROJECT

CONSULTANT

THE MEADOWS BUILDING ELEVATIONS

SHEET TITLE

23-804

PROJECT NUMBER

A-201

SHEET NUMBER

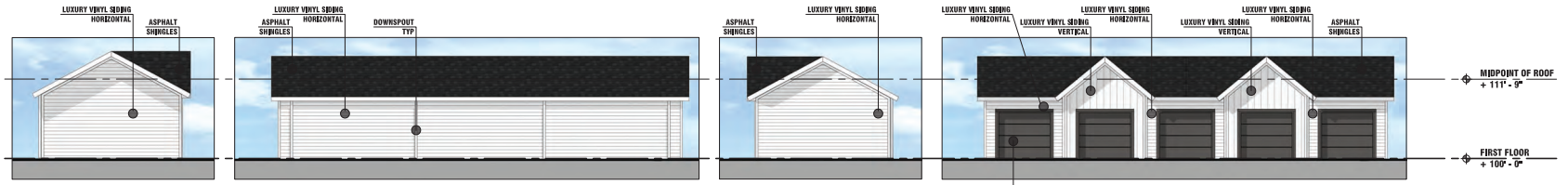
Drawing: P:\2023\23804\Design\Sheets\a201x24_06-12_elevation2024_7726 THE GROVE - BUILDING ELEVATIONS.dwg
Date: Jul 25, 2024 - 21:19pm Layout: A-201 Plotted by: jstolen

F4 RESIDENCE FLATS RIGHT ELEVATION
SCALE - 1/8" = 1'-0"

ELEVATION MATERIAL QUANTITY:	
±25%	BRICK
±58%	LUXURY VINYL SIDING

B4 RESIDENCE FLATS LEFT ELEVATION
SCALE - 1/8" = 1'-0"

ELEVATION MATERIAL QUANTITY:	
±25	BRICK
±58	LUXURY VINYL SIDING



H2 LEFT ELEVATION
SCALE - 1/8" = 1'-0"

ELEVATION MATERIAL QUANTITY:	
100%	LUXURY VINYL SIDING

F2 REAR ELEVATION
SCALE - 1/8" = 1'-0"

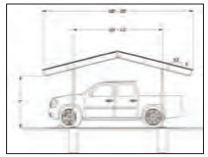
ELEVATION MATERIAL QUANTITY:	
100%	LUXURY VINYL SIDING

E2 RIGHT ELEVATION
SCALE - 1/8" = 1'-0"

ELEVATION MATERIAL QUANTITY:	
100%	LUXURY VINYL SIDING

B2 GARAGE FRONT ELEVATION
SCALE - 1/8" = 1'-0"

ELEVATION MATERIAL QUANTITY:	
±52%	LUXURY VINYL SIDING



E1 CARPORT ELEVATION
SCALE - 1/8" = 1'-0"

C1 3D CARPORT DIAGRAM
SCALE - NOT TO SCALE

NOTE: ALL RENDERINGS AND ELEVATIONS ARE ARTISTIC IN NATURE AND SUBJECT TO CHANGE - REFER TO CIVIL AND LANDSCAPE PLANS FOR BUILDING LAYOUT. MATERIAL COLORS ARE REPRESENTATIONAL OF MANUFACTURED PRODUCTS.

Sheet Size - 24x36

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SUBMITTAL	7/26/2024
BUILDING ELEVATIONS	7/1/2024

DATE ISSUED

DRAWN BY

CHECKED BY

HOBBS + BLACK ARCHITECTS
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Ann Arbor, MI 48104
P.734.663.4189

THE GROVE
NOVI, MI

PROJECT

CONSULTANT

THE MEADOWS BUILDING ELEVATIONS

SHEET TITLE

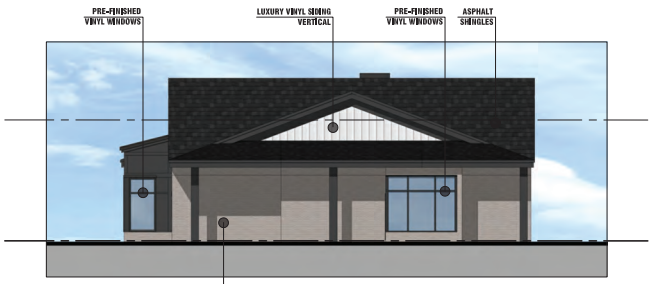
23-804

PROJECT NUMBER

A-202

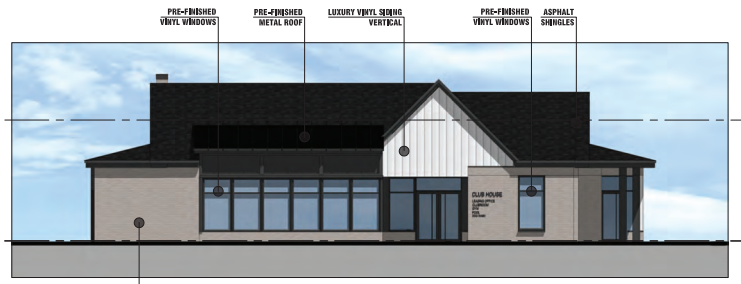
SHEET NUMBER

Drawing: P:\2023\23804\Design\Sht Iss\2024_Oct-12 elevation\2024_0726 THE GROVE - BUILDING ELEVATIONS.dwg
Date: Jul 25, 2024, 2:20pm Layout: A-202 Plotted by: jstolen



F4 - CLUBHOUSE RIGHT ELEVATION
SCALE - 1/8" = 1'-0"
FILENAME

ELEVATION MATERIAL QUANTITY:	
±61% SF	BRICK
±8% SF	LUXURY VINYL SIDING

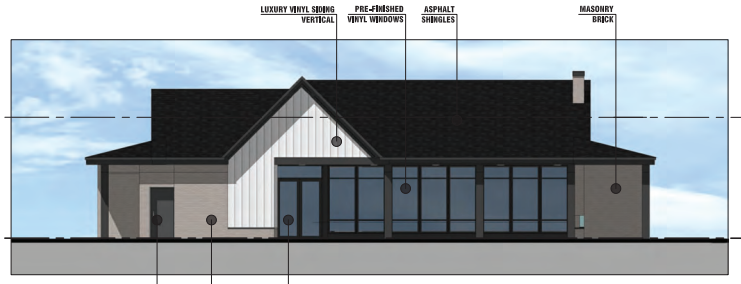


D4 - CLUBHOUSE FRONT ELEVATION
SCALE - 1/8" = 1'-0"
FILENAME

ELEVATION MATERIAL QUANTITY:	
±36%	BRICK
±23%	LUXURY VINYL SIDING

F2 - CLUBHOUSE LEFT ELEVATION
SCALE - 1/8" = 1'-0"
FILENAME

ELEVATION MATERIAL QUANTITY:	
±36%	BRICK
±28%	LUXURY VINYL SIDING



D2 - CLUBHOUSE REAR ELEVATION
SCALE - 1/8" = 1'-0"
FILENAME

ELEVATION MATERIAL QUANTITY:	
±28%	BRICK
±22%	LUXURY VINYL SIDING

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SUBMITTAL	7/24/2024
BUILDING ELEVATIONS	7/1/2024

DATE ISSUED

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THE GROVE
NOVI, MI.

PROJECT

CONSULTANT

CLUBHOUSE BUILDING ELEVATIONS

SHEET TITLE

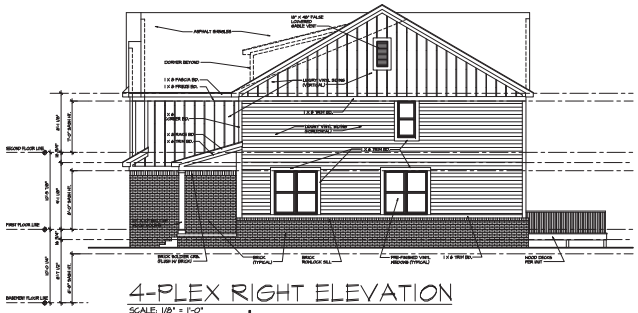
23-804

PROJECT NUMBER

A-203

SHEET NUMBER

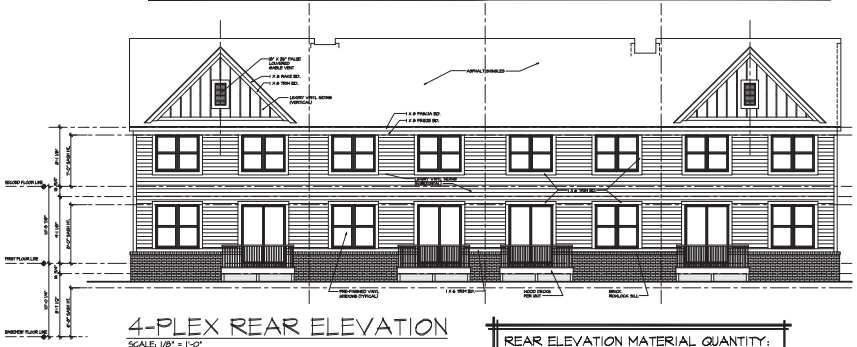
Drawing: P:\2023\23804\Design\Sheets\23804_Clbhse_elevation2024_07.24 - 12 elevation2024_07.24 THE GROVE - BUILDING ELEVATIONS.dwg
Date: Jul 25, 2024 - 2:44pm Layout: A-203 Plotted by: jstolen



4-PLEX RIGHT ELEVATION

SCALE: 1/8" = 1'-0"

RIGHT ELEVATION MATERIAL QUANTITY:
BRICK VENEER = 314 SQ.FT. = 25%
LUXURY VINYL SIDING / HOOD TRIM = 950 SQ.FT. = 75%



4-PLEX REAR ELEVATION

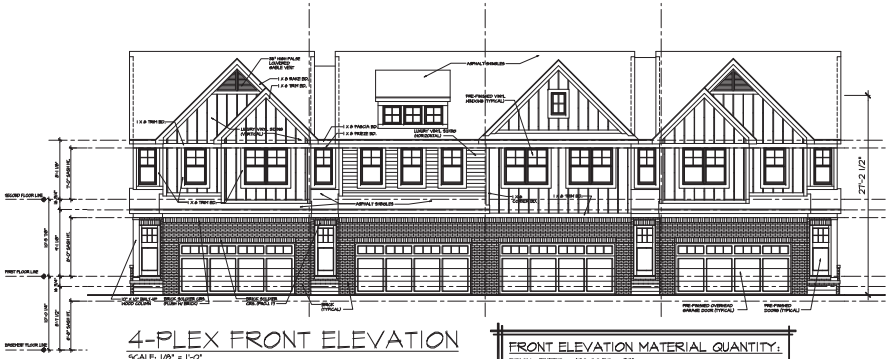
SCALE: 1/8" = 1'-0"

REAR ELEVATION MATERIAL QUANTITY:
BRICK VENEER = 356 SQ.FT. = 23%
LUXURY VINYL SIDING / HOOD TRIM = 1185 SQ.FT. = 77%

4-PLEX LEFT ELEVATION

SCALE: 1/8" = 1'-0"

LEFT ELEVATION MATERIAL QUANTITY:
BRICK VENEER = 314 SQ.FT. = 25%
LUXURY VINYL SIDING / HOOD TRIM = 950 SQ.FT. = 75%



4-PLEX FRONT ELEVATION

SCALE: 1/8" = 1'-0"

FRONT ELEVATION MATERIAL QUANTITY:
BRICK VENEER = 410 SQ.FT. = 37%
LUXURY VINYL SIDING / HOOD TRIM = 815 SQ.FT. = 63%

NOTE:
GRADE IS SUBJECT TO CHANGE PER UNIT / BUILDING. REFER TO FINAL SITE AND GRADING PLAN

NOTE:
BUILDING CONFIGURATIONS MAY VARY BETWEEN 3,4,5,6 UNIT BUILDINGS

NOTE:
ALL RENDERINGS AND ELEVATIONS ARE ARTISTIC IN NATURE AND SUBJECT TO CHANGE REFER TO CIVIL AND LANDSCAPE PLANS FOR BUILDING LAYOUT. MATERIAL COLORS ARE REPRESENTATIONAL OF MANUFACTURED PRODUCT

Ivanhoe Companies
The Grove - Novi, Michigan
The Woods and The Pointe

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(Office) 248-792-3288 | (Fax) 248-792-3289 | www.TRA-DesignGroup.com

Drwn: B.H. | Chkd: J.R.

Review Set: 07/26/24 | Permit Set:
Final Set: NOT FOR CONSTRUCTION
Revisions:

23073
Job Number

A-204
Sheet

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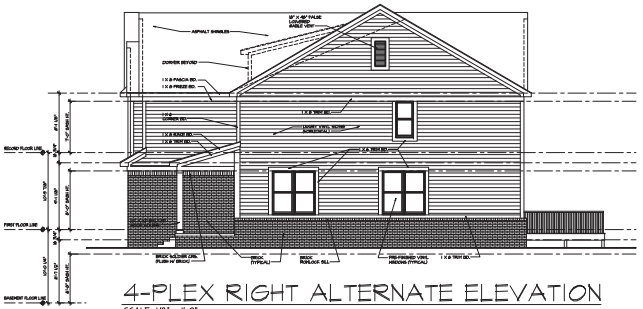
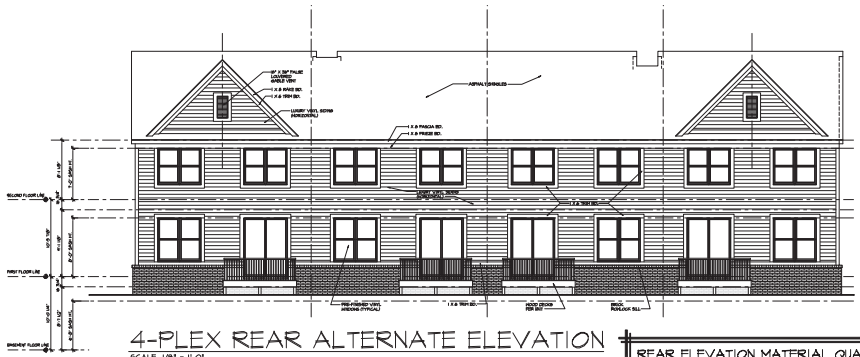


4-PLEX RIGHT ALTERNATE ELEVATION

SCALE: 1/8" = 1'-0"

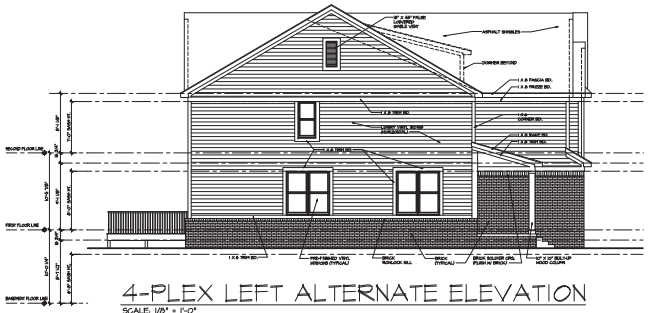
RIGHT ELEVATION MATERIAL QUANTITY:
BRICK VENEER = 314 SQ.FT. = 25%
LUXURY VINYL SIDING / WOOD TRIM = 950 SQ.FT. = 75%



4-PLEX REAR ALTERNATE ELEVATION

SCALE: 1/8" = 1'-0"

REAR ELEVATION MATERIAL QUANTITY:
BRICK VENEER = 356 SQ.FT. = 29%
LUXURY VINYL SIDING / WOOD TRIM = 1185 SQ.FT. = 71%



4-PLEX LEFT ALTERNATE ELEVATION

SCALE: 1/8" = 1'-0"

LEFT ELEVATION MATERIAL QUANTITY:
BRICK VENEER = 314 SQ.FT. = 25%
LUXURY VINYL SIDING / WOOD TRIM = 950 SQ.FT. = 75%

4-PLEX FRONT ALTERNATE ELEVATION

SCALE: 1/8" = 1'-0"

FRONT ELEVATION MATERIAL QUANTITY:
BRICK VENEER = 470 SQ.FT. = 37%
LUXURY VINYL SIDING / WOOD TRIM = 815 SQ.FT. = 63%

NOTE:
GRADE IS SUBJECT TO CHANGE PER UNIT / BUILDING. REFER TO FINAL SITE AND GRADING PLAN

NOTE:
BUILDING CONFIGURATIONS MAY VARY BETWEEN 3,4,5,6 UNIT BUILDINGS

NOTE:
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Ivanhoe Companies
The Grove - Novi, Michigan
The Woods and The Pointe

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(Office) 248-792-3588 | (Fax) 248-792-3589 | www.TRA-DesignGroup.com

Drwn: B.H. | Chkd: J.R.

Review Set: 07/26/24 | Permit Set:
Final Set: NOT FOR CONSTRUCTION
Revisions:

23073
Job Number

A-205
Sheet

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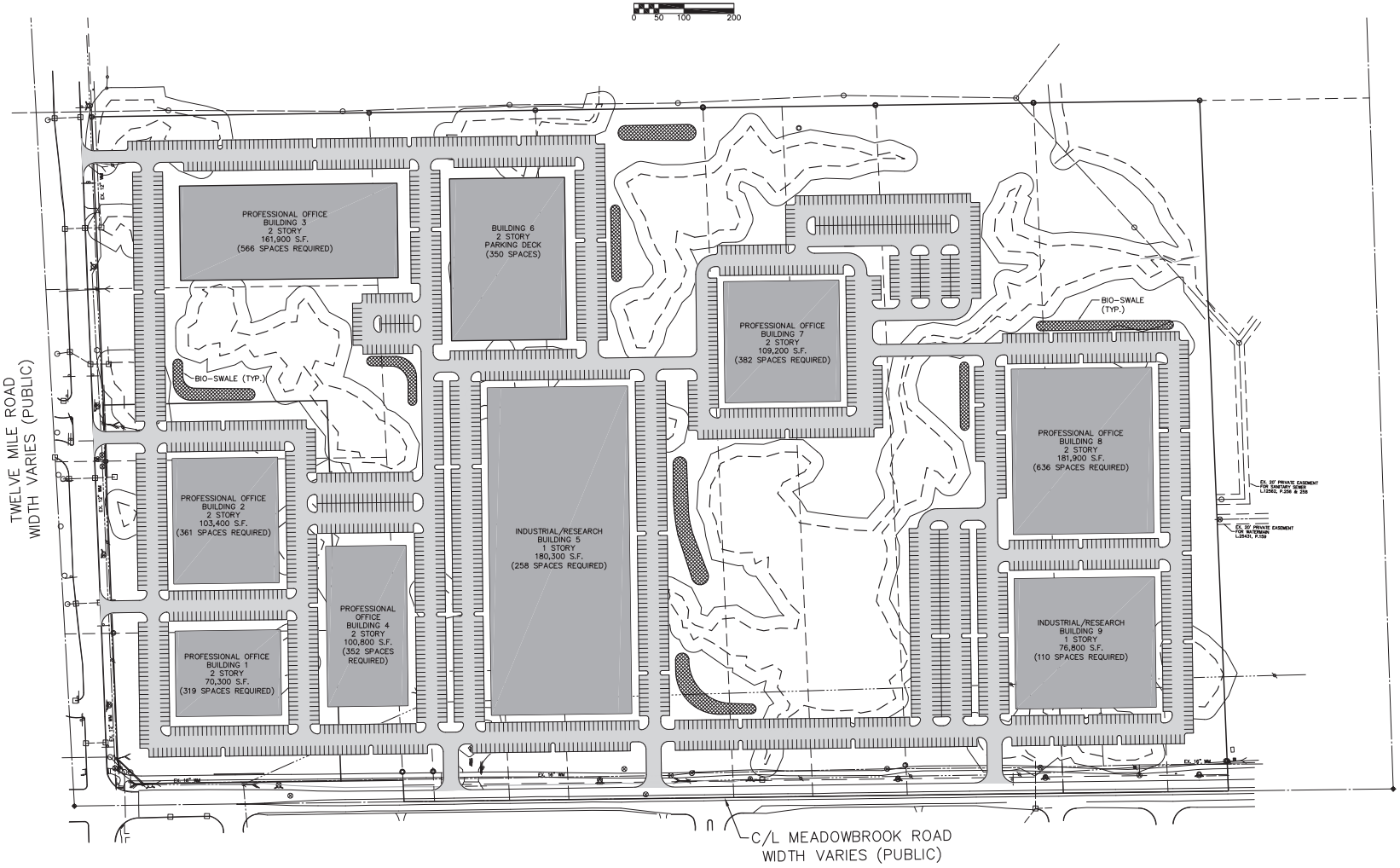

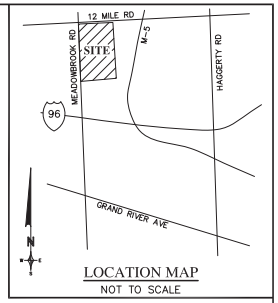

LOCATION MAP
NOT TO SCALE

LEGEND

BUILDING 1	70,300 S.F.
BUILDING 2	103,400 S.F.
BUILDING 3	161,900 S.F.
BUILDING 4	100,800 S.F.
BUILDING 5	180,300 S.F.
BUILDING 7	109,200 S.F.
BUILDING 8	181,900 S.F.
BUILDING 9	76,800 S.F.
TOTAL	984,600 S.F.
PARKING REQUIRED	2,984 SPACES
PARKING PROVIDED	2,998 SPACES

STORMWATER MANAGEMENT PROVIDED BY UNDERGROUND DETENTION AND BIO-SWALES.

USEABLE OPEN SPACE 4.48 AC.

ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE

ZEIMET WOZNIAK & ASSOCIATES
Consulting Civil Engineers
55800 GRAND RIVER AVE., SUITE 100
NEW HUDSON, MICHIGAN 48165
P: (248) 437-5099 F: (248) 437-5222 www.zeimetwozniak.com

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6689 ORCHARD LAKE ROAD, SUITE 314
WEST BLOOMFIELD, MI 48322 (248) 626-6114

OST CONCEPT PLAN
THE GROVE
NOVI, MICHIGAN

FIELD BOOK NO.
DATE 1/14/24
DESIGNED BY SRB
DRAWN BY DAB
SCALE HOR: 1" = 100' VER: 1" = N/A
JOB NO. 22149
SHEET 10F1

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PROJECT NARRATIVE

Via E-Mail and Hand Delivery

IVANHOE
(248) 626-6114

Barb McBeth - City Planner
City of Novi
45175 Ten Mile Road
Novi, Michigan 48375

August 12, 2024

RE: Application for Rezoning to RM-2 with Planned Rezoning Overlay for The Grove--Northeast Corner of 12 Mile Rd. and Meadowbrook Rd.

Dear Barb:

I am submitting this letter and the enclosed application and supporting information in connection with the Ivanhoe Companies' ("Ivanhoe")[1] proposed rezoning to RM-2 with a planned rezoning overlay (PRO) for 12 parcels of land located at the southeast corner of 12 Mile Rd. and Meadowbrook Rd. (the "Project" or the "Grove"). This letter outlines some project background and Ivanhoe and its design team's vision for the Project, developed after substantial planning and analysis over several years of study. It is intended as the project narrative describing the proposed rezoning and addressing the PRO eligibility requirements. The Presentation Booklet that accompanies the application provides visual depictions of the matters described in this narrative.

As you may recall, we had our concept plan meeting for the Project on December 14, 2023. We then submitted comprehensive materials for the pre-application review required by the Zoning Ordinance. The current revised plans and supporting materials also address the comments in the various City staff and department review letters and reflect the collaborative process we have embarked on with the City.

A. <u>Description of the Property and Background</u>.

The subject property (the "Property") consists of approximately 62 acres and has frontage along both 12 Mile and Meadowbrook Roads. The property is currently zoned OST (Office Service Technology) and is owned by Trinity Health-Michigan ("Trinity"). Ivanhoe entered into an agreement with Trinity in November 2022 to acquire approximately 62 acres of the nearly 70 acres of land owned by Trinity. While Trinity is retaining ownership of approximately 8 acres at the corner of 12 Mile and Middlebelt Roads, Ivanhoe has included that land in its development due diligence, planning and design work, including with respect to woodlands, wetlands and connectivity, so that any future development of that land could be integrated into the whole at the appropriate time.

[1] The Ivanhoe Companies, working with a diverse development team of community planners, designers and engineers, are creative community developers and have developed over 100 residential communities in Oakland, Wayne, Washtenaw and Livingston Counties. In the last decade we have specialized in unique sites in suburban infill locations in developed or partially developed areas to meet growing residential housing needs. We are proud of our reputation as environmentally sensitive developers and are the only three-time winner of the Michigan Society of Planning Officials award for best new project design.

The Property is close to a variety of offices, retail, recreation, entertainment and residential land uses. To the north, across 12 Mile Rd., there are residential enclaves, with planned commercial uses, plus the MSU Tollgate Farms, and a City of Novi trailhead and park developed and deeded to the City by Ivanhoe as part of the Beacon Hill mixed-use project. There is an older office/type building on the southwest corner of 12 Mile Road and Meadowbrook. Twelve Oaks Mall and Twelve Mile Crossing at Fountain Walk are located a short distance to the west along 12 Mile Road. A substantial amount of office/commercial is located to the east; across M-5 Adjacent to the south is a small office park and then the I-96/M-5 interchanges. The entire eastern boundary of the Property abuts approximately 32 acres of MDOT right-of-way adjacent to the M-5 expressway, which is an undeveloped natural area containing wetlands and woodlands.

The Property has scattered small wetlands throughout, in which invasive species are present. The location, topography, and natural features present development challenges which is why it remains one of the larger pieces of undeveloped properties left in the City, particularly considering the size and configuration of buildings typically developed for OST uses. As explained in more detail in the accompanying materials, there are sufficient and more suitable areas available for OST development. These environmental challenges also provide opportunities to create something unique, impactful and synergistic with the key nearby, large-scale retail shopping areas in the City—Twelve Oaks Mall, Fountain Walk and Novi Town Center.

With both current and potential future City planning objectives in mind, Ivanhoe spent months developing multiple iterations of potential development plans for the Property. We believe that the plan described below and illustrated in the enclosed materials satisfies the key City objectives and presents an exciting modern, mixed-use development and reflects current and future market trends. The natural features and constraints on the Property and the nature of nearby uses guided the design of the development plan.

B. <u>The Grove PRO Development Plan—A Multi-Generational Destination Community</u>

The overall Property development is divided into two parts—Parcel A is the portion of the land that will be retained by Trinity and is targeted for business development as described further below; and Parcel B, which will be developed by Ivanhoe as a unique master-planned residential community containing four (4) villages integrated with parks, woodlands and other natural features, with multiple housing types, including a mixture of for sale and rental housing options. The Grove is intended to provide a full range of flexible housing options catering to diverse, multi-generational residents, ranging from younger residents and families to active seniors.

Per the Master Plan "A variety of housing options will welcome younger residents and families as well as older residents to age in the community." The corresponding objective is to "Attract new residents to the city by providing a full range of quality housing opportunities that meet the housing needs of all demographic groups including but not limited to singles, couples, first time home buyers, families and the elderly." The plan for The Grove is guided by these Master Plan objectives and will be a unique multi-generational community.

There are three key factors that drive this development. First, the size of the property offers the opportunity to provide diverse, but integrated housing options. Second, the isolated location of the Property and the natural features on and around the site are ideal and attractive for a successful residential project. Moreover, the entire west side of the property—over 2,200 hundred feet—abuts the M/5 right-of-way which will remain undeveloped. That MDOT-controlled property contains wetlands, woodlands, and storm drainage features. A pathway with observation areas on the Property adjacent to the MDOT wetland mitigation conservation easement will allow residents to appreciate the natural area. The Grove will include a non-motorized system that connects to pathways along the roads that will provide easy and direct access to MSU's Tollgate Farms and the Beacon Hill Park access trail, which was developed by Ivanhoe as part of the Beacon Hill mixed-use project on the north side of 12 Mile Road.

An equally important consideration is the proximity to some of the premiere shopping areas in Oakland County—Twelve Oaks Mall, Fountain Walk and Novi Town Center. The stress on brick and mortar stores is well documented. Many shopping malls around the country and in Michigan are failing and some have closed (such as Lakeside Mall in Sterling Heights). Oversaturation of commercial lands and loss of on-site sales means that new residential areas are needed to support the retailers and restaurants. The Grove is perfectly positioned to provide easy access to these shopping districts. In fact, Twelve Oaks would be less than a mile walk or bike ride from the project along a bike path fronting the Property. The residents would benefit from easily accessible retail and commercial services, and the commercial business would benefit from the additional customers living in close proximity.

The Concept Plan for the Grove calls for four distinct villages all interconnected and governed by common themes of high quality and compatible designs. Two of the villages—the Woods and the Pointe—are targeted for condominiums. The other two villages—the Vistas and Meadows—can be offered for sale or rent depending on the market and demand. Current plans envision homes with flex space for home office or library use, 2 or 3 bedrooms, and 2.5 baths. The quality and nature of the design and development of these units would make them suitable for sale, either initially or as a later conversion. Thus, the Grove has the ultimate flexibility to address multiple housing targets within an interconnected project, responsive to market conditions, and fully consistent with both the current and proposed new Master Plan housing objectives.

The Villages are tied together by an extensive pathway system and recreational and natural amenities, including an approximate 5.5 acre central gathering park, pocket parks, a nature area, clubhouse and pool facilities, pickleball courts and a dog park. In total there are approximately 39 acres of green space with extensive internal sidewalks and walking and hiking trails.

Additionally, our traffic engineers at Fleis & VandenBrink, compared the number of expected trips in the peak hours for a typical office use with the number of trips expected with the residential use. A typical OST development, for example, would generate far more traffic during an average weekday versus the proposed residential development. Peak hour traffic differences are even more dramatic. The traffic benefits could be even greater if people walk or bike ride to nearby retail and restaurants in the area.

Finally, consistent with the City's objectives and goals for sustainable development and Ivanhoe's own development philosophy, the Project will include numerous sustainable design features, such as: EV charging stations; numerous bike racks and bike storage space; use of native vegetation and strategically placed canopy trees; applicable plumbing fixtures shall be Water Sense labeled or equivalent standard; use of energy efficient exterior building materials, glass/glazing and insulation; installing smart scheduling technology for water use; and LED exterior lighting.

C. <u>Trinity Parcel A Development</u>.

While there is no specific use now proposed for Parcel A at the southeast corner of 12 Mile Rd. and Meadowbrook Rd., Parcel A has been included in all the due diligence and planning analysis for the overall Property. The potential uses for Parcel A include without limitation, corporate headquarters and offices, healthcare facilities for Trinity, commercial, high-tech research and office, high-end health club, hotel and other mixed uses. The residential villages have been carefully situated to provide appropriate setbacks and screening for future business uses and to be compatible with them. With an appropriate plan in place and synergistic uses, Ivanhoe and Trinity anticipate that Trinity Parcel A will attract business uses that would be an asset for the City and integrate and enhance the development or redevelopment of nearby properties.

D. <u>Next Steps—Rezoning to RM-2 with PRO Development Approval</u>.

As the City knows, it currently has limited zoning tools available to accomplish the alternative and mixed-use approach envisioned for the Property. The City has two multiple family zoning classifications. Both ordinances are not targeted for development of the multiple housing options within a single development. The RM-1 density is insufficient for the development, while the RM-2 provides greater

density than proposed. Therefore Ivanhoe is proposing a rezoning of approximately 62 acres of the property to the RM-2 zoning district with a PRO (planned rezoning overlay) similar to the procedure used for the development of the Beacon Hill project across 12 Mile Road from the Grove, which included single-family housing, a public park dedicated to the City and future commercial/retail development. The conditions and circumstances supporting the PRO include at least the following:

1. It will permit the development of multiple housing options in a single integrated development with vehicular and pedestrian connections serving diverse populations in close proximity to the City's extensive commercial corridors, which will also benefit those commercial shopping areas;
2. Because of the challenging topographical, wetlands and woodlands conditions, the Property is less suitable for an OST development. Such a development would have an extensive adverse impact on the natural features, while a carefully designed residential project would preserve and enhance the natural features for use and enjoyment of the residents;
3. It provides the ability to view an extensive preserved wetland/woodland system owned by MDOT and other adjacent preserved natural areas;
4. It will create substantially less traffic congestion than an OST development and, with the density restriction stated below, less traffic than a traditional RM-2 development;
5. Although the RM-2 zoning would permit approximately 1,235 two-bedroom residences or 926 three-bedroom residences, the proposed PRO would limit the density to only 438 residences;
6. All of the wetlands, which are generally small in size, are full of invasive species. Under the PRO Ivanhoe will remove invasive species and upgrade the wetland features as to both function and aesthetics;
7. The Grove's 39 acres of strategically located green space, combined with the adjacent MDOT property to the east (34 acres) and land included in a conservation easement to the south (around 6 acres abutting The Grove), create 80 acres of contiguous natural wildlife habitat;
8. Extensive pathways, view features and recreational and exercise amenities will be included, including 4 places of interest for general public use along the main roads;
9. An extensive list of sustainable design features as to both structures and landscape features will be included in the proposed PRO; and
10. The design of the Villages will be integrated, consistent and complimentary and will include high quality and diverse materials.

E. <u>Conclusion</u>.

Ivanhoe is very excited about this new development and expects it to be a successful and unique place-making destination for living within the community, and an asset to the City.

Sincerely,

Gary Shapiro
Ivanhoe Companies

cc: Lindsay Bell (via email: lbell@cityofnovi.org)
Brad Strader (via email: Brad.Strader@itsc2g.com)
Andy Wozniak (via email: awozniak@zeimetwozniak.com)
Alan M. Greene (via email: agreene@dykema.com)

C2G
CINCAR CONSULTING GROUP

400 Renaissance Center
Suite 2600
Detroit, MI 48243

17199 N. Laurel Park Drive
Suite 204
Livonia, MI 48152

August 9, 2024

City of Novi
Attn: City of Novi Planning Commission
45175 Ten Mile Road
Novi, Michigan 48375

Re: Statement of Planned Rezoning Overlay – Deviations and Public Benefits for The Grove

Dear Planning Commissioners,

The City of Novi Zoning Ordinance includes an option for a Planned Rezoning Overlay (PRO). This option allows a conditional rezoning where the applicant tailors the use and design to be integrated with the site features. A PRO allows deviations from the Zoning Ordinance standards that would typically apply. An applicant needs to demonstrate that the deviations and other conditions provide an overall benefit to the City compared to the zoning standards that would otherwise apply.

The PRO option is intended to provide the City with a better overall project versus if the standard Zoning Ordinance standards were applied to a unique property. We believe this option applies to The Grove project given its extensive wetlands, woodland corridors, and strategic location in the City.

The overall submittal booklet, various reports and the submittal package all demonstrate why an RM-2 rezoning with a PRO for The Grove development is appropriate for this site. This report summarizes the PRO and the deviations requested, using the following order:

A) Why the Office Service Technology (OST) zoning is not appropriate for The Grove site;
B) Reasons for diverse multiple-family housing at this location;
C) How The Grove development is consistent with the PRO intent and criteria in Section 7-13 of the Zoning Ordinance;
D) Statement of Public Benefits and Conditions offered with the PRO; and
E) Support for deviations requested (refer to the plan sheets for detailed descriptions of the dimensions).

A. WHY OST IS NO LONGER AN APPROPRIATE ZONING DISTRICT FOR THE PROPERTY

The Property currently consists of 12 separate parcels. It is currently zoned for Office Service Technology (OST) uses. Permitted OST uses are typically large footprint buildings, up to 3 stories, with extensive parking requirements. The Property, on the other hand, has extensive natural features, including woodlands and wetlands, which are not attractive to OST users because of the extreme development limitations and related high costs of development compared to other available OST sites in the City.

While the results may have been self-evident, Ivanhoe engaged CBRE to conduct an assessment of the OST needs in the area. Ivanhoe also engaged design professionals who have experience in developing high-tech, mixed-use buildings to evaluate if this site could be developed in terms of its site suitability, given the wetlands and woodlands and their configuration. Various market consultants engaged by Ivanhoe concluded that there was and remains little interest in OST uses for this site. This is due to the

overall depressed office market, other more attractive locations, and the environmental factors on the Ivanhoe site.

Ivanhoe representatives attended many of the City's Master Plan meetings where the City's outside planning consultant, Beckett-Rader, expressed similar opinions. In fact, Beckett-Rader recommended this site be classified to allow a wide range of uses, including multi-family residential, to respond to market demand and the diversity of existing and planned uses in the immediate area.

There are several factors that reduce the appeal of this site for OST uses:

No Market Demand. The need for office development nationally and in southeast Michigan has severely declined over the last several years. Initially, as a reaction to COVID-19, virtual technology has allowed people to work remotely. More people are now working from home full-time or a few days during the week. Owners of office buildings and business parks are struggling to achieve high occupancy rates and rents for many offices have fallen. Development for new offices has also notably dropped in response to this trend.

Location: Most of the OST uses in the City have viewsheds from I-96, M-5, are along rail lines, or have been used for industrial uses for decades. There are also some limited OST uses along Meadowbrook Avenue south of The Grove. The Grove site, with its abundance of natural features, is not easily adapted to large-scale OST uses. There are other locations in the City that are more suitable for future OST uses.

Environmental Features on the Site. The Property includes scattered small wetlands (many of which contain invasive species). These wetlands have been flagged and were reviewed by the City's environmental consultant, who concurred that the highest quality wetlands are being conserved, with only the low-quality wetlands (which contain invasive species) being disturbed by the proposed residential development.

The location, topography and natural features on the site present development challenges which explains why it remains one of the larger pieces of undeveloped properties left in the City, particularly considering the size and configuration of buildings and parking lots typically developed for OST uses. The location of the wetlands and woodland corridors would severely limit the scope of development (and the tax base benefit to the City), making it cost prohibitive for OST development. Or, such a development could require extensive alterations of the wetland and woodlands to accommodate development, assuming approvals could be obtained for such extensive impact. On the other hand, the existing natural features provide opportunities to create a unique, impactful, and synergistic residential development compatible with the key nearby, large-scale retail shopping areas—Twelve Oaks Mall, Fountain Walk and Novi Town Center.

B. REASONS TO PROVIDE DIVERSE HOUSING AT THIS LOCATION

Housing demand has changed and is continuing to change. To address the market trends and need for more choices, Ivanhoe will offer diverse housing options within a single residential community, geared toward young professionals, families and those looking for a more maintenance-free lifestyle. The goal is to attract former younger residents back to the City, and new residents that are seeking a lifestyle in a beautiful setting with access to some of the best retail and commercial businesses in southeast Michigan.

Per the City's current adopted Master Plan, an objective is to "*Attract new residents to the city by providing a full range of quality housing opportunities that meet the housing needs of all demographic groups.*" Some objectives to help accomplish this include "*captur[ing] growth opportunities that will enhance short-and long-term viability of the community*." The plan for the Grove is guided by these Master Plan objectives and will be a unique community with a range of diversified housing options.

The City is also a Redevelopment Ready Community (RRC) with the Michigan Economic Development Corporation (MEDC) which "empowers communities to shape their future by building a foundation of planning, zoning, and economic development best practices and integrating them into their everyday functions." The RRC Best Practices handbook provides insight into what types of development policies and procedures are expected for RCC certified communities. In terms of housing, the handbook elaborates that City's should "allow for areas of context-sensitive concentrated development [which provide] myriad benefits including enabling pedestrian mobility [and] providing a sense of place…" MEDC also stresses that cities should have "an ordinance which clearly allows for diverse housing types that create unique neighborhoods, provides lifestyle options for residents…, helps attract talent, and provides flexibility for meeting market demand."

Ivanhoe consulted with several market experts to review the need for housing, the absorption rates, the specific housing designs in demand, and the price points. The market consultants noted that around 80% of the housing in the City of Novi is single-family. This attracted the "Baby-Boomer" generation and new families, which favor a single-family home. But the consultants noted that the City is lacking housing for the "Missing Middle," housing that appeals to the several generations of residents who may not currently be interested in purchasing a single-family home. Many of these potential residents are looking for more attainable housing options that fit their lifestyles. Some of them will want to rent initially, become familiar with Novi, and then purchase a home here when their family grows. Others grew up in the City and want return if they can find housing that they can afford.

While Ivanhoe uses the market information as a guide, we also do our own assessment of the marketing and housing needs. Based on our previous work in the City of Novi, nearby communities, and western Oakland County, we are aware of the current housing needs. We also know the market can be fickle.

Ivanhoe wants to provide something unique that is not available in the expanse of single-family subdivisions and some of the newer mid-rise multiple family. Ivanhoe proposes a unique master-planned residential community containing four villages with a mixture of for-sale and rental housing options. Some of the housing established initially for rent will be designed and constructed in such a manner that they could easily be converted to for-sale units as demand changes. This variety of housing types allows The Grove to adjust to changing market demands.

C. CONSISTENCY WITH THE CRITERIA OF THE CITY'S PRO ORDINANCE

The PRO section of the Zoning Ordinance requires that the applicant demonstrate the City will benefit from the proposal based on the following five criteria. Information applicable to each criterion is summarized below. This information is also covered in more detail in a series of separate documents, including the Community Impact Study, market studies, a traffic study, wetlands/woodlands evaluations, and other presentation materials included by Ivanhoe in its submission package.

1. Integration of the Project with the Characteristics of the Project Area.

Changes in spending habits, with a growing number of sales over the internet, have impacted brick and mortar stores in recent years. Additional residents in the retail and service market area will frequent the nearby commercial uses in the 12 Oaks Mall, Fountain Walk, Novi Town Center, and stores across the M-5 interchange. New residents in the market area will also support the planned retail along the northside of 12 Mile Road within the future Ivanhoe Beacon Hill mixed use project.

2. **The PRO Is in the Public Interest and Is reflective of the natural environment (compared to OST uses or a development that meets the typical dimensional standards).**

As noted above, development of OST uses (buildings, parking, detention) could destroy much of the wetland areas and woodlands that we are protecting. Ivanhoe's development, using the deviations requested, takes advantage of the natural features and allows residential buildings and paved areas to be clustered in order to retain abundant open space. For OST uses, the natural features are an impediment and whatever may be preserved is not really accessible or enjoyed by City residents. The residential project incorporates the natural features as amenities and carefully plans the preservation in such a way as to coordinate the open space with preservation areas on adjacent properties to create a large natural habitat area that could be enjoyed by City residents.

Over 38.92 acres of the site will be "green space." This includes all areas that are not impervious surfaces and includes open space, detention basins and wetland areas. This greatly exceeds the requirements for a traditional development. Open space is linked by a community park, four other parks, and a system of non-motorized connections. The Grove's 38 acres of total green space, combined with the adjacent MDOT property to the east (34 acres) and land included in a conservation easement to the south (around 6 acres abutting The Grove), create 80 acres of contiguous natural wildlife habitat.

The Grove preserves wetlands and woodland corridors by locating development into pockets. There will be very little change to the state-regulated wetlands. Those wetlands, and the woodland corridors, will be preserved through a Conservation Easement.

3. **More consistent with the capacity of the City's Services.**

One key benefit is the reduction in traffic congestion. According to the Traffic Impact Study prepared by Fleis and Vandenbrink, dated July 16, 2024, the proposed RM-2 zoning with a PRO will generate significantly less trips than the potential trip generation that is currently permitted under the existing OST zoning classifications (see Table 5 from the Traffic Impact Study). Therefore, the proposed development plan is expected to have a lower impact on adjacent roadway network than development based on the current zoning. The transportation benefits could be even greater if people walk or bike to nearby retail and restaurants in the area as intended.

The Grove will expand the public pathway system along 12 Mile and Meadowbrook Roads. The Grove will pay for the addition of off-site pathways along 12 Mile Road, on the Trinity Corner, so that the public can travel uninterrupted along the City's existing pathways.

The internal circular pathway near 12 Mile will be 10 feet wide (instead of 8 feet) as shown on the plans to increase capacity and safety. The internal looped pathway will also be a wider 10 feet in this location, where higher non-motorized use is expected. Overall, there will be approximately three miles of non-motorized paths along Meadowbrook, 12 Mile and internally (sidewalks, internal pathways, compacted limestone and natural hiking trails).

Improved mobility for public transit users will be enhanced by a proposed new bus stop with benches that connects to the public pathway along SMART's 12 Mile Route 740.

Finally, instead of multiple access points for 12 separate properties, which can cause congestion and greater potential of accidents, The Grove has just three access intersections along 12 Mile and Meadowbrook Roads, which also increases screening and landscaping opportunities

4. **Compatibility with adjacent land uses.**

The Grove was designed to support eventual non-residential development of the land at the corner of Meadowbrook and 12 Mile Roads to be retained by Trinity Heath. The building setbacks, buffering and landscaping provide flexibility for future development of various typologies. Trinity Health has collaborated with Ivanhoe in the planning and supports the proposed setbacks, buffering, landscaping and residential land uses. The proposed walkways, overlook, and open space along the MDOT property to the east are intended to take advantage of that open space resource. It will also expand the wildlife habitat in the area.

We understand the City's intent for high quality views along Meadowbrook Road. Views and our extensive landscaping along Meadowbrook Road will complement the intended character. Almost 50% of the Property frontage along 12 Mile and Meadowbrook Roads will be Open Space. There will be four places of interest, with extensive tree envelopes, benches and other amenities.

Finally, adding residential at this location, will add consumers to the market area of existing commercial uses in the area, including 12 Oaks Mall, Fountain Walk and other business centers within a short biking or driving distance.

5. **Other benefit to support "Public Health, Safety and Welfare."**

The design of the development, including the architecture, and layout in inter-connected Villages is intended to achieve a "placemaking" destination. There will be "pocket parks" and an internal "Central" park community gathering area with many amenities (pool, clubhouse, Pickleball counts, picnic areas, playground, dog park, electric vehicle charging and bike racks).

D. STATEMENT OF PUBLIC BENEFITS AND CONDITIONS

Section 7.13 of the Zoning Ordinance notes that a PRO requires a Statement of Public Benefit, things that would not otherwise be expected if one of the other zoning districts were applied. The Grove provides a long list of benefits as summarized below and illustrated on the attached figures.

OPEN SPACE AND PARKS – The Project design and layout is intended to create a "Placemaking" destination. These benefits will provide the City and its residents with great views, open space, pathways available to the public and, linked with the adjacent MDOT preserve, a large open space for wildlife habitat.

1. Over one-third (33%+) of the site will be open space.

2. The open space includes “pocket parks” and an internal “Central” park community gathering area with many amenities (pool, clubhouse, Pickleball counts, picnic areas, playground, and a dog park).
3. Landscaping will focus on the use of native Michigan vegetation.
4. Setbacks, buffering and connectivity to support the eventual development of the corner parcel.
5. Views along Meadowbrook and 12 Mile Roads will have four places of interest, with extensive tree envelopes, benches and other amenities. Almost 50% of the frontage along those streets will be open space.
6. Preserves wetlands and woodland corridors by mingling development into pockets. This is in contrast to development of OST uses that likely would have greater disruption of the natural features. Major wetlands will be preserved through a Conservation Easement.

HOUSING – Housing demand has changed. To address the market trends and need for more choices, we will offer multi-generational housing, geared toward young professionals and those looking for a more maintenance-free lifestyle.

7. Converts a long vacant OST parcel into a type of development that the public needs.
8. A more “attainable” housing cost compared to other options prevalent in the City.
9. Attractive, flexible housing types – Townhomes, Residential Flats, designed for rent, sale or conversion to condominiums.

MOBILITY AND TRANSPORTATION – Connections to the Regional Pathways and the various internal non-motorized connections are consistent with “Walkable Novi” and the City’s new Mobility Plan.

10. Combining 12 parcels, which could be developed with individual access points, into one unified destination with just two access points.
11. Connections to a new bus stop for residents of the area for SMART’s Route 740 along 12 Mile Road.
12. An integrated pathway systems that links to the regional non-motorized system along 12 Mile and Meadowbrook Roads, that connects to the Michigan Air Line Trail, M-5 and I-275 systems.
13. Our internal non-motorized system includes sidewalks, pathways, compacted limestone and natural hiking trails. We are providing a wider, 10-foot wide, circular pathway system in the area where we believe the demand will be highest (see the drawing in the submittal booklet).
14. Significant reduction in traffic compared to development of the site with typical OST uses (as noted in the Community Impact Statement and our traffic impact study).

E. REQUESTED DEVIATIONS AND RATIONAL

Ivanhoe has developed a plan that preserves the most important wetlands, conserves key woodland corridors, and nestles the development in between those features. In a number of situations, the features are beyond those otherwise required by the City. For example, we are using more Michigan native vegetation, adding additional non-motorized pathways and providing much more open space than required.

To achieve those benefits, we seek deviations from the zoning standards that would otherwise apply in the RM-2 zone. The RM-2 standards reflect an older style garden apartment-type project that is not fully consistent with modern multi-family housing options, nor consistent with the specific location and unique features of the Property. This includes reducing certain setbacks slightly between individual buildings and adjacent properties allows us to better connect the open spaces and preserve the

wetlands/woodlands. In other cases, we offer a different screening program than the berms typically required. Those deviations are noted below, with the justification explained.

We believe the PRO, with the requested deviations, demonstrates an innovative, unified, planned approach to developing the site with an innovative design. These features would not be possible without the deviations. Deviations requested and their justification are listed below:

Deviation #1: Residential Building Setbacks (Sec 3.1.8.D)
The proposed building setbacks along the Meadowbrook Rd. frontage, the East property line and the South property line are 50 feet. These setbacks are less than the required 75 feet. See the table below:

Table 1.1 Building perimeter setbacks (Sec 3.1.8.D)

	Proposed	Ordinance
Eastern Setback	50’	75’
Southern Setback	50’	75’
Western Setback	50’	75’

Eastern Setback. Along this side of the development, the adjacent land use is the MDOT wetland conservation easement. A deeper setback will not provide additional benefit here. The setbacks allow the public and residents to enjoy views of the MDOT open space.

Southern Setback. Similarly, we have a reduced setback along our southern border. Much of our southern border is a wooded wetland in a conservation easement. In this area, we are showing additional screening instead of a berm abutting a future berm. The proposed units are 2 stories and are adjacent to one story OST. Existing vegetation in combination with a berm is sufficient to provide a buffer.

Western Setback. We have some modest reductions in setbacks and landscaping adjacent to the Trinity corner along Meadowbrook Road. The proposed 50’ setback is consistent with existing developments along Meadowbrook Road. Trinity Health has also readily endorsed the design of the site which supports the setbacks and spacing.

Deviation #2: Parking Setback (Sec 3.1.8.D) (Sec 3.1.12.D)
The proposed front parking setback along Meadowbrook Rd. is 50 feet. This setback is less than the required 75 feet. Per the justification provided above for building setbacks, our modest reductions are consistent with existing developments along Meadowbrook Road and also still have ample landscaping and buffering provided on site.

Deviation #3: RM-1 and RM-2 Required Conditions (Sec 3.8), Total Number of Rooms (Section 3.8.1.A &B)
The total number of rooms permitted is 1,195 (where total number of rooms is less than the net site area in square feet per 2,000). The requested number of rooms proposed is 1,389 total. While the proposed number of rooms exceeds the number of rooms allowed, the proposed density for each unit type is less than the allowed density. The proposed unit mix for this development is consistent with current market conditions and demand.

Table 1.2 Room Breakdown

Room Breakdown	
The Meadows	83 Rooms per Building
Studio (458 s.f. min.)	2 Rooms (42 Rooms)
1 Bedroom (658 s.f. min.)	2 Rooms (172 Rooms)
2 Bedroom (861 s.f. min.)	3 Rooms (447 Rooms)
The Vistas - 3 bdrm. (1,905 s.f.)	4 Rooms (196 Rooms)
The Woods - 3 bdrm. (1,958 s.f.)	4 Rooms (224 Rooms)
The Pointe - 3 bdrm.(1,958 s.f.)	4 Rooms (308 Rooms
Rooms Proposed	1,389
Rooms Allowed	1,195 Rooms (2,389,266 s.f. / 2,000)

Deviation #4: RM-1 and RM-2 Required Conditions (Sec 3.8), Maximum length of the buildings (Sec 3.8.2.C)

The maximum building length in the Meadows is 216 feet, which exceeds the allowed length of 180 feet. The overall building length of 216 feet, with 29 or 32 units per building is smaller than most modern multi-family buildings of this type, providing a more intimate feel while still achieving the desired residential density. Additionally, over a third of the front façade of the building is landscaped which helps add visual interest as well.

Deviation #5: RM-1 and RM-2 Required Conditions (Sec 3.8), Modification of maximum length (Sec 3.8.2.C)

An additional setback of 1 foot for every 3 feet in excess of 180 ft. from all property lines abutting a residential district or major thoroughfare is required (12 feet of additional setback is required for the 216 feet length of buildings proposed). See Table 1.3 below.

Table 1.3: Modification of maximum length (Sec. 3.8.2.C)

	Proposed	Ordinance
Additional setback requirement	75’	87’

Internally, the residential structures have been located on the most suitable areas of the Property, considering the scattered wetlands and woodlands present on the Property. This allows conservation of the key wetlands and some of the prime woodlot corridors. If the traditional setbacks were met, the wetlands and woodlands would be more severely impacted.

Deviation #6: RM-1 and RM-2 Required Conditions (Sec 3.8), Building Orientation (Sec 3.8.2.D)

The Ordinance requires that “where any multiple dwelling structure and/ or accessory structure is located along an outer perimeter property line adjacent to another residential or nonresidential district, said structure shall be oriented at a minimum angle of forty-five (45) degrees to said property line.” The site plan proposes that the Vistas, Meadows, and Pointe buildings are all oriented 90 degrees to perimeter property lines which is consistent with existing development patterns. This proposed orientation also presents a well-designed internal streetscape when buildings are parallel to the street rather than the required 45 degrees orientation.

Deviation #7: RM-1 and RM-2 Required Conditions (Sec 3.8) Minimum distance between the buildings (Sec 3.8.2.H)

The following table (Table 1.4) details the required minimum distance between buildings based on the calculations from the Ordinance:

Table 1.4 Distance between buildings (Sec. 3.8.2)

Vistas

	Proposed	Ordinance
Side to Side	25’	30’ min, formula is 34.8’
Rear to Rear	50’	56’

Woods and Meadows

	Proposed	Ordinance
Side to Side	25’	30’ min, formula is 39.6’

Bldg. 9 vista to Bldg. 1 Meadows

	Proposed	Ordinance
Corner to Rear	32.8’	41.3’

The side yard deviation clusters the development and reduces natural features impacts. Open space constitutes over 30% of the entire site.

Deviation #8: Parking on a major drive (Sec. 5.10.1.B)

Perpendicular parking is not permitted along a major drive. However, the site shows parking on a major drive occurring in three instances with guest spaces. These spaces provide convenient parking for guests at locations that are safe and will not conflict with the main entry points of the site.

Respectfully submitted,

Brad Strader, PTP, AICP
Planning Director
Cincar Consulting Group

Exhibit A: Hobbs and Black Architects Support Letter

HOBBS + BLACK ARCHITECTS
ARCHITECTURE | ENGINEERING | INTERIOR DESIGN

July 1, 2024

Gary Shapiro
Ivanhoe Companies
6689 Orchard Lake Rd.
West Bloomfield, MI 48322

Re: The Meadows Residence Flats at The Grove
Novi, MI

Dear Gary:

Per your request, attached are renderings of The Meadows Residence Flats building, focusing on the three individual building entry components.

Each building entry contains an open stair serving 4 units per floor on the second and third floors and two or three units on the ground floor. There are no common corridors. This creates a more welcoming and individualized environment than would be experienced in a corridor building of similar size.

The overall building length of 216 feet, with 29 or 32 units per building is smaller than most apartment buildings of this type, providing a more intimate feel while still achieving the desired residential density.

HOBBS+BLACK ASSOCIATES, INC.

Steven B. Dykstra
Vice President

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ANN ARBOR | LANSING | PHOENIX

RESIDENCE FLATS - LEFT ENTRANCE

RESIDENCE FLATS - MIDDLE ENTRANCE

RESIDENCE FLATS - RIGHT ENTRANCE

SCALE : NTS

HOBBS + BLACK ARCHITECTS THE GROVE _THE GROVE NOVI| MICHIGAN 2024.07.01 23-804

PLANNING REVIEW

PLAN REVIEW CENTER REPORT

Planning Review

September 11, 2024

JZ 24-31 The Grove

Zoning Map Amendment No. 18.745

PETITIONER

Ivanhoe Companies

REVIEW TYPE

PRO Concept Plan: Consideration of Eligibility
Rezoning Request from OST Office Service Technology to RM-2 High-Density Multiple Family with a Planned Rezoning Overlay

PROPERTY CHARACTERISTICS

Section	13	
Site Location	East side of Meadowbrook, south of Twelve Mile Road;	
Site School District	Novi Community School District	
Current Site Zoning	OST, Office Service Technology	
Proposed Site Zoning	RM-2, High-Density Multiple Family	
Adjoining Zoning	North	R-4 and B-3 with a PRO; RA Residential Acreage
	East	OST, Office Service Technology
	West	OST, Office Service Technology
	South	OST, Office Service Technology
Current Site Use	Vacant	
Adjoining Uses	North	Vacant, Beacon Hill park
	East	MDOT-owned natural area
	West	U of D Mercy, vacant, Single Family, Office Buildings
	South	Office Complex
Site Size	Gross: 61.86 Acres; Net: 54.85 acres (ROW: 2.32, Wetlands > 2: 4.69)	
Parcel ID's	22-13-100-024; 22-13-100-026; 22-13-100-030; 22-13-100-028; 22-13-100-005; 22-13-100-006; 22-13-100-007; 22-13-100-008; 22-13-100-009; 22-13-100-010; 22-13-100-020; 22-13-100-021	
Plan Date	July 26, 2024	

PROJECT SUMMARY

The subject property is located on the east side of Meadowbrook Road, south of Twelve Mile Road in Section 13 of the City of Novi. The property to be rezoned totals about 61.86 acres and contains a significant amount of regulated woodlands and wetland areas. The applicant is proposing to develop a 438-unit multiple-family residential development. The development consists of four "villages" of homes: The Meadows (256 residential flats in 6 mid-rise buildings), The Vistas (49 townhome units in 11 buildings), The Woods (56 attached condominiums) and The Pointe (77 attached condominiums). The development utilizes a private street network with two entrances off Meadowbrook Road, and one entrance off Twelve Mile Road. The applicant is requesting to rezone the site from Office Service Technology (OST) to High-Density Multiple Family (RM-2) with a Planned Rezoning Overlay.

PRO OPTION

The PRO option creates a "floating district" with a conceptual plan attached to the rezoning of a parcel. As part of the PRO, the underlying zoning is proposed to be changed (in this case from OST to RM-2), and the applicant submits a conceptual plan for development of the site, along with site-specific conditions relating to the proposed improvements. After Staff and consultant review, the proposed request goes through initial consideration by the Planning Commission and City Council to review and comment on whether the project meets the requirements of eligibility for a PRO. The applicant can then make any changes to the Concept Plan based on the feedback received, and resubmit for formal review. The Planning Commission holds a public hearing and makes a recommendation to City Council. The City Council reviews the Concept Plan, and if the plan receives tentative approval, it directs the preparation of an agreement between the City and the applicant, which also requires City Council approval. Following final approval of the PRO Plan and Agreement, the applicant will submit for Preliminary and Final Site Plan approval under standard site plan review procedures. If development is not commenced within two years from the effective date of the PRO Agreement it will expire, unless otherwise agreed to by the parties.

RECOMMENDATION

Staff notes concerns about the proposed residential uses' compatibility with the surrounding uses, a deficiency of proposed wetland mitigation, the extensive removal of regulated woodlands, and façade material issues. The identified benefits of rezoning are the provision of four "places of interest" along Meadowbrook and 12 Mile Roads that are accessed from the public sidewalk. These focal point amenities (seating areas) consist of "tree envelopes, benches and other amenities." One of these areas along 12 Mile Road could serve as a bus stop for SMART. Many of the other benefits mentioned in the applicant's narrative would be nice amenities for the residents of The Grove, but will not be open to the general public. Some are incidental to the development, such as a reduction in traffic compared to a potential development under OST standards. The extensive preservation of larger wetland and woodland areas could be considered a benefit to the public if they are permanently protected. The applicant should consider additional benefits to the overall public.

REVIEW CONCERNS

This project was reviewed for conformance with the Zoning Ordinance with respect to Article 3 (Zoning Districts), Article 4 (Use Standards), Article 5 (Site Standards), Section 7.13 (Amendments to Ordinance) and any other applicable provisions of the Zoning Ordinance. **Please see the attached chart for additional information pertaining to ordinance requirements.** Items in **bold** below must be addressed and incorporated as part of the next submittal:

1. Supporting Documentation: The applicant has provided the following studies as part of their application packet
   a. **Narrative:** The statement provided states Rezoning allows for development of an otherwise very difficult parcel to develop, and that a residential development will result in significantly less impact on the existing natural features as compared to a commercial development. The applicant notes office market challenges that restricts the desirability of office development on this site. The proposed development will offer "diverse housing options within a single residential community, geared toward young professionals, families, and those looking for a maintenance-free lifestyle." The proposed community will be organized into 4 "villages" offering different types of housing options: residential flats (3-story apartment buildings), 3-story townhomes, and 2-story attached condominiums. The narrative statement indicates the isolated location of the Property and the natural features on and around the site are ideal and attractive for a successful residential project.
   b. The statement also notes the conditions and deviations proposed, as well as public benefits. Those are detailed later in this review.
   c. **Traffic Impact Study** (Fleis & Vandenbrink, 7/16/24): The City's review of the submitted study notes that the change of use should result in fewer vehicle trips on the traffic system

compared to development under OST standards. See AECOM's review of the TIS for further comments. They have identified some issues that will need to be addressed in a revised TIS before approval can be granted.

d. **Community Impact Statement** (8/7/24): This document describes the property and its relationship to adjacent land uses. It also discusses the environmental features on the site, as well as open space and stormwater disposal strategies. Economic benefits, community and social impacts are mentioned. Finally, the impacts on City services and utilities are covered, including police and fire demand, utilities, and traffic/mobility networks.
e. **Commercial Market Study** (CBRE, INC. 12/13/23): The study area includes a map of OST-zoned property in Novi, which encompasses areas zoned for Regional Commercial. The study concludes that there is little interest in OST-type uses on this site due to the overall depressed office market, more attractive locations, and the environmental factors on the subject property. The extensive presence of both woodland and wetland areas on this particular site are not attractive to OST development because of the development limitations and high costs associated with developing large-scale uses and needing to mitigate for those impacts.
f. **Residential Market Evaluation** (The Chesapeake Group, INC. 8/9/24): The document notes a strong demand for multi-family housing types in Novi and Oakland County, like that proposed by The Grove. A survey found that the majority of respondents who indicated they may move within 5 years would seek homes that are smaller or the same size as their current home. The most dominant factors in determining where to live are safety and walkability. "The Grove's housing mix, walkability, ownership-rental options, and proximity to the region's amenities are consistent with the market's desires. Inclusion of townhomes provides attainable housing even for those who want to purchase. The Grove's longer-term success is extremely probable due to the variety of options."
g. **Sign Location Plan:** Location and size of signage is indicated and meets the requirements. **The wording of the signage should be corrected to:**

ZONING CHANGE PROPOSED FROM
OST TO RM-2 WITH PRO
For more information call:
Novi Community Development Department
248-347-0475

2. Future Land Use Map: The most recent adopted Master Plan (2017) and Future Land Use map indicates that both sides of Meadowbrook Road between I-96 and 12 Mile Road is planned for Office Research Development and Technology. **The applicant's request to allow multiple-family development on over a quarter of this OST area would be a significant departure from the future envisioned for this part of the City. However, there is another area on the west side of Meadowbrook Road that is also subject to a PRO request (Elm Creek), which has been favorably received by Planning Commission and City Council. If that request is granted final approval, the nature of development in this area will already start to transform to allow more residential uses.**

3. Usable Open Space: Sheet SP3.4 is indicated on the Index to contain the Open Space Plan, but it was missing from the plan set (both PDF and printed set). This is an important component of the overall plan, so **should be provided prior to the Planning Commission public hearing**. According to other materials and calculations provided by the applicant, they are providing 11 acres of Usable Open Space and 7.36 acres of "Additional Open Space." If verified, this would far exceed the required 87,600 square feet of required Usable Open Space required by the Ordinance (200 square feet x 438 units = 87,600 sf or ~2 acres).

4. Wetland Mitigation: The applicant appears to indicate that wetlands smaller than 0.25 acres are not regulated by the City. Chapter 12 of the City Code (Section 12-174(b)), indicates that

any wetland in the City that meets one or more of the 10 criteria listed in that section would be considered essential, and therefore would be regulated. As described in the Wetland Review, each of the delineated wetlands on the site meet the criteria of providing wildlife habitat as well as flood and storm control. Wetland review notes that the proposed development appears to result in a total permanent wetland impact area of 1.71 acres out of the total 9.64 acres present on site. The amount of required wetland mitigation is currently unclear as the applicant's calculations remove wetlands smaller than .25 acre from consideration. **Approximately 1.4 acres of on-site mitigation area is noted on the plan, which is not likely to meet the full requirement for mitigation. The applicant should note in future submittals that the City has determined that all wetlands on the site are regulated, and therefore should update the wetland impacts and mitigation calculation requirements accordingly. See detailed comments in the Wetland review letter.**

5. Façade Materials (Sec. 5.15): As noted in the Façade Review, the façade materials proposed do not conform to the Ordinance requirements. The building design shows extensive use of vinyl siding, which is not permitted. Most of the building facades do not meet the 30% minimum brick requirement. **The façade materials should be reconsidered to bring the units into substantial compliance.**

6. Plan Review Chart: **The attached chart provides additional comments on many of the Ordinance review standards. Identified deviations from ordinance standards are listed in detail on pages 12-14 of this review letter.**

7. Summary of Other Reviews:
   a. **Engineering:** Engineering does not have an objection to the PRO Plan at this time. Negative impacts to public utilities are not expected with the requested change to residential use.
   b. **Landscape:** Landscape review recommends approval of the rezoning and PRO Plan. Five deviations from landscape ordinance standards are needed for the current design – most are supported by staff in order to preserve existing natural features. However, significant deficiencies in foundation landscaping are *not supported by staff.* Modifications to the concept layout may be required to address this concern on the next submittal.
   c. **Traffic:** Traffic review does not recommend approval at this time. Traffic review notes that the applicant would need a deviation for the parking areas on the major drive, sight distance, and parking setback.
   d. **Traffic Study Review:** The traffic study is not recommended for approval at this time. Please see the review letter for additional comments to be addressed in a revised study.
   e. **Woodlands:** The tree survey indicates 2,775 trees within the regulated woodland areas. The plan proposes a total of 2,134 tree removals (75%) requiring about 3,360 Woodland Replacement Credits. Approximately 265 credits are to be planted on-site, with the remainder to be paid into the Tree Fund. Woodland review does not object to the rezoning request if the Woodland Ordinance requirements will be followed.
   f. **Wetlands:** Wetland review notes that the proposed development appears to result in a total permanent wetland impact area of 1.71 acres out of the total 9.64 acres present on site. The amount of required wetland mitigation is currently unclear as the applicant's calculations remove wetlands smaller than .25 acre from consideration. Approximately 1.4 acres of on-site mitigation area is noted on the plan.
   g. **Façade:** Façade notes that the elevations provided are not compliant with ordinance standards. The façade materials should be reconsidered to bring the units into substantial compliance.
   h. **Fire**: No objections to the rezoning at this time.

LAND USE AND ZONING: FOR SUBJECT PROPERTY AND ADJACENT PROPERTIES

The following table summarizes the zoning and land use status for the subject property and surrounding properties.

	Existing Zoning	Existing Land Use	Master Plan Land Use Designation
Subject Property	OST: Office Service Technology and RM-1 Multiple Family	Vacant	Office Research Service and Technology (Uses consistent with OST)
Northern Parcels	RA, R-4: One Family Residential and B-3 General Business	Public Park and Vacant	Public Park, Community Commercial, and Single Family
Eastern Parcels	OST: Office Service Technology	M-DOT wetland/stormwater area	Public
Western Parcels	OST: Office Service Technology and RM-1: Multiple Family (proposed)	Single family; Multi-family residential (proposed) and Office/warehouse uses	Office Research Service and Technology (Uses consistent with OST)
Southern Parcels	OST: Office Service Technology	Office park	Office Research Service and Technology (Uses consistent with OST)

Figure 1: Current Zoning

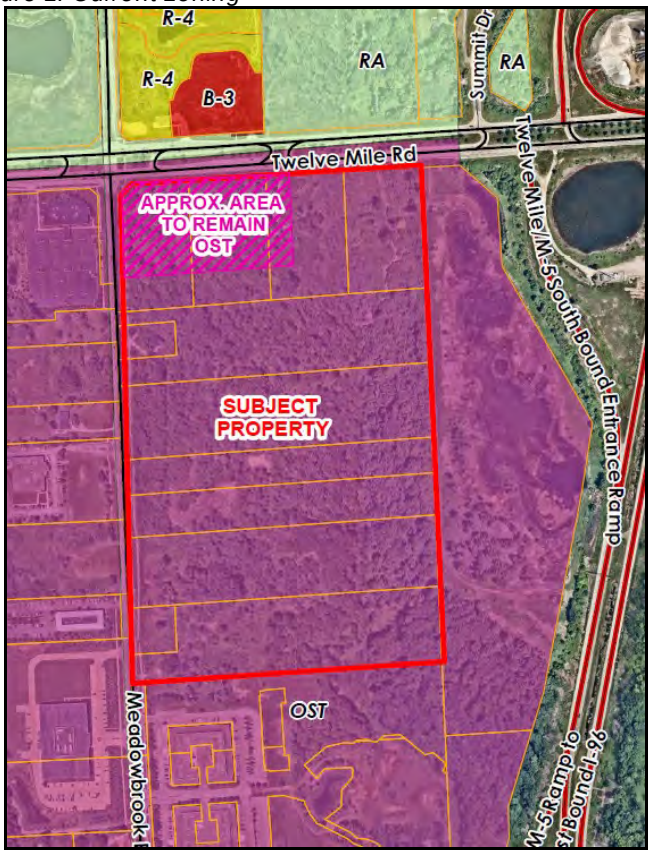


Figure 2: Future Land Use

Compatibility with Surrounding Land Use

The subject property is located along the east side of Meadowbrook Road, south of Twelve Mile Road and west of M-5. There are existing office developments to the south and west in areas zoned OST. On the west side of Meadowbrook the Elm Creek PRO is under consideration for RM-1 zoning to allow a townhome development. The area to the east is a 30-acre property owned by M-DOT

that is used for wetland mitigation and stormwater management. To the north across Twelve Mile Road is the City's Beacon Hill Trailhead Park and a vacant area zoned B-3 which was part of the Beacon Hill PRO. To the northeast is area zoned Residential Acreage, which has been approved for the Armenian Church and Cultural Center. Most of the surrounding properties are developed, but there are some parcels that are currently vacant. The proposed use is not consistent with the surrounding existing uses to the north, west and south based on current Zoning requirements. However, it would be consistent with the open space to the east and the proposed Elm Creek development on the west side of Meadowbrook Road.

Figure 3: Names of surrounding developments and businesses

The applicant's narrative notes that the target market of the proposed development is multi-generational. With the availability of various choices in unit types, the project aims to attract "young professionals, families and those looking for a more maintenance-free lifestyle." They note that some people who want to live in Novi may "rent initially, become familiar with Novi, and then purchase a home here when their family grows. Others grew up in the City and want [to] return if they can find housing that they can afford."

The narrative states that there are natural buffers in place that will shield the residential units from the surrounding commercial uses. The undisturbed woodland and wetland areas on the site and surrounding properties would allow the proposed use to "remain relatively secluded" from the commercial properties, as well as provide natural spaces contiguous with adjacent preserved areas. The remaining undeveloped properties in the area that could develop under the OST zoning district, are not likely to cause significantly greater conflicts with residential use on this site since they are located on the other side of Meadowbrook. The applicant has proposed a berm and dense landscaping along the southern portion of the property, which will provide an adequate screening buffer to that office complex. The area to the east of the property will remain undeveloped as it is an MDOT stormwater and wetland mitigation site.

Comparison of Zoning Districts

The following table provides a comparison of the current (OST) and proposed (RM-2) zoning classifications. It is not a direct comparison between the two uses, given that the two uses are clearly distinct from each other. It is a change of use from Office to Residential. The requirements for building setbacks, buffering and lot coverage are also different between the two districts.

	OST (EXISTING)	RM-2 (PROPOSED)
Principal Permitted Uses	Professional and Medical offices; Data processing and computer centers; Laboratories; Research, testing, design & development, technical training; Hotels; Higher learning institutions; Motion picture, TV, & radio production facilities; Facilities for human care; Public parks/parkways, outdoor recreation; Public utilities; Financial institutions; Indoor/outdoor recreation facilities; Day care centers and adult day care; Sit down restaurants	Multiple-family dwellings; Independent and congregate elderly living facilities; Two-family dwellings; Shared elderly housing; One-family dwellings; Farms & greenhouses; Public parks, parkways, and outdoor recreation; Cemeteries; Home occupations; Family day care homes Keeping of horses and ponies (See Sec. 3.1.8.B for additional details)
Special Land Uses	Retail business and retail service; Restaurants, sit down and drive-through	Retail commercial services and office uses
Lot Size	Except where otherwise provided in this Ordinance, the minimum lot area and width, and the maximum percent of lot coverage shall be determined on the basis of off-street parking, loading, greenbelt screening, yard setback or usable open space requirements as set forth in this Ordinance.	See Section 3.8.1
Lot Coverage		45%
Usable Open Space	NA	200 sf per unit
Building Height	46 ft. or 3 stories, whichever is less	65 ft or 5 stories, whichever is less
Building Setbacks	Front: 50 feet Rear: 50 feet Side: 50 feet Exterior side yard setbacks same as front yard	Front: 75 feet Rear: 75 feet Side: 75 feet Exterior side yard setbacks same as front yard
Parking Setbacks See 3.6.2. for additional conditions	Front: 20 feet Rear: 20 feet Side: 20 feet Exterior side yard setbacks same as front yard	Front and exterior side: 75 feet Interior side/Rear: 20 feet

	OST (EXISTING)	RM-2 (PROPOSED)

DEVELOPMENT POTENTIAL

Like much of the City of Novi, this area was formerly agricultural land. Based on aerial imagery, the land was no longer plowed for crops after 1960. There were 5 homes present for many years, but all were demolished by 2010. Land records indicate that all 12 properties were purchased by Mercy Health in 1997-1998. The land is currently vacant.

Development under the current OST zoning could result in a substantial amount of Office or Research & Development building space being constructed on this large parcel. In the narrative provided, the applicant states that a commercial development on this property would result in significantly greater disturbance of the woodlands and wetlands on the site due to the typically large footprint of the buildings and the parking lots that are required to support the use. No conceptual layouts or building sizes were included with the submittal. There have been no formal submittals for development proposals in the last 30 years for the subject property. The City's records show a development called Sinai Park was proposed on the property in the mid-1990s, proposing a 540,000 square foot medical health care and office complex. As indicated in the office market study provided, there is a lack of development potential for OST-type uses on this site due to the overall depressed office market, more attractive locations, and the environmental factors on the subject property. The extensive presence of both woodland and wetland areas on this particular site are not attractive to OST development because of the development limitations and high costs associated with developing large-scale uses and needing to mitigate for those impacts.

The current concept plan proposes a development of 438 units (density of 8 dwellings per net acre) for a mid-density multifamily development which is below the 15.6 maximum density allowed for three-bedroom units in the RM-2 zoning district. The buildings are clustered in 4 different "villages," thoughtfully arranged to allow for the preservation of extensive wetland and woodland areas on the site. The applicant is proposing a deviation to allow 50-foot setbacks in several locations, which are consistent with the current OST zoning, rather than the 75 feet requirement for RM-2 zoning. This also places the units closer to the existing office uses in the surrounding area than would be expected in the RM-2 district.

The Master Plan for Land Use does not anticipate residential uses of this property, so no density guidelines are provided on the plan. The site is adjacent to high tech office developments to the west and south, where the zoning will remain OST. Some potential conflicts with the adjacent users could be the noise and disruption of truck traffic, including loading and unloading functions, on the proposed residents. The adjacent OST property owners may be affected in the future being adjacent to a residential zoning district: additional berming and screening may be required. The closest residential unit would be about 125 feet from a potential future building site in the office park to the south. To the north, there are approved but not yet built projects that will eventually be built on the north side of 12 Mile Road: the B-3 portion is subject to a PRO Agreement that allows about 11,000 square feet of retail uses to be developed, and on the R-A zoned property the multi-phased Armenian Church and Cultural Center is anticipated to be developed.

The applicant provides some reasonable justification for the change of use to residential to meet demand for housing with a site that appears unsuitable to larger office-type uses. However, staff has concerns about the overall change to the character of the Meadowbrook Road corridor, wetland mitigation, and façade materials.

Based on the feedback provided in the staff and consultant review letters, and any additional comments from the Planning Commission and City Council, the applicant should consider addressing those comments and revise the drawings accordingly before the formal PRO Concept submittal.

2016 MASTER PLAN FOR LAND USE: GOALS AND OBJECTIVES

The proposed use is currently not recommended by the 2016 Master Plan for Land Use. The following objectives (underlined) as listed in the Master Plan are applicable for the proposed development. **The applicant should consider revisions to the plan to comply with as many goals as possible. Please refer to staff comments in bold and revisions recommended in bold and underline.**

1. **General Goal: Quality and Variety of Housing**
    a. Provide residential developments that support healthy lifestyles. Ensure the provision of neighborhood open space within residential developments. **The development mostly proposes the required sidewalks along the private streets, as well as a 10-foot mutli-use pathway along the main internal roadway. Pathways are present along Meadowbrook Road, and will be constructed on 12 Mile Road. Additional recreational amenities are also provided like a clubhouse with a pool and gym, pickleball courts, dog park, playground, and nature trails.**
    b. Safe housing and neighborhoods. Enhance the City of Novi's identity as an attractive community in which to live by maintaining structurally safe and attractive housing choices and safe neighborhoods. **The development would provide attractive housing choices with nice amenities and green spaces.**
    c. Maintain existing housing stock and related infrastructure. **The development would not remove any existing homes.**
    d. Provide a wide range of housing options. Attract new residents to the City by providing a full range of quality housing opportunities that meet the housing needs of all demographic groups including but not limited to singles, couples, first time home buyers, families and the elderly. **The proposed development does provide multiple types of homes that could be appealing to various demographic groups.**

2. **General Goal: Community Identity**
    a. Maintain quality architecture and design throughout the City. **The current proposed elevations are not compliant with Façade Ordinance standards and would require several Section 9 waivers, which are not supported. Please refer to the façade review letter for opportunities to maintain quality architecture.**

3. **General Goal: Environmental Stewardship**
    a. Protect and maintain the City's woodlands, wetlands, water features, and open space. The concept plan proposes additional removal of regulated woodlands. **Please refer to the wetlands and woodlands review letter for opportunities to further protect these natural features.**
    b. Increase recreational opportunities in the City. **The Concept plan proposes recreational opportunities for the residents. The applicant proposes a clubhouse with a pool and park area with pickleball courts and a playground. A 10-foot pathway along their 12 Mile frontage is shown, as required. The applicant has also included an internal 10-foot multiuse pathway and a network of walking trails and nature overlooks. Along Meadowbrook and 12 Mile the plan also proposes four "focal areas" that would be available to the general public. The focal areas appear to consist of landscaping and benches and are the primary public benefit proposed.**
    c. Encourage energy-efficient and environmentally sustainable development through raising awareness and standards that support best practices. **The applicant indicates**

they will utilize sustainable, energy-efficient and best-practice design for site elements and building materials. Further details should be provided.

4. **General Goal: Infrastructure**
   a. Provide and maintain adequate water and sewer service for the City's needs. **Please refer to the Engineering memo.**
   b. Provide and maintain adequate transportation facilities for the City's needs. Address vehicular and non-motorized transportation facilities. **A bus stop is proposed along 12 Mile Road frontage, which would need to be coordinated with SMART.**

5. **General Goal: Economic Development / Community Identity**
   a. Ensure compatibility between residential and non-residential developments. **Please refer to comments about compatibility with surrounding development earlier in this review.**

2023 ACTIVE MOBILITY PLAN (AMP)

There is an existing 10-foot wide pathway along the Meadowbrook Road frontage. This pathway connects the I-275 non-motorized pathway to the Beacon Hill Trailhead Park at the northeast corner of Meadowbrook and 12 Mile. From there, connections are also available to the Airline Trail in Commerce Township, north of the City's boundary, via the M-5 pathway.

The applicant is proposing to construct the missing pathway gap along their 12 Mile Road frontage, which is a *Near-term priority* in the AMP. This would result in approximately 1,300 feet of new 10-foot pathway. To the east, the M-5 interchange presents a significant barrier to continuing the pathway – there will remain a 2,060 foot gap in the non-motorized network. Existing pathway to the west would connect this area to the Twelve Oaks, West Oaks and Fountain Walk commercial areas.

Meadowbrook Road is classified as a cross-town corridor in the AMP, while 12 Mile Road is a multi-modal thoroughfare. The recommended baseline pedestrian facility improvements for minor road stops (where the pathway crosses the entrances to the development) on both roads would include crosswalk lighting, a raised high visibility crossing and recessed crossings where feasible. For bicycle facility improvements, separated bike lanes are preferred, or a 12-foot shared-use pathway to accommodate both bikes and pedestrians. Mid-block crossings might be considered on 12 Mile Road – the AMP contains an example of a Median U-turn on page 77, which would need to be controlled with traffic signals. **These treatments should be considered by the applicant as the project moves forward.**

MAJOR CONDITIONS OF PLANNED REZONING OVERLAY AGREEMENT

The Planned Rezoning Overlay process involves a PRO concept plan and specific PRO conditions in conjunction with a rezoning request. The submittal requirements and the process are codified under the PRO ordinance (Section 7.13.2). Within the process, which is initiated by the applicant, the applicant and City Council can agree on a series of conditions to be included as part of the approval which must be reflected in the Concept Plan and or the PRO agreement.

The PRO conditions must be in material respects, more strict or limiting than the regulations that would apply to the land under the proposed new zoning district. *Development and use of the property shall be subject to the more restrictive requirements shown or specified on the PRO Plan, and/or in the PRO Conditions imposed, and/or in other conditions and provisions set forth in the PRO Agreement.*

The applicant could consider the following conditions for development to be included in the PRO Agreement:

1. Preservation of _____ acres of City regulated woodlands
2. Preservation of _____acres of City regulated wetlands
3. Density shall not exceed ____ dwelling units per acre (More limiting than the dwelling units per acre allowed in the RM-2 District)
4. Providing the community amenities shown in the PRO Plan
5. Dedication of ____ linear feet (or acres) of Right of Way
6. Building height will be limited to _____ feet.
7. The landscape plan will exceed the required 50% native species.
8. Specifying uses of land that will not be permitted (which are otherwise allowed in the RM-2 District.
9. Improvements or other measures to improve traffic congestion or vehicular movement with regard to existing conditions or conditions anticipated to result from the development.
10. Creation or preservation of public or private parkland or open space

Additional conditions to be included in the PRO Agreement, if it should be approved, will likely be added during the review process.

APPLICANT'S BURDEN UNDER PRO ORDINANCE

The Planned Rezoning Overlay ordinance (PRO) requires the applicant to demonstrate that certain requirements and standards are met. The applicant should be prepared to discuss these items, especially in number 1 below, where the ordinance suggests that the enhancement under the PRO request would be unlikely to be achieved or would not be assured without utilizing the Planned Rezoning Overlay. Section 7.13.2.D.ii states the following:

1. *(Sec. 7.13.2.D.ii.a) The PRO accomplishes the integration of the proposed land development project with the characteristics of the project area in such a manner that results in an enhancement of the project area as compared to the existing zoning that would be unlikely to be achieved or would not be assured in the absence of the use of a Planned Rezoning Overlay.*
2. *(Sec. 7.13.2.D.ii.b) Sufficient conditions shall be included on and in the PRO Plan and PRO Agreement such that the City Council concludes, in its discretion, that, as compared to the existing zoning and considering the site specific land use proposed by the applicant, it would be in the public interest to grant the Rezoning with Planned Rezoning Overlay. In determining whether approval of a proposed application would be in the public interest, the benefits which would reasonably be expected to accrue from the proposal shall be balanced against, and be found to clearly outweigh the reasonably foreseeable detriments thereof, taking into consideration reasonably accepted planning, engineering, environmental and other principles, as presented to the City Council, following recommendation by the Planning Commission, and also taking into consideration the special knowledge and understanding of the City by the City Council and Planning Commission.*

The following benefits are suggested by the applicant as listed in their narrative **(Staff comments in Bold)**:

Open Space and Parks – The Project design and layout is intended to create a "Placemaking" destination. These benefits will provide the City and its residents with great views, open space, pathways available to the public and, linked with the adjacent MDOT preserve, a large open space for wildlife habitat.

1. Over 1/3 of the site will be open space.

2. The open space includes "pocket parks" and an internal "Central" park community gathering area with many amenities (pool, clubhouse, Pickleball courts, picnic areas, playground, and a dog park).
3. Landscaping will focus on the use of native Michigan vegetation.
4. Setbacks, buffering and connectivity to support the eventual development of the corner parcel.
5. Views along Meadowbrook and 12 Mile Roads will have four places of interest, with extensive tree envelopes, benches and other amenities. Almost 50% of the frontage along those streets will be open space. **Who will be responsible for maintaining these spaces?**
6. Preserves wetland and woodland corridors by mingling development into pockets. This is in contrast to development of OST uses that likely would have greater disruption of the natural features. Major wetlands will be preserved through a Conservation Easement.

Housing – Housing demand has changed. To address the market trends and need for more choices, we will offer multi-generational housing, geared toward young professionals and those looking for a more maintenance-free lifestyle.

7. Converts a long vacant OST parcel into a type of development that the public needs.
8. A more "attainable" housing cost compared to other options prevalent in the City.
9. Attractive, flexible housing types – townhomes, residential flats, designed for rent, sale or conversion to condominiums.

Mobility and Transportation – Connections to the Regional Pathways and the various internal non-motorized connections are consistent with "Walkable Novi" and the City's new Mobility Plan.

10. Combining 12 parcels, which could be developed with individual access points, into one unified destination with just two access points. **There are two access points on Meadowbrook, and one on 12 Mile Road. The retained Trinity parcel at the corner would likely have at least two access points as well.**
11. Connections to a new bus stop for residents of the area for SMART's Route 740 along 12 Mile Road. **Would a bus shelter be provided?**
12. An integrated pathway system that links to the regional non-motorized system along 12 Mile and Meadowbrook Roads, that connects to the Michigan Air Line Trail, M-5 and I-275 systems.
13. Our internal non-motorized system includes sidewalks, pathways, compacted limestone and natural hiking trails. We are providing a wider, 10-foot wide, circular pathway system in the area where we believe the demand will be highest.
14. Significant reductions in traffic compared to development of the site with typical OST uses (as noted in the Community Impact Statement and Traffic Impact Study).

This is a PRO in which the applicant seeks both a rezoning and a list of ordinance deviations. In Staff's opinion the proposed benefits to the community at large are relatively minor and additional benefits could be offered to balance out the detriments of the rezoning (in this case: significant impact to existing woodlands and wetlands, compatibility concerns with adjacent existing non-residential uses, lack of required landscaping, and building materials that are inconsistent with the ordinance standards). Additionally, the applicant should clarify if Right of Way (ROW) is being dedicated.

ORDINANCE DEVIATIONS

Section 7.13.2.D.i.c(2) permits deviations from the strict interpretation of the Zoning Ordinance within a PRO agreement. These deviations must be accompanied by a finding by City Council that "***each Zoning Ordinance provision sought to be deviated would, if the deviation were not granted, prohibit an enhancement of the development that would be in the public interest, and that approving the deviation would be consistent with the Master Plan and compatible with the surrounding areas.***" Such deviations must be considered by City Council, who will make a finding of whether to include those deviations in a proposed PRO agreement. A proposed PRO

agreement would be considered by City Council only after tentative approval of the proposed concept plan and rezoning.

The Concept Plan submitted with an application for a rezoning with a PRO is not required to contain the same level of detail as a preliminary site plan. Staff has reviewed the applicant's Concept Plan in as much detail as possible to determine what deviations from the Zoning Ordinance are currently shown. The applicant may choose to revise the concept plan to better comply with the standards of the Zoning Ordinance, or may proceed with the plan as submitted with the understanding that those deviations would have to be approved by City Council in a proposed PRO agreement. **The applicant provided a request for certain deviations. However, it is not comprehensive. The applicant should refer to all review letters and identify what deviations they would seek and what they would revise the plan to conform**.

The following are Ordinance deviations that have been requested by the applicant. **Staff comments are in bold.**

1. **Building Setbacks** *(Sec 3.1.7.D):* A Zoning Ordinance deviation is requested to reduce the building setbacks from 75 feet to 50 feet along the east, west and south property lines. The applicant indicates the property to the east will not be developed as it is the MDOT wetland and stormwater natural area, so the reduced setback will not impact this property. The applicant states that much of the property to the south is in a conservation easement, and a berm with landscaping for additional screening is proposed. **The conservation easement area is not in the area adjacent to the proposed homes.** On the western side, the applicant states the 50-foot setback is consistent with existing developments along Meadowbrook, and that Trinity Health has endorsed the design of the site, including the setbacks. **The setbacks from the Trinity Health parcel observe a 75-foot setback as is required. Most of the existing buildings along this segment of Meadowbrook are set back more than 70 feet from the road right-of-way. The only building setback that is less than 70 feet is the University of Detroit Mercy building, which is approximately 30 feet from Meadowbrook ROW.**

2. **Parking Setback** *(Sec 3.1.7.D):* A Zoning Ordinance deviation is requested to reduce the parking setback from 75 feet to 50 feet along the west property lines. The deviation is requested as it is similar to other developments along Meadowbrook Road, and ample landscaping will provide a screening buffer. **Parking areas along Meadowbrook Road are in the 30-50 foot range for setbacks. There is only one location on the proposed plan with parking this close to the road, and it is shown to be covered by a carport structure.**

3. **Total Number of Rooms** (Sec. 3.8.1.A): A Zoning Ordinance deviation is requested to allow a greater number of rooms than the RM-2 District permits for buildings less than 4-stories (1,389 rooms proposed, 1,195 permitted). The applicant states while the proposed number of rooms exceeds the number allowed, the proposed density for each unit type is less than the allowed density, and the proposed unit mix is consistent with current market conditions and demand. **The RM-2 district allows a greater number of rooms for buildings 4 stories or taller, with corresponding higher units. This deviation has been permitted previously, as the overall density permitted by the district is not exceeded.**

4. **Building Length** (Sec. 3.8.2.C): The maximum building length in The Meadows is 216 feet, which exceeds the allowed length of 180 feet. The applicant states that the buildings are smaller than most modern multi-family buildings of this type. **Architectural details like changes in building materials, as well as over a third of the front façade of the building being landscaped, there is visual interest that helps to break up the bulk of the building**.

5. **Building Orientation** *(Sec. 3.8.2.D):* A Zoning Ordinance deviation is requested to revise the required orientation of the buildings from a minimum of 45 degrees in certain locations. This

allows for a more uniform site layout with all of the units backing up to open space/wooded areas. **All buildings are either parallel or perpendicular to property lines abutting non-residential districts. This deviation has been requested and granted for many residential projects in the City in the last 5 years.**

6. **Distance between Buildings** *(Sec 3.8.2.H): A Zoning Ordinance deviation is requested to reduce the building separation distance from the calculated formula as follows: The Vistas (side to side: 25 feet minimum proposed, 34.8 feet required; rear to rear: 50 feet proposed, 56 feet required); Woods and Meadows: (side to side: 25-feet proposed, 39.6 feet required); between Building 9 and 10 (32.8 feet proposed, 41.3 feet required).* **This deviation enables the layout of this project to fit within the available space while minimizing wetland and woodland impacts.**

7. **Parking along Major Drives** *(Sec. 5.10):* A Zoning Ordinance deviation is requested to allow for perpendicular parking on a major drive. This deviation is requested to due to the impracticality of providing a minor road (defined as less than 600 feet in length) given the site constraints (woodlands, wetlands, and property configuration). **Perpendicular parking for guests is proposed on two Major Drives (Simi Drive and Beckham Drive) in several locations, where driveways are also proposed. The parking spaces will not cause any more disruption on the roadway than cars that will be backing out of the driveways.**

8. **Wetland Mitigation** (Code of Ordinances, Chapter 12, Sec 12-173): At this time it appears the applicant would need to request deviations from the requirements of the Wetland and Watercourse Protection ordinance based on the information provided in the plan**. The applicant should reevaluate their calculated impacts and mitigation plans based on comments in the Wetland Review. Current deviations needed would not be supported by staff.**

9. **Section 9 Waiver** (Section 5.15): Proposed elevations for residential buildings have an underage of minimum required brick (0% proposed on some buildings, 30% minimum required), and an overage of Vinyl Siding on all buildings (0% allowed). **This waiver is not supported. As a minimum, the amount of brick should be increased to more closely match the 30% required. As vinyl siding is not permitted, the applicant should consider wood of fiber cement siding.**

10. **Parking Distance to Buildings** (Sec. 3.8.2.F): In two locations, off-street parking spaces are within 13-17 feet from the adjacent building. The ordinance requires 25-feet between parking spaces and a dwelling structure that contains openings involving living areas. **The parking spaces are further away than the driveways where parking is permitted, so it does not appear they will have a greater impact.**

11. **Pedestrian Connectivity** (Sec. 3.8.2.G): Five-foot sidewalks are required on both sides of private drives. It appears that a 5-foot sidewalk is missing from the west side of Lila Way. **Please provide the required sidewalk, or provide a justification for the deviation.**

12. **Number of Accessory Buildings** (Sec. 4.19.1.J): For lots greater than ½ acre, not more than 2 detached accessory buildings are permitted. The PRO plan shows 4 detached garages. **A recent text amendment allows the number of carports to exceed 2. This deviation to allow a greater number of garages is supported as it is a large site, provides covered parking options for a greater number of residents, and will not be detrimental to the area.**

13. **Landscape Berms** (Sec. 5.5.3.A.ii): A landscape deviation is requested to not provide a 4-foot, 6-inch to 6-foot high landscape berm on a proposed RM-2 district adjacent to an OST district on the east and south side. This deviation is supported by staff because of topography and the provision of dense landscaping along both property lines**.**

14. **Right-of-Way Landscaping** (Sec. 5.5.3.B.ii): A deviation to the required greenbelt berm and plantings along 12 Mile and Meadowbrook Road due to the existing natural areas to be preserved, and a heavily landscaped detention basin.

15. **Right-of-Way Landscaping** (Sec. 5.5.3.B.ii): A landscape deviation to allow a deficiency in street trees along Meadowbrook Road. **This may be supported by staff depending on the justification. The applicant is asked to provide rationale for this deficiency.**

16. **Building Foundation Landscaping** (Sec. 5.5.3.F.iii): A landscape deviation for the deficiency in building foundation landscaping. **This deviation is not supported by staff as there are opportunities to more closely comply with the ordinance standards.**

See other review letters for deviations that have been identified other reviewers. Deviations from Ordinance standards may continue to be identified during the PRO Review process. All deviations from the ordinance requirements shall be identified and included in PRO Agreement. Any additional deviations identified during Site Plan Review (after the Concept Plan and PRO Agreement is approved), will require amendment of the PRO Agreement.

NEXT STEP: PLANNING COMMISSION CONSIDERATION OF ELIGIBILITY

The Planning Commission will have an opportunity to discuss the initial submittal and eligibility of the rezoning request from OST (Office Service Technology) to RM-1 (Multiple Family Low Rise Residential) with a Planned Rezoning Overlay.

As stated in the newly amended PRO Ordinance,

> *In order to be eligible for the proposal and review of a rezoning with PRO, an applicant must propose a rezoning of property to a new zoning district classification, and must, as part of such proposal, propose clearly-identified site-specific conditions relating to the proposed improvements that,*
>
> *(1) are in material respects, more strict or limiting than the regulations that would apply to the land under the proposed new zoning district, including such regulations or conditions as set forth in Subsection C below; and*
>
> *(2) constitute an overall benefit to the public that outweighs any material detriments or that could not otherwise be accomplished without the proposed rezoning.*

(Full text of the PRO ordinance, including Subsection C, is available here)

Unless the applicant would like to modify the PRO Plan, this item will be scheduled for initial review and comment on the PRO Plan on Wednesday, October 16, 2024. **Please ensure that the rezoning signage, as shown on the Rezoning Sign Detail, are posted in the appropriate location indicated on the map provided no later than September 26, 2024, to give proper notice prior to the public hearing before the Planning Commission.**

CITY COUNCIL CONSIDERATION OF ELIGIBILITY

Following the Planning Commission's initial review of the proposed project, the City Council will likewise have the opportunity to review the PRO proposal and comment on whether the project is eligible for the PRO process.

If the applicant has any questions concerning the above review or the process in general, do not hesitate to contact me at 248.347.0484 or lbell@cityofnovi.org.

Lindsay Bell, *AICP*, Senior Planner

PLANNING REVIEW CHART: RM-2 with PRO

Review Date: September 12, 2024
Review Type: Initial PRO Plan
Project Name: **JZ24-31 THE GROVE**
Plan Date: July 26, 2024
Prepared by: Lindsay Bell, *AICP*, Senior Planner
E-mail: lbell@cityofnovi.org; **Phone:** (248) 347-0484

Bold	To be addressed in Formal PRO Plan submittal
Underline	To be addressed with Preliminary Site Plan submittal
Bold and Underline	Possible deviations to be included as part of PRO agreement
Italics	Items to be noted

Item	Required Code	Proposed	Meets Code	Comments
Zoning and Use Requirements				
Master Plan *(adopted July 26, 2017)*	Office research development and technology	Multiple Family Residential	**No**	- *The proposed rezoning is not supported by the 2017 Master Plan.*
Area Study	The site does not fall under any special category	NA	NA	
Zoning *(Effective January 8, 2015)*	OST Office Service and Technology	RM-2 High-density Multiple Family with a PRO	**No**	
Uses Permitted (Sec 3.1.21.B & C)	Office and Service Uses Sec. 3.1.21.B. - Principal Uses Permitted. Sec. 3.1.21.C. – Special Land Uses Permitted.	Sec. 3.1.8. Multi-Family Residential	**No**	*The proposed rezoning category would allow Multi-family uses of various types.*
Phasing	If proposed, show proposed phasing lines on the plan. Each phase should be able to stand on its own with regards to utilities, open space, parking, etc.	Clarify whether the project would be phased	**TBD**	
Planned Rezoning Overlay Document Requirements *(SDM link: Site Plan & Development Manual)*				
Written Statement *(Site Plan & Development manual) The statement should describe the following*	Potential development under the proposed zoning and current zoning	Provided	Yes	*See Planning Review letter for detailed comments*
	Identified benefit(s) of the development	Provided	Yes	
	Conditions proposed for inclusion in the PRO Agreement (i.e., Zoning Ordinance deviations, limitation on total units, etc.)	Provided	Yes	
Sign Location Plan *(Page 23,SDM)*	Installed within 15 days prior to public hearing Located along all road frontages	Provided	Yes	

Item	Required Code	Proposed	Meets Code	Comments
Traffic Impact Study *(Site Plan & Development manual)*	A Traffic Impact Study as required by the City of Novi Site Plan and Development Manual.	Provided – by Fleis & Vandenbrink, 7/16/24	Yes	*See AECOM review of TIS*
Community Impact Statement *(Sec. 2.2)*	- Over 30 acres for permitted non-residential projects - Over 10 acres in size for a special land use - All residential projects with more than 150 units - A mixed-use development, staff shall determine	Provided – dated 8/7/24	Yes	*See Planning Review letter for detailed comments*
Market Study	Optional: a Market study to provide a market demand analysis for the proposed project.	Provided – • Office Market Report, 12/13/23 by CBRE • Housing Report, 8/9/24 by The Chesapeake Group	Yes	*See Planning Review letter for detailed comments*
Height, bulk, density and area limitations *(Sec 3.1.8.D)*				
Frontage on a Public Street. *(Sec. 5.12)*	Frontage on a Public Street is required	The site has frontage and access to Meadowbrook and 12 Mile Roads	Yes	
Minimum Zoning Lot Size for each Unit: in Acres *(Sec 3.8.1)*	RM-1 and RM-2 Required Conditions	61.86 acres gross 54.85 acres net	Yes	
Minimum Zoning Lot Size for each Unit: Width in Feet *(Sec 3.8.1)*			NA	
Usable Open Space Area *(Sec 3.1.8.D) Article 2: Definitions*	200 sf of Minimum usable open space per dwelling unit For a total of 438 dwelling units, <u>required Open Space: 87,600 SF (~2 acre)</u> <u>Refer to definitions for Usable Open Space and Open Space</u>	Sheet SP3.4 Open Space Plan is missing from the PRO Plan set; Other sheets and narrative materials refer to 11 acres of Usable Open Space and 7.36 acres of "Additional Open Space"	**Yes?**	**SP3.4 will need to be included in future submittals to verify spaces meet the definitions**
Maximum % of Lot Area Covered (By All Buildings)	*45%*	16%	Yes	
Building Height *(Sec. 3.20)*	65 ft. or 5 stories whichever is less	2-3 stories proposed 2-story units: 27 ft 3 in	Yes	

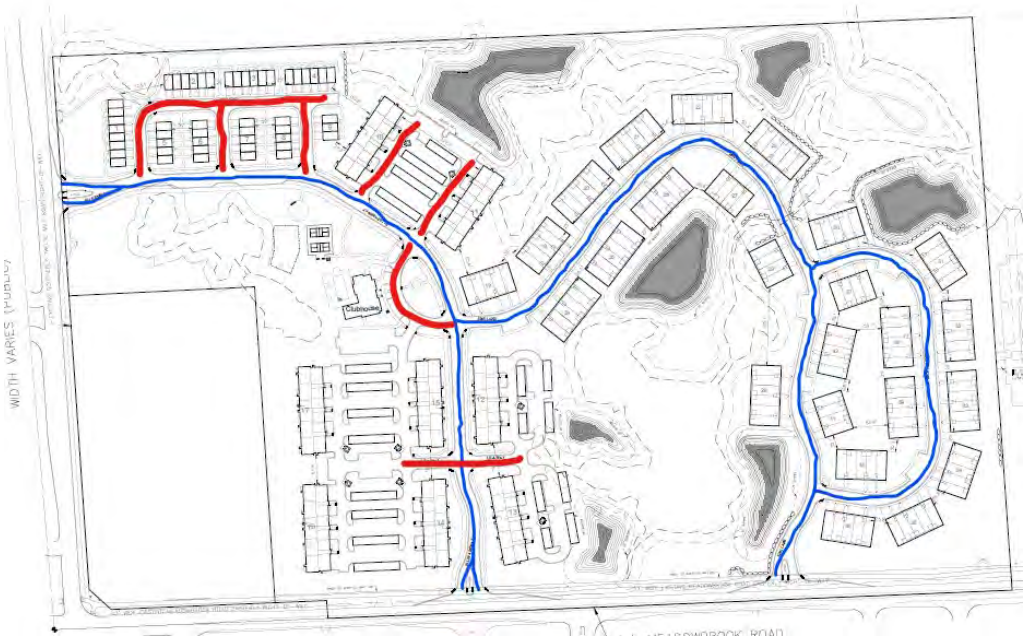
Item	Required Code		Proposed	Meets Code	Comments
			3-story towns: 33 ft 7 in Residence flats: 40 ft 7 in		
Minimum Floor Area per Unit *(Sec. 3.1.8.D)*	Efficiency	400 sq. ft.	458 sf	Yes	
	1 bedroom	500 sq. ft.	658 sf	Yes	
	2 bedroom	750 sq. ft.	861 sf	Yes	
	3 bedroom	900 sq. ft.	1905 sf	Yes	
	4 bedroom	1,000 sq. ft.		NA	
Maximum Dwelling Unit Density/Net Site Area *(Sec. 3.1.8.D)* ***Per Sec. 3.8.2.B, all buildings less than four stories should comply with RM-1 regulations for limits on percent of 1 bedroom units and number of rooms.***	Efficiency	Max 5%	4.8%	Yes	*See Sec. 3.8.1.A; in RM-2 District buildings less than 4 stories must meet RM-1 standards for room count and unit mix*
	1 bedroom	Max 20% 31.1du/ac	19.6%		
	2 bedroom	20.7 du/ac	34%		
	3+ bedroom	15.8 du/ac	42%		
Residential Building Setbacks *(Sec 3.1.8.D)*					
Front @ Meadowbrook Rd	75 ft. (Sec. 3.6.B)		50 ft	**No**	**West, east and south setbacks would require a deviation**
Exterior Side at 12 Mile	75 ft.		121 ft	Yes	
Side - East	75 ft.		54 ft	**No**	
Side - South	75 ft.		50 ft	**No**	
Parking Setback *(Sec 3.1.8.D) (Sec 3.1.12.D)Refer to applicable notes in Sec 3.6.2*					
Front *(3.6.2.B)*	75 ft.		50 ft	**No**	**Deviation would be required for parking setback along Meadowbrook for Zone 2**
Exterior side	75 ft.		>75 ft	Yes	
Rear *(3.6.2.B)*	20 ft.			NA	
Side *(3.6.2.B)*	20 ft.			NA	
Note To District Standards *(Sec 3.6.2)*					
Exterior Side Yard Abutting a Street *(Sec 3.6.2.C)*	All exterior side yards abutting a street shall be provided with a setback equal to front yard.		12 Mile Road considered exterior side yard	Yes	
Off-Street Parking in Front Yard *(Sec 3.6.2.E)*	Off-street parking is allowed in front yard		Parking is not proposed in the front yard	NA	
Distance between buildings *(Sec 3.6.2.H)*	It is governed by sec. 3.8.2 or by the minimum setback requirements, whichever is greater		RM-2 code has additional requirements for distance between buildings.		**See Comments later in the review**
Wetland/Watercourse Setback *(Sec*	A setback of 25ft from wetlands and from high		Extensive wetland areas exist –buffer impacts	**TBD**	**Refer to wetland review letter for more detail**

Item	Required Code		Proposed	Meets Code	Comments
3.6.2.M)	watermark course shall be maintained		likely		
Parking setback screening *(Sec 3.6.2.P)*	Required parking setback area shall be landscaped per sec 5.5.3.				**Refer to landscape review for comments**
Modification of parking setback requirements *(Sec 3.6.2.Q)*	The Planning Commission may modify parking setback requirements based on its determination according to Sec 3.6.2.Q			NA	*This would be addressed in the PRO Agreement if the deviation is granted*
RM-1 and RM-2 Required Conditions *(Sec 3.8)*					
Total number of rooms *(Sec. 3.8.1.A & B)*	For RM-2 building under 4 stories, Total No. of rooms < Net site area in SF/2000 Buildings 4 stories or greater may have Total No. of rooms < Net site area in SF/700		2,389,266 sf/2000 = **1,195 rooms allowed** **Total number of rooms Proposed: 1,392**	**No**	*See Sec. 3.8.1.A; in RM-2 District buildings less than 4 stories must meet RM-1 standards for room count and unit mix* **<u>This is considered a deviation to exceed the allowable number of rooms.</u>**
Public Utilities *(Sec. 3.8.1)*	All public utilities should be available		All public utilities are available	Yes	**Refer to Engineering review for more details**
Maximum Number of Units *(Sec. 3.8.1.A.ii)* *Applicable for RM-1 building and RM-2 buildings less than four stories*	Efficiency < 5 percent of the units		4.8%	Yes	
	1 bedroom units < 20 percent of the units		19.6%	Yes	
	Balance should be at least 2 bedroom units		Proposed	Yes	
Room Count per Dwelling Unit Size *(Sec. 3.8.1.C)* **An extra room such as den count towards an extra room*	**Dwelling Unit Size**	**Room Count ***		Yes	*Floorplans are provided. The plans indicate a combined living/dining, The Vistas include Office/Flex room as 5th room*
	Efficiency	1	1		
	1 bedroom	2	2		
	2 bedroom	3	3		
	3 or more bedrooms	4	4		
For the purpose of determining lot area requirements and density in a multiple-family district, a room is a living room, dining room or bedroom, equal to at least eighty (80) square feet in area. A room shall not include the area in kitchen, sanitary facilities, utility provisions, corridors, hallways, and storage. Plans presented showing one (1), two (2), or three (3) bedroom units and including a "den," "library," or other extra room shall count such extra room as a bedroom for the purpose of computing density.					
Setback along natural shore line *(Sec. 3.8.2.A)*	A minimum of 150 feet along natural lake shore line is required.		No natural lake shore line exists within the property	NA	
Structure frontage *(Sec. 3.8.2.B)*	Each structure in the dwelling group shall front either on a dedicated public street or approved private drive.		Proposed Private Drives	Yes	**Subject to City Council approval**

Item	Required Code	Proposed	Meets Code	Comments
Maximum length of the buildings *(Sec. 3.8.2.C)*	A single building or a group of attached buildings cannot exceed 180 ft.	216 feet (The Meadows)	**No**	**This is considered a deviation**
Modification of maximum length *(Sec. 3.8.2.C)*	Planning Commission may modify the extra length up to 360 ft. if		NA	*Would be addressed in the PRO Agreement if the deviation is granted, so this is not applicable*
	Common areas with a minimum capacity of 50 persons for recreation or social purposes			
	Additional setback of 1 ft. for every 3 ft. in excess of 180 ft. from all property lines abutting a residential district or major thoroughfare			
Building Orientation *(Sec. 3.8.2.D)*	Where any multiple dwelling structure and/ or accessory structure is located along an outer perimeter property line adjacent to another residential or nonresidential district, said structure shall be oriented at a minimum angle of forty-five (45) degrees to said property line.	Buildings 1-4, 16-17, 31-36 do not appear to meet the minimum requirement for 45-degree orientation	**No**	**This is considered a deviation**
Yard setback restrictions *(Sec. 3.8.2.E)*	Within any front, side or rear yard, off-street parking, maneuvering lanes, service drives or loading areas cannot exceed 30% of yard area	Complies –parking areas are largely internal to the site	Yes	
Off-Street Parking or related drives *(Sec. 3.8.2.F)* Off-street parking and related drives shall be	No closer than 25 ft. to any wall of a dwelling structure that contains openings involving living areas or	In two locations off-street parking spaces are within 13-17 feet from the adjacent building	**No**	**This is considered a deviation**
	No closer than 8 ft. for other walls or	Appears to comply	Yes	
	No closer than 20 ft. from ROW and property line	Minimum of 20 ft. is maintained	Yes	
Pedestrian Connectivity *(Sec. 3.8.2.G)*	5 feet sidewalks on both sides of the Private drive are required to permit safe and convenient pedestrian access.	5-ft sidewalks mostly proposed, 10-ft pathway on one side of Elle Pkwy	Yes?	**5-ft sidewalk required on west side of Lila Way**
	Where feasible sidewalks shall be connected to other pedestrian features	Provides connectivity to Meadowbrook and 12 Mile Road	Yes	

Item	Required Code	Proposed	Meets Code	Comments
	abutting the site.			
	All sidewalks shall comply with barrier free design standards	Details not yet provided	Yes?	Will be verified during Site Plan review
Minimum Distance between the buildings *(Sec. 3.8.2.H)*	**(**Total length of building A **+** total length of building B **+** 2(height of building **+** height of building B)**)/**6	Table provided on sheet SP3.5 – several proposed distances are less than the calculated requirement	**No**	**This is considered a deviation**
Minimum Distance between the buildings *(Sec. 3.8.2.H)*	In no instance shall this distance be less than thirty (30) feet unless there is a corner-to-corner relationship in which case the minimum distance shall be fifteen (15) feet.	Corner to corner relationships are min. of 25 feet	Yes	
Relationship between Streets *(Sec. 3.8.3.A)*	Proper relationship between local streets and any proposed service roads, driveways and parking areas to encourage pedestrian and vehicle safety	Appears to comply		
Architectural design and materials *(Sec. 3.8.3.B)*	All Development features of buildings and any accessory buildings (architectural design & façade materials) shall be clearly shown and identified			**See Façade review**
Interrelated Streets *(Sec. 3.8.3.C)*	All roads, driveways, parking areas and open spaces shall be located and interrelated so as to minimize any adverse effects upon adjacent streets and properties	Appears to comply		
Relationship between Buildings and uses *(Sec. 3.8.3.D)*	All buildings or building groupings shall be located so as to properly related one to the other and to uses on adjacent properties.	Appears to comply		
5.10 Additional Road Design, Building Setback, And Parking Setback Requirements, Multiple-Family Uses				
Road standards *(Sec. 5.10)*	A private drive network within a cluster, two -family, multiple-family, or non-residential uses and developments shall be built to City of Novi Design and Construction Standards for	Major and minor drive network shown	Yes	

Item	Required Code	Proposed	Meets Code	Comments
	local street standards (twenty-eight (28) feet back-to-back width			



For the purpose of this review, staff categorized the drives as follows:

1. Major Drive: Blue line
2. Minor Drive: Red line

Major Drives	- Width: 28 feet	Elle Pkwy, Simi Ln and Beckham Dr are 28-feet width	Yes	
Minor Drive	- Cannot exceed 600 feet - Width: 24 feet with no on-street parking - Width: 28 feet with parking on one side - Parking on two sides is not allowed - Needs turn-around if longer than 150 feet	Appears to comply	Yes	
Parking on Major and Minor Drives	- Angled and perpendicular parking, permitted on minor drive, but not from a major drive; - minimum centerline radius: 100 feet - Adjacent parking and on-street parking shall be limited near curves with less than two-hundred thirty (230) feet of centerline radius	**On-street perpendicular parking is proposed on the Major Drives (Simi Ln and Beckham Dr)** Centerline radius: 125', 140', 150'	**No**	**<u>This is considered a deviation</u>**
Driveways, Parking, Loading and Dumpster Requirements				

Item	Required Code	Proposed	Meets Code	Comments
Number of Parking Spaces *(Sec.5.2.12.A & B)*	For 2 or less bedroom units: 2 spaces each For 3 or more bedroom units: 2 ½ spaces each 24 Studios: 48 spaces 80-1 BR units: 160 spaces 128-2 BR units: 256 spaces 206- 3 bedroom units: 515 spaces **TOTAL REQUIRED: 968 spaces**	Meadows: 479 spaces Vistas: 212 spaces (garage, driveways and on-street) The Woods & the Pointe: 562 (garage, driveways and on-street) Clubhouse: 36 spaces **TOTAL PROPOSED: 1289**	Yes	
Landbank Parking *(Sec.5. 2.14)*	Maximum number of Landbank spaces: 25% of required parking	Not proposed	NA	
Parking Space Dimensions and Maneuvering Lanes *(Sec. 5.3.2)*	- 90° Parking: 9 ft. x 19 ft. - 24 ft. two way drives - 9 ft. x 17 ft. parking spaces allowed along 7 ft. wide interior sidewalks as long as detail indicates a 4" curb at these locations and along landscaping			
Parking stall located adjacent to a parking lot entrance(public or private) *(Sec. 5.3.13)*	- shall not be located closer than twenty-five (25) feet from the street right-of-way (ROW) line, street easement or sidewalk, whichever is closer	Not applicable	NA	
End Islands *(Sec. 5.3.12)*	- End Islands with landscaping and raised curbs are required at the end of all parking bays that abut traffic circulation aisles. - The end islands shall generally be at least 8 feet wide, have an outside radius of 15 feet, and be constructed 3' shorter than the adjacent parking stall as illustrated in the Zoning Ordinance	End Islands are proposed	Yes	**Refer to Traffic comments.**
Barrier Free Spaces *Barrier Free Code*	36 spaces for the clubhouse will require 2 ADA spaces	2 proposed	Yes	**Refer to Building Code requirements to identify how many ADA accessible units are required and provide necessary Handicap**

Item	Required Code	Proposed	Meets Code	Comments
				spaces in that location
Barrier Free Space Dimensions *Barrier Free Code*	- 8‘ wide with an 8’ wide access aisle for van accessible spaces - 8’ wide with a 5’ wide access aisle for regular accessible spaces	8‘ wide with an 8’ wide access aisle	Yes	
Barrier Free Signs *Barrier Free Code*	One sign for each accessible parking space.			Traffic Signage will be verified during site plan review
Minimum number of Bicycle Parking *(Sec. 5.16.1)*	One (1) space for each five (5) dwelling units For 438 units, 88 bike spaces are required 10% of total parking for clubhouse: 4 spaces	4 spaces at clubhouse 4 spaces at Pickleball courts 129 in unit garages	Yes	**Consider providing more bike racks near the clubhouse/park, as well as the bus stop to make it easier for more residents to bike/walk to destinations within the community**
Bicycle Parking General requirements *(Sec. 5.16)*	No farther than 120 ft. from the entrance being served	Complies	Yes	
	When 4 or more spaces are required for a building with multiple entrances, the spaces shall be provided in multiple locations	Complies	Yes	
	Spaces to be paved and the bike rack shall be inverted “U” design Shall be accessible via 6 ft. paved sidewalk			
Covered Bicycle Parking *(Sec 5.16.4)*	When 20 or more bike parking spaces are required, 25% shall be in covered locations	129 parking spaces provided in unit garages	Yes	
Bicycle Parking Lot layout *(Sec 5.16.6)*	Parking space width: 7 ft. One tier width: 11 ft. Two tier width: 18 ft. Maneuvering lane width: 4 ft. Parking space depth: 32 in	Not provided	No	Provide the bike layout plan as required at the time of final site plan. It should meet the requirements.
Loading Spaces *Sec. 5.4.1*	- Every building involving receipt or distribution of vehicles or materials or merchandise there shall be provided and maintained adequate space for standing, loading and unloading to avoid undue interference with public use of ROW	Loading area appears to be proposed on east side of clubhouse?	Yes	**Clarify if this area is intended as a loading area**

Item	Required Code	Proposed	Meets Code	Comments
Exterior lighting *Sec. 5.7*	Photometric plan and exterior lighting details needed at time of Final Site Plan submittal	A lighting and photometric plan is not provided at this time	TBD	
Accessory Use (Sec. 4.19)				
Accessory Buildings *Sec. 2.2. Definitions*	Any structure, either temporary or permanent, having a roof supported by columns or walls, and intended for the shelter, or enclosure of persons, animals, chattels, or property of any kind.	Proposed carports and detached garages are subject these requirements	Yes	
Location: Accessory Building *Sec. 4.19.1.B*	They shall not be erected in any required front yard or in any required exterior side yard.	Proposed internal to site	Yes	
Setbacks: Detached Accessory Building *Sec. 4.19.1.G*	- It shall not be located closer than ten (10) feet to any main building - It shall not be located closer than six (6) feet to any interior side lot or rear lot line.	Garages: appear to comply	Yes	
Height: Detached Accessory Building *Sec. 4.19.1.G*	The height equal to the maximum permitted height of the district; provided, if the accessory building exceeds one (1) story or fourteen (14) feet in height, the building shall be set back one (1) foot for each foot the building exceeds fourteen (14) feet in height.	12 feet max	Yes	
Façade requirements for Carport Canopies *Sec. 5.15.12.b*	- Not greater than 12' tall - <40 ft width - Powder coated steel or aluminum material, neutral in color to harmonize with primary buildings - Solar photo voltaic and EV charging integration strongly encouraged	Elevations of garage and carports provided		**See Façade review**
Canopies and Carports *Sec. 4.19.2.C*	Two or more carports permitted on any lot greater than 2 acres, provided they comply with accessory building setback and height	9 carports proposed, meet height requirements and setbacks	Yes	
Maximum	Lots more than 21,780 SF: 2	Number of detached	**No**	**<u>This is considered a</u>**

Item	Required Code	Proposed	Meets Code	Comments
number of Accessory buildings *Sec. 4.19.1.J*		garages exceeds 2 (4 proposed)		**deviation**
Dumpster *Sec 4.19.2.F*	- Located in rear yard - Attached to the building or - No closer than 10 ft. from building if not attached - Not located in parking setback - If no setback, then it cannot be any closer than 10 ft, from property line. - Away from Barrier free Spaces	Dumpsters are located at 8 different locations All are detached Farther than 10 ft.	Yes	
Dumpster Enclosure *Sec. 21-145. (c) Chapter 21 of City Code of Ordinances*	- Screened from public view - A wall or fence 1 ft. higher than height of refuse bin - And no less than 5 ft. on three sides - Posts or bumpers to protect the screening - Hard surface pad. - Screening Materials: Masonry, wood or evergreen shrubbery	Unable to determine.	**TBD**	**Will be reviewed in future submittals**
Roof top equipment and wall mounted utility equipment *Sec. 4.19.2.E.ii*	All roof top equipment must be screened and all wall mounted utility equipment must be enclosed and integrated into the design and color of the building	Unable to determine.	**TBD**	**See Façade Review**
Roof top appurtenances screening	Roof top appurtenances shall be screened in accordance with applicable facade regulations, and shall not be visible from any street, road or adjacent property.	Unable to determine.	**TBD**	**See Façade Review**
Accessory Structures *(Sec. 4.19.2)*	Anything constructed or erected, the use of which requires location on the ground or attachment to something having location on the ground. Flagpoles, solar structures, transformers and utility	The plan does not appear to propose any other accessory structures	NA	Contact Planning department if any accessory structures are proposed Any future proposed structures are expected to comply with the requirements if not

Item	Required Code	Proposed	Meets Code	Comments
	boxes			approved as part of the PRO plan
Sidewalks				
Active Mobility Plan	Proposed Off-Road Trails, enhanced road crossings, Shared-use Path of 10 feet on S side of 12 Mile, support new transit route on 12 Mile	10-foot pathway along S side of 12 Mile Road; 10-foot pathway along N side of major drive	Yes	**See new Active Mobility Plan for other guidelines/recommendations, especially for 12 Mile and Meadowbrook**
Internal Sidewalks *Sec. 3.8.2.G*	Five foot sidewalks required on both sides of internal public or private drives	5-ft Sidewalk provided on both sides for most par, 10-foot pathway along Elle Pkwy.	Yes	**See comment above regarding Lila Way**
Public Sidewalks *(Chapter 11, Sec.11-276(b))*	A 10- foot sidewalk is required along 12-Mile Road; Existing pathway on Meadowbrook	Pathway proposed along 12 Mile Road	Yes	
Other Requirements				
Residential Entryway lighting *Sec. 5.7*	One street light is required per entrance.	Not provided at this time	No	Will be verified during site plan process
Design and Construction Standards Manual	Land description, Sidwell number (metes and bounds for acreage parcel, lot number(s), Liber, and page for subdivisions).	Legal description provided SP 7.3	Yes	
General layout and dimension of proposed physical improvements	Location of all existing and proposed buildings, proposed building heights, building layouts, (floor area in square feet), location of proposed parking and parking layout, streets and drives, and indicate square footage of pavement area (indicate public or private).	Generally Provided		Please provide additional information as requested in this and other review letters
Economic Impact	- Total cost of the proposed building & site improvements - Number of anticipated jobs created (during construction & after building is occupied, if known)	Numbers not provided	No	
Other Permits and Approvals				
Development/ Business Sign *(City Code Sec 28.3)*	Signage if proposed requires a permit.	Signage is not proposed at this time.		For sign permit information contact Ordinance Division at **248-735-5678.**

Item	Required Code	Proposed	Meets Code	Comments
Development and Street Names	Development and street names must be approved by the Street Naming Committee	Not received	**TBD**	**Project and Street Name application; Contact Diana Shanahan at 248-347-0475 to schedule consideration by the Committee**
Property Split or Combination	The proposed property split must be submitted to the Assessing Department for approval.	12 parcels are supposed to be combined, with one 7-acre area at the corner of 12 Mile and Meadowbrook to be split off and remain OST	NA	The parcel combination must be completed prior to final stamping set approval.
Other Legal Requirements				
PRO Agreement *(Sec. 7.13.2.D(3)*	A PRO Agreement shall be prepared by the City Attorney and the applicant (or designee) and approved by the City Council, and which shall incorporate the PRO Plan and set forth the PRO Conditions and conditions imposed	Not applicable at this moment	NA	PRO Agreement would need to be approved by the City Council if the Concept Plan is tentatively approved
Master Deed/Covenants and Restrictions	Applicant is required to submit this information for review with the Final Site Plan submittal	Not applicable at this moment	NA	If one is proposed, then a Master Deed draft shall be submitted prior to Stamping Set approval.
Conservation easements	Conservation easements may be required for woodland/wetlands	Not applicable at this moment	NA	Documents will be required during Site Plan review process after the Concept PRO approval
Lighting and Photometric Plan (Sec. 5.7)				
Intent *(Sec. 5.7.1)*	Establish appropriate minimum levels, prevent unnecessary glare, reduce spillover onto adjacent properties & reduce unnecessary transmission of light into the night sky	Not provided at this time		*A lighting and photometric plan is typically required during site plan review. If deviations are anticipated, we recommend providing one with the Concept Plan submittal*
Lighting Plan *(Sec. 5.7.A.i)*	Site plan showing location of all existing & proposed buildings, landscaping, streets, drives, parking areas & exterior lighting fixtures			
Building Lighting *(Sec. 5.7.2.A.iii)*	Relevant building elevation drawings showing all fixtures, the portions of the walls to be illuminated, illuminance levels of walls			

Item	Required Code	Proposed	Meets Code	Comments
	and the aiming points of any remote fixtures.			
Lighting Plan Elements *(Sec.5.7.2.A.ii)*	Specifications for all proposed & existing lighting fixtures			
	Photometric data			
	Fixture height			
	Mounting & design			
	Glare control devices *(Also see Sec. 5.7.3.D)*			
	Type & color rendition of lamps			
	Hours of operation			
Maximum Height *(Sec. 5.7.3.A)*	Height not to exceed maximum height of zoning district (or 25 ft. where adjacent to residential districts or uses.			
Required Conditions *(Sec. 5.7.3.B)*	- Electrical service to light fixtures shall be placed underground - Flashing light shall not be permitted - Only necessary lighting for security purposes & limited operations shall be permitted after a site's hours of operation			
Indoor Lighting *(Sec. 5.7.3.H)*	- Indoor lighting shall not be the source of exterior glare or spillover			
Security Lighting *(Sec. 5.7.3.I)* Lighting for security purposes shall be directed only onto the area to be secured.	- All fixtures shall be located, shielded and aimed at the areas to be secured. Fixtures mounted on the building and designed to illuminate the facade are preferred			
Color Spectrum Management *(Sec. 5.7.3.F)*	Non-Res and Multifamily: For all permanent lighting installations - minimum Color Rendering Index of 70 and Correlated Color Temperature of no greater than 3000 Kelvin			
Parking Lot Lighting *(Sec. 5.7.3.J)*	- Provide the minimum illumination necessary to ensure adequate vision and comfort. Full cut-off fixtures shall be used to prevent glare and			

Item	Required Code	Proposed	Meets Code	Comments
	spillover.			
Min. Illumination *(Sec. 5.7.3.L)*	Parking areas: 0.2 min			
	Loading & unloading areas: 0.4 min			
	Walkways: 0.2 min			
	Building entrances, frequent use: 1.0 min			
	Building entrances, infrequent use: 0.2 min			
Average Light Level *(Sec.5.7.3.L)*	Average light level of the surface being lit to the lowest light of the surface being lit shall not exceed 4:1			
Max. Illumination adjacent to Non-Residential *(Sec. 5.7.3.L)*	When site abuts a non-residential district, maximum illumination at the property line shall not exceed 1 foot candle			
Max. Illumination adjacent to Residential *(Sec. 5.7.3.M)*	- Fixture height not to exceed 25 feet - Cut off angle of 90 degrees or less - No direct light source shall be visible at the property line adjacent to residential at ground level - Maximum illumination at the prop line not to exceed 0.5 fc.			
Residential Developments *(Sec. 5.7.3.O)*	- Provide sufficient illumination (0.2 fc min) at each entrance from major thoroughfare - Residential projects may deviate from the min. illumination levels and uniformity requirements of 5.7.3.L so long as site lighting for parking lots, property lines and security lighting is provided			

NOTES:

1. This table is a working summary chart and not intended to substitute for any Ordinance or City of Novi requirements or standards.
2. The section of the applicable ordinance or standard is indicated in parenthesis. Please refer to those sections in Article 3, 4 and 5 of the zoning ordinance for further details
3. Please include a written response to any points requiring clarification or for any corresponding site plan modifications to the City of Novi Planning Department with future submittals.

ENGINEERING REVIEW

PLAN REVIEW CENTER REPORT

9/9/2024

Engineering Review

The Grove
JZ24-0031

APPLICANT

Ivanhoe Companies

REVIEW TYPE

Initial PRO submittal

PROPERTY CHARACTERISTICS

- Site Location: Located on the south side of 12 Mile Road east of Meadowbrook Road
- Site Size: +/- 67 acres
- Plan Date: 1-14-2024
- Design Engineer: Andy Wozniak

PROJECT SUMMARY

- Proposed rezoning from OST to RM-2. The Grove shall consist of 4 residential zones:
    - Zone 1: The Vistas 49 Townhomes
    - Zone 2: The Meadows 256 Residential Flats
    - Zone 3: The Woods 56 Attached Condominiums
    - Zone 4: The Pointe 77 Attached Condominiums
- Site access shall be provided by on entrance on Meadowbrook Road and two entrances on12 Mile Road. The residential development shall be on 61.83 acres and 7.74 acres shall be left for future development.
- Three water main connections are proposed, one connection is proposed to the existing 24-inch water main on the south side of 12 Mile Road. Two connections are proposed to the 16-inch water main on the east side of Meadowbrook Road.
- Two sanitary sewer connections are proposed, one to the existing 21-inch sanitary sewer located on-site on the southeast corner of the property and on to the existing 12-inch sanitary sewer located off-site along the east side of the property.
- Storm water would be collected by the proposed storm sewer system, there are seven total detention basins proposed on-site. All the proposed detention basins on-site outlet to the wetlands on-site.

RECOMMENDATION

No objections to applicant to move forward with the rezoning process.

Items that must be addressed at time of Formal PRO submittal

1. Indicate if proposed roads will be private or public.
2. Provide an approximate timeline for each phase of the site plan. Indicate if utilities and roads will also be phased out.
3. Relocation of the sanitary sewer outside of the proposed roadway is recommended in order to minimize the number of structures in pavement. Indicate if there are areas where this is not possible because of conflicts with street trees.
4. Provide geotechnical report for the provided soil borings.
5. Additional borings will be required at time of site plan submittal, at least one boring per basin is required.
6. Soil boring locations should be shown on the stormwater management sheet/the overall utility sheet.

Items to be addressed at time of site plan submittal:

7. Provide a construction materials table on the utility plan listing the quantity and material type for each utility (water, sanitary and storm) being proposed.
8. Provide a utility crossing table indicating that at least 18-inch vertical clearance will be provided, or that additional bedding measures will be utilized at points of conflict where adequate clearance cannot be maintained.
9. Provide a note stating if dewatering is anticipated or encountered during construction, then a dewatering plan must be submitted to the Engineering Division for review.
10. Generally, all proposed trees shall remain outside utility easements. Where proposed trees are required within a utility easement, the trees shall maintain a minimum 5-foot horizontal separation from water main and storm sewer and 10-foot horizontal separation from sanitary sewer. All utilities shall be shown on the landscape plan, or other appropriate sheet, to confirm the separation distance.
11. Show the locations of all light poles on the utility plan and indicate the typical foundation depth for the pole to verify that no conflicts with utilities will occur. Light poles in a utility easement will require a License Agreement.

Water Main

12. A tapping sleeve, valve and well is required at the connection to the existing water main.
13. Water Systems must have the ability to serve at least three thousand (3,000) gallons per minute in apartment, cluster residential and similar complexes.
14. Provide additional valves to limit pipe runs to a maximum of 800 feet between valves.
15. Per current EGLE requirement, provide a profile for all proposed water main 8-inch and larger.

16. 6-inch hydrant leads are allowed for leads less than or equal to 25 feet in length. 8-inch leads are required for leads greater than 25 feet in length.
17. All gate valves 6" or larger shall be placed in a well with the exception of a hydrant shut off valve. A valve shall be placed in a box for water main smaller than 6".
18. Valves shall be arranged so that no single line failure will require more than eight hundred (800) feet of main to be out of service.
19. Provide a separate domestic lead and, if required by the Fire Marshal, a minimum 6-inch fire lead for each building with a unique shut-off valve for each.
20. A sealed set of utility plans along with the Michigan Department of Environment, Great Lakes & Energy (EGLE) permit application for water main construction, the Streamlined Water Main Permit Checklist, Contaminated Site Evaluation Checklist, and an electronic version of the utility plan should be submitted to the Engineering Division for review, assuming no further design changes are anticipated. Utility plan sets shall include only the cover sheet, any applicable utility sheets, and the standard detail sheets.

Sanitary Sewer

21. All public sanitary sewer shall be within a dedicated sanitary sewer easement unless proposed in the right-of-way. Show proposed 20-foot wide sanitary sewer easement.
22. It is recommended that proposed sanitary sewer be relocated outside the influence of pavement.
23. Provide a sanitary sewer monitoring manhole, unique to this site, within a dedicated access easement or within the road right-of-way. If not in the right-of-way, provide a 20-foot-wide access easement to the monitoring manhole from the right-of-way (rather than a public sanitary sewer easement). Required for non-residential buildings.
24. Provide a sanitary sewer basis of design for the development on the utility plan sheet. (Calculations should use peaking factor of 4.0 and 3.2 People/REU, peaking factor of 4.0 is only for sanitary not for water main).
25. Note on the construction materials table that 6-inch sanitary leads shall be a minimum SDR 23.5, and mains shall be SDR 26.
26. Provide a note on the Utility Plan and sanitary profile stating the sanitary leads will be buried at least 5 feet deep where under the influence of pavement.
27. Illustrate all pipes intersecting with manholes on the sanitary profiles.
28. Three (3) sealed sets of revised utility plans along with the Michigan Department of Environment, Great Lakes & Energy (EGLE) permit application, electronic utility plan for sanitary sewer construction, and the Streamlined Sanitary Sewer Permit Certification Checklist should be submitted to the Engineering Division for review, assuming no further design changes are anticipated. Utility plan sets shall include only the cover sheet, any applicable utility sheets, and the standard detail sheets. It should be indicated with the application if an expedited EGLE review is requested. EGLE will charge a fee that can be paid directly to the State.

Storm Sewer

29. A minimum cover depth of 3 feet shall be maintained over all proposed storm sewer. Grades shall be elevated, and minimum pipe slopes shall be used to maximize the cover depth. In situations where the minimum cover cannot be achieved, Class V pipe must be used with an absolute minimum cover depth of 2 feet. An explanation shall be provided where the cover depth cannot be provided.
30. Provide a four-foot-deep sump and an oil/gas separator in the last storm structure prior to discharge to the storm water basin.
31. The minimum pipe size for storm sewers receiving surface runoff shall be 12-inch diameter.
32. Provide profiles for all storm sewer 12-inch and larger. All storm pipes accepting surface drainage shall be 12-inch or larger.
33. Illustrate all pipes intersecting storm structures on the storm profiles.
34. Provide a schedule listing the casting type, rim elevation, diameter, and invert sizes/elevations for each proposed, adjusted, or modified storm structure on the utility plan. Round castings shall be provided on all catch basins except curb inlet structures.
35. Show and label all roof conductors and show where they tie into the storm sewer.

Storm Water Management Plan

36. The Storm Water Management Plan (SWMP) for this development shall be designed in accordance with the Storm Water Ordinance and Chapter 5 of the **Engineering Design Manual** **(updated Jan 31, 2024)**
37. Provide a soil boring in the vicinity of the storm water basin to determine soil conditions and to establish the high-water elevation of the groundwater table. Note the bottom of the detention facility must be a minimum of **three (3) feet** above the groundwater elevation.

Paving & Grading

38. For residential developments, if driveways do not meet the city standard 16-foot wide with 3-tapers on each side, indicate if a design construction variance will be needed.
39. For residential developments, show individual driveway tapers (standard driveway 16-foot wide with 3-foot tapers on each side) on plans to ensure no conflict with sidewalks, hydrants, street signs and etc. Detectable warning surfaces and sidewalk ramps shall not be proposed within a residential driveway.
40. Provide at least 3-foot of buffer distance between the sidewalk and any fixed objects, including hydrants and irrigation backflow devices. Include a note on the plan where the 3-foot separation cannot be provided.

Soil Erosion and Sediment Control

41. *A Soil Erosion plan will be required at time of site plan submittal.*

Off-site Easements

42. No off-site utilities anticipated at this time.

License Agreement

43. A license Agreement may be required at time of site plan submittal for the proposed retaining wall proposed within the proposed sanitary sewer/water main easement. A license agreement will also be required if there are any light poles proposed in utility easements, show light pole locations on utility sheets.

To the extent this review letter addresses items and requirements that require the approval of or a permit from an agency or entity other than the City, this review shall not be considered an indication or statement that such approvals or permits will be issued.

Please contact Humna Anjum at (248)735-5632 or email at hanjum@cityofnovi.org with any questions.

Humna Anjum,
Project Engineer

cc: Lindsay Bell, Community Development
Diana Shanahan, Planning Assistant
Ben Nelson, Engineering
Ben Croy, City Engineer

LANDSCAPE REVIEW

PLAN REVIEW CENTER REPORT

September 10, 2024

The Grove

Initial PRO Site Plan - Landscaping

Review Type	**Job #**
Initial PRO Site Plan Landscape Review	JZ24-31

Property Characteristics

- Site Location: Southwest corner of Meadowbrook and 12 Mile Road
- Site Acreage: xx ac.
- Site Zoning: OST
- Proposed Zoning: RM-2 with PRO
- Adjacent Zoning: North: RA, R-4, R-3; East, South, West: OST
- Plan Date: 7/26/2024

Ordinance Considerations

This project was reviewed for conformance with Chapter 37: Woodland Protection, Zoning Article 5.5 Landscape Standards, the Landscape Design Manual and any other applicable provisions of the Zoning Ordinance. Items in **bold** below must be addressed and incorporated as part of the Preliminary Site Plan submittal. Underlined items must be addressed on the Final Site Plans. Please follow guidelines of the Zoning Ordinance and Landscape Design Guidelines. This review and the accompanying Landscape Chart are summaries and are not intended to substitute for any Ordinance.

RECOMMENDATION:

This project is **recommended for approval for rezoning**. Some site plan-related corrections need to be made, but there are no serious unsupported deviations from the landscape ordinances.

LANDSCAPE DEVIATIONS THAT ARE REQUIRED FOR THE PROPOSED LAYOUT:

- Deficiency in required screening berms between the site and Office Service/Tech – *supported by staff for east and south property lines because of topography and the provision of dense landscaping along both areas.*
- Lack of greenbelt berms – *supported by staff for 12 Mile Road and for the areas with a heavily landscaped detention bond and preserved natural areas along Meadowbrook Road*
- No greenbelt plantings in preserved areas – *supported by staff*
- Deficiency in street trees provided along Meadowbrook Road – *may be supported by staff*
- Significant deficiencies in foundation landscaping – *not supported by staff*

Ordinance Considerations

Existing Trees (Sec 37 Woodland Protection, Preliminary Site Plan checklist #17 and LDM 2.3 (2))

1. Tree survey and wetland surveys are provided.
2. Please see the Merjent letter for a detailed review of the woodlands and wetlands.
3. A total of 265 trees are shown as being planted, with a deposit to the tree fund being made to the remaining 3254 credits required.
4. When species are assigned to the symbols shown, please try to use species that are similar to those removed as much as possible.

Adjacent to Residential - Buffer (Zoning Sec. 5.5.3.B.ii and iii)

1. The project is adjacent to OST property on the east and south so a 4.5-6 foot tall landscaped berm is required for buffering.
2. The plan proposes dense landscaping as a buffer around the site instead of the required berm where significant existing landscaping is not preserved and where site grading makes a berm impractical. This requires a landscape deviation. It is supported by staff due to the nature of the adjacent uses, and the landscaping provided.
3. Please consider using staggered Green Giant arborvitaes south of buildings 31-34 where only a single row of evergreen trees are proposed to increase the screening there.

Adjacent to Public Rights-of-Way – Berm/Wall, Buffer and Street Trees (Zoning Sec. 5.5.3.B.ii, iii)

1. The required greenbelt widths are proposed for both 12 Mile Road and Meadowbrook Road.
2. No berm is proposed along 12 Mile Road. **This requires a landscape deviation**. *It is supported due to the existing preserved wetlands that would prevent a consistent berm from being provided.*
3. Berms are proposed along Meadowbrook except in the areas to be preserved in a natural condition, and where sitting areas are proposed. **This requires a landscape deviation**. *It is supported by staff to preserve the natural areas.*
4. The required greenbelt plantings are proposed for all developed areas. **Landscape deviations are required for the areas being preserved in their natural state**. *They are supported by staff.*
5. *Most of the required street trees are proposed along 12 Mile Road.* **If additional trees as noted on the landscape chart are proposed, a deviation will not be required.**
6. **A deviation is required to not provide street trees south of the southern Meadowbrook entrance, due to a stated lack of space for the trees.** *If engineering agrees that there is insufficient space, then this deviation would be supported by staff. If they feel there is sufficient room, the trees should be added. Subcanopy trees may be required at a rate of 1.5 trees per required canopy tree in that area due to the overhead utility wires.*

Parking Lot Landscaping (Zoning Sec. 5.5.3.C.)

1. There are three parking lots on the site and numerous small bays on one side of a drive.
2. The required parking lot interior and perimeter trees are provided for those lots, but **some additional trees should be added on the south end of the visitor lot.**

Multi-family Residential Landscaping (Zoning Sec 5.5.3.F.iii)

1. **Multi-family unit trees**
   a. 278 units are proposed, so 824 trees are required. It appears that all of the required trees are provided, but please double-check the counts and add more if required.
   b. Tree species should be provided on the Preliminary Site Plans if possible, but no later than Final Site Plans.
2. **Interior roadway trees**
   a. The plan indicates all of the required 237 trees are proposed.
   b. When species are assigned, all of them should be deciduous canopy trees.
3. **Foundation landscaping**
   a. The detailed plans indicate that none of the buildings have the required 35% of frontage landscaped. In some cases, less than 49% of the requirement is met. A landscape deviation is required for these deficiencies. *It is not supported by staff.* **Every effort should be made to increase the building frontages' landscaping.**

Building Foundation Landscaping (Zoning Sec 5.5.3.D)

1. It appears from the calculations and shading shown around the building that the required foundation landscaping for the clubhouse will be provided.

2. Please provide detailed foundation planting plans on Final Site Plans.

Plant List (LDM 4, 10)

1. **Please provide a plant list on the Preliminary Site Plans if possible.**
2. At least 50% of the non-woodland replacement species used must be species native to Michigan.
3. The non-woodland tree diversity should have no more than 10% of the trees planted composed of a single species, and no more than 15% of them composed of a single genus.

Planting Notations and Details (LDM 10)

Provided

Storm Basin Landscape (Zoning Sec 5.5.3.E.iv and LDM 3)

1. All required landscaping appears to be proposed.
2. **Please see the notes on the landscape chart for a more detailed discussion of the detention landscaping.**

Irrigation (LDM 10)

1. If an irrigation system will be used, a plan for it must be provided with Final Site Plans.
2. If alternative means of providing water to the plants for their establishment and long-term survival, information regarding that is also required with Final Site Plans.

If the applicant has any questions concerning the above review or the process in general, do not hesitate to contact me at 248.735.5621 or rmeader@cityofnovi.org.

Rick Meader – Landscape Architect

LANDSCAPE REVIEW SUMMARY CHART – Initial PRO Concept Plan

Review Date: September 10, 2024
Project Name: JZ24-31: The Grove
Plan Date: July 26, 2024
Prepared by: Rick Meader, Landscape Architect E-mail: rmeader@cityofnovi.org; Phone: (248) 735-5621

Items in **Bold** need to be addressed by the applicant before approval of the Preliminary Site Plan.
Underlined items need to be addressed on the Final Site Plan.

LANDSCAPE DEVIATIONS THAT MAY BE REQUIRED FOR PROPOSED LAYOUT:

- Deficiency in required screening berms between the site and Office Service/Tech – *supported by staff for east and south property lines because of topography and the provision of dense landscaping along both areas.*
- Lack of greenbelt berms – *supported by staff for 12 Mile Road and for the areas with a heavily landscaped detention bond and preserved natural areas along Meadowbrook Road*
- No greenbelt plantings in preserved areas – *supported by staff*
- Deficiency in street trees provided along Meadowbrook Road – *may be supported by staff*
- Significant deficiencies in foundation landscaping – *not supported by staff*

Item	Required	Proposed	Meets Code	Comments
Landscape Plan Requirements – Basic Information (LDM (2))				
Landscape Plan *(Zoning Sec 5.5.2, LDM 2.e)*	• New commercial or residential developments • Addition to existing building greater than 25% increase in overall footage or 400 SF whichever is less. • 1"-20' minimum with proper North. Variations from this scale can be approved by LA	• Overall site (Sheets L-1 – L-3 and L-6): 1"=50 ft • Detention Ponds (Sheets L-7, L-8): 1" = 40 ft • Entry Plans (Sheets L-4, L-5): 1" = 30 ft • Building foundation landscaping: 1"=40'	Yes	
Owner/Developer Contact Information *(LDM 2.a.)*	Name, address and telephone number of the owner and developer or association	Ivanhoe Companies - on Cover Sheet and on the landscape plan title block	Yes	
Project Information *(LDM 2.d.)*	Name and Address	Location map on Cover Sheet and Sheet L-1	Yes	
Survey information *(LDM 2.c.)*	Legal description or boundary line survey	Sheets SP9-SP9.4	Yes	
Landscape Architect contact information *(LDM 2.b.)*	Name, Address and telephone number of RLA/PLA/LLA who created the plan	Jim Allen – Allen Design	Yes	

Item	Required	Proposed	Meets Code	Comments
Sealed by LA. *(LDM 2.g.)*	Requires original signature	Copy of seal and signature	Yes	Final stamping sets must be sealed by LA and have live LA signature
Miss Dig Note (800) 482-7171 *(LDM.3.a.(8))*	Show on all plan sheets	On Landscape Plan Title block	Yes	
EXISTING CONDITIONS				
Existing plant material Existing woodlands or wetlands *(LDM 2.e.(2), Sec 12, 37))*	• Show location type and size. • Label to be saved or removed. • Plan shall state if none exists.	• Tree survey are provided on Sheets SP9-9.8. • Tree survey and removals are also provided on Sheets L-12-L-19. • Woodland replacement calculations are provided on L-19. • Wetland boundaries are indicated on SP-8 and topographic survey sheets	• Yes • Yes • Yes • Yes	**See Merjent letter for detailed reviews of wetlands and woodlands**
Natural Features protection				**1. Please be sure that proper buffers and protection for streams and wetlands are provided.** **2. Please work to preserve as many trees as possible through building placement and grading.**
Phragmites and Japanese Knotweed Control *(Sec 6.B.i)*	• Any/all populations of *Phragmites australis* and/or Japanese knotweed and related species shall be noted on plans. • If any is found, instructions for their complete removal should be added to the plans. • If none is found, a note stating that shall be added.	• Phragmites locations are shown on L-2 • Methods for its removal are also on L-2	• Yes • Yes	
Soil type *(LDM.2.r.)*	As determined by Soils survey of Oakland County	• Soils boundaries and types are shown on SP-2	• Yes • Yes	

Item	Required	Proposed	Meets Code	Comments
		• Soil Boring information is provided on Sheets, SP-9.9 and SP-9.10		
Zoning *(LDM 2.f.)*	Site: OST Proposed:RM-2 with PRO North: RA, R-4, B-3, East: OST, South: OST, West: OST	Shown on L-1	Yes	
PROPOSED IMPROVEMENTS				
Existing and proposed improvements *(LDM 2.e.(4))*	Existing and proposed buildings, easements, parking spaces, vehicular use areas, and R.O.W	• Site plan shows locations of buildings and drives • All proposed improvements are shown on the landscape plans.	• Yes • Yes	
Existing and proposed utilities *(LDM 2.e.(4))*	• Overhead and underground utilities, including hydrants • Show all proposed light posts	• Utilities are shown on SP-6.1 and SP-6.2 • Utilities are included on the landscape plans • Light posts are not provided yet	Yes	Please add all proposed light posts to the landscape plans and resolve all tree/post conflicts.
Proposed topography - 2' contour minimum *(LDM 2.e.(1))*	Provide proposed contours at 2' interval	• Proposed spot elevations and berms are shown on SP-4.1 and SP-4.2 • Berms are shown on landscape plans • Retaining wall heights are shown but no TW/BW are given – they'll be provided later	• Yes • Yes • Yes	Please add TW/BW elevations for retaining walls
Clear Zones *(LDM 2.e.(5))*	• Show clear vision zones for all entry points. • Use RCOC clear vision guidelines for 12 Mile Road and City clear vision guidelines for Meadowbrook. • Refer to exhibits at end of this chart.	• City clear vision zones are shown for all entries. • No trees or shrubs are shown within the zones.	Yes	
LANDSCAPING REQUIREMENTS				

Item	Required	Proposed	Meets Code	Comments
Berms and ROW Planting				
• All berms shall have a maximum slope of 33%. Gradual slopes are encouraged. Show 1ft. contours • Berm should be located on lot line except in conflict with utilities. • Berms should be constructed with 6" of topsoil.				
Residential Adjacent to Non-residential (Sec 5.5.3.A) & (LDM 1.a)				
Berm requirements *(Zoning Sec 5.5.A)*	<u>Residential adjacent to Office Service/Tech residential requires:</u> • 4.5-6 foot high landscaped berm with 5 foot wide crest. • Opacity 80% winter, 90% summer.	• No berms are provided along the east side where there is just a large wetland mitigation/detenti on area. • Dense plantings are provided east of Buildings 2-4 and over 140 feet of existing trees to remain are left between Buildings 21-23 • Buildings 31-33 are about 50 feet north of the property line and between 6-7 below the industrial park to the south. Dense plantings are provided as screening and some extra space and undisturbed area is south of Building 31. No berm is provided due to the juxtaposition of the buildings versus the existing grades along the south property line. • Building 34 is 50 feet or more away from the property line and about 14 feet above the edge of the property. Dense plantings are also proposed	• No • No • No • No	**1. Since there are no actual Office Service/ Tech buildings east of the site, and either new or existing trees will provide screening from M-5, the screening berm is not required. This requires a landscape deviation** *but it would be supported by staff.* **2. The proposed plantings and distance appear to provide sufficient screening so** *the deviation is supported by staff.* **3.** <u>Please consider using densely planted staggered Green Giant arborvitaes in the section with a single row of evergreen trees to provide as much screening as possible in that area</u>**.**

Item	Required	Proposed	Meets Code	Comments
		south of the building. No berm is provided due to the juxtaposition of the buildings versus the existing grades along the south property line.		
Planting requirements *(LDM 1.a.)*	LDM Novi Street Tree List	Many trees are shown but are not identified yet	TBD	
Adjacent to Public Rights-of-Way (Sec 5.5.B) and (LDM 1.b)				
ROW Landscape Screening Requirements Chart *(Sec 5.5.3.B. ii)* ***(RM-1)***				
Greenbelt width (2)(3) (5)	• Adj to parking: 20 ft • Not adj to parking: 34 ft • **12 Mile Road**: 34 ft • **Meadowbrook Road**: 20 feet/34 feet	**12 Mile Rd:** 120 feet **Meadowbrook Rd:** 50 feet	• Yes • Yes	
Min. berm crest width	**2 feet** • **12 Mile Road**: 2 ft • **Meadowbrook Road**: 2 ft	**12 Mile Rd:** 0 ft **Meadowbrook Rd:** 3-4 ft when a berm exists	• No • No	**1. A landscape waiver is required for the lack of berm.** ***2.*** *It would be supported for the 12 Mile Road frontage since wetlands occupy most of the frontage.* ***3.*** *It is supported for the sections of Meadowbrook Road where existing natural areas are being preserved and the detention pond near Meadowbrook.*
Min. berm height (9)	• **12 Mile Road**: 3 ft • **Meadowbrook Road**: 3 ft	• **12 Mile Rd**: 0 feet • **Meadowbrook Rd:** 3-4 ft	• No • Yes	**See above**
3' wall	(4)(7)	No walls are proposed in the greenbelts	NA	
Canopy deciduous or large evergreen trees Notes (1) (10)	**1 tree per 35 lf** **12 Mile Road:** • Developed frontage: (577-60-290)/35=6 trees • Preserved frontage: 290lf/35=8 trees	**12 Mile Rd:** 6 trees **Meadowbrook Rd:** 39 trees	• Yes • Yes	**1. A landscape waiver would be required for deducting the preserved areas from the calculation.** *It would be supported by staff.*

Item	Required	Proposed	Meets Code	Comments
	Meadowbrook Road: • Developed frontage: (1760-60-60-275-70)/35 = 37 trees • Preserved frontage: (275+70)/35 = 10 trees			**2. Note regarding waiver: Focus areas are not considered to be undeveloped.**
Sub-canopy deciduous trees Notes (2)(10)	**1 tree per 25 lf** **12 Mile Road:** • Developed frontage: 577-60-290)/25= 9 trees • Preserved frontage: 290lf/25=12 trees **Meadowbrook Road:** • Developed frontage: (1760-60-60-275-70)/25 = 52 trees • Preserved frontage: (275+70)/25 = 14 trees	**12 Mile Rd:** 9 trees **Meadowbrook Rd:** 59 trees	• Yes • Yes	**See above regarding the landscape waiver.**
Canopy deciduous trees in area between sidewalk and curb	**1 tree per 35 lf** **12 Mile Road:** • (577-220)/35= 10 trees **Meadowbrook Road:** • (1760-145-145)/35 = 42 trees	**12 Mile Rd:** 6 trees **Meadowbrook Rd:** 15 trees The applicant indicates that there is approximately 900lf of frontage along Meadowbrook Road where street trees can't be planted due to a lack of planting area.	• No • TBD	**1. Please add more trees east of the 12 Mile Road Entrance as it appears there is room for at least 3 since the clear vision zone does not apply to the east.** 2. If the RCOC does not allow some or all of the trees along 12 Mile Road they do not need to be planted, but a copy of their decision must be provided to the City. **3. If the City of Novi Engineering department agrees that street trees should not be planted in the section of Meadowbrook south of the entrance due to a lack of space, then a waiver for those trees will be supported by staff. Otherwise they**

Item	Required	Proposed	Meets Code	Comments
				should be planted. 4. Subcanopy trees may need to be planted near the overhead wires at a rate of 1.5 subcanopy trees per required canopy tree.
Multi-Family Residential (Sec 5.5.3.F.ii)				
Building Landscaping *(Zoning Sec 5.5.3.E.ii.)*	• 3 deciduous canopy trees or large evergreen trees per dwelling unit on the first floor. • # units * 3 = # trees • Up to 25% of requirement can be subcanopy trees 278 units * 3 = 834 trees	• 824 trees • At this point it can't be determined if the 25% maximum subcanopy tree limit is met.	• No • TBD	**1. Please verify the unit tree count, including parking lot interior and perimeter trees and add any missing trees.** 2. On the final site plans, the species must be provided and the percentage of subcanopy trees provided.
Interior Street Landscaping	• 1 deciduous canopy tree along interior roads for every 35 lf (both sides), excluding driveways, interior roads adjacent to public rights-of-way and parking entry drives. • Trees in boulevard islands do not count toward street tree requirement • (11744-3444)/35 = 237 trees	237 trees	Yes	
Foundation Landscaping	35% of building façades facing road must be landscaped	• None of the residential units has the required 35% of frontage landscaped. • It appears that the required foundation landscaping for the clubhouse will be provided.	• No • Yes	***1.*** **A landscape deviation will be required for the significant deficiencies proposed.** *It will not be supported by staff.* **2. Please add required foundation landscaping** **3.** Plant selections can be made on Final Site Plans if desired.

Item	Required	Proposed	Meets Code	Comments
Parking Area Landscape Requirements (Zoning Sec 5.5.3.C & LDM 5)				
General requirements *(LDM 1.c)*	• Clear sight distance within parking islands • No evergreen trees	NA		
Name, type and number of ground cover (LDM 1.c.(5))	As proposed on planting islands	Sod is indicated	Yes	
General *(Zoning Sec 5.5.3.C)*				
Parking lot Islands *(a, b. i)*	• A minimum of 200 SF to qualify • 200sf landscape space per tree planted in island. • 6" curbs • Islands minimum width 10' BOC to BOC	All of the islands of parking areas are labeled and are appropriately sized	Yes	
Curbs and Parking stall reduction *(c)*	Parking stall can be reduced to 17' with 4" curb adjacent to a sidewalk of minimum 7 ft.	Spaces are 17' long with either a 7' wide sidewalk or open space at the end	Yes	
Contiguous space limit *(i)*	Maximum of 15 contiguous spaces	No bay is more than 15 spaces.	Yes	
Category 1: For OS-1, OS-2, OSC, OST, B-1, B-2, B-3, NCC, EXPO, FS, TC, TC-1, RC, Special Land Use or non-residential use in any R district *(Zoning Sec 5.5.3.C.iii)*				
A = Total square footage of vehicular use areas x 7.5%	• **A = x SF x 7.5% = A sf** • **Buildings 10-17:** A=50,000*7.5%= 3750sf • **Visitor Parking:** A=4800*7.5%= 360sf • **Clubhouse Parking:** A=12034*7.5% = 903sf	Calculations provided		
B = Total square footage of additional paved vehicular use areas over 50,000 SF x 1 %	B = x SF x 1% = B sf **Buildings 10-17:** B = 3028 * 1.0% = 30sf	Calculations provided		
All Categories				
C = A+B Total square footage of landscaped islands	• **C = A + B** • **Buildings 10-17:** C = 3750sf + 30sf = 3780sf • **Visitor Parking:** C = 360 + 0 = 360 sf • **Clubhouse Parking:** C = 903sf + 0 = 903sf	• **Buildings 10-17:** 13087 sf • **Clubhouse Parking:** 1110 sf	• Yes • Yes	
D = C/200 Number of canopy trees required	• **D = C/200** • **Buildings 10-17:** D = 3780sf/200 = 19 trees • **Visitor Parking:** D = 360/200 = 2 trees	• **Buildings 10-17:** 19 trees • **Visitor Parking:** 2 trees • **Clubhouse**	• Yes • Yes • No	**1. Please add canopy trees on the south endcap islands for the Visitor Parking Lot.**

Item	Required	Proposed	Meets Code	Comments
	• **Clubhouse Parking:** C = 903/200 = 5 trees	**Parking:** 3 trees		**2. As all of the required corners for the clubhouse parking lot have canopy trees in them, and endcap canopy trees are provided for the bays south of the building the shortage is accepted.** **3. Please be sure to label all parking lot interior and perimeter trees as such to show that the requirements are ment, as well as the sf of all parking lot interior islands.**
Parking Lot Perimeter Trees	• 1 Canopy tree per 35 lf • Sub-canopy trees can be used under overhead utility lines. • Perimeter within 20 feet of a building does not need to be included in the basis • **Buildings 10-17:** 1335/35 = 38 trees • **Visitor Parking:** 228/35 = 7 trees • **Clubhouse Parking:** 318/35 = 9 trees	• **Buildings 10-17:** 39 trees • **Visitor Parking:** 9 trees • **Clubhouse Parking:** 10 trees	• Yes • Yes • Yes	<u>All parking lot and interior street trees should be deciduous canopy trees. Please consider this when assigning species to the tree symbols.</u>
Parking land banked	None			
Miscellaneous Landscaping Requirements				
Plantings around Fire Hydrant *(d)*	• No plantings with matured height greater than 12' within 10 ft. of fire hydrants, manholes, catch basins or other utility structures. • Trees should not be planted within 5 feet of underground lines.	For the most part, trees are properly spaced	Yes	
Landscaped area *(g)*	Areas not dedicated to parking use or driveways exceeding 100 sq. ft. shall be landscaped	Yes	Yes	

Item	Required	Proposed	Meets Code	Comments
Name, type and number of ground cover (LDM 1.c.(5))	As proposed on planting islands	No indication is given	Yes	Please indicate groundcovers on landscape plan
Snow deposit *(LDM.2.q.)*	Show leave snow deposit areas on plan in locations where landscaping won't be damaged	A note indicates that the snow will be deposited along the drives except when the sidewalk is adjacent to the road. In that case the snow shall be deposited elsewhere.	Yes	Please be sure that that information is included in the master deed and is passed along to the snow removal contractors.
Transformers/Utility boxes *(LDM 1.e from 1 through 5)*	• A minimum of 2 ft. separation between box and the plants • Ground cover below 4" is allowed up to pad. • No plant materials within 8 ft. from the doors	No utility boxes or utility box landscaping is shown	TBD	1. Please show transformers and other utility boxes when their locations are determined. 2. If box locations are not determined by final site plans, add a note to the plans stating that all utility boxes are to be landscaped per the detail. 3. Please add an allowance of 10 shrubs per box on the plant list and label as such
Detention/Retention Basin Planting requirements *(Sec. 5.5.3.E.iv)*	• Clusters of large native shrubs shall cover 70-75% of the basin rim area at 10 ft away from the permanent water line. • Canopy trees must be located at 1 per 35lf of the pond rim 10 feet away from the permanent water level • 10" to 14" tall grass along sides of basin • Refer to wetland for basin mix • Include seed mix details on landscape plan	• The tree requirement is met with woodland replacement trees • The required shrub symbols are provided • A stormwater seed mix is called out on the pond details but no seed mix is provided	• Yes • Yes • Yes/No	**1. Please clearly show the permanent water level of all ponds on the landscape plans.** **2.** Please add the shrub species on the Final Site Plans. **3.** Please add all appropriate seed mixes to the plans on the Final Site Plans.
Landscape Notes and Details– Utilize City of Novi Standard Notes				
Plant List (LDM 4) – Include all cost estimates				

Item	Required	Proposed	Meets Code	Comments
Quantities and sizes		No plant list is given	TBD	**Provide plant list on landscape plans, preferably on the Preliminary Site Plans but no later than Final Site Plans.**
Root type		No plant list is given	TBD	**See above**
Botanical and common names	• At least 50% of plant species used, not including seed mixes or woodland replacement trees, must be species native to Michigan. • The non-woodland replacement tree diversity must meet the standards of the Landscape Design Manual section 4. As the number of trees will be more than 200, no more than 10% of the trees planted shall be of a given species, and no more than 15% shall be from a single genus. • Woodland replacements do not need to meet the LDM diversity requirements, and should resemble the percentages of trees removed as much as possible.	No plant list is provided	TBD	**See above**
Type and amount of lawn		No		Need for final site plan
Cost estimate (LDM 2.t)	For all new plantings, mulch and sod as listed on the plan	No		Need for final site plan
Planting Details/Info (LDM 2.i) – Utilize City of Novi Standard Details				
Canopy Deciduous Tree	Refer to LDM for detail drawings	Yes	Yes	
Evergreen Tree		Yes	Yes	
Shrub		Yes	Yes	
Multi-stem tree		Yes	Yes	
Perennial/ Ground Cover		Yes	Yes	

Item	Required	Proposed	Meets Code	Comments
Tree stakes and guys	Wood stakes, fabric guys.	Yes	Yes	
Cross-Section of Berms (LDM 2.j)				
Slope, height and width	• Label contour lines • Maximum 33% slope • Constructed of loam • 6" top layer of topsoil	A standard berm cross section detail is provided	Yes	
Type of Ground Cover		Lawn is noted	Yes	
Walls (LDM 2.k & Zoning Sec 5.5.3.vi)				
Material, height and type of construction footing	Freestanding walls should have brick or stone exterior with masonry or concrete interior	No retaining walls are proposed		
Walls greater than 3 ½ ft. should be designed and sealed by an Engineer				If walls are taller than 3 ½ feet, please have engineer design, sign and seal.
Notes (LDM 2.i) – Utilize City of Novi Standard Details				
Installation date *(LDM 2.l. & Zoning Sec 5.5.5.B)*	• Provide intended date • Between Mar 15 – Nov 15	Between March 15 and November 15	Yes	
Maintenance & Statement of intent *(LDM 2.m & Zoning Sec 5.5.6)*	• Include statement of intent to install and guarantee all materials for 2 years. • Include a minimum one cultivation in June, July and August for the 2-year warranty period.	Notes are provided	Yes	
Plant source *(LDM 2.n & LDM 3.a.(2))*	Shall be northern nursery grown, No.1 grade.	Noted	Yes	
Establishment period *(Zoning Sec 5.5.6.B)*	**2 yr. Guarantee**	Noted	Yes	
Approval of substitutions. *(Zoning Sec 5.5.5.E)*	City must approve any substitutions in writing prior to installation.	Noted	Yes	
Miscellaneous Landscape Requirements (LDM 3)				
General Conditions *(LDM 3.a)*	Plant materials shall not be planted within 4 ft. of property line	Note has been added	Yes	
Irrigation plan *(LDM 2.s.)*	A fully automatic irrigation system and a method of draining is required with Final Site Plan	No		**1.** Please add an irrigation plan or information as to how plants will be watered sufficiently for establishment

Item	Required	Proposed	Meets Code	Comments
				and long- term survival on the final site plans **2.** The plan should meet the requirements listed at the end of this chart. **3.** If xeriscaping is used, please provide information about plantings included.
Other information *(LDM 2.u)*	Required by Planning Commission	NA		
Landscape tree credit *(LDM11.b.(d))*	• Substitutions to landscape standards for preserved canopy trees outside woodlands/ wetlands should be approved by LA. • Refer to Landscape tree Credit Chart in LDM	None		
Plant Sizes for ROW, Woodland replacement and others (*LDM 11.b)*	• Canopy Deciduous shall be 3" and sub-canopy deciduous shall be 2.5" caliper. • Refer to LDM section 11.b for more details	No plant list is provided	TBD	Include correct sizes on plant list.
Plant size credit *(LDM11.b)*	NA	None taken		
Prohibited Plants *(LDM 11.b)*	Do not use any plants on the Prohibited Species List	No plant list is provided	TBD	
Recommended trees for planting under overhead utilities *(LDM 3.e)*		Overhead lines are not labeled on the landscape plans		
Collected or Transplanted trees *(LDM 3.f)*		None indicated		
Nonliving Durable Material: Mulch *(LDM 4)*	• Trees shall be mulched to 3" depth and shrubs, groundcovers to 2" depth • Specify natural color, finely shredded hardwood bark mulch. • Include in cost estimate.	Shown on planting details		
NOTES: 1. This table is a working summary chart and not intended to substitute for any Ordinance or City of Novi				

Item	Required	Proposed	Meets Code	Comments
requirements or standards. 2. The section of the applicable ordinance or standard is indicated in parenthesis. For the landscape requirements, please see the Zoning Ordinance landscape section 5.5 and the Landscape Design Manual for the appropriate items under the applicable zoning classification. 3. Please include a written response to any points requiring clarification or for any corresponding site plan modifications to the City of Novi Planning Department with future submittals.				

Irrigation System Requirements

- Any booster pump installed to connect the project's irrigation system to an existing irrigation system must be downstream of the RPZ.
- The RPZ must be installed in accordance with the 2015 Michigan Plumbing Code.
- The RPZ must be installed in accordance with the manufacture installation instructions for winterization that includes drain ports and blowout ports.
- The RPZ must be installed a minimum of 12-inches above FINISHED grade.
- Attached is a handout that addresses winterization installation requirements to assist with this.
- A plumbing permit is required.
- The assembly must be tested after installation with results recorded on the City of Novi test report form.

WOODLAND & WETLAND REVIEW

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September 5, 2024

Lindsay Bell
Planner – Community Development
City of Novi
45175 Ten Mile Road
Novi, MI 48375

Submitted electronically to lbell@cityofnovi.org

Re: The Grove Planned Rezoning Overlay Wetland and Woodland Review (Initial Concept Plan; JZ24-31)

Dear Lindsay,

Merjent, Inc. (Merjent) has conducted a site plan review of the planned rezoning overlay (PRO) for the Initial Concept PRO Plan (ICP) for The Grove (site). Two sets of plans were provided:

- One plan prepared by Zeimet Wozniak and Associates dated July 26, 2024. This plan contains the primary design/engineering information for the ICP.
- One plan prepared by Allen Design dated July 26, 2024 with Landscape Plans dated June 17, 2024. This plan contains the landscape and woodland replacement information for the ICP.

Merjent reviewed the plans for conformance with the City of Novi's (City) current Woodland Protection Ordinance, Chapter 37, and Wetlands and Watercourse Protection Ordinance, Chapter 12 Article V. The site is located southeast of the intersection of Meadowbrook Road and Twelve Mile Road in Section 13 of the City. Development is proposed within and is identified by approximately 12 different parcel numbers in the City of Novi records. The site contains City-regulated woodlands and City-regulated wetlands (**Figure 1** and **Figure 2**).

Woodlands

Woodland Recommendation: Merjent **recommends approval** of The Grove PRO ICP. A list of comments is provided below to meet the requirements of the Woodland Protection Ordinance. The following Woodland Regulations apply to this site:

Woodland Regulation	Required
Woodland Permit (Chapter 37, Section 37-26)	Yes
Tree Replacement (Chapter 37, Section 37-8)	Yes
Tree Protection (Fence; Chapter 37, Section 37-9)	Yes
Woodland Conservation Easement (Chapter 37-30[e])	Yes, if feasible

Woodland Review Comments

1. City-regulated woodlands, as identified on the City of Novi Woodlands interactive map website, are present onsite (**Figure 1**)**.** A site visit was performed on August 23, 2024 to verify and review the extent of woodlands on-site. Due to the extent of invasive species on-site, such as European buckthorn

(*Rhamnus cathartica*), it is Merjent's opinion that the extent of the Woodlands listed in the map viewer is accurate. Select photos from the site visit are included in **Attachment A**.

2. When a proposed site plan is located within a regulated woodland, any tree proposed for removal with a diameter at breast height (DBH) greater than or equal to eight inches will require tree replacement and a Woodland Use Permit per Section 37-8. This also applies to any tree that will be preserved, but where impacts to critical root zones are proposed.

3. Regardless of the presence of regulated woodlands onsite, a Woodland Use Permit is required to perform construction on any site containing the removal of trees larger than 36 inches in diameter at breast height (DBH).

4. The plans have proposed the cumulative removal of 2,134 regulated trees (does not include dead or dying [very poor] trees). A **Woodland Use Permit** is required to perform construction on any site containing regulated woodlands. The permit for this site would require Planning Commission approval because there are more than three trees proposed to be impacted/removed by construction.

5. **Woodland Replacement**. Based on review of the plans, the following woodland replacements are currently listed:

Tree Size (DBH, inches)	Number of Trees (Site + mitigation)	Ratio Replacement/Removed Tree	Total Replacements Required (Site + mitigation)
8-11	1,207 (1,181 + 26)	1	1,207 (1,181 + 26)
12-20	726 (703 + 23)	2	1,452 (1,406 + 46)
21-29	64 (64 + 0)	3	192 (192 + 0)
30+	18 (16 + 2)	4	72 (64 + 8)
Multi-stem	119 (112 + 7)	Sum of Stem DBH/8 (rounded up)	437 (411 + 26)
Total	**2,134**	**-**	**3,360**

Table adapted from Sheet L-19. See Comment 6 regarding table accuracy.

6. A detailed review of the tree survey/replacement plan shows that the following tree IDs may have incorrect replacement values:
   - Tree 6304
   - Tree 4826
   - Tree 4443

   Additionally, based off the *current* table provided, the following replacement counts were found to be different than those provided in the summary table on Sheet L-12:
   - 1,182 single (8-11 inches DBH) replacements (vs. 1,181)

   For the preliminary site plan submittal, these tree replacement values should be reviewed and may slightly alter the total amount of replacements required on-site.

7. For tree replacement credits that will be planted on-site, a financial guarantee of $400/tree replacement credit is required to ensure the planting of the on-site woodland replacement credits. The financial guarantee will be released after trees have been planted and approved by the City of Novi. The applicant must request a tree planting inspection. For The Grove PRO, the applicant has proposed planting 265 replacement trees on-site. A **Woodland Replacement Financial Guarantee of $106,000** (265 trees x $400/tree) is required as part of the Woodland Use Permit fees to ensure a successful planting of on-site Woodland Replacement Tree Credits.

   The Applicant shall guarantee trees for two growing seasons after installation and the City's acceptance, per the City's Performance Guarantees Ordinance. A **two-year maintenance bond in the amount of 25% ($26,500)** of the value of the trees, but in no case less than $1,000, shall be required to ensure the continued health of the trees following acceptance (Chapter 26.5, Section 26.5-37).

   Note that the Applicant is responsible for requesting an inspection of the installed on-site Woodland Replacement Trees.

   While not necessary for PSP approval, a list of trees proposed for replacement will need to be provided in the final site plan. Approximate locations are provided in the associated landscape plans. Section 37-8 of the City of Novi Woodlands Protection Ordinance and the City of Novi Landscape Design Manual provide guidelines for replacement trees.

8. The Applicant will be required to pay into the **City of Novi Tree Fund $1,238,000** for the remaining 3,095 woodland replacements not planted on site (3,095 woodland replacement credits x $400/credit). This fee is non-refundable.
   a. Merjent understands that a small amount of tree replacements are required for the creation of a potential wetland mitigation site. It should be noted that any trees planted specifically to meet the requirements of the wetland mitigation performance standards (see wetland comments) cannot be double counted to meet the requirements of woodland replacement credits and vice-versa. Therefore, any trees planted for potential wetland mitigation sites will only be counted toward either wetland mitigation performance standards or woodland replacement credits. Additional/supplemental plantings in these areas that exceed wetland mitigation performance standards can then be counted toward woodland replacement credits.

9. **Critical root zone**. Accurate critical root zones must be depicted on the site plan for all regulated trees within 50 feet of the proposed grading or construction activities. Tree symbols are present on the plan but are relatively small. Additionally, it is unclear whether the tree symbol on the plan represents the trunk, dripline, or critical root zone of the tree. The tree symbol should be clarified in the legend or elsewhere on the plan. Critical root zones should be identified using a separate symbol on the site plans. These impacts may have already been accounted for in the removal table provided, but the symbol should be clarified prior to the final site plan approval.

10. Regulated woodland disturbance includes impacts to the critical root zone of regulated trees, including but not limited to encroachment by grading, landscaping, and construction. If impacts to the critical root zone of regulated woodland trees are proposed – woodland replacements are required. Revised woodland replacement calculations or plan revisions may be necessary to address any unclear encroachments into the critical root zone.

11. A **woodland fence guarantee of $6,000** ($5,000 x 120%) is required per Chapter 26.5-37. The financial guarantee shall be paid prior to issuance of the City of Novi Woodland Use Permit.
    a. The cost to stake, install, and remove the tree protection fencing should be added to Sheet L-19 in order to calculate woodland fence inspection fees.

12. **Woodland Replacement Inspection** – The Applicant is responsible for walking the entire site to confirm that all woodland replacement trees/shrubs have been planted on site according to the approved site plan stamping set. If any material is missing, dead or dying, replacements should be made prior to requesting the inspection. The applicant should also provide an as-built landscape plan if the trees planted do not match the species and/or location shown on the approved site plan stamping set. Once this occurs the Applicant should contact the Bond Coordinator to schedule the inspection (Angie Sosnowski at asosnowski@cityofnovi.org; 248-347-0441) and complete the inspection request form. If additional inspections are needed, then additional inspection fees will be required to be paid by the applicant.

13. **Woodland Guarantee Inspection –** Prior to requesting the 2-year woodland guarantee inspection, the Applicant is responsible for walking the entire site to confirm that all plant material has survived and is healthy. If any material is missing, dead or dying, replacements should be made prior to requesting the inspection. Once this occurs the Applicant should contact the Bond Coordinator to schedule the 2-year guarantee inspection (Angie Sosnowski at asosnowski@cityofnovi.org / 248-347-0441) and complete the inspection request form. If additional inspections are needed, then additional inspection fees will be required to be paid by the applicant. Based upon a successful inspection for the 2-year warranty the Landscape/Woodland/Street trees financial guarantee will be returned to the Applicant.

    If the woodland replacements, street trees, or landscaping guarantee period is scheduled to end during the period when inspections are not conducted (November 15th – April 15th) the Applicant is responsible for contacting the Bond Coordinator and Woodland/Landscape Inspector in the late summer/early fall prior to the 2-year expiration to schedule an inspection.

14. The Applicant may be required to provide preservation/conservation easements as directed by the City of Novi Community Development Department for any areas of woodland replacement trees. The applicant shall demonstrate that all proposed woodland replacement trees and existing regulated woodland trees to remain will be guaranteed to be preserved as planted with a conservation easement or landscape easement to be granted to the city. This language shall be submitted to the City Attorney for review. The executed easement must be returned to the City Attorney within 60 days of the issuance of the City of Novi Woodland permit. Any associated easement boundaries shall be indicated on the Plan.
    a. An existing conservation easement is present southeast of the site associated with Meadowbrook Investments LLC. A map of conservation easements is provided as **Attachment B**.

Wetlands

Wetland Recommendation: Merjent **recommends approval** of the The Grove PRO Initial Concept Plan based on the comments provided below. However, if the project moves toward a formal application, several comments should be addressed to meet the requirements of the City's Wetlands and Watercourse Protection Ordinance.

Upon review of published resources, the Site appears to contain or immediately borders:

- ☒ City-regulated wetlands, as identified on the City of Novi interactive map website. Note that both wetland and property limits depicted on the City's map are considered approximations (**Figure 2**).
- ☒ Wetlands that are regulated by the Michigan Department of Environment, Great Lakes, and Energy (EGLE).
- ☒ Wetlands as identified on National Wetland Inventory (NWI) and Michigan Resource Inventory System (MIRIS) maps, as identified on the EGLE Wetlands Viewer interactive map website (map provided in Wetland Boundary Review). NWI and MIRIS wetlands are identified by the associated governmental bodies' interpretation of topographic data and aerial photographs.
- ☒ Hydric (wetland) soil as mapped by the U.S. Department of Agriculture, Natural Resources Conservation Service, as identified on the EGLE Wetlands Viewer interactive map website (map provided in Wetland Boundary Review).

Permits and Regulatory Status

Due to the comments below, the following wetland-related items will be required for this project:

Item	Required/Not Required
Wetland Permit (specify Non-minor or Minor)	Required, Non-minor
Wetland Mitigation	Required
Environmental Enhancement Plan	Required, Mitigation Plan
Wetland Buffer Authorization	Required
EGLE Wetland Permit	Likely Required*
Wetland Conservation Easement	Required

*Final determination is at the discretion of EGLE

Wetland Review Comments

1. Merjent previously provided a Wetland Boundary Review (PWT24-05; 6/5/2024) to the applicant and performed a site visit on May 31, 2024. The applicant's wetland consultant, Barr Engineering, provided a response letter dated August 7, 2024. Photographs of each wetland were provided in the Wetland Boundary Review.
    a. Since the Wetland Boundary Determination issuance, the applicant has expanded/connected Wetland I and Wetland K, which caused an increase in the total size of the wetland to now be 4.79 acres.
    b. The applicant has updated the classification of each wetland type in the Initial Concept Plan and an updated summary table is provided in **Table 1** below.
    c. In the Wetland Boundary Review, Merjent noted that due to the broad coverage of essentiality criteria listed in Section 12-174 (b), that all wetlands on-site are likely City-regulated (City Essential). The applicant notes that they do not consider any wetlands smaller than 0.25 acre

to be City-regulated. Merjent reviewed similar PRO projects that have been approved within the City, as well as similar projects reviewed by the City's previous Environmental Consultants, Environmental Consulting and Technology, Inc. (ECT) and the Mannik and Smith Group (MSG). As noted in Section 12-151, the City adopted a Wetlands and Watercourse Protection Ordinance because "the wetlands and watercourses of the city are indispensable and fragile natural resources subject to floodwater capacity limitations, erosion, soil bearing capacity limitations and other hazards." Additionally, the City has established essentiality criteria in Section 12-174 (b) that any wetlands that meet one of the following criteria would be considered essential:

i. *The site supports state or federal endangered or threatened plants, fish or wildlife appearing on a list specified in Section 36505 of the Natural Resources Environmental Protection Act (Act 451 of 1994) [previously section 6 of the endangered species act of 1974, Act No. 203 of the Public Acts of 1974, being section 229.226 of the Michigan Compiled Laws].*
ii. *The site represents what is identified as a locally rare or unique ecosystem.*
iii. *The site supports plants or animals of an identified local importance.*
iv. *The site provides groundwater recharge documented by a public agency.*
v. *The site provides flood and storm control by the hydrologic absorption and storage capacity of the wetland.*
vi. *The site provides wildlife habitat by providing breeding, nesting or feeding grounds or cover for forms of wildlife, waterfowl, including migratory waterfowl, and rare, threatened or endangered wildlife species.*
vii. *The site provides protection of subsurface water resources and provision of valuable watersheds and recharging groundwater supplies.*
viii. *The site provides pollution treatment by serving as a biological and chemical oxidation basin.*
ix. *The site provides erosion control by serving as a sedimentation area and filtering basin, absorbing silt and organic matter.*
x. *The site provides sources of nutrients in water food cycles and nursery grounds and sanctuaries for fish.*

Because of the broad coverage of wildlife species and wildlife species present throughout the City, the entire site being undeveloped would easily allow all wetlands to meet criteria (vi) above. Common wildlife seen on-site include but are not limited to white-tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), eastern raccoons (*Procyon lotor*), fox squirrels (*Sciurus niger*), and sandhill crane (*Antigone canadensis*). Additionally, the applicant provided wetland storage calculations (Sheet SP-5) that show that all wetlands on-site meet criteria (v) above.

2. Impacts have been proposed to 17 wetlands on-site, totaling approximately 1.71 acres loss of wetland. The impacts are summarized below.

Table 1. Wetland Summary and Impact Table

Wetland ID	Classification*	Acres On-site	Wetland Impact Area (acre)	Wetland Impact Volume (cu. yd.)	Permanent Buffer Impact Area (acre)	Temporary Buffer Impact Area (acre)	Buffer Impact Volume (cu. ft.)
C	Emergent	0.10	0.100	525	Not Provided‡	Not Provided‡	Not Provided§
E	Emergent	0.44	0.330	400	0.240	0.000	Not Provided§

Wetland ID	Classification*	Acres On-site	Wetland Impact Area (acre)	Wetland Impact Volume (cu. yd.)	Permanent Buffer Impact Area (acre)	Temporary Buffer Impact Area (acre)	Buffer Impact Volume (cu. ft.)
F	Emergent/Forested	0.29	0.210	0†	0.140	0.040	Not Provided§
G	Forested	0.07	0.060	0†	0.230	0.000	Not Provided§
H	Forested	1.12	0.000	0	0.110	0.035	Not Provided§
I/K	Emergent/Scrub-shrub/Forested	4.79	0.114	601	0.330	0.410	Not Provided§
J	Scrub-shrub/Forested	0.04	0.034	68	0.140	0.000	Not Provided§
L	Scrub-shrub	0.29	0.000	0	0.026	0.050	Not Provided§
M	Emergent/Forested	0.21	0.060	0†	0.27	0.000	Not Provided§
N	Emergent/Scrub-shrub	0.06	0.000	0	0.020	0.000	Not Provided§
O	Emergent/Scrub-shrub	0.39	0.000	0	0.074	0.000	Not Provided§
P	Scrub-shrub	0.03	0.030	130	0.13	0.000	Not Provided§
Q	Forested	0.23	0.230	805	Not Provided‡	Not Provided‡	Not Provided§
R	Emergent/Scrub-shrub	0.04	0.040	152	Not Provided‡	Not Provided‡	Not Provided§
S	Forested	0.05	0.050	379	Not Provided‡	Not Provided‡	Not Provided§
T	Emergent/Scrub-shrub	0.97	0.002	1.9	0.040	0.019	Not Provided§
U	Forested	0.12	0.070	0†	Not Provided‡	Not Provided‡	Not Provided§
V	Forested	0.14	0.140	0†	Not Provided‡	Not Provided‡	Not Provided§
X	Scrub-shrub	0.07	0.010	0†	Not Provided‡	Not Provided‡	Not Provided§
Y	Emergent	0.21	0.210	0†	Not Provided‡	Not Provided‡	Not Provided§
Z	Scrub-shrub	0.02	0.020	0†	Not Provided‡	Not Provided‡	Not Provided§
Total	-	**9.64**	**1.71**	**3,061.9**	**1.480**	**0.554**	--

*Classification per Sheet SP-8.1

†No fill listed, a description should be provided as to what the proposed impact is and why it is necessary for the project.

‡Wetland impacts are shown in the plan as well as impacts to the buffer area. Buffer impacts should be provided for all wetland impacts and associated buffer impacts.

§Wetland buffer impact volumes (whether temporary or permanent) should be quantified on site plans.

3. In **Table 1** above (extracted from Sheet SP-8.1), some wetland impacts do not contain fill quantities. The applicant should clarify what the impact is to certain wetlands if a fill will not occur (i.e., cut, grade change, vegetation removal, etc.) and reasoning for why the impact is needed. If any culverts will be

installed, for example through Wetland I/K, the size and type of culvert beneath the road will be needed for the site plan review process.

4. In addition to wetlands, the City of Novi regulates wetland and watercourse buffers/setbacks. Article 24 of the Zoning Ordinance, Schedule of Regulations, states: "There shall be maintained in all districts a wetland and watercourse setback, as provided herein, unless and to the extent, it is determined to be in the public interest not to maintain such a setback. The intent of this provision is to require a minimum setback from wetlands and watercourses". The established wetland and watercourse buffer/setback limit is 25 horizontal feet, regardless of grade change.
    a. Appropriate setbacks have been incorporated into the site plans. Prior to the site plan review process, the applicant should provide the buffer impact area for all wetlands on-site (see **Table 1**). Additionally, buffer impact volumes should be provided for all impacts.

5. The City of Novi requires the boundary lines of any watercourses or wetlands on the Site to be clearly flagged or staked and such flagging/staking shall remain in place throughout the conduct of permit activity. During Merjent's site visit on May 31, 2024 it was noted that the flagging from the delineation was still present. Select photos are included in **Attachment A**. The site does not need to be re-flagged during the site plan review process, but prior to granting a Wetland Use Permit and construction the wetlands should be verified as being accurately staked or flagged.

6. The cost to perform any wetland protection and restoration shall be listed on the site plan, per Chapter 26.5, Section 26.5-7 (b) of the City of Novi Code of Ordinances. A **Wetland Financial Performance Guarantee** in the amount of 120% of the cost to perform any wetland protection, restoration, and development will be collected prior to the granting of a Wetland Use Permit.

7. When a project permanently impacts 0.25 acre or more of essential wetland, the City of Novi requires mitigation at a ratio of 2:1 for forested wetlands and 1.5:1 for emergent and scrub-shrub wetlands. Current wetland classifications in **Table 1** above reflect the classifications noted on Sheet SP-8.1. The total proposed impact to City-regulated wetlands is approximately 1.71 acres.
    a. As noted in Comment 1, all wetlands on-site are essential to the City of Novi. Mitigation amounts should be updated to reflect total impacts on-site. The permanent impacts to 0.25 acre, or more, of wetlands represent cumulative impacts on-site and encompasses the total amount of impacts to City-essential wetlands.
    b. Wetland F is noted to be both emergent and forested but the mitigation ratio listed on Sheet SP-8.1 is a ratio of 1.5:1. The impacts should be refined to indicate whether the impact is specifically to an emergent or a forested portion of the wetland. If the extent of the emergent portion of Wetland F is not identified, a conservative ratio of 2:1 will be used during the site plan review process.

8. According to the City Ordinance Section 12-176 (Mitigation), "Mitigation shall be provided onsite where practical and beneficial to the wetland resources. If onsite mitigation is not practical and beneficial, mitigation in the immediate vicinity, within the same watershed, may be considered. Mitigation at other locations within the city will only be considered when the above options are impractical."
    a. Mitigation is provided on-site but may not be large enough to encompass impacts to City-essential wetlands. The applicant is encouraged to either redesign portions of the ICP/site plan to either reduce impacts to wetlands or to increase the amount of mitigation provided on-site.

b. City-regulated mitigations will follow the City of Novi Mitigation Performance Standards (**Attachment C**), which are similar to EGLE's typical Mitigation Performance Standards.

9. The Applicant is encouraged to provide wetland conservation easements for any areas of remaining wetland and 25-foot wetland buffer. The Applicant shall provide wetland conservation easements as directed by the City of Novi Community Development Department for any areas of proposed wetland mitigation areas (if necessary). Additionally, EGLE may request conservation easements around remaining wetlands on-site if a permit is required from EGLE. This requirement would be unrelated to the requirements of the City of Novi Wetland Use Permit. This language shall be submitted to the City Attorney for review. The executed easement must be returned to the City Attorney within 60 days of the issuance of the City of Novi Wetland Use Permit.
    a. An existing conservation easement is present southeast of the site associated with Meadowbrook Investments LLC. A map of conservation easements is provided as **Attachment B**.

Should you have any questions or concerns with this review, please contact me via email at jason.demoss@merjent.com or via phone at (619) 944-3835.

Sincerely,

Merjent, Inc.

Jason DeMoss, PWS
Environmental Consultant

Enclosures:

Figure 1 – City of Novi Woodlands Map
Figure 2 – City of Novi Wetlands Map
Attachment A – Site Photographs
Attachment B – Conservation Easement Map
Attachment C – Wetland Mitigation Performance Standards

CC:
Diana Shanahan, City of Novi, dshanahan@cityofnovi.org
Rick Meader, City of Novi, rmeader@cityofnovi.org
Barbara McBeth, City of Novi, bmcbeth@cityofnovi.org
Robb Roos, Merjent, robb.roos@merjent.com

Figure 1. City of Novi Regulated Woodlands Map
Approximate Site boundary is shown in red.
(Approximate) Regulated Woodland areas are shown in green.

Figure 2. City of Novi Regulated Wetlands Map
Approximate Site boundary is shown in red.
(Approximate) Regulated Wetland areas are shown in turquoise.

Attachment A
Site Photographs

Overview of the northeastern forest within the site

Overview of the central portion/forest within the site

Overview of the southern forest within the site

Typical tree tag on-site; Tree 4301 identified

Typical tree tag on-site; Tree 4482 identified

Typical tree tag on-site; Tree 4484 identified

Typical tree tag on-site; Tree 6756 identified

Overview of the western/northwestern forest on-site.

Attachment B
Conservation Easement Map

City of Novi Conservation Easements

9/4/2024

1:9,046

Conservation Easement

Wetland

Wetland & Woodland

World Imagery

Low Resolution 15m Imagery

High Resolution 60cm Imagery

High Resolution 30cm Imagery

Citations

2.4m Resolution Metadata

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Maxar, Esri Community Maps Contributors, City of Novi, MI, Province of Ontario, Oakland County, Michigan, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS

Attachment C
Wetland Mitigation Performance Standards

merjent

a. Construction has been completed in accordance with the City of Novi's approved plans and specifications included in the permit and mitigation plan (and associated approved site plan).

b. The mitigation wetland is characterized by the presence of water at a frequency and duration sufficient to support a predominance of wetland vegetation and the wetland types specified at the end of the monitoring period. The monitoring period will follow the U.S. Army Corps of Engineers definition of the growing season as stated in the 1987 *Wetland Delineation Manual*:

    i. "The portion of the year when soil temperatures at 19.7 inches (50 cm) below the soil surface are higher than biological zero (5°C [41°F]). For ease of determination, this period can be approximated by the number of frost-free days."

    ii. "Estimating starting and ending dates for the growing season are based on 28°F (-2.2°C) air temperature thresholds at a frequency of five years in 10."

c. A layer of high-quality topsoil, from the A horizon of an organic or loamy surface texture soil, is placed (or exists) over the entire wetland mitigation area at a minimum thickness of six inches.

d. The mitigation wetland shall be free of oil, grease, debris, and all other contaminants.

e. A minimum of six wildlife habitat structures, consisting of at least three types, have been placed per acre of mitigation wetland. At least 50 percent of each structure shall extend above the normal water level. The types of acceptable wildlife habitat structures are:

    i. Tree stumps laid horizontally within the wetland area. Acceptable stumps shall be a minimum of six feet long (log and root ball combined) and 12 inches in diameter.

    ii. Logs laid horizontally within the wetland area. Acceptable logs shall be a minimum of 10 feet long and six inches in diameter.

    iii. Whole trees laid horizontally within the wetland area. Acceptable whole trees shall have all of their fine structure left intact (i.e., not trimmed down to major branches for installation), be a minimum of 20 feet long (tree and root ball), and a minimum of 12 inches in diameter.

    iv. Snags which include whole trees left standing that are dead or dying, or live trees that will be flooded and die, or whole trees installed upright into the wetland. A variety of tree species should be used for the creation of snag habitat. Acceptable snags shall be a minimum of 20 feet tall (above the ground surface) and a minimum of 12 inches in diameter at breast height. Snags should be grouped together to provide mutual functional support as nesting, feeding, and perching sites.

    v. Sand mounds at least 18 inches in depth and placed so that they are surrounded by a minimum of 30 feet of water measuring at least 18 inches in depth. The sand mound shall have at least a 200 square foot area that is 18 inches above the projected high-water level and oriented to receive maximum sunlight.

f. The mean percent cover of native wetland species in the herbaceous layer at the end of the monitoring period is not less than:

    i. 60 percent for emergent wetland.

    ii. 80 percent for scrub-shrub wetland.

iii. 80 percent for forested wetland.

g. Extensive areas of open water and submergent vegetation areas having no emergent and/or rooted floating vegetation shall not exceed 20 percent of the mitigation wetland area. Extensive areas of bare soil shall not exceed five percent of the mitigation wetland area. For the purposes of these performance standards, extensive refers to areas greater than 0.01 acre (436 square feet) in size.

h. The total percent cover of wetland species in each plot shall be averaged for plots taken in the same wetland type to obtain a mean percent cover value for each wetland type. For the purposes of this standard, total percent cover is the percent cover of the ground surface covered by vegetation, bare soil, and open water, when viewed from above. Total percent cover cannot exceed 100 percent. Plots within identified extensive open water and submergent areas, bare soil areas, and areas without a predominance of wetland vegetation shall not be included in this average. Wetland species refers to species listed as facultative and wetter (FAC, FACW, OBL) on the U.S. Army Corps of Engineer's 2020 Regional Plant List (version 3.5) for the Midwest Region.

i. The mitigation wetland supports a predominance of wetland (hydrophytic) vegetation (as defined in the 2010 U.S. Army Corps of Engineers “Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region [Version 2.0]”) in each vegetative layer, represented by a minimum number of native wetland species, at the end of the monitoring period. The minimum number of native wetland species per wetland type shall not be less than:

   i. 15 species within the emergent wetland.

   ii. 15 species within the scrub-shrub wetland.

   iii. 15 species within the forested wetland.

   The total number of native wetland plant species shall be determined by a sum of all species identified in sample plots of the same wetland type.

j. At the end of the monitoring period, the mitigation wetland supports a minimum of:

   i. 300 individual surviving, established, and free-to-grow trees per acre in the forested wetland that are classified as native wetland species and consisting of at least three different species.

   ii. 300 individual surviving, established, and free-to-grow shrubs per acre in the scrub-shrub wetland that are classified as native wetland species and consisting of at least four different species.

   iii. *Optional*: Eight native wetland species of grasses, sedges, or rushes per acre in the wet meadow wetland.

k. Physiognomic classification of trees and shrubs shall be in accordance with the most updated resource from the following list:

   i. The Michigan Floristic Quality Assessment

   ii. Michigan Flora (also referred to as the University of Michigan Herbarium)

   iii. The U.S. Army Corps of Engineer's Regional Plant List for the Midwest Region.

l. The mean percent cover of invasive species including, but not limited to, *Phragmites australis* (Common Reed), *Lythrum salicaria* (Purple Loosestrife), and *Phalaris arundinacea* (Reed Canary Grass) shall in combination be limited to no more than 10 percent within each wetland type. Invasive species shall not dominate the vegetation in any extensive area of the mitigation wetland. A more exhaustive list of invasive species that are known to be in Michigan can be found on the State of Michigan’s Invasive Species plant list (https://www.michigan.gov/invasives/id-report/plants)

If the mean percent cover of invasive species is more than 10 percent within any wetland type or if there are extensive areas of the mitigation wetland in which an invasive species is one of the dominant plant species, the permittee shall submit an evaluation of the problem to the City of Novi and/or the. If the permittee determines that it is infeasible to reduce the cover of invasive species to meet the above performance standard, the permittee must submit an assessment of the problem, a control plan, and the projected percent cover that can be achieved for review by the City of Novi. Based on this information, the City of Novi may approve an alternative invasive species standard. Any alternative invasive species standard must be approved in writing by the City of Novi.

If the mitigation wetland does not satisfactorily meet these standards by the end of the monitoring period, or is not satisfactorily progressing during the monitoring period, the permittee will be required to take corrective

Consultant review of Monitoring Reports will be split into the following sections:

1. Vegetation
2. Invasive Species
3. Hydrology
4. Wildlife Observations
5. Topsoil
6. Pollutants
7. Signage
8. Wetland Recommendations (as applicable)
    a. Financial Guarantee Release

TRAFFIC REVIEW

AECOM
39575 Lewis Dr, Ste. 400
Novi
MI, 48377
USA
aecom.com

Project name:
JZ24-31 – The Grove PRO Initial Concept Traffic Review

To:
Barbara McBeth, AICP
City of Novi
45175 10 Mile Road
Novi, Michigan 48375

From:
AECOM

Date:
September 5, 2024

CC:
Lindsay Bell, Dan Commer, Heather Zeigler, Humna Anjum, Diana Shanahan, Adam Yako

Memo

Subject: JZ24-31 – The Grove PRO Initial Concept Traffic Review

The initial concept site plan was reviewed to the level of detail provided and AECOM recommends **denial** until the comments provided below are adequately addressed to the satisfaction of the City.

GENERAL COMMENTS

1. The applicant, Ivanhoe Companies, is proposing a residential development consisting of 49 townhomes, 133 attached condominiums, and 256 residence flats.
2. The development is located on the southeast corner of Twelve Mile Road and Meadowbrook Road. Twelve Mile Road is under the jurisdiction of the Road Commission for Oakland County and Meadowbrook Road is under the jurisdiction of the City of Novi.
3. The site is zoned OST (Office Service Technology) and the applicant is requesting a PRO for RM-2 (High-Density Multiple-Family).
4. The following traffic related deviations have been requested by the applicant:
    a. Parking setback along Meadowbrook Road of 50', instead of the required 75'.
    b. Parking on a major drive.
5. The following traffic-related deviations along with engineering study may be required if changes are not made to the plans:
    a. Below standard sight distance at driveways.

TRAFFIC IMPACTS

1. AECOM performed an initial trip generation based on the ITE Trip Generation Manual, 11th Edition, as follows.

    ITE Code: 220 – Multifamily Housing (Low-Rise)
    Development-specific Quantity: 438 Units
    Zoning Change: OST to RM-2 PRO

Trip Generation Summary	Estimated Trips	Estimated Peak-Direction Trips	City of Novi Threshold	Above Threshold?
AM Peak-Hour Trips	159	121	100	**Yes**
PM Peak-Hour Trips	209	132	100	**Yes**
Daily (One-Directional) Trips	2883	N/A	750	**Yes**

2. The City of Novi generally requires a traffic impact study/statement if the number of trips generated by the proposed development exceeds the City's threshold of more than 750 trips per day or 100 trips per either the AM or PM peak hour, or if the project meets other specified criteria.

Trip Impact Study Recommendation	
Type of Study:	**Justification**
Traffic Impact Statement (TIS) And Rezoning Traffic Impact Statement (RTIS)	Proposed rezoning from OST to RM-2 and estimated trips are above the City's threshold. The applicant submitted a Traffic Impact Study dated July 16, 2024, and is reviewed under a separate letter.

TRAFFIC REVIEW

The following table identifies the aspects of the plan that were reviewed. Items marked O are listed in the City's Code of Ordinances. Items marked with ZO are listed in the City's Zoning Ordinance. Items marked with ADA are listed in the Americans with Disabilities Act. Items marked with MMUTCD are listed in the Michigan Manual on Uniform Traffic Control Devices.

The values in the 'Compliance' column read as 'met' for plan provision meeting the standard it refers to, 'not met' stands for provision not meeting the standard and 'inconclusive' indicates applicant to provide data or information for review and 'NA' stands for not applicable for subject Project. The 'remarks' column covers any comments reviewer has and/or 'requested/required variance' and 'potential variance'. A potential variance indicates a variance that will be required if modifications are not made or further information provided to show compliance with the standards and ordinances. The applicant should put effort into complying with the standards; the variances should be the last resort after all avenues for complying have been exhausted. Indication of a potential variance does not imply support unless explicitly stated.

EXTERNAL SITE ACCESS AND OPERATIONS				
No.	**Item**	**Proposed**	**Compliance**	**Remarks**
1	Driveway Radii | O Figure IX.3	35'	Met	
2	Driveway Width | O Figure IX.3	21'	**Not Met**	**24' is the standard width, 22' is the minimum width for a divided driveway.**
3	Driveway Taper | O Figure IX.11			
3a	Taper length	100' and 75'	Met	
3b	Tangent	50'	Met	
4	Emergency Access | O 11-194.a.19	3 access points	Met	
5	Driveway sight distance | O Figure VIII-E	Indicated, 510' required along 12 Mile Rd and 410' required along Meadowbrook Rd	**Partially Met**	**It is difficult to read all the sight distance dimensions on sheet SP-4, but it appears requirements are not met in some areas. if changes are not made, a waiver with an Engineering study will be required if not met.**
6	Driveway spacing			

EXTERNAL SITE ACCESS AND OPERATIONS				
No.	**Item**	**Proposed**	**Compliance**	**Remarks**
6a	Same-side | O 11.216.d.1.d	N/A	-	
6b	Opposite side | O 11.216.d.1.e	235.35' 12 Mile Rd, 199.51' and 493.08' Meadowbrook Rd	Met	
7	External coordination (Road agency)	Indicated to follow RCOC standards	**Partially Met**	**Add note to the cover sheet that a permit will be required for any work within the right-of-way of 12 Mile Rd.**
8	External Sidewalk | Master Plan & EDM	Proposed 10' along Twelve Mile Rd, tying into existing on Meadowbrook Rd	Met	Label width of proposed portion on Meadowbrook Rd.
9	Sidewalk Ramps | EDM 7.4 & R-28-K	Indicated	**Partially Met**	**Include current R-28 detail in future submittal.**
10	Any Other Comments:	**Label island width and radii and each entrance/exit.**		

INTERNAL SITE OPERATIONS				
No.	**Item**	**Proposed**	**Compliance**	**Remarks**
11	Loading zone | ZO 5.4	Loading indicated at the clubhouse	**Partially Met**	**Add dimensions of loading area.**
12	Trash receptacle | ZO 5.4.4	Trash enclosures located in some parking areas	**Partially Met**	**Indicate trash collection at areas where dumpsters are not proposed, including the clubhouse.**
13	Emergency Vehicle Access	Provided	Met	
14	Maneuvering Lane | ZO 5.3.2	Varies, 24' minimum	Met	
15	End islands | ZO 5.3.12			
15a	Adjacent to a travel way	Partially dimensioned	**Partially Met**	**Dimension width of end island to ensure 10' minimum requirement is met. Dimension radii at the parking spaces in The Pointe.**
15b	Internal to parking bays	Not dimensioned	**Not Met**	**Dimension radii in future submittal.**

INTERNAL SITE OPERATIONS				
No.	**Item**	**Proposed**	**Compliance**	**Remarks**
16	Parking spaces | ZO 5.2.12	On-street, off-street, garage and driveway parking		See Planning review letter.
17	Adjacent parking spaces | ZO 5.5.3.C.ii.i	<15 spaces in all parking bays	Met	
18	Parking space length | ZO 5.3.2	17' and 19' perpendicular spaces, 23' parallel spaces	Met	
19	Parking space Width | ZO 5.3.2	9' perpendicular spaces, 8' parallel spaces	Met	
20	Parking space front curb height | ZO 5.3.2	4" in front of 17' spaces, 6" everywhere else	Met	
21	Accessible parking – number | ADA	2 required at clubhouse, 2 proposed	**Partially Met**	**The applicant indicated that 6 ADA accessible units are required, and accessible parking will be provided at each of these units. The applicant should indicate those locations in future submittals.**
22	Accessible parking – size | ADA	17' x 8' with 8' aisle	Met	
23	Number of Van-accessible space | ADA	1 required at clubhouse, 2 proposed	Met	
24	Bicycle parking			
24a	Requirement | ZO 5.16.1	88 required and 129 provided in units, 4 required at clubhouse and 4 provided	Met	
24b	Location | ZO 5.16.1	Not indicated	**Inconclusive**	**Provide in future submittal.**
24c	Clear path from Street | ZO 5.16.1	Not indicated	**Inconclusive**	**6' clear path required, note 2' overhang is not part of clear path.**
24d	Height of rack | ZO 5.16.5.B	Not indicated	**Inconclusive**	**Provide in future submittal.**
24e	Other (Covered / Layout) | ZO 5.16.1	Not indicated	**Inconclusive**	**Provide in future submittal.**
25	Sidewalk – min 5' wide | Master Plan	5' minimum	Met	
26	Sidewalk ramps | EDM 7.4 & R-28-K	Indicated	**Partially Met**	**Include current R-28 detail in future submittal.**
27	Sidewalk – distance back of curb | EDM 7.4	Not dimensioned	**Inconclusive**	**Dimension in future submittal.**

INTERNAL SITE OPERATIONS				
No.	**Item**	**Proposed**	**Compliance**	**Remarks**
28	Cul-De-Sac | O Figure VIII-F	N/A	-	
29	EyeBrow | O Figure VIII-G	N/A	-	
30	Turnaround | ZO 5.10	Not dimensioned	**Inconclusive**	**Provide dimensions in future submittal.**
31	Any Other Comments:			

SIGNING AND STRIPING				
No.	**Item**	**Proposed**	**Compliance**	**Remarks**
32	Signing: Sizes | MMUTCD	Indicated	Met	
33	Signing table: quantities and sizes	Indicated	Met	
34	Signs 12" x 18" or smaller in size shall be mounted on a galvanized 2 lb. U-channel post | MMUTCD	Indicated	Met	
35	Signs greater than 12" x 18" shall be mounted on a galvanized 3 lb. or greater U-channel post | MMUTCD	Indicated	Met	
36	Sign bottom height of 7' from final grade | MMUTCD	Indicated	Met	
37	Signing shall be placed 2' from the face of the curb or edge of the nearest sidewalk to the near edge of the sign | MMUTCD	Indicated	Met	
38	FHWA Standard Alphabet series used for all sign language | MMUTCD	Indicated	Met	
39	High-Intensity Prismatic (HIP) sheeting to meet FHWA retro-reflectivity | MMUTCD	Indicated	Met	
40	Parking space striping notes	Indicated	Met	
41	The international symbol for accessibility pavement markings | ADA	Provided	Met	
42	Crosswalk pavement marking detail	Provided	Met	
43	Any Other Comments:	Provide maintaining traffic information for Meadowbrook Road and Twelve Mile Road entrance work in future submittal.		

Note: Hyperlinks to the standards and Ordinances are for reference purposes only, the applicant and City of Novi to ensure referring to the latest standards and Ordinances in its entirety.

Should the City or applicant have questions regarding this review, they should contact AECOM for further clarification.

Sincerely,

AECOM

Paula K. Johnson, PE
Senior Transportation Engineer

Saumil Shah, PMP
Project Manager

TRAFFIC STUDY REVIEW

AECOM
39575 Lewis Drive
Suite 400
Novi, MI 48377
T 248.204.5900
www.aecom.com

Project name:
JZ24-31 – The Grove PRO TIS Traffic Review

To:
Barbara McBeth, AICP
City of Novi
45175 10 Mile Road
Novi, Michigan 48375

From:
AECOM

Date:
September 6, 2024

CC:
Lindsay Bell, Heather Zeigler, Diana Shanahan, Dan Commer

Memo

Subject: JZ24-31 – The Grove PRO TIS Traffic Review

This Traffic Impact Study was reviewed by AECOM to the level of detail provided below and AECOM recommends **denial of the Traffic Impact Study**; the applicant should review the comments provided below and provide a revised study to the City of Novi.

GENERAL COMMENTS

1. This memo will provide comments on a section-by-section basis following the format of the submitted report.
2. The project is located on the southeast quadrant of the 12 Mile Road and Meadowbrook Road intersection.
3. The development consists of 182 single family attached housing and 256 multi-family housing.
4. The development is a Planned Rezoning Overlay (PRO) plan, and the project site is currently zoned OST (Office Service Technology) and is proposed to be rezoned RM-2 (High-Density Multiple-Family).

BACKGROUND DATA

1. Applicant elaborated on uses permitted under the existing OST zoning and calculated trip generation based on the General Office Building land use category within the *ITE Trip Generation Manua 11th Edition*. The study concluded that the number of trips under existing OST zoning is estimated to be higher compared to the proposed rezoning to RM-2
2. The following roadways were included in the study:
    a. 12 Mile Road: 45 mph, four (4) lanes divided, east/west
    b. Meadowbrook Road: 35/40 mph, two (2) lanes, north/south
    c. The following intersections were included in the study:
        - 12 Mile Road at Meadowbrook Road
        - 12 Mile Road eastbound to westbound crossover east of Meadowbrook Road
        - 12 Mile Road westbound to eastbound crossover west of Meadowbrook Road
        - 12 Mile Road westbound to eastbound crossover west of Summit Drive
        - 12 Mile Road westbound to eastbound crossover east of Meadowbrook Road
3. Applicant collected turning movements that occurred between the 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM peak periods at the study intersections on Tuesday, June 11, 2024.
4. Novi Schools were not in session when the data collection was performed; therefore, the data was reviewed to determine if adjustments to the AM peak hour traffic volumes are necessary to consider the impact of school traffic volumes. The result of the evaluation indicates that the data collection performed was greater than the historical traffic volume data when the school was in session. Therefore, the performed data collection was utilized in the analysis and no adjustments were applied to AM peak hour traffic counts.

EXISTING CONDITIONS

1. The overall levels of service (LOS) at the study area intersections is LOS D or better with no movements experiencing a delay of LOS E or F (Table 2).

BACKGROUND (NO BUILD) CONDITIONS 2024

1. A 0.5% annual growth rate was used to project the existing 2024 traffic volumes to the site buildout year of 2030.
2. Overall operations at the intersections are not expected to change significantly compared to existing conditions except the LOS C in existing conditions is expected to be LOS D in future background conditions (Table 3) at the following intersection:
    a. 12 Mile Road at Meadowbrook Road
    b. Westbound 12 Mile Road through Meadowbrook Road in the PM peak hour
    c. Westbound u-turn for 12 Mile Road at the eastbound to westbound crossover east of Meadowbrook Road in the PM peak hour

SITE TRIP GENERATION

1. A total of 3,052 daily trips are anticipated based on the *ITE Trip Generation Manual 11th Edition* (Table 4).
2. A net increase of 191 trips during the morning peak hour and 236 trips during the evening peak hour are considered for a traffic impact study on the surrounding road network (Table 4).

SITE TRAFFIC ASSIGNMENT

1. Adjacent street peak hour volumes were used to calculate site trip distribution.
    a. The largest portion of the traffic is assumed to be coming from/going to 12 Mile Road with approximately 74% in morning peak hours and 60% in evening peak hours (Table 6).

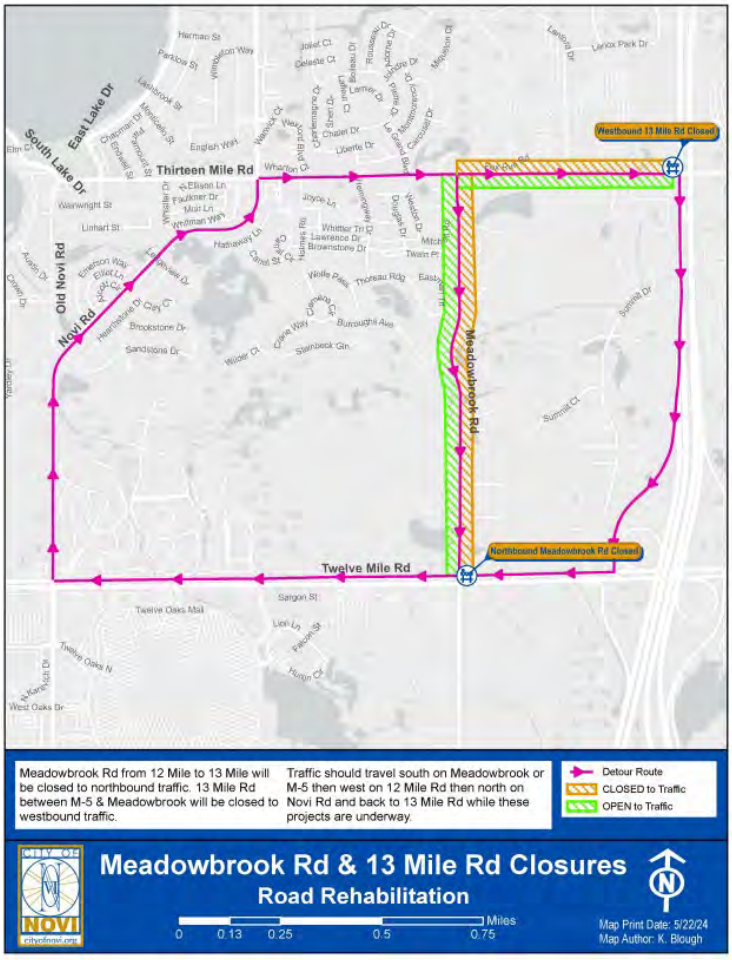
FUTURE CONDITIONS

1. Overall operations at the intersections are not expected to change significantly compared to background conditions, except at the following locations:
    a. LOS C in background conditions are expected to be LOS D in future build conditions:
        i. Westbound 12 Mile Road u-turn at the westbound to eastbound crossover west of Meadowbrook Road in the PM peak hour
        ii. Eastbound Meadowbrook Road at Elm Creek Drive/Site Driveway in the PM peak hour
    b. LOS D in background conditions are expected to be LOS E in future build conditions:
        i. Northbound Meadowbrook Road right-turn at 12 Mile Road in the PM peak hour
2. Eastbound 12 Mile Road at Site Drive #1 has a LOS E (44 seconds), however, the queue analysis indicated a small queue of only two (2) to three (3) vehicles.
3. The following major movements are estimated to experience or continue to experience a relatively higher delay in the future:
    a. Westbound 12 Mile Road through at Meadowbrook Road would have a LOS D in the AM peak hour (20 seconds existing versus 46 seconds in the future).
    b. Southbound M-5 Off-ramp southbound left-turn and right-turn at 12 Mile Road would have a LOS D in the AM (36 seconds in Existing and build conditions) and PM (42 seconds in existing and build conditions) peak hours.
    c. Eastbound 12 Mile Road u-turn at the eastbound to westbound crossover east of Meadowbrook Road would have a LOS D in the PM peak hour (22 seconds existing versus 29 seconds in the future).

CONCLUSIONS

1. The study concluded with a recommendation that would improve the failing levels of service and traffic conditions as shown below. However, it is not clear if the applicant has coordinated such improvement with the Road Commission for Oakland County (RCOC).
    - 12 Miler Road and Meadowbrook Road intersection: Re-stripe the northbound approach (currently provides a through lane and a right-turn lane) to provide dual right-turn lanes; with a shared through/right lane and an exclusive right-turn lane.

2. **AECOM does not agree with the consultant's proposal of restriping the northbound through as a shared through and right-turn lane. The analysis that the consultant carried out to evaluate this mitigation at Meadowbrook Road at 12 Mile Road Intersection is considered a very low volume of traffic on northbound through (5 cars in AM peak hour and 10 cars in PM peak hour, Figure 3). It seems these volumes were influenced by the detour and closing of northbound through traffic due to construction (GLWA 54-Inch Water Main Loop) that has been ongoing for a very long period (February 2022 to August 2024) on Meadowbrook Road between 12 Mile Road and 13 Mile Road as per the image below. The consultant should perform a sensitivity analysis with the volumes growing to the future year by applying a growth rate to a set of volumes when there was no construction (pre-pandemic) and then confirm/explore the mitigation measures.**



Access: Sight Distance, Right-turn Lane and Left-turn Lane

Accesses will also be reviewed under the site plan review and please refer comments provided in the site plan review letter. Please provide detailed drawings showing sight distances and right-turn and left-turn lanes for the proposed site driveways as part of the site plan review. The comments here are based on the level of detail provided as part of the Traffic Impact Study:

- Sight Distance: **The applicant needs to show the sight distance triangle and details on the plan set for further review and confirmation.**
- Right-tun lane: There is currently an existing center two-way left-turn lane (TWLTL) on Meadowbrook Road adjacent to the project site. 12 Mile Road is median divided with left-turn movements accommodated via median U-turns (crossovers) intersections. Therefore, only the right-turn treatment criteria were evaluated at the proposed site driveways. The traffic study concluded that due to high traffic volumes along 12 Mile Road (Table 8), this site driveway qualifies for a right-turn lane according to the RCOC warrant graph. **However, the applicant needs to coordinate with RCOC for geometrical standards and approval for the right-turn taper. The applicant will need to show the right-turn taper details with dimensions and adherence to the applicable standards on the plan set for further review and confirmation.**

RCOC Comments:

The study indicated the site trip distribution for westbound 12 Mile Road to be 33% AM (63 trips) and 28% PM (66 trips). RCOC has some concerns related to the ability of vehicles to weave across the 3 lanes of 12 Mile Rd to enter/exit the site. The applicant should conduct a weave analysis from the nearest cross-overs. This is particularly concerning for the WB to EB 12 Mile Road movement as the M-5/I-696 ramp traffic utilizes this same cross-over.

Should the City or applicant have questions regarding this review, they should contact AECOM for further clarification.

Sincerely,

AECOM

Saumil Shah
Project Manager

Sarah Binkowski, PE, PTOE
Michigan Traffic Engineering Manager

FAÇADE REVIEW

DRN & ASSOCIATES, ARCHITECTS, PC
Phone: (248) 880-6523
E-Mail: dnecci@drnarchitects.com
Web: drnarchitects.com
50850 Applebrooke Dr., Northville, MI 48167

September 5, 2024

City of Novi Planning Department
45175 W. 10 Mile Rd.
Novi, MI 48375-3024

Attn: Ms. Barb McBeth – Director of Community Development

Re: FACADE ORDINANCE
The Grove PRO, JZ24-31, PRO Initial Concept
Façade Region: 1
Zoning District - Current: OST, Proposed: PRO RM-2.

Dear Ms. McBeth:

The following is the Facade Review for the above referenced project based on the drawings provided by Hobbs & Black Architects and TR-Design Group, dated 7/26/24. This project is subject to the Façade Ordinance Section 5.15, and the Planned Rezoning Overlay Ordinance (PRO) Section 7.13. The percentages of materials proposed for each façade are as shown in the tables below. Materials in non-compliance are highlighted in bold.

The Meadows Residence Flats Hobbs & Black Drawings Dated 7/26/24 (A-201)	Front	Left	Right	Rear	Ordinance Maximum (Minimum)
Brick	**15%**	**18%**	**18%**	**22%**	100% (30% Minimum)
Vinyl Siding, Vertical	**22%**	**26%**	**26%**	**20%**	0%
Vinyl Siding, Horizontal	**25%**	**20%**	**20%**	**20%**	0%
Trim	6%	6%	6%	6%	15%
Asphalt Shingles	32%	30%	30%	32%	50% (Note 14)

The Meadows Residence Flats Garage Hobbs & Black Drawings Dated 7/26/24 (A-202)	Front	Left	Right	Rear	Ordinance Maximum (Minimum)
Brick	**0%**	**0%**	**0%**	**0%**	100% (30% Minimum)
Vinyl Siding, Vertical	**33%**	0%	0%	0%	0%
Vinyl Siding, Horizontal	**33%**	**90%**	**90%**	**66%**	0%
Trim	4%	4%	4%	4%	15%
Asphalt Shingles	30%	6%	6%	30%	50% (Note 14)

The Vistas Townhomes Hobbs & Black Drawings Dated 7/26/24 (A-200)	Front	Left	Right	Rear	Ordinance Maximum (Minimum)
Brick	36%	31%	31%	**24%**	100% (30% Minimum)
Vinyl Siding, Vertical	**26%**	**25%**	**25%**	**38%**	0%
Faux Wood	10%	0%	0%	10%	25%
Trim	5%	2%	2%	5%	15%
Asphalt Shingles	23%	42%	42%	23%	50% (Note 14)

The Woods and The Pointe TR-Design Drawing Dated 7/26/24 (A-204)	Front	Left	Right	Rear	Ordinance Maximum (Minimum)
Brick	**20%**	**20%**	**20%**	**24%**	100% (30% Minimum)
Vinyl Siding, Vertical	**24%**	**21%**	**21%**	**38%**	0%
Vinyl Siding, Horizontal	**11%**	**32%**	**32%**	**10%**	0%
Trim	5%	3%	3%	5%	15%
Asphalt Shingles	40%	24%	24%	23%	50% (Note 14)

All Above Residential Units - As shown above the minimum percentage of Brick is not provided and the percentage of Vinyl Siding exceeds the maximum amount allowed by the Façade Ordinance an all facades. Vinyl siding is not allowed by the Façade Ordinance. The Façade Ordinance allows 50% Wood Siding on residential style architecture (Footnote 10). Therefore, it is recommended that wood or fiber cement siding be used in lieu of vinyl. With this change the only remaining deviation would be the underage of Brick. It is recommended that the percentage of brick be increased to more closely comply with the Façade Ordinance. It appears that 30% minimum Brick can be readily achieved by adding brick to selected areas of the façades.

Clubhouse **Hobbs & Black Drawings Dated 7/26/24** **(A-203)**	Front	Left	Right	Rear	Ordinance Maximum (Minimum)
Brick	40%	48%	56%	40%	100% (30% Minimum)
Vinyl Siding, Vertical	**12%**	**16%**	**10%**	**12%**	0%
Standing Seam Metal Roof	10%	0%	0%	10%	25%
Trim	2%	4%	2%	2%	15%
Asphalt Shingles	36%	32%	32%	36%	50% (Note 14)

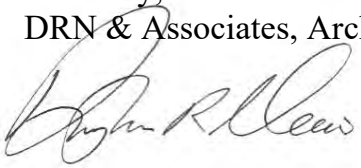
Clubhouse - As shown the percentage of Vinyl Siding exceeds the maximum amount allowed by the Façade Ordinance an all facades. Vinyl siding is not allowed by the Façade Ordinance. The Façade Ordinance allows 50% Wood Siding on residential style architecture (Footnote 10). Therefore, it is recommended that wood or fiber cement siding be used in lieu of vinyl. With this change the clubhouse will be in full compliance.

Rezoning Overlay Ordinance (PRO) Section 7.13 (Townhomes & Detached Units) – Section 7.13.2.D.ii.a of the PRO Ordinance requires that the application shall result in an enhancement of the project as compared to the existing zoning and such enhancement would be unlikely in the absence of the use of a PRO." In general, the design of all buildings does not meet this requirement due to the underage of brick and the extensive use of vinyl siding, which is expressly prohibited by the Façade Ordinance.

It should be noted that in some cases the elevations provided are inconsistent with the floor plans. While we do not believe this would significantly affect the above findings, this should be corrected in future submittals. Also, the sample board required by Section 5.15.4.D of the Façade Ordinance should be provided.

If you have any questions regarding this project please do not hesitate to call.

Sincerely,
DRN & Associates, Architects PC



Douglas R. Necci, AIA

FIRE REVIEW

August 28, 2024

TO: Barbara McBeth - City Planner
Lindsay Bell - Plan Review Center
Heather Zeigler – Plan Review Center
Dan Commer – Plan Review Center
Diana Shanahan – Planning Assistant

RE: **The Grove – response to Pre-App review on April 24, 2024 & response to developer letter dated July 26, 2024.**

PREAPP -24-0006
JZ24-31 - Concept

Project Description:
New Multi residential building complex

Comments:

- **Review of response letter from developer is ACCEPTABLE at this time. Items addressed on July 26 2024 letter to be followed in final stamping set.**

Recommendation:
Approved. No objections at this time.

Sincerely,

Andrew Copeland – Acting Fire Marshal
City of Novi Fire Department

cc: file

CITY COUNCIL

Mayor
Justin Fischer

Mayor Pro Tem
Laura Marie Casey

Dave Staudt

Brian Smith

Ericka Thomas

Matt Heintz

Priya Gurumurthy

City Manager
Victor Cardenas

Director of Public Safety
Chief of Police
Erick W. Zinser

Fire Chief
John B. Martin

Assistant Chief of Police
Scott R. Baetens

Assistant Fire Chief
Todd Seog

Novi Public Safety Administration
45125 Ten Mile Road
Novi, Michigan 48375
248.348.7100
248.347.0590 fax

cityofnovi.org

APPLICANT RESPONSE LETTERS

IVANHOE

6689 Orchard Lake Rd. - #314
West Bloomfield, MI 48323
248-626-6114 (office)
248-626-6104 (fax)
248-520-6980 (cell)
GARY SHAPIRO
gshapiro@ivanhoecompanies.com

November 14, 2024 **Via Email and Hand Delivery**

Novi City Council
c/o Lindsay Bell
Novi Community Development Department
45175 Ten Mile Road
Novi, Michigan 48375

Re: JZ 24-31 The Grove-PRO Concept Plan Review

Dear Members of City Council:

We look forward to presenting City Council with our vision for the proposed The Grove (the "Project") rezoning with planned rezoning overlay (PRO) on a portion of the property owned by Trinity Health at Meadowbrook and Twelve Mile Roads. We appreciate the many positive comments provided regarding the Project by City Staff and members of the Planning Commission. While we have not revised the plans presented to the Planning Commission at the public hearing held on October 29 (no member of the public appeared to object to the Project), we wanted the Council to be aware that after we receive comments from City Council, we will prepare a revised formal submission for preliminary site plan and PRO zoning approval. One or more members of the Planning Commission made comments regarding the building materials for the Project, the City's master planning for the area and some of the deviations requested. We can collaborate on these issues at the meeting, and we plan to address each of these comments in the next formal submission of the PRO rezoning request.

Several of the questions raised were addressed in our most recent responses to the Staff review letters. With over 500 pages of material to review and our desire to keep our presentation to Council succinct and not repetitive, I am enclosing a copy of the power point presentation given to the Planning Commission at the public hearing and those responses again here for your convenience in that they summarize and clarify comments from the staff review and the benefits of the Project and why we believe the Project meets all of the rezoning requirements. The C2G letter dated October 11,2024 provides a detailed list of the response letters provided. As a longtime developer in the City and property owner, I appreciate all of the time and hard work Council devotes to these matters. We look forward to bringing a unique, multi-generational, destination community to the City of Novi. Thank you.

Sincerely,

Enclosures

cc: Alan M. Greene
Andy Wozniak
Brad Strader
Woody Held
Jim Allen

C2G
CINCAR CONSULTING GROUP

400 Renaissance Center
Suite 2600
Detroit, MI 48243

17199 N. Laurel Park Drive
Suite 204
Livonia, MI 48152

October 11, 2024

Lindsay Bell, Senior Planner
City of Novi Community Development Department
45175 Ten Mile Road
Novi, MI 48375

Re: JZ 24-31 The Grove--PRO Concept Plan Review

Dear Ms. Bell,

Thank you for the comprehensive and thoughtful Plan Review Center Report dated September 11, 2024, regarding the plans for the proposed The Grove (the "Project") rezoning with planned rezoning overlay (PRO) on a portion of the property owned by Trinity Health at Meadowbrook and Twelve Mile Roads. We appreciate the many positive comments regarding the Project. Our design team has reviewed each of the staff review letters and have prepared the following responses to comments and requests for clarification and additional information, which are enclosed herewith:

1. Zeimet Wozniak Planning Review Response dated October 7, 2024;
2. Zeimet Wozniak Traffic Review Response dated October 7, 2024;
3. Zeimet Wozniak Response to Engineering Review dated October 7, 2024;
4. Barr Woodland/Wetland Review Response dated September 30, 2024;
5. Letter from Hobbs & Black re Exterior Cladding Materials dated September 30, 2024;
6. Allen Design Landscape Review Response dated October 2, 2024
7. Updated Traffic Impact Study prepared by Fleis & Vanderbrink, Review Response dated October 11, 2024, and Synchro model for review by City's consultant ;
8. Concept OST Development Plan;
9. Open Space Plan SP- 3.4; and
10. Letter from SMART to Lindsay Bell regarding relocating the eastbound bus stop to be near The Grove (as shown on the concept plan).

As you will see, we either acknowledged the comments or provided the additional information or clarification requested. After we receive comments from the Planning Commission and City Council, we will incorporate everything into a revised formal submission for preliminary site plan and PRO zoning approval. There are a few topics that were referenced in the City's review letters that I thought could be better addressed in this cover letter and then referenced by the design team in the accompanying response letters. These include comments regarding the character of the Meadowbrook Road corridor, public benefits, building design and wetlands. Each is addressed below.

A. <u>Changing Character of the Meadowbrook Road Corridor</u>.

While the Staff Report notes that changing the property to multi-family development would be a departure from the future OST uses planned for this area, it also notes the existence of the pending Elm Creek PRO project ("which has been favorably received by the Planning Commission and City Council"). The Staff Report goes on to state that Elm Creek "will already start to transform the area to allow more residential use." (Staff Report, at p. 3.) We agree that allowing a greater diversity of compatible land uses is consistent with modern development trends and creates a more dynamic environment. Residential and planned commercial already exist on the north side of Twelve Mile Road (Beacon Hill and Tollgate Farms).

As explained in detail in the application materials, some of the property in the area (and most particularly the property involved here) is particularly unsuitable for OST development and has remained vacant for decades. The existence and location of extensive natural features, including wetlands and woodlands, makes development of the property for OST uses, and its large, required parking areas, challenging and undesirable for the typical OST user. And any such development would adversely impact the natural features, especially the wetlands, in a manner inconsistent with the City's planning goals to protect and preserve such features. The property also abuts extensive preserved wetland and natural areas owned by MDOT and others. A carefully designed residential development as proposed here integrates the open spaces to provide extensive natural habitat areas and provides residents with a greater opportunity to see and enjoy the natural features of the property.

Moreover, the Project is designed to be compatible and complementary to additional OST or related business development. Within the Trinity property itself, over 7 acres at the corner of Meadowbrook and Twelve Mile is being preserved for a future business use and the residential development is specifically designed to be compatible with such use. This represents approximately 18% of the developable area of the entire Trinity property. The OST zoning district provisions recognize that OST uses can be adjacent to residential uses and include specific standards regarding building heights, setbacks, etc., to protect adjacent residential uses. (*See* Ordinance Section 3.123A.2). Our concept has been designed, with support from Trinity, to be compatible with the future use of the corner parcel.

Also, as described in more detail in the application materials, the Project is located in close proximity to an extensive network of recreational trails and will be made accessible to those trails. Finally, the Project is in close proximity and easily accessible to Twelve Oaks Mall and Fountain Walk and other nearby commercial and retail services, which can be easily reached by walking, bicycling, SMART bus or a short drive. Increased residential density in proximity to the retail areas is critical to the continued future success of the City's vast commercial development.

B. <u>Public Benefits</u>.

The Staff Report acknowledges the extensive on-site benefits and amenities offered by the Project, including a central park, pool, clubhouse, facilities for active recreation and extensive pathways, but asks the applicant to consider additional benefits for the public. We are evaluating this request and will work with Staff and City officials to enhance those public benefits, but we also wanted to restate the extensive public benefits already included in this reply.

We believe that taking a property that has remained idle for decades and converting it into a modern and integrated diverse village development, which preserves and utilizes natural features and provides multiple housing options (both for rent and for sale) is a public benefit. Our project addresses the City's planning goal to improve and expand the "missing middle" housing, with for rent or sale options to appeal

to both younger and older generations to remain or return to the City. We have carefully crafted the design of our units to offer options that are not available elsewhere in the City, including other multiple-family being proposed. We have clustered the placement of our buildings, parking and roads to reduce the impact on the environment compared to OST type uses.

Our specific benefits are listed below:

1. Four "places of interest" or pocket parks for the general public along Meadowbrook and Twelve Mile Roads.

2. A conservation easement will be used to protect the wetlands and certain woodlands. At the suggestion of City staff, we have increased the width of our circular non-motorized pathway from the typical 8 feet to 10 feet. This will make it more comfortable for travel and reduce any conflicts between walkers and bicyclists in the area where we anticipate the highest use.

3. Reducing vehicle trips is one of the goals of Novi's transportation plans. Our site will generate generally less traffic than OST. Our site is located within the City's and Regional non-motorized network, giving residents and visitors options to walk or bike ride.

4. Proximity along the SMART route 740 allowing travelers to take a bus to go shopping, entertainment and employment without driving. There is a westbound bus stop across 12 Mile. The eastbound stop will be moved to be near our 12 Mile Road entrance, as noted by SMART (see their letter). Ivanhoe will connect that stop to the new pathway along 12 Mile Road that we will be constructing.

5. In addition to constructing a pathway along our 12 Mile Road frontage, Ivanhoe will also construct a 730-foot-long pathway across the corner parcel, owned by Trinity. This will complete the non-motorized network in the area.

C. <u>Building Design</u>.

Although the Staff Report does not criticize the aesthetics of the various Village building designs or the diversity of the design and housing offerings, it notes that the buildings do not satisfy the City's requirements for 30% brick and the utilization of some vinyl siding material. We will continue to work with City staff on this issue but wanted to explain that the architectural design of the buildings was proposed by a well-known local architect specific for this project, along with an experienced marketing team seeking a modern aesthetic attractive to younger generations of residents. The design is contemporary and utilizes contemporary building materials. (*See* the enclosed letter from Hobbs & Black regarding building cladding materials.) Adding brick will not enhance the aesthetics of the Project but will simply add costs at a time where it is a challenge to build housing that is attainable in cost. New luxury vinyl products are energy efficient, attractive and long-lasting. This is a situation where ordinance requirements may be out-of-date and not consistent with modern standards.

D. <u>Wetlands</u>.

The applicant has a long history of successful environmental stewardship and as acknowledged in the Staff Report, has focused extensively on the protection and incorporation of environmental features into the Project. The site has numerous scattered wetlands throughout, some of which are tiny isolated pockets, under .25 acre, which primarily consist of invasive species and may not have existed a decade ago. The

total wetland impact to 17 identified wetlands, including the unregulated ones identified above is 1.71 acres. Applicant, at the advice of Barr, its wetland consultant, proposed excluding the non-regulated, isolated and tiny wetland pockets under .25 acres, and has proposed 1.4 acres of wetland mitigation.

The City's consultant suggests that all wetlands should be considered "essential" as providing animal habitat and/or storm water storage and that all pockets of wetland be mitigated. We respectfully disagree with this conclusion. In view of the large size of the property and the preservation of the vast majority of the wetlands and intentional design to create large natural feature complexes in conjunction with adjacent properties, these isolated, tiny wetland pockets are not essential. As explained in the application materials, the Project plans are carefully designed to complement large adjacent wetland and woodland properties (*i.e.*, MDOT), to create one of the largest areas of preserved animal habitat in the City. Moreover, the Project site is primarily wooded, and it would seem illogical to remove additional trees to provide mitigation for tiny pockets of emerging wetlands choked with invasive species. But again, we will work cooperatively with the City and we are certain we can resolve this issue with City Staff before we submit the revised plans for preliminary PRO consideration.

Thank you again for considering these comments and the responses from our design team enclosed herewith. Please reach out to me if you have any additional comments or questions.

Sincerely,

Brad Strader, AICP, PTP
Planning Director

Enclosures

cc: Alan M. Greene
Andy Wozniak
Woody Held

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248.437.5099 · 248.437.5222 fax
www.zeimetwozniak.com

October 7, 2024

Ms. Lindsay Bell, AICP, Senior Planner
City of Novi Community Development Department – Planning Division
45175 Ten Mile Road
Novi, MI 48375

Re: The Grove
Initial PRO Plan JZ24-31
Planning Review Response

Dear Ms. Bell:

Thank you for your review comments regarding the Grove Concept Plan submittal. Please accept our response to your comments in **blue** detailed in the Plan Review Center Report dated September 11, 2024, and Planning Review Chart Dated September 12, 2024.

REVIEW CONCERNS

This project was reviewed for conformance with the Zoning Ordinance with respect to Article 3 (Zoning Districts), Article 4 (Use Standards), Article 5 (Site Standards), Section 7.13 (Amendments to Ordinance) and any other applicable provisions of the Zoning Ordinance. **Please see the attached chart for additional information pertaining to ordinance requirements.** Items in **bold** below must be addressed and incorporated as part of the next submittal:

1. Supporting Documentation: The applicant has provided the following studies as part of their application packet
   a. **Narrative:** The statement provided states Rezoning allows for development of an otherwise very difficult parcel to develop, and that a residential development will result in significantly less impact on the existing natural features as compared to a commercial development. The applicant notes office market challenges that restricts the desirability of office development on this site. The proposed development will offer "diverse housing options within a single residential community, geared toward young professionals, families, and those looking for a maintenance-free lifestyle." The proposed community will be organized into 4 "villages" offering different types of housing options: residential flats (3-story apartment buildings), 3-story townhomes, and 2-story attached condominiums. The narrative statement indicates the isolated location of the Property and the natural features on and around the site are ideal and attractive for a successful residential project. **Agreed.**
   b. The statement also notes the conditions and deviations proposed, as well as public benefits. Those are detailed later in this review. **Agreed.**
   c. **Traffic Impact Study** (Fleis & Vandenbrink, 7/16/24): The City's review of the submitted study notes that the change of use should result in fewer vehicle trips on the traffic system compared to development under OST standards. See AECOM's review of the TIS for further comments. They have identified some issues that will need to be addressed in a revised TIS before approval can be granted. **The Traffic Study has been updated to address the review comments. A separate response letter, prepared by Fleis & Vanderbrink has been provided.**

d. **Community Impact Statement** (8/7/24): This document describes the property and its relationship to adjacent land uses. It also discusses the environmental features on the site, as well as open space and stormwater disposal strategies. Economic benefits, community and social impacts are mentioned. Finally, the impacts on City services and utilities are covered, including police and fire demand, utilities, and traffic/mobility networks. **Agreed.**

e. **Commercial Market Study** (CBRE, INC. 12/13/23): The study area includes a map of OST-zoned property in Novi, which encompasses areas zoned for Regional Commercial. The study concludes that there is little interest in OST-type uses on this site due to the overall depressed office market, more attractive locations, and the environmental factors on the subject property. The extensive presence of both woodland and wetland areas on this particular site are not attractive to OST development because of the development limitations and high costs associated with developing large-scale uses and needing to mitigate for those impacts. **Agreed. Please refer to the response letter prepared by Cincar Consulting Group.**

f. **Residential Market Evaluation** (The Chesapeake Group, INC. 8/9/24): The document notes a strong demand for multi-family housing types in Novi and Oakland County, like that proposed by The Grove. A survey found that the majority of respondents who indicated they may move within 5 years would seek homes that are smaller or the same size as their current home. The most dominant factors in determining where to live are safety and walkability. "The Grove's housing mix, walkability, ownership-rental options, and proximity to the region's amenities are consistent with the market's desires. Inclusion of townhomes provides attainable housing even for those who want to purchase. The Grove's longer-term success is extremely probable due to the variety of options." **Agreed.**

g. **Sign Location Plan:** Location and size of signage is indicated and meets the requirements. **The wording of the signage should be corrected to:**

ZONING CHANGE PROPOSED FROM
OST TO RM-2 WITH PRO
For more information call:
Novi Community Development
Department 248-347-0475

The signs were installed on October 4, 2024.

2. Future Land Use Map: The most recent adopted Master Plan (2017) and Future Land Use map indicates that both sides of Meadowbrook Road between I-96 and 12 Mile Road is planned for Office Research Development and Technology. **The applicant's request to allow multiple-family development on over a quarter of this OST area would be a significant departure from the future envisioned for this part of the City. However, there is another area on the west side of Meadowbrook Road that is also subject to a PRO request (Elm Creek), which has been favorably received by Planning Commission and City Council. If that request is granted final approval, the nature of development in this area will already start to transform to allow more residential uses.**

Please refer to the response letter prepared by Cincar Consulting Group, dated October 5, 2024.

3. Usable Open Space: Sheet SP3.4 is indicated on the Index to contain the Open Space Plan, but it was missing from the plan set (both PDF and printed set). This is an important component of the overall plan, so **should be provided prior to the Planning Commission public hearing**. According to other materials and calculations provided by the applicant, they are providing 11 acres of Usable Open Space and 7.36 acres of "Additional Open Space." If verified, this would far exceed the required 87,600 square feet of required Usable Open Space required by the Ordinance (200 square feet x 438 units = 87,600 sf or ~2 acres).

The attached Open Space plan is consistent with the areas noted above and it will be included in future submittals. The proposed open space far exceeds the required open space.

4. Wetland Mitigation: The applicant appears to indicate that wetlands smaller than 0.25 acres are not regulated by the City. Chapter 12 of the City Code (Section 12-174(b)), indicates that any wetland in the City that meets one or more of the 10 criteria listed in that section would be considered essential, and therefore would be regulated. As described in the Wetland Review, each of the delineated wetlands on the site meet the criteria of providing wildlife habitat as well as flood and storm control. Wetland review notes that the proposed development appears to result in a total permanent wetland impact area of 1.71 acres out of the total 9.64 acres present on site. The amount of required wetland mitigation is currently unclear as the applicant's calculations remove wetlands smaller than .25 acre from consideration. **Approximately 1.4 acres of on-site mitigation area is noted on the plan, which is not likely to meet the full requirement for mitigation. The applicant should note in future submittals that the City has determined that all wetlands on the site are regulated, and therefore should update the wetland impacts and mitigation calculation requirements accordingly. See detailed comments in the Wetland review letter. Please refer to the Wetland response letter prepared by Barr Engineering and the response letter prepared by Cincar Consulting Group.**

5. Façade Materials (Sec. 5.15): As noted in the Façade Review, the façade materials proposed do not conform to the Ordinance requirements. The building design shows extensive use of vinyl siding, which is not permitted. Most of the building facades do not meet the 30% minimum brick requirement. **The façade materials should be reconsidered to bring the units into substantial compliance. Please refer to the Façade response letter prepared by Hobbs and Black and the response letter prepared by Cincar Consulting Group.**

6. Plan Review Chart: **The attached chart provides additional comments on many of the Ordinance review standards. Identified deviations from ordinance standards are listed in detail on pages 12-14 of this review letter.**

   Responses to the Plan Review Chart comments are addressed below.

7. Summary of Other Reviews:
   a. **Engineering:** Engineering does not have an objection to the PRO Plan at this time. Negative impacts to public utilities are not expected with the requested change to residential use. **We appreciate that Engineering has no objections currently and offer a separate response letter to address their review comments.**
   b. **Landscape:** Landscape review recommends approval of the rezoning and PRO Plan. Five deviations from landscape ordinance standards are needed for the current design – most are supported by staff in order to preserve existing natural features. However, significant deficiencies in foundation landscaping are *not supported by staff.* Modifications to the concept layout may be required to address this concern on the next submittal. **We appreciate that Landscape has no objections currently and offer a separate response letter, prepared by Allen Design, to address their review comments.**
   c. **Traffic:** Traffic review does not recommend approval at this time. Traffic review notes that the applicant would need a deviation for the parking areas on the major drive, sight distance, and parking setback. **The Traffic review comments appear to be relatively minor. Please refer to the Traffic review response letter prepared by Zeimet Wozniak & Associates.**
   d. **Traffic Study Review:** The traffic study is not recommended for approval at this time. Please see the review letter for additional comments to be addressed in a revised study. **The Traffic Study has been updated to address the review comments. A separate response letter, prepared by Fleis & Vanderbrink has been provided.**
   e. **Woodlands:** The tree survey indicates 2,775 trees within the regulated woodland areas. The

plan proposes a total of 2,134 tree removals (75%) requiring about 3,360 Woodland Replacement Credits. Approximately 265 credits are to be planted on-site, with the remainder to be paid into the Tree Fund. Woodland review does not object to the rezoning request if the Woodland Ordinance requirements will be followed. **We appreciate that the Woodland review does not object to the rezoning request, and we offer a separate response letter, prepared by Barr Engineering, to address their review comments.**

f. **Wetlands:** Wetland review notes that the proposed development appears to result in a total permanent wetland impact area of 1.71 acres out of the total 9.64 acres present on site. The amount of required wetland mitigation is currently unclear as the applicant's calculations remove wetlands smaller than .25 acre from consideration. Approximately 1.4 acres of on-site mitigation area is noted on the plan. **Please refer to the Wetland review response letter prepared by Barr Engineering and the response letter prepared by Cincar Consulting Group.**
g. **Façade:** Façade notes that the elevations provided are not compliant with ordinance standards. The façade materials should be reconsidered to bring the units into substantial compliance. **Please refer to the Façade response letters prepared by Hobbs and Black and the response letter prepared by Cincar Consulting Group.**
h. **Fire**: No objections to the rezoning at this time. **We appreciate that Fire has no objections currently.**

Compatibility with Surrounding Land Use

The subject property is located along the east side of Meadowbrook Road, south of Twelve Mile Road and west of M-5. There are existing office developments to the south and west in areas zoned OST. On the west side of Meadowbrook the Elm Creek PRO is under consideration for RM-1 zoning to allow a townhome development. The area to the east is a 30-acre property owned by M-DOT that is used for wetland mitigation and stormwater management. To the north across Twelve Mile Road is the City's Beacon Hill Trailhead Park and a vacant area zoned B-3 which was part of the Beacon Hill PRO. To the northeast is area zoned Residential Acreage, which has been approved for the Armenian Church and Cultural Center. Most of the surrounding properties are developed, but there are some parcels that are currently vacant. The proposed use is not consistent with the surrounding existing uses to the north, west and south based on current Zoning requirements. However, it would be consistent with the open space to the east and the proposed Elm Creek development on the west side of Meadowbrook Road.

Please refer to the response letter prepared by Cincar Consulting Group.

The applicant's narrative notes that the target market of the proposed development is multi-generational. With the availability of various choices in unit types, the project aims to attract "young professionals, families and those looking for a more maintenance-free lifestyle." They note that some people who want to live in Novi may "rent initially, become familiar with Novi, and then purchase a home here when their family grows. Others grew up in the City and want [to] return if they can find housing that they can afford."

The narrative states that there are natural buffers in place that will shield the residential units from the surrounding commercial uses. The undisturbed woodland and wetland areas on the site and surrounding properties would allow the proposed use to "remain relatively secluded" from the commercial properties, as well as provide natural spaces contiguous with adjacent preserved areas. The remaining undeveloped properties in the area that could develop under the OST zoning district, are not likely to cause significantly greater conflicts with residential use on this site since they are located on the other side of Meadowbrook. The applicant has proposed a berm and dense landscaping along the southern portion of the property, which will provide an adequate screening buffer to that office complex. The area to the east of the property will remain undeveloped as it is an MDOT stormwater and wetland mitigation site.

DEVELOPMENT POTENTIAL

Like much of the City of Novi, this area was formerly agricultural land. Based on aerial imagery, the land was no longer plowed for crops after 1960. There were 5 homes present for many years, but all were demolished by 2010. Land records indicate that all 12 properties were purchased by Mercy Health in 1997-1998. The land is currently vacant.

Development under the current OST zoning could result in a substantial amount of Office or Research & Development building space being constructed on this large parcel. In the narrative provided, the applicant states that a commercial development on this property would result in significantly greater disturbance of the woodlands and wetlands on the site due to the typically large footprint of the buildings and the parking lots that are required to support the use. **No conceptual layouts or building sizes were included with the submittal. An OST Concept Plan was submitted as part of the Traffic Study. A separate copy is included with this submittal.** There have been no formal submittals for development proposals in the last 30 years for the subject property. The City's records show a development called Sinai Park was proposed on the property in the mid-1990s, proposing a 540,000 square foot medical health care and office complex. As indicated in the office market study provided, there is a lack of development potential for OST-type uses on this site due to the overall depressed office market, more attractive locations, and the environmental factors on the subject property. The extensive presence of both woodland and wetland areas on this particular site are not attractive to OST development because of the development limitations and high costs associated with developing large-scale uses and needing to mitigate for those impacts.

The current concept plan proposes a development of 438 units (density of 8 dwellings per net acre) for a mid-density multifamily development which is below the 15.6 maximum density allowed for three-bedroom units in the RM-2 zoning district. The buildings are clustered in 4 different "villages," thoughtfully arranged to allow for the preservation of extensive wetland and woodland areas on the site. The applicant is proposing a deviation to allow 50-foot setbacks in several locations, which are consistent with the current OST zoning, rather than the 75 feet requirement for RM-2 zoning. This also places the units closer to the existing office uses in the surrounding area than would be expected in the RM-2 district.

The Master Plan for Land Use does not anticipate residential uses of this property, so no density guidelines are provided on the plan. The site is adjacent to high tech office developments to the west and south, where the zoning will remain OST. Some potential conflicts with the adjacent users could be the noise and disruption of truck traffic, including loading and unloading functions, on the proposed residents. The adjacent OST property owners may be affected in the future being adjacent to a residential zoning district: additional berming and screening may be required. The closest residential unit would be about 125 feet from a potential future building site in the office park to the south. To the north, there are approved but not yet built projects that will eventually be built on the north side of 12 Mile Road: the B-3 portion is subject to a PRO Agreement that allows about 11,000 square feet of retail uses to be developed, and on the R-A zoned property the multi-phased Armenian Church and Cultural Center is anticipated to be developed.

The applicant provides some reasonable justification for the change of use to residential to meet demand for housing with a site that appears unsuitable to larger office-type uses. However, staff has concerns about the overall change to the character of the Meadowbrook Road corridor, wetland mitigation, and façade materials. **Please refer to the response letter prepared by Cincar Consulting Group, dated October 5, 2024.**

Based on the feedback provided in the staff and consultant review letters, and any additional comments from the Planning Commission and City Council, the applicant should consider addressing those comments and revise the drawings accordingly before the formal PRO Concept submittal.

Extensive detail has been provided with this initial PRO submittal. The feedback provided by the staff and consultants appears to be generally favorable. We are confident that all issues can be addressed to satisfy staff, the Planning Commission, and the City Council during future submittals. Please refer to the detailed response letters provided, to address these comments.

2016 MASTER PLAN FOR LAND USE: GOALS AND OBJECTIVES

The proposed use is currently not recommended by the 2016 Master Plan for Land Use. The following objectives (underlined) as listed in the Master Plan are applicable for the proposed development. **The applicant should consider revisions to the plan to comply with as many goals as possible. Please refer to staff comments in bold and revisions recommended in bold and underline.**

The plans will be updated for future submittals to comply with as many goals as possible. Please accept our written response to this submittal.

1. **General Goal: Quality and Variety of Housing**
   a. Provide residential developments that support healthy lifestyles. Ensure the provision of neighborhood open space within residential developments. **The development mostly proposes the required sidewalks along the private streets, as well as a 10-foot mutli-use pathway along the main internal roadway. Pathways are present along Meadowbrook Road, and will be constructed on 12 Mile Road. Additional recreational amenities are also provided like a clubhouse with a pool and gym, pickleball courts, dog park, playground, and nature trails.**
   As noted, the Grove is intended to be an active community and provides many amenities to help meet that goal.
   b. Safe housing and neighborhoods. Enhance the City of Novi's identity as an attractive community in which to live by maintaining structurally safe and attractive housing choices and safe neighborhoods. **The development would provide attractive housing choices with nice amenities and green spaces. Agreed.**
   c. Maintain existing housing stock and related infrastructure. **The development would not remove any existing homes. Agreed.**
   d. Provide a wide range of housing options. Attract new residents to the City by providing a full range of quality housing opportunities that meet the housing needs of all demographic groups including but not limited to singles, couples, first time home buyers, families and the elderly. **The proposed development does provide multiple types of homes that could be appealing to various demographic groups. Agreed.**

2. **General Goal: Community Identity**
   a. Maintain quality architecture and design throughout the City. **The current proposed elevations are not compliant with Façade Ordinance standards and would require several Section 9 waivers, which are not supported. Please refer to the façade review letter for opportunities to maintain quality architecture. Please refer to the Façade response letter prepared by Hobbs and Black and the response letter prepared by Cincar Consulting Group.**

3. **General Goal: Environmental Stewardship**
   a. Protect and maintain the City's woodlands, wetlands, water features, and open space. The concept plan proposes additional removal of regulated woodlands. **Please refer to the wetlands and woodlands review letter for opportunities to further protect these natural features. Please refer to the Wetland review response letter prepared by Barr Engineering and the response letter prepared by Cincar Consulting Group.**
   b. Increase recreational opportunities in the City. **The Concept plan proposes recreational opportunities for the residents. The applicant proposes a clubhouse with a pool and**

park area with pickleball courts and a playground. A 10-foot pathway along their 12 Mile frontage is shown, as required. The applicant has also included an internal 10-foot multiuse pathway and a network of walking trails and nature overlooks. Along Meadowbrook and 12 Mile the plan also proposes four "focal areas" that would be available to the general public. The focal areas appear to consist of landscaping and benches and are the primary public benefit proposed. Please refer to the response letter prepared by Cincar Consulting Group.

c. Encourage energy-efficient and environmentally sustainable development through raising awareness and standards that support best practices. **The applicant indicates they will utilize sustainable, energy-efficient and best-practice design for site elements and building materials. Further details should be provided.**

Ivanhoe is anticipating the following sustainable design features which will continue to develop during the design process:

- **Pre-wire all garages for one (1) 240 Volt EV charging station.**
- **All appliances used within the development must be Energy Star-rated or applicable equivalent standards.**
- **All applicable plumbing fixtures shall be WaterSense labeled or applicable equivalent standard.**
- **Building material on the exterior façade of a majority of the exterior elevations are energy-efficient, durable, and low maintenance, including brick and vinyl siding.**
- **Use of energy-efficient glass/glazing.**
- **Use of energy-efficient insulation materials.**
- **All building site lighting will be solar-powered and Dark Sky friendly.**
- **Offer a tankless water heater option.**
- **Install smart scheduling technology for water use – sprinklers.**
- **Multi-modal non-motorized pathway network and infrastructure as shown on the PRO plan that reduces emissions and promotes pedestrian connectivity with bike/pedestrian-friendly streets, and bicycle parking in units throughout the site.**
- **Benches made with recycled materials will be used throughout open space areas.**

4. **General Goal: Infrastructure**
   a. Provide and maintain adequate water and sewer service for the City's needs. **Please refer to the Engineering memo. Please refer to the Engineering response letter.**
   b. Provide and maintain adequate transportation facilities for the City's needs. Address vehicular and non-motorized transportation facilities. **A bus stop is proposed along 12 Mile Road frontage, which would need to be coordinated with SMART.**
   Please refer to the response letter prepared by Cincar Consulting Group.

5. **General Goal: Economic Development / Community Identity**
   a. Ensure compatibility between residential and non-residential developments. **Please refer to comments about compatibility with surrounding development earlier in this review.**
   Please refer to the response letter prepared by Cincar Consulting Group.

2023 ACTIVE MOBILITY PLAN (AMP)

There is an existing 10-foot wide pathway along the Meadowbrook Road frontage. This pathway connects the I-275 non-motorized pathway to the Beacon Hill Trailhead Park at the northeast corner of Meadowbrook and 12 Mile. From there, connections are also available to the Airline Trail in Commerce Township, north of the City's boundary, via the M-5 pathway.

The applicant is proposing to construct the missing pathway gap along their 12 Mile Road frontage, which is a *Near-term priority* in the AMP. This would result in approximately 1,300 feet of new 10-foot pathway. To the east, the M-5 interchange presents a significant barrier to continuing the pathway – there will remain a 2,060 foot gap in the non-motorized network. Existing pathway to the west would connect this area to the Twelve Oaks, West Oaks and Fountain Walk commercial areas.

Meadowbrook Road is classified as a cross-town corridor in the AMP, while 12 Mile Road is a multi-modal thoroughfare. The recommended baseline pedestrian facility improvements for minor road stops (where the pathway crosses the entrances to the development) on both roads would include crosswalk lighting, a raised high visibility crossing and recessed crossings where feasible. For bicycle facility improvements, separated bike lanes are preferred, or a 12-foot shared-use pathway to accommodate both bikes and pedestrians. Mid-block crossings might be considered on 12 Mile Road – the AMP contains an example of a Median U-turn on page 77, which would need to be controlled with traffic signals. **These treatments should be considered by the applicant as the project moves forward. Additional Active Mobility Plan treatments will be considered as the project moves forward.**

MAJOR CONDITIONS OF PLANNED REZONING OVERLAY AGREEMENT

The Planned Rezoning Overlay process involves a PRO concept plan and specific PRO conditions in conjunction with a rezoning request. The submittal requirements and the process are codified under the PRO ordinance (Section 7.13.2). Within the process, which is initiated by the applicant, the applicant and City Council can agree on a series of conditions to be included as part of the approval which must be reflected in the Concept Plan and or the PRO agreement.

The PRO conditions must be in material respects, more strict or limiting than the regulations that would apply to the land under the proposed new zoning district. *Development and use of the property shall be subject to the more restrictive requirements shown or specified on the PRO Plan, and/or in the PRO Conditions imposed, and/or in other conditions and provisions set forth in the PRO Agreement.*

The applicant could consider the following conditions for development to be included in the PRO Agreement:

1. Preservation of _____ acres of City regulated woodlands
2. Preservation of _____acres of City regulated wetlands
3. Density shall not exceed _____ dwelling units per acre (More limiting than the dwelling units per acre allowed in the RM-2 District)
4. Providing the community amenities shown in the PRO Plan
5. Dedication of ____ linear feet (or acres) of Right of Way
6. Building height will be limited to _____ feet.
7. The landscape plan will exceed the required 50% native species.
8. Specifying uses of land that will not be permitted (which are otherwise allowed in the RM-2 District.
9. Improvements or other measures to improve traffic congestion or vehicular movement with regard to existing conditions or conditions anticipated to result from the development.
10. Creation or preservation of public or private parkland or open space

Additional conditions to be included in the PRO Agreement, if it should be approved, will likely be added during the review process. These conditions for development, along with additional conditions added during the review process, will be included in the PRO Agreement.

APPLICANT'S BURDEN UNDER PRO ORDINANCE

The Planned Rezoning Overlay ordinance (PRO) requires the applicant to demonstrate that certain

requirements and standards are met. The applicant should be prepared to discuss these items, especially in number 1 below, where the ordinance suggests that the enhancement under the PRO request would be unlikely to be achieved or would not be assured without utilizing the Planned Rezoning Overlay. Section 7.13.2.D.ii states the following:

1. *(Sec. 7.13.2.D.ii.a) The PRO accomplishes the integration of the proposed land development project with the characteristics of the project area in such a manner that results in an enhancement of the project area as compared to the existing zoning that would be unlikely to be achieved or would not be assured in the absence of the use of a Planned Rezoning Overlay.*

2. *(Sec. 7.13.2.D.ii.b) Sufficient conditions shall be included on and in the PRO Plan and PRO Agreement such that the City Council concludes, in its discretion, that, as compared to the existing zoning and considering the site specific land use proposed by the applicant, it would be in the public interest to grant the Rezoning with Planned Rezoning Overlay. In determining whether approval of a proposed application would be in the public interest, the benefits which would reasonably be expected to accrue from the proposal shall be balanced against, and be found to clearly outweigh the reasonably foreseeable detriments thereof, taking into consideration reasonably accepted planning, engineering, environmental and other principles, as presented to the City Council, following recommendation by the Planning Commission, and also taking into consideration the special knowledge and understanding of the City by the City Council and Planning Commission.*

The following benefits are suggested by the applicant as listed in their narrative **(Staff comments in Bold)**:

Open Space and Parks – The Project design and layout is intended to create a "Placemaking" destination. These benefits will provide the City and its residents with great views, open space, pathways available to the public and, linked with the adjacent MDOT preserve, a large open space for wildlife habitat.

1. Over 1/3 of the site will be open space.
2. The open space includes "pocket parks" and an internal "Central" park community gathering area with many amenities (pool, clubhouse, Pickleball courts, picnic areas, playground, and a dog park).
3. Landscaping will focus on the use of native Michigan vegetation.
4. Setbacks, buffering and connectivity to support the eventual development of the corner parcel.
5. Views along Meadowbrook and 12 Mile Roads will have four places of interest, with extensive tree envelopes, benches and other amenities. Almost 50% of the frontage along those streets will be open space. **Who will be responsible for maintaining these spaces? The owner of the development will be responsible for maintaining these spaces as a requirement of the PRO agreement.**
6. Preserves wetland and woodland corridors by mingling development into pockets. This is in contrast to development of OST uses that likely would have greater disruption of the natural features. Major wetlands will be preserved through a Conservation Easement.

Housing – Housing demand has changed. To address the market trends and need for more choices, we will offer multi-generational housing, geared toward young professionals and those looking for a more maintenance-free lifestyle.

7. Converts a long vacant OST parcel into a type of development that the public needs.
8. A more "attainable" housing cost compared to other options prevalent in the City.
9. Attractive, flexible housing types – townhomes, residential flats, designed for rent, sale or

conversion to condominiums.

Mobility and Transportation – Connections to the Regional Pathways and the various internal non-motorized connections are consistent with "Walkable Novi" and the City's new Mobility Plan.

10. Combining 12 parcels, which could be developed with individual access points, into one unified destination with just two access points. **There are two access points on Meadowbrook, and one on 12 Mile Road. The retained Trinity parcel at the corner would likely have at least two access points as well. We agree that the retained Trinity parcel at the corner would likely have at least two additional access points.**

    Connections to a new bus stop for residents of the area for SMART's Route 740 along 12 Mile Road. **Would a bus shelter be provided? Please refer to the response letter prepared by Cincar Consulting Group.**

11. An integrated pathway system that links to the regional non-motorized system along 12 Mile and Meadowbrook Roads, that connects to the Michigan Air Line Trail, M-5 and I-275 systems.
12. Our internal non-motorized system includes sidewalks, pathways, compacted limestone and natural hiking trails. We are providing a wider, 10-foot wide, circular pathway system in the area where we believe the demand will be highest.
13. Significant reductions in traffic compared to development of the site with typical OST uses (as noted in the Community Impact Statement and Traffic Impact Study).

This is a PRO in which the applicant seeks both a rezoning and a list of ordinance deviations. In Staff's opinion the proposed benefits to the community at large are relatively minor and additional benefits could be offered to balance out the detriments of the rezoning (in this case: significant impact to existing woodlands and wetlands, compatibility concerns with adjacent existing non- residential uses, lack of required landscaping, and building materials that are inconsistent with the ordinance standards). Additionally, the applicant should clarify if Right of Way (ROW) is being dedicated. Please refer to the response letter prepared by Cincar Consulting Group, regarding the proposed benefits. Additional Right-of-Way will be dedicated along Meadowbrook Rd. frontage. The proposed 60-foot ROW is shown on Sheets SP-3.1 and SP-3.2. No additional ROW is required along the 12 Mile Rd. frontage.

ORDINANCE DEVIATIONS

Section 7.13.2.D.i.c(2) permits deviations from the strict interpretation of the Zoning Ordinance within a PRO agreement. These deviations must be accompanied by a finding by City Council that "***each Zoning Ordinance provision sought to be deviated would, if the deviation were not granted, prohibit an enhancement of the development that would be in the public interest, and that approving the deviation would be consistent with the Master Plan and compatible with the surrounding areas.***" Such deviations must be considered by City Council, who will make a finding of whether to include those deviations in a proposed PRO agreement. A proposed PRO agreement would be considered by City Council only after tentative approval of the proposed concept plan and rezoning.

The Concept Plan submitted with an application for a rezoning with a PRO is not required to contain the same level of detail as a preliminary site plan. Staff has reviewed the applicant's Concept Plan in as much detail as possible to determine what deviations from the Zoning Ordinance are currently shown. The applicant may choose to revise the concept plan to better comply with the standards of the Zoning Ordinance, or may proceed with the plan as submitted with the understanding that those deviations would have to be approved by City Council in a proposed PRO agreement. **The applicant provided a request for certain deviations. However, it is not comprehensive. The applicant should refer to all review letters and identify what deviations they would seek and what they would revise the plan to conform. Please see below for a detailed response to the requested deviations.**

The following are Ordinance deviations that have been requested by the applicant. **Staff**

comments are in bold.

1. **Building Setbacks** *(Sec 3.1.7.D):* A Zoning Ordinance deviation is requested to reduce the building setbacks from 75 feet to 50 feet along the east, west and south property lines. The applicant indicates the property to the east will not be developed as it is the MDOT wetland and stormwater natural area, so the reduced setback will not impact this property. The applicant states that much of the property to the south is in a conservation easement, and a berm with landscaping for additional screening is proposed. **The conservation easement area is not in the area adjacent to the proposed homes.** On the western side, the applicant states the 50-foot setback is consistent with existing developments along Meadowbrook, and that Trinity Health has endorsed the design of the site, including the setbacks. **The setbacks from the Trinity Health parcel observe a 75-foot setback as is required. Most of the existing buildings along this segment of Meadowbrook are set back more than 70 feet from the road right-of-way. The only building setback that is less than 70 feet is the University of Detroit Mercy building, which is approximately 30 feet from Meadowbrook ROW. We can confirm that a Zoning Ordinance deviation for the building setback listed above is requested.**

2. **Parking Setback** *(Sec 3.1.7.D):* A Zoning Ordinance deviation is requested to reduce the parking setback from 75 feet to 50 feet along the west property lines. The deviation is requested as it is similar to other developments along Meadowbrook Road, and ample landscaping will provide a screening buffer. **Parking areas along Meadowbrook Road are in the 30-50 foot range for setbacks. There is only one location on the proposed plan with parking this close to the road, and it is shown to be covered by a carport structure. We can confirm that a Zoning Ordinance deviation for the parking setback in one location, as noted above is requested.**

3. **Total Number of Rooms** (Sec. 3.8.1.A): A Zoning Ordinance deviation is requested to allow a greater number of rooms than the RM-2 District permits for buildings less than 4-stories (1,389 rooms proposed, 1,195 permitted). The applicant states while the proposed number of rooms exceeds the number allowed, the proposed density for each unit type is less than the allowed density, and the proposed unit mix is consistent with current market conditions and demand. **The RM-2 district allows a greater number of rooms for buildings 4 stories or taller, with corresponding higher units. This deviation has been permitted previously, as the overall density permitted by the district is not exceeded. We can confirm that a Zoning Ordinance deviation for the number of rooms, as previously permitted, is requested.**

4. **Building Length** (Sec. 3.8.2.C): The maximum building length in The Meadows is 216 feet, which exceeds the allowed length of 180 feet. The applicant states that the buildings are smaller than most modern multi-family buildings of this type. **Architectural details like changes in building materials, as well as over a third of the front façade of the building being landscaped, there is visual interest that helps to break up the bulk of the building. We can confirm that a Zoning Ordinance deviation for the building length, considering the visual interest as noted above, is requested.**

5. **Building Orientation** *(Sec. 3.8.2.D):* A Zoning Ordinance deviation is requested to revise the required orientation of the buildings from a minimum of 45 degrees in certain locations. This allows for a more uniform site layout with all of the units backing up to open space/wooded areas. **All buildings are either parallel or perpendicular to property lines abutting non-residential districts. This deviation has been requested and granted for many residential projects in the City in the last 5 years. We can confirm that a Zoning Ordinance deviation for the building orientation, as granted for many residential projects in the city, is requested.**

6. **Distance between Buildings** *(Sec 3.8.2.H): A Zoning Ordinance deviation is requested to*

reduce the building separation distance from the calculated formula as follows: The Vistas (side to side: 25 feet minimum proposed, 34.8 feet required; rear to rear: 50 feet proposed, 56 feet required); Woods and Meadows: (side to side: 25-feet proposed, 39.6 feet required); between Building 9 and 10 (32.8 feet proposed, 41.3 feet required). **This deviation enables the layout of this project to fit within the available space while minimizing wetland and woodland impacts. We can confirm that a Zoning Ordinance deviation for the distance between buildings, to minimize wetland and woodland impacts as noted above, is requested.**

7. **Parking along Major Drives** *(Sec. 5.10):* A Zoning Ordinance deviation is requested to allow for perpendicular parking on a major drive. This deviation is requested to due to the impracticality of providing a minor road (defined as less than 600 feet in length) given the site constraints (woodlands, wetlands, and property configuration). **Perpendicular parking for guests is proposed on two Major Drives (Simi Drive and Beckham Drive) in several locations, where driveways are also proposed. The parking spaces will not cause any more disruption on the roadway than cars that will be backing out of the driveways. We can confirm that a Zoning Ordinance deviation for parking along major drives, as they will not cause any more disruption on the roadway than cars that will be backing out of driveways as noted above, is requested.**

8. **Wetland Mitigation** (Code of Ordinances, Chapter 12, Sec 12-173): At this time it appears the applicant would need to request deviations from the requirements of the Wetland and Watercourse Protection ordinance based on the information provided in the plan**. The applicant should reevaluate their calculated impacts and mitigation plans based on comments in the Wetland Review. Current deviations needed would not be supported by staff. Please refer to the Wetland review response letter prepared by Barr Engineering and the response letter prepared by Cincar Consulting Group.**

9. **Section 9 Waiver** (Section 5.15): Proposed elevations for residential buildings have an underage of minimum required brick (0% proposed on some buildings, 30% minimum required), and an overage of Vinyl Siding on all buildings (0% allowed). **This waiver is not supported. As a minimum, the amount of brick should be increased to more closely match the 30% required. As vinyl siding is not permitted, the applicant should consider wood of fiber cement siding. Please refer to the Façade response letter prepared by Hobbs and Black and the response letter prepared by Cincar Consulting Group.**

10. **Parking Distance to Buildings** (Sec. 3.8.2.F): In two locations, off-street parking spaces are within 13-17 feet from the adjacent building. The ordinance requires 25-feet between parking spaces and a dwelling structure that contains openings involving living areas. **The parking spaces are further away than the driveways where parking is permitted, so it does not appear they will have a greater impact. We can confirm that a Zoning Ordinance deviation for the parking distance to buildings as listed above is requested.**

11. **Pedestrian Connectivity** (Sec. 3.8.2.G): Five-foot sidewalks are required on both sides of private drives. It appears that a 5-foot sidewalk is missing from the west side of Lila Way. **Please provide the required sidewalk, or provide a justification for the deviation. A deviation for the 5-foot sidewalk along Lila Way is not needed. The sidewalks will be included in future submittals.**

12. **Number of Accessory Buildings** (Sec. 4.19.1.J): For lots greater than ½ acre, not more than 2 detached accessory buildings are permitted. The PRO plan shows 4 detached garages. **A recent text amendment allows the number of carports to exceed 2. This deviation to allow a greater number of garages is supported as it is a large site, provides covered parking options for a greater number of residents, and will not be detrimental to the area. We can confirm that a Zoning Ordinance deviation for the number of accessory buildings listed above is requested.**

13. **Landscape Berms** (Sec. 5.5.3.A.ii): A landscape deviation is requested to not provide a 4-foot,

6- inch to 6-foot high landscape berm on a proposed RM-2 district adjacent to an OST district on the east and south side. This deviation is supported by staff because of topography and the provision of dense landscaping along both property lines**. We can confirm that a Zoning Ordinance deviation for landscape berms, as supported by staff, is requested.**

14. **Right-of-Way Landscaping** (Sec. 5.5.3.B.ii): A deviation to the required greenbelt berm and plantings along 12 Mile and Meadowbrook Road due to the existing natural areas to be preserved, and a heavily landscaped detention basin. **We can confirm that a Zoning Ordinance deviation for the right-of-way landscaping, as supported by staff, is requested.**

15. **Right-of-Way Landscaping** (Sec. 5.5.3.B.ii): A landscape deviation to allow a deficiency in street trees along Meadowbrook Road. **This may be supported by staff depending on the justification. The applicant is asked to provide rationale for this deficiency. We can confirm that a Zoning Ordinance deviation for Right-of-Way landscaping is requested. The area to plant street trees along Meadowbrook Rd. was greatly reduced during reconstruction. Street trees will be planted in this area to the greatest extent possible.**

16. **Building Foundation Landscaping** (Sec. 5.5.3.F.iii): A landscape deviation for the deficiency in building foundation landscaping. **This deviation is not supported by staff as there are opportunities to more closely comply with the ordinance standards. Please refer to the landscape response letter prepared by Allen Design.**

PLANNING REVIEW CHART: RM-2 with PRO

Review Date: September 12, 2024

Usable Open Space Area *(Sec 3.1.8.D)Article 2: Definitions*
SP3.4 will need to be included in future submittals to verify spaces meet the definitions
Sheet SP-3.4 will be included in future submittals.

Residential Building Setbacks (Sec 3.1.8.D)
West, east, and south setbacks would require a deviation.
An Ordinance deviation for the building setbacks is requested.

Parking Setback *(Sec 3.1.8.D) (Sec 3.1.12.D)Refer to applicable notes in Sec 3.6.2*
Deviation would be required for parking setback along Meadowbrook for Zone 2
An Ordinance deviation for the parking setback is requested.

Distance between buildings *(Sec 3.6.2.H*
See Comments later in the review
Comment is addressed later in this review.

Wetland/Watercourse Setback
Refer to wetland review letter for more detail
A detailed response to the Wetland review, prepared by Barr Engineering is included with this submittal.

Parking setback screening *(Sec 3.6.2.P)*
Refer to landscape review for comments
A detailed response to the Landscape review, prepared by Allen Design is included with this submittal.

Total number of rooms *(Sec. 3.8.1.A & B)*
See Sec. 3.8.1.A; in RM-2 District buildings less than 4 stories must meet RM-1 standards for room count and unit mix **This is considered a deviation to exceed the allowable number of rooms.**
An Ordinance deviation for the number of rooms is requested.

Public Utilities *(Sec. 3.8.1)*
Refer to Engineering review for more details
A detailed response to the Engineering review, Prepared by Zeimet Wozniak is included with this submittal.

Structure frontage *(Sec. 3.8.2.B)*
Each structure in the dwelling group shall front either on a dedicated public street or approved private drive. **Subject to City Council approval.**
We acknowledge that the City Council must approve a structure fronting on a private drive.

Maximum length of the buildings *(Sec. 3.8.2.C)* A single building or a group of attached buildings cannot exceed 180 ft. 216 feet (The Meadows) **This is considered a deviation**
An Ordinance deviation for the building length is requested.

Building Orientation (Sec. 3.8.2.D) Buildings 1-4, 16-17, 31-36 do not appear to meet the minimum requirement for 45-degree orientation. **This is considered a deviation.**
An Ordinance deviation for the building orientation is requested.

Off-Street Parking or related drives (Sec. 3.8.2.F) Off-street parking and related drives shall be No closer than 25 ft. to any wall of a dwelling structure that contains openings involving living areas. In two locations off- street parking spaces are within 13-17 feet from the adjacent Building. **This is considered a deviation.**
An Ordinance deviation for the parking distance to buildings is requested.

Pedestrian Connectivity (Sec. 3.8.2.G) 5-ft sidewalk required on west side of Lila Way.
The sidewalks will be added to the west side of Lila Way and it will be included in future submittals.

Minimum Distance between the buildings *(Sec. 3.8.2.H)* Table provided on sheet SP3.5 – several proposed distances are less than the calculated requirement. **This is considered a deviation.**
An Ordinance deviation for the distance between buildings is requested.

Architectural design and materials *(Sec. 3.8.3.B)* **See Façade review.**
A response to the Façade review, prepared by Hobbs and Black, is included with this submittal.

Parking on Major and Minor Drives. On-street perpendicular parking is proposed on the Major Drives (Simi Ln and Beckham Dr) This is considered a deviation.
An Ordinance deviation for parking along major drives is requested

End Islands *(Sec. 5.3.12)* ***Refer to Traffic comments.***
A response to the Traffic review, prepared by Zeimet Wozniak is included with this submittal.

Barrier Free Spaces *Barrier Free Code.* ***Refer to Building Code requirements to identify how many ADA accessible units are required and provide necessary Handicap*** **spaces in that location.**
A total of six ADA-accessible units are required. Handicapped parking spaces will be provided for these units.

Minimum number of Bicycle Parking *(Sec. 5.16.1)* **Consider providing more bike racks near the clubhouse/park, as well as the bus stop to make it easier for more residents to bike/walk to**

destinations within the community.
Additional bike racks will be provided at the clubhouse/park and the bus stop.

Loading Spaces Sec. 5.4.1 Loading area appears to be proposed on east side of clubhouse? **Clarify if this area is intended as a loading area.**
The proposed driveway on the east side of the clubhouse is intended as a loading area.

Façade requirements for Carport Canopies Sec. 5.15.12.b See Façade review.
A response to the Façade review, prepared by Hobbs and Black is included with this submittal.

Maximum number of Accessory buildings *Sec. 4.19.1.J* Number of detached garages exceeds 2 (4 proposed). **This is considered a deviation.**
An Ordinance deviation for the number of accessory buildings is requested.

Dumpster Enclosure Sec. 21-145. (c) Chapter 21 of City Code of Ordinances **Will be reviewed in future submittals.**
We acknowledge that the dumpster enclosures will be reviewed in future submittals.

Roof top equipment and wall mounted utility equipment *Sec. 4.19.2.E.ii* ***See Façade Review***
No rooftop equipment and wall-mounted utility equipment is proposed.

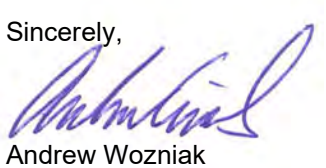
Roof top appurtenances screening See Façade Review.
Rooftop appurtenance screening is not needed.

Active Mobility Plan. See new Active Mobility Plan for other guidelines/recommendations, especially for 12 Mile and Meadowbrook
Additional Active Mobility Plan treatments will be considered as the project moves forward.

Development and Street Names. Project and Street Name application; Contact Diana Shanahan at 248-347-0475 to schedule consideration by the Committee.
Development and Street Names will be submitted for consideration by the Committee.

Please let me know if you have any questions or comments.

Sincerely,



Andrew Wozniak

ZEIMET WOZNIAK & ASSOCIATES
Consulting Civil Engineers
55800 Grand River Avenue, Suite 100
New Hudson, Michigan 48165-9318
248.437.5099 · 248.437.5222 fax
www.zeimetwozniak.com

October 7, 2024

Ms. Lindsay Bell, AICP, Senior Planner
City of Novi Community Development Department – Planning Division
45175 Ten Mile Road
Novi, MI 48375

Re: The Grove
PRO Initial Concept Plan - Traffic Review Response
JZ24-31 THE GROVE

Dear Ms. Bell:

Please accept our response to AECOM review comments detailed in their review letter, dated September 5, 2024.

Traffic Impacts

The Traffic Impact Study review response is provided under a separate letter prepared by Fleis & Vandenbrink.

External Site Access and Operations

2. The driveway width will be increased to 24 feet.
5. The driveway sight distance will be adjusted to meet the requirements.
7. A note will be added to the cover sheet that a permit will be required for any work within the road right-of-way of 12 Mile Rd.
9. Sidewalk ramp R-28 will be included in future submittals.
10. Island width and Radii at each entrance will be added to the plans.

Internal Site Operations

11. Loading zone dimensions will be added to the plans.
12. Trash collection for the Clubhouse, Vistas, Woods, and Pointe will be at each individual driveway with receptacle storage in the garage.
15. End island dimensions will be added to the plans.
21. Accessible parking for the six ADA accessible units will be added to the plans.
24. Additional bicycle parking locations and details will be added to the plans.
26. Sidewalk ramp detail R-28-K will be added to the plans.
27. Sidewalk distance dimensions to the back of curb will be added to the plans.
30. The turnaround dimensions will be added to the plans.

Please contact us if you have any questions or comments.

Very truly yours,

Andrew Wozniak

ZEIMET WOZNIAK & ASSOCIATES
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248.437.5099 · 248.437.5222 fax
www.zeimetwozniak.com

October 7, 2024

Ms. Humna Anjum, Project Engineer
City of Novi Public Works – Engineering Division
23600 Lee Begole Drive
Novi, MI 48375

Re: The Grove
PRO Plan Review Response

Dear Ms. Anjum:

Thank you for your review comments and noting that you have no objection to the PRO Plan at this time. In response to your Engineering Review letter for the initial PRO Plan submittal, dated September 9, 2024, we offer the following.

Items that must be addressed at time of Formal PRO submittal

1. Indicate if proposed roads will be private or public. **The roads will be private. The appropriate notation will be added to the plans.**
2. Provide an approximate timeline for each phase of the site plan. Indicate if utilities and roads will also be phased out. **An approximate timeline and phasing will be detailed in the next plan update.**
3. Relocation of the sanitary sewer outside of the proposed roadway is recommended in order to minimize the number of structures in pavement. Indicate if there are areas where this is not possible because of conflicts with street trees. **The proposed sanitary sewer will be moved out of the pavement areas where possible.**
4. Provide geotechnical report for the provided soil borings. **The geotechnical report will be provided.**
5. Additional borings will be required at time of site plan submittal, at least one boring per basin is required. Noted.
6. Soil boring locations should be shown on the stormwater management sheet/the overall utility sheet. **Soil boring locations will be added to the stormwater management sheet/the overall utility sheet.**

Items to be addressed at time of site plan submittal:

Review comments 7-43 will be addressed during the Site Plan Submittal.

Please contact us if you have any questions or comments.

Very truly yours,

Shawn Blaszczyk, PE

September 30, 2024

Lindsay Bell
Planner – Community Development
City of Novi
45175 Ten Mile Road
Novi, MI 48375

Re: The Grove Initial PRO Plan JZ24-31Woodland and Wetland Review Response

Dear Ms. Bell:

The letter is provided in response to the Merjent woodland and wetland comments in their letter to you dated September 5, 2024.

Woodland Review Comments Responses

1. Agreed.
2. Agreed.
3. Agreed.
4. Agreed.
5. Agreed.
6. The woodland replacement table will be updated for Preliminary Site Plan (PSP) submittal.
7. The required woodland replacement financial guarantee will be updated for the PSP.
8. The tree fund requirement will be updated for the PSP.
    a. We believe the use of woodland replacement trees for the establishment of forested wetland mitigation areas is not specifically prohibited by either the woodland or wetland ordinances and has been previously approved by the City in forested wetland mitigation areas for projects such as the Catholic Central Wixom Road improvements. Forested wetlands also require the provision of woodland replacements and the Michigan Department of Environment, Great Lakes, and Energy prefers larger trees to be planted in forested wetland mitigation areas when possible.
9. Agreed.
10. Woodland replacements will be adjusted to reflect critical root zone impacts.
11. Agreed.
    a. Tree protection fencing costs will be added to Sheet L-19.

12. Agreed.

13. Agreed.

14. Agreed.
    a. Agreed.

Wetland Review Comments Responses

1. Merjent appears to contend that the presence of any of the criteria listed in the Wetlands and Watercourse Protection Ordinance make a wetland essential and cites common wildlife use and storm water storage functions in all The Grove wetlands. Common wildlife such as the list of generalist species provided by Merjent can be found in many types of habitats and the wetland storage calculations Merjent cites from Sheet SP-5 demonstrate that for many of the wetlands the stormwater storage is miniscule due to the wetland's size. Merjent appears to assume that all wetlands in Novi are essential because of the presence of a wetland function without consideration of the amount or quality of the wetland function. This approach is not consistent with all past City wetland ordinance approvals. As evidence we provide the attached Catholic Central – North Campus; JSP22-37 Wetland Review of Revised Preliminary Site Plan letter dated December 2, 2022 from the City's (then) wetland consultant Mannik & Smith Group. In this letter, the following opinion is provided on page 2:

   "Wetlands C and D were observed to be composed primarily of few invasive species and their function as wildlife habitat is likely minimal. Wetlands C and D may contribute storm water management functions, and while MSG does not consider Wetlands C or D essential, the applicant is encouraged to consider the on- and off-site consequences on stormwater management if the wetlands are eliminated."

   This opinion appears to take into account habitat quality and the amount of wetland function a wetland can provide. It should be noted that Wetland C was 0.63 acres in size and Wetland D was 0.65 acres.

   The provision of wetland mitigation for what could be considered non-essential wetlands will increase the unavoidable encroachment into regulated wetland and watercourse buffers/setbacks as well as into regulated woodland which comprises most of the subject property.

   The applicant requests the City consider a re-evaluation of Novi-only regulated wetlands at The Grove for essentiality based on the above described considerations.

2. Wetland impacts will be adjusted and additional requested detail provided at PSP.

3. Wetland impacts will be adjusted and additional requested detail provided at PSP.

4. Agreed.
    a. Wetland buffer impacts will be adjusted and additional request detail provided at PSP.

5. Agreed.

6. Agreed.

7. Agreed.
    a. Wetland mitigation amounts will be adjusted and additional request detail provided at PSP.
    b. Wetland mitigation amounts will be adjusted and additional request detail provided at PSP.
8. Agreed.
    a. Agreed.
    b. Agreed.

9. Agreed.
    a. Agreed.

We appreciate the Merjent recommendations for approved of The Grove PRO ICP.

Thank you.

Sincerely,

BARR ENGINEERING CO.

Woody L. Held
Senior Environmental Consultant

Attachment:
Catholic Central – North Campus; JSP22-37 Wetland Review of Revised Preliminary Site Plan Letter Dated December 2, 2022

Cc: Gary Shapiro – Ivanhoe Companies
Andy Wozniak – Zeimet Wozniak & Associates

December 2, 2022

Lindsay Bell
City Planner
Department of Community Development
City of Novi
45175 W. Ten Mile Road
Novi, Michigan 48375

RE: Catholic Central – North Campus; JSP22-37
Wetland Review of Revised Preliminary Site Plan
MSG Project No. N1030126

Dear Ms. Bell:

The Mannik & Smith Group, Inc. (MSG) reviewed the revised plan set titled *Preliminary Site Plan and Stormwater Management Plan for North Campus Athletics and Parking Structure, Catholic Central High School* prepared by Zeimet Wozniak & Associates dated November 14, 2022 (rPSP). The project site is located south of Twelve Mile Road and west of Wixom Road, Parcel 50-22-18-200-026, in Section 18 (Site). The rPSP depicts construction of athletic competition and practice fields, a parking structure, and a hospitality building with associated utility connections and landscaping changes (Project).

Published Data

Upon review of published resources, the portion of the Site included in the Project appears to contain:

- ☒ City-regulated wetlands, as identified on the City of Novi Wetlands interactive map website (Figure 1).
- ☐ Wetlands that are regulated by the Michigan Department of Environment, Great Lakes, and Energy (EGLE).
- ☐ Wetlands as identified on National Wetland Inventory (NWI) and Michigan Resource Inventory System (MIRIS) maps, as identified on the EGLE Wetlands Viewer interactive map website (Figure 2). NWI and MIRIS wetlands are identified through interpretation of topographic data and aerial photographs by the associated governmental bodies.
- ☐ Hydric (wetland) soil as mapped by the U.S. Department of Agriculture, Natural Resource Conservation Service, as identified on the EGLE Wetlands Viewer interactive map website (Figure 2).

MSG Wetland Boundary Verification

Sheet CE-9 of the rPSP, *Wetland Impacts*, depicts the location of four wetlands within the Project area and the following proposed impacts:

Wetland	Area	Permanent Impact Area	Mitigation Area	Permanent Buffer Impact Area
A	2.24 Acres	0.03 Acre	0.06 Acre	0.07 Acre
B	0.06 Acre	0.06 Acre	None proposed*	0.22 Acre
C	0.63 Acre	0.63 Acre	None proposed	0.42 Acre
D	0.65 Acre	0.65 Acre	None proposed	0.46 Acre
Total	3.58 Acres	1.37 Acres	0.06 Acre	1.17 Acres

* see Permits and Regulatory Status below

No temporary wetland impact and no temporary buffer impact are proposed in the rPSP.

MSG visited the Site on October 4, 2022 and November 18, 2022 to evaluate the accuracy of the rPSP's depiction of wetlands on the Site. Selected inspection photographs are found at the end of this letter. Identifiable wetland delineation flagging was not present at the time of MSG's initial evaluation but was present for the second evaluation. Wetland A is composed of both emergent and forested wetland; the proposed impact area is in the forested portion of the wetland (Photos 1 and 2). Wetland B is composed of scrub-shrub and emergent wetland (identified as only emergent in the rPSP) (Photos 3 and 4). Wetlands C and D is composed of emergent vegetation, primarily reed canary grass (*Phalaris arundinacea*) and common reed (*Phragmites australis*) respectively (Photos 5 and 6). The northern area of Wetland C included trees and brush.

MSG concurs with the general depiction of Wetlands A through D in the rPSP. Portions of Wetland D and portions of the buffers of each of the four wetlands appeared to have been subjected to mowing. Sheet CE-9 of the rPSP states "*Phragmites australis* in entire Wetland D", but the area of *Phragmites australis* was observed to end abruptly and was surrounded by reed canary grass. Topographical depressions were also observed extending from Wetland D into regularly mown lawn grass areas, which suggests areas that are currently mown could support wetland habitat (Photo 7).

Permits and Regulatory Status

The City of Novi Code of Ordinances, Chapter 12, Article V defines an essential wetland as meeting one or more of the criteria listed in subsections 12-174(b)(1) through (10). It is MSG's opinion Wetlands A and B provide the functional characteristics of storm water storage capacity and wildlife habitat, and accordingly Wetlands A and B meet the criteria for an essential wetland. Wildlife (primarily foraging birds) was observed actively using both of these wetlands at the time of MSG's evaluation(s).

Wetlands C and D were observed to be composed primarily of few invasive species and their function as wildlife habitat is likely minimal. Wetlands C and D may contribute storm water management functions, and while MSG does not consider Wetlands C or D essential, the applicant is encouraged to consider the on- and off-site consequences on stormwater management if the wetlands are eliminated.

Mitigation is required per Section 12-176 of the Novi Code of Ordinances when an activity results in 0.25 acre or greater of impairment or destruction of wetland areas that are determined to be essential wetland area, two acres in size or greater, or contiguous to a lake, pond, river, or stream. The Novi Code of Ordinances, Section 12-176 – Mitigation, states "Where an activity results in the impairment or destruction of wetland areas of less than one-quarter (¼) acre that are determined to be essential under subsection 12-174(b), are two (2) acres in size or greater or are contiguous to a lake, pond, river or stream, additional planting or other environmental enhancement shall be required onsite within the wetlands or wetland and watercourse setback where the same can be done within the wetland and without disturbing further areas of the site."

The proposed impact to essential wetlands is 0.03 acre (Wetland A) and 0.06 acre (Wetland B) for a total of 0.09 acre. Based on the total being less than 0.25 acre, mitigation is not required but an environmental enhancement plan will be required. An environmental enhancement plan typically includes the removal of non-native species and/or planting of native wetland species within the affected wetland to compensate for lost wildlife habitat.

EGLE typically regulates wetlands that are located within 500 feet of an inland lake, pond, stream, or river, and/or isolated wetlands of an area of 5 acres or more. The applicant has provided a letter from EGLE dated October 24, 2022 that indicates an EGLE permit will not be required for the proposed project.

Based on the available information, the following wetland related items appear to be required for this project:

Item	Required/Not Required/Not Applicable
City Wetland Permit (specify Non-Minor or Minor)	Required, likely Non-Minor; see Comment 1 below
Wetland Buffer Authorization	Required
Wetland Mitigation	Not required
Environmental Enhancement Plan	Required
EGLE Wetland Permit	Not required
Wetland Conservation Easement	Not required

Comments

1. Fill volumes for wetlands must be identified on Site plans for determination if a Minor or Non-Minor City Wetland Permit is required.

2. The City of Novi requires the boundary lines of any watercourses or wetlands on the Site be clearly flagged or staked and such flagging or staking shall remain in place throughout the conduct of permit activity.

3. The Wetland A vegetative cover currently includes non-native species (e.g. reed canary grass, common reed). MSG recommends the applicant incorporate replacement native plantings, including trees and shrubs, in the project plans as well as removal of non-native invasive species to enhance the aesthetics and natural habitat benefits of the wetland area.

MSG recommends approval of the Preliminary Site Plan for Wetlands, on the condition that the following are provided:

- Wetland fill volumes on the project plans, and
- An Environmental Enhancement Plan.

Please contact the undersigned if you have any questions regarding the matters addressed in this letter.

Sincerely,

The Mannik & Smith Group, Inc.

Keegan Mackin
Environmental Scientist

Douglas Repen, CDT
Project Manager
Certified Storm Water Management Operator

CC: Sarah Marchioni, City of Novi Project Coordinator
Barbara McBeth, City of Novi Planner
Christian Carroll, City of Novi Planner
Ben Peacock, City of Novi Planning Assistant
Rick Meader, City of Novi Landscape Architect

FIGURES

Figure 1	City of Novi Regulated Wetland Map. Approximate Site boundary is shown in red. Regulated wetland areas are shown in blue.

Figure 2	EGLE Wetlands Viewer Map. Approximate Site boundary is shown in red.

SITE PHOTOGRAPHS

Photo 1: Approximate location of proposed impact to Wetland A, facing north (Oct. 4, 2022)

Photo 2: View of emergent vegetation in Wetland A, facing west (Oct. 4, 2022)

Photo 3: View of scrub-shrub vegetation area of Wetland B (Nov. 18, 2022)

Photo 4: View of emergent vegetation area of Wetland B (Nov. 18, 2022)

Photo 5: View of Wetland C with construction road in foreground, facing east (Oct. 4, 2022)

Photo 6: View of Wetland D with wetland delineation flagging (pink ribbon on stakes) (Nov. 18, 2022)

Photo 7: View of Wetland D, facing north. Note lower area of lawn grass in foreground (Oct. 4, 2022)

HOBBS + BLACK ARCHITECTS
ARCHITECTURE | ENGINEERING | INTERIOR DESIGN

September 30, 2024

Gary Shapiro
Ivanhoe Companies
6689 Orchard Lake Rd.
West Bloomfield, MI 48322

Re: The Grove Residential Development – Exterior Cladding Materials

Dear Gary:

It is our opinion that The Grove buildings would not benefit from additional amounts of brick cladding on the building elevations. The mix of siding types is an important aspect of the transitional aesthetic of the development, which blends traditional and contemporary elements to achieve a fresh and timeless design.

We also believe that luxury vinyl siding is an appropriate product for use here. It can produce a similar look to traditional board and batten and lap siding but with integral color it requires less maintenance than a fiber cement product.

Also note that today's vinyl siding is more sustainable, with a smaller life cycle impact on global warming than fiber cement products and substantially less than brick and mortar.

HOBBS+BLACK ASSOCIATES, INC.

Steven B. Dykstra
Vice President

ALLENDESIGN
LAND PLANNING / LANDSCAPE ARCHITECTURE

557 Carpenter · Northville, MI 48167
e. jca@wideopenwest.com
t. (248) 467-4668

October 2, 2024

Mr. Rick Meader, Landscape Architect
City of Novi Community Development
45175 West 10 Mile
Novi, MI 48375

RE: The Grove Landscape Response

Dear Mr. Meader:

Thank you for your thoughtful comments regarding the Groves. I'm certain we'll be able to work through your concerns as outlined in your review dated September 10, 2024. The responses below address your bolded comments.

Landscape Comments:

- *Adjacent to Public-Rights-Way.* We will work with engineering to determine if there is enough room for the street trees in the southern portion of Meadowbrook. The small curb lawn and intermittent swale is present where the trees are currently omitted.
- *Parking lot landscaping.* Additional trees will be added to the south end of the visitor parking lot.
- *Multi-family residential landscaping.* Plant species will be provided on the Preliminary Site Plan. All interior street trees will be deciduous canopy trees.
- *Foundation landscaping.* Due to the unit type proposed in the Vistas, foundation plantings facing a street are not possible. Additional landscaping will be added to the building corners and sides to help mitigate this scenario. The Woods and The Pointe are also deficient due to being 24' wide units with two car garages. As with the Vistas, additional plantings will be added to the building corners and sides.
- *Plant list.* A plant list will be provided at Preliminary Site Plan and will provide at least 50% native species.
- *Existing conditions.* Please see the response letter from Barr Engineering.
- *Natural features protection.* Wetland buffers are being preserved where possible. The plans incorporates retaining walls to preserve the site's natural features.
- *Proposed improvements.* Lighting and wall elevations will be shown on the plans for Preliminary Site Plan.
- *Berm requirements.* Two rows of staggered Green Giant arborvitaes will be added to the plans to better screen Meadowbrook Corporate Park.
- *ROW landscape screening.* The focal areas located on Meadowbrook and 12 Mile are included in the frontage calculations.
- *Canopy deciduous between the sidewalk and curb.* Additional trees will be provided east of the 12 Mile entrance. These will be ornamental trees due to the existing powerline. As noted above, we will work with staff to determine the extent of plantings along Meadowbrook Road.
- *Multi*-family residential. The unit tree count is accurate. We will provide confirmation from the architect for easy verification.

- *Parking lot landscaping.* Additional trees will be added to the south visitor parking endcap islands. The parking lot and perimeter trees will be uniquely labeled showing the requirements are met. These trees will be deciduous canopy trees.
- *Ground covers.* Ground covers will be identified at Preliminary Site Plan.
- *Snow deposit.* The snow deposit areas will be included in the Master Deed and passed along to the maintenance company.
- *Transformer/utility boxes.* Transformers will be shown when identified. A detail is provided on Sheet L-11. Additional shrubs will be added to the plant list on a per cabinet basis.
- *Detention.* Permanent water elevations are identified for each basin. Plantings will be called out for Preliminary Site Plan.
- *Irrigation.* An irrigation plan will be provided for stamping sets.

If you have any questions or comments regarding this response, please contact me at your convenience.

Sincerely,

James C. Allen
Allen Design L.L.C.

FLEIS&VANDENBRINK
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October 11, 2024

VIA EMAIL: gshapiro@ivanhoecompanies.com

Mr. Gary Shapiro
Ivanhoe Companies
6689 Orchard Lake Rd., Suite 314
West Bloomfield, MI 48322

RE: Response to Comments – The Grove Residential Development TIS

Fleis & VandenBrink (F&V) staff has completed this letter in response to comments provided by the City of Novi Traffic Engineering Consultant (AECOM) and RCOC in their letter dated September 19, 2024, regarding their review of the F&V Traffic Impact Study (TIS) Report dated July 16, 2024. The comments related to the traffic study provided by AECOM/RCOC and the corresponding F&V responses are summarized herein. F&V has prepared a revised TIS to address several of the comments noted herein.

AECOM Comment #1: *The study concluded with a recommendation that would improve the failing levels of service and traffic conditions as shown below. However, it is not clear if the applicant has coordinated such improvement with the Road Commission for Oakland County (RCOC).*

F&V Response: RCOC was contacted, and they did not have an opinion on the proposed operations of the approach and deferred to the City, as Meadowbrook Road is under the jurisdiction of the City Novi.

AECOM Comment #2: *AECOM does not agree with the consultant's proposal of restriping the northbound through as a shared through and right-turn lane. The analysis that the consultant carried out to evaluate this mitigation at Meadowbrook Road at 12 Mile Road Intersection is considered a very low volume of traffic on northbound through (5 cars in AM peak hour and 10 cars in PM peak hour, Figure 3). It seems these volumes were influenced by the detour and closing of northbound through traffic due to construction (GLWA 54-Inch Water Main Loop) that has been ongoing for a very long period (February 2022 to August 2024) on Meadowbrook Road between 12 Mile Road and 13 Mile Road as per the image below. The consultant should perform a sensitivity analysis with the volumes growing to the future year by applying a growth rate to a set of volumes when there was no construction (pre-pandemic) and then confirm/explore the mitigation measures.*

F&V Response: The Meadowbrook Road closure was not identified by City's consultant (AECOM) when scoping the project with the City. The City's consultant requested the data collection to be performed at the intersection, however, with the through traffic closed, this data did not reflect those operations without the closure. Therefore, F&V obtained RCOC SCATS counts from January 11, 2022, prior to the Meadowbrook Road closure. These counts were obtained for the intersections of 12-Mile Rd & Meadowbrook Rd, and 12-Mile Rd & SB M-5 Exit-Ramp and were used to adjust the traffic volumes for use in the revised TIS.

AECOM Comment #3: *Sight Distance: The applicant needs to show the sight distance triangle and details on the plan set for further review and confirmation.*

F&V Response: The sight distance evaluation was performed and shown on the site plan. These exhibits have been included in the revised TIS.

27725 Stansbury Boulevard, Suite 195
Farmington Hills, MI 48334
P: 248.536.0080
F: 248.536.0079
www.fveng.com

AECOM Comment #4: *Right-turn lane: the applicant needs to coordinate with RCOC for geometrical standards and approval for the right-turn taper. The applicant will need to show the right-turn taper details with dimensions and adherence to the applicable standards on the plan set for further review and confirmation.*

F&V Response: Noted.

RCOC Comment #1: *The study indicated the site trip distribution for westbound 12 Mile Road to be 33% AM (63 trips) and 28% PM (66 trips). RCOC has some concerns related to the ability of vehicles to weave across the 3 lanes of 12 Mile Rd to enter/exit the site. The applicant should conduct a weave analysis from the nearest cross-overs. This is particularly concerning for the WB to EB 12 Mile Road movement as the M-5/I-696 ramp traffic utilizes this same cross-over.*

F&V Response: A weaving analysis has been performed and is included in the revised TIS..

Please let me know if there are any further questions or comments related to the letter.

Sincerely,

FLEIS & VANDENBRINK

Julie M. Kroll

Julie M. Kroll, PE, PTOE
Traffic Engineering, Group Manager

Buhl Building • 535 Griswold Street, Suite 600 • Detroit, MI 48226 • (313) 223-2100

Ms. Lindsay Bell, AICP, Senior Planner
City of Novi Community Development Department – Planning Division
45175 Ten Mile Road
Novi, MI 48375

Re: The Grove
SMART 12 Mile Rd. Bus Stop

Dear Ms. Bell:

We were contacted by Brad Strader with Cinar Consulting Group on behalf of Ivanhoe Companies, regarding relocating a SMART bus stop. Ivanhoe sent us a concept plan for the proposed "Grove" residential project including a proposal to add a bus stop near the Grove's entry along 12 Mile Road. Ivanhoe had noted that SMART provides residents of the development with a convenient way to travel to shopping and services to the west, such as Twelve Oaks Mall, and eastbound to many destinations and connections to other SMART routes to the east. There is already a bus stop on the westbound direction of 12 Mile Road, near the Ivanhoe's residential and approved commercial development across the street from the Grove.

We understand that the Grove is in the initial stage of a Planned Residential Overlay (PRO) process, and that a 10' wide pathway will be constructed along the south side of 12 Mile Road, from Meadowbrook Rd. to the east property line of the Grove. The current SMART bus stop for eastbound 12 Mile (SMART route 740) would be moved from its current location (west of its intersection with Meadowbrook Road) to the east side of Meadowbrook Road, to be near the entry to the proposed Grove residential development.

At this stage, SMART would support moving our eastbound 12 Mile bus stop to the other side of Meadowbrook Rd, as proposed by Ivanhoe. We will work with the City of Novi and the Ivanhoe companies to finalize the location and design of the new bus stop as the project moves forward during the approval and construction process.

We appreciate that the developer and the City are looking for ways to increase transit ridership, and look forward to future collaborations.

Sincerely,

Jordan VonZynda

Jordan VonZynda
Manager of Planning

APPLICANT PRESENTATION

THE GROVE

A PLACEMAKING DESTINATION

NOVI - MICHIGAN

10/30/24

PRESENTATION

IVANHOE COMPANIES

EXPERIENCE

+ previous developments

IVANHOE COMPANIES

- Proven track record of high-quality development and creative master planned communities.

- Environmentally-sensitive, award-winning projects in development, construction, and planning

- 3-time winner of the Michigan Association of Planning Best Project Award

- 2020 Home Builders Association of Southeast Michigan Developer of the Year Award

2020 HBA HOME BUILDERS ASSOCIATION OF SOUTHEASTERN MICHIGAN DEVELOPER OF THE YEAR

THE IVANHOE COMPANIES

- Barr Engineering - Environmental
- Zeimet-Wozniak Associates - Civil Engineering
- Allen Design - Land Planning,
  Landscape Architecture
- MKSK - Landscape Architecture and Planning
- Cincar Consult Group (C2G) - Land Planning
- Hobbs + Black - Architecture
- Fleis & VandenBrink - Traffic Engineering
- Alan Greene - Dykema
- TR Design Group - Architecture
- The Chesapeake Group - Market analysis
- CBRE - Market analysis

IVANHOE COMPANIES

Ivanhoe works with the finest planning, design, engineering, environmental and target marketing team in planning the community.

FLEIS&VANDENBRINK
DESIGN. BUILD. OPERATE.

C2G

Dykema

MKSK

ZEIMET WOZNIAK & ASSOCIATES
Civil Engineers & Land Surveyors

HOBBS + BLACK ARCHITECT

TR DESIGN GROUP

ALLEN DESIGN
LAND PLANNING / LANDSCAPE ARCHITECTURE

BARR

THE GROVE
" A placemaking destination "

OUR VISION

OUR VISION

A DESTINATION COMMUNITY WITH FOUR UNIQUE VILLAGES

- Diverse options, including Townhomes, Residence Flats and Condominiums.
- The Central Park community gathering and amenity area.
- 7.8-acre, user-ready site for a multitude of typologies or demands for Trinity Health.
- Our market profile is to meet the needs of home buyers and long-term renters.
- Goal is to create a compatible community integrated with the environment and provide shared amenities for both renters and home-buyers.

THE GROVE
" A placemaking destination "

THE VILLAGES

THE VISTAS

THE WOODS

CENTRAL PARK

THE MEADOWS

THE POINTE

MDOT
Natural Preservation Area

Crushed Limestone Path

Natural Preservation Views

Zoned OST

Existing Vegetation. No Excavation within Woodland Limits

50' Setback

Detention

Conservation Area

Focal Area

75' Setback

Dog Park

Pickleball

Pool

Clubhouse

Park

Clubhouse Parking
28 Spaces

Covered Pkg.

Detention

Meadowbrook

Zoned OST

Elm Creek Entry

Best Buy Health Entry

Office Entries

12 Mile

THE GROVE

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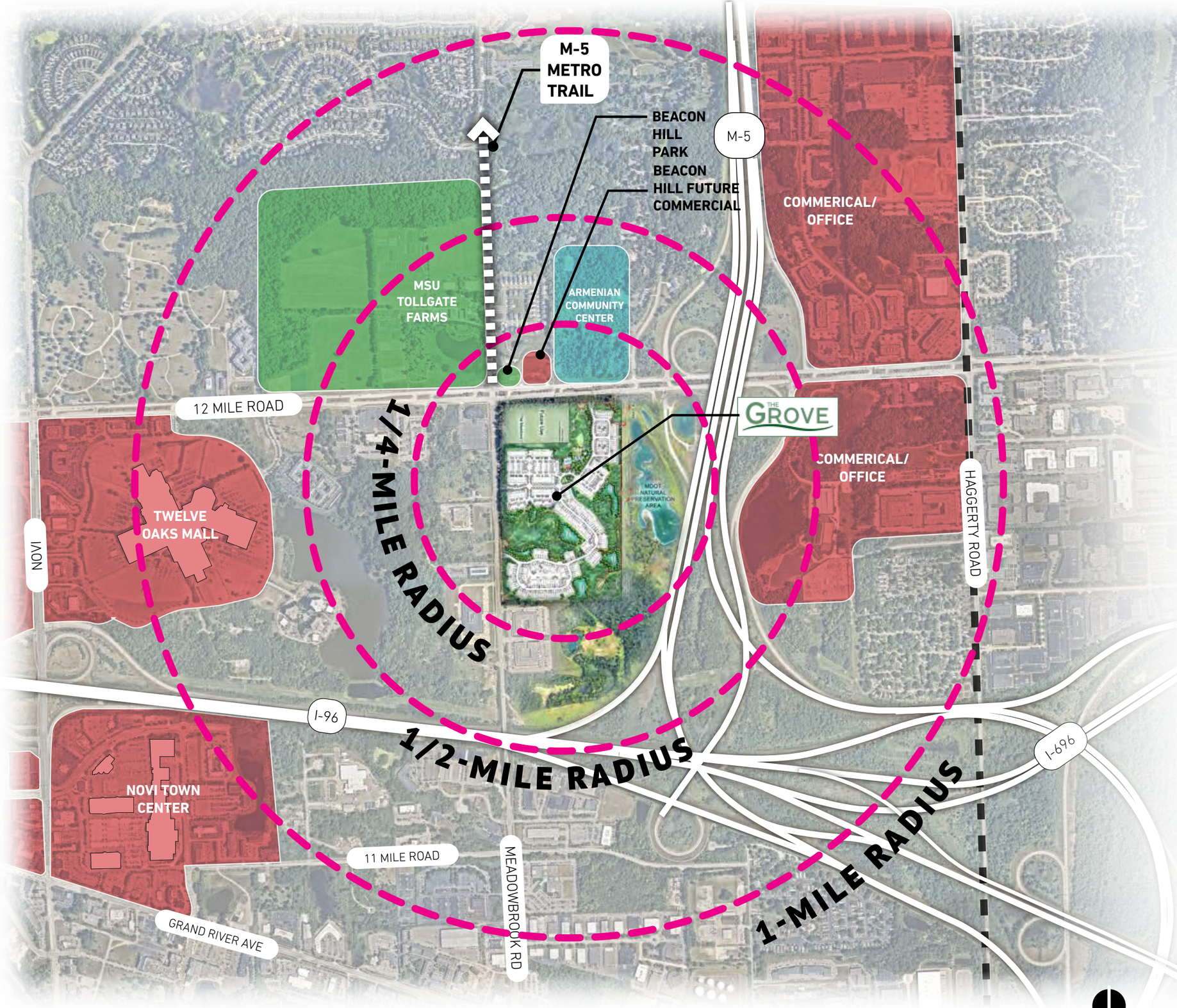
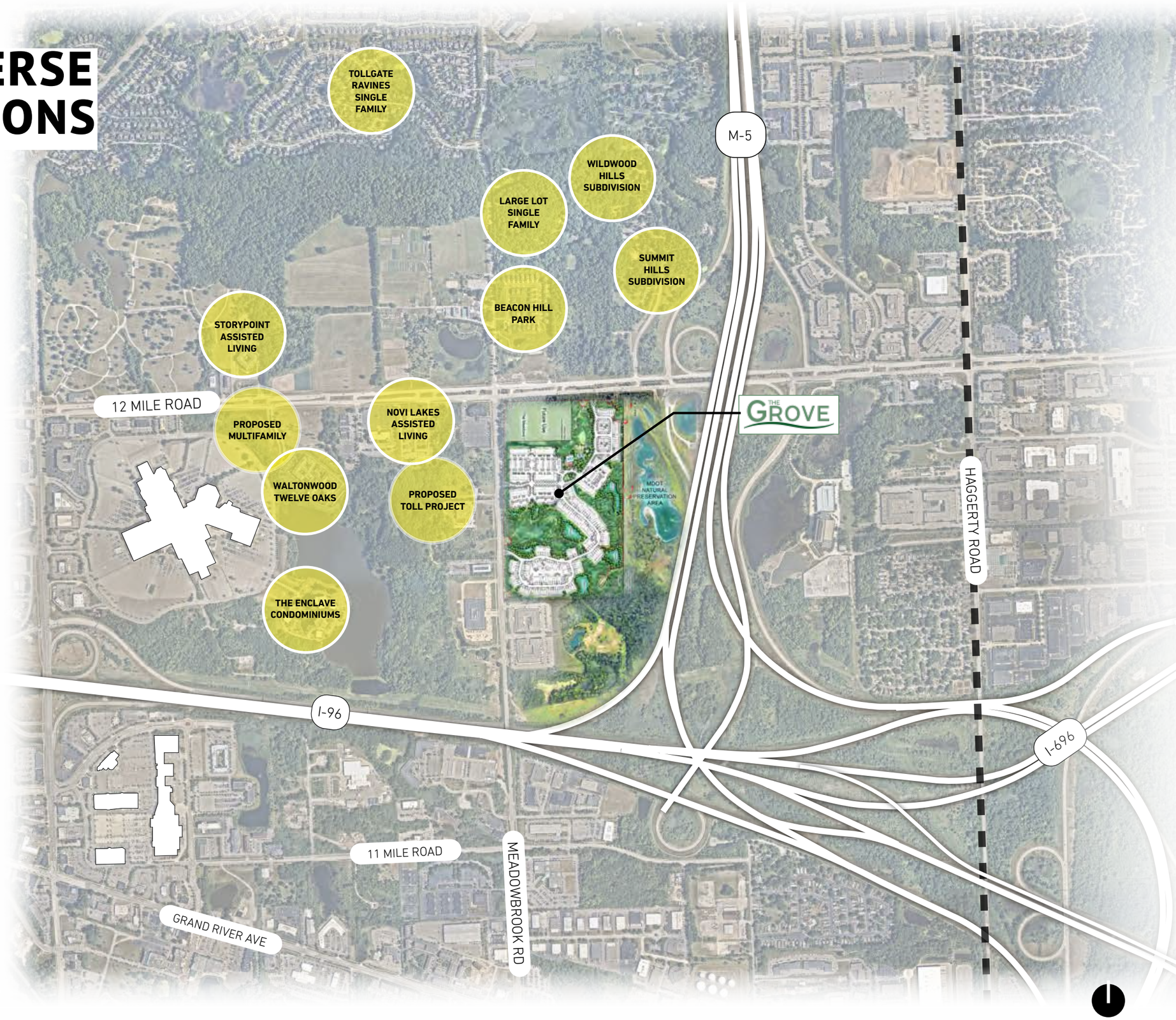
ACCESSIBILITY TO COMMERCIAL & RECREATION

- Site has great locational advantages – convenient access to freeways
- Site convenient to shopping, along a SMART route
- Integrated into non-motorized network, including M-5 Metro Trail
- Twelve Oaks Mall within biking and walking distance
- Proximity to accessible wetland and woodland areas for passive recreational activities- including hiking, biking, and nature-viewing



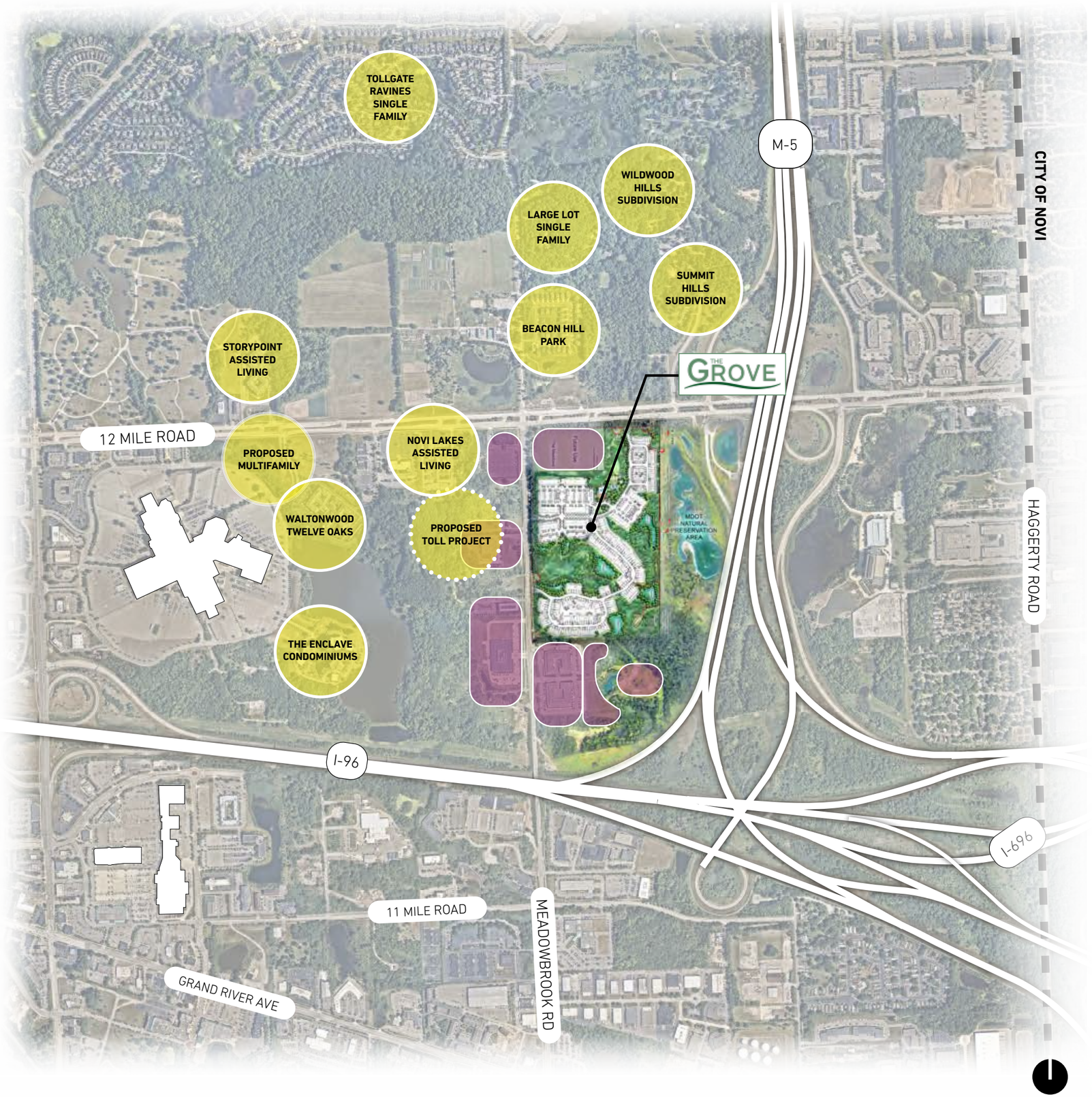
DEMAND FOR DIVERSE RESIDENTIAL OPTIONS

- Ivanhoe engaged numerous market consultants to evaluate potential uses
- Market studies concluded that there is a need for more diverse housing
  - Singles
  - Young Couples
  - Long-Term Renters
  - First-Time Home Buyers
  - Active Seniors
- Housing that appeals to Generation X, Y, Z including those who grew up in the City
- Housing for seniors in Novi who want to downsize but stay in the City
- A walkable, environmentally sensitive design with ample open space and amenities
- Aligns with Master Plan goals for more diverse housing options



WHY OST IS NOT APPROPRIATE FOR THE ENTIRE SITE

- Limited market for OST uses, even when the office market was strong the was no interest
- Wetlands on our site makes it difficult to develop with OST uses and their parking
- Various sites, more attractive in Novi, remain available for development or redevelopment, especially along the M-5/Haggerty Corridor
- OST is most appropriate for the prominent northwest corner of the site

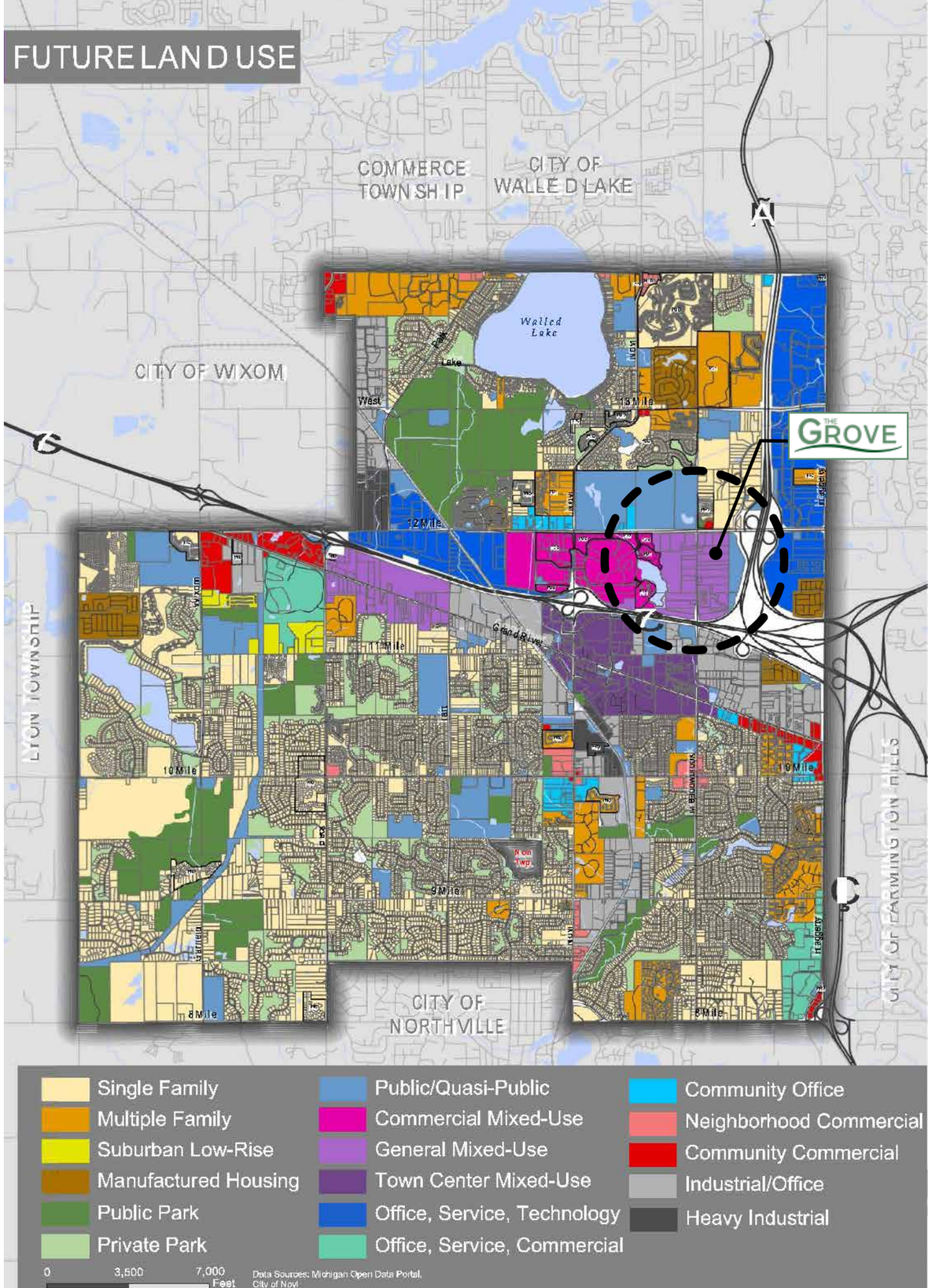


FUTURE LAND USE DESIGNATION

Master Plan DRAFT

- The location, size and environmental features make the site unique.
- Our proposal is consistent with the draft Master Plan GMX designation.
- Provide attainable and desirable housing essential to support the existing and evolving retail and entertainment hub of Novi.

> *The GMX land use category provides the highest flexibility of the categories. It recognizes that certain properties will be developed based on the prevailing market trends utilizing a site-specific master plan to guide development reserving certain portions of the subject property for different land use typologies.*
>
> *-Proposed Master Plan*

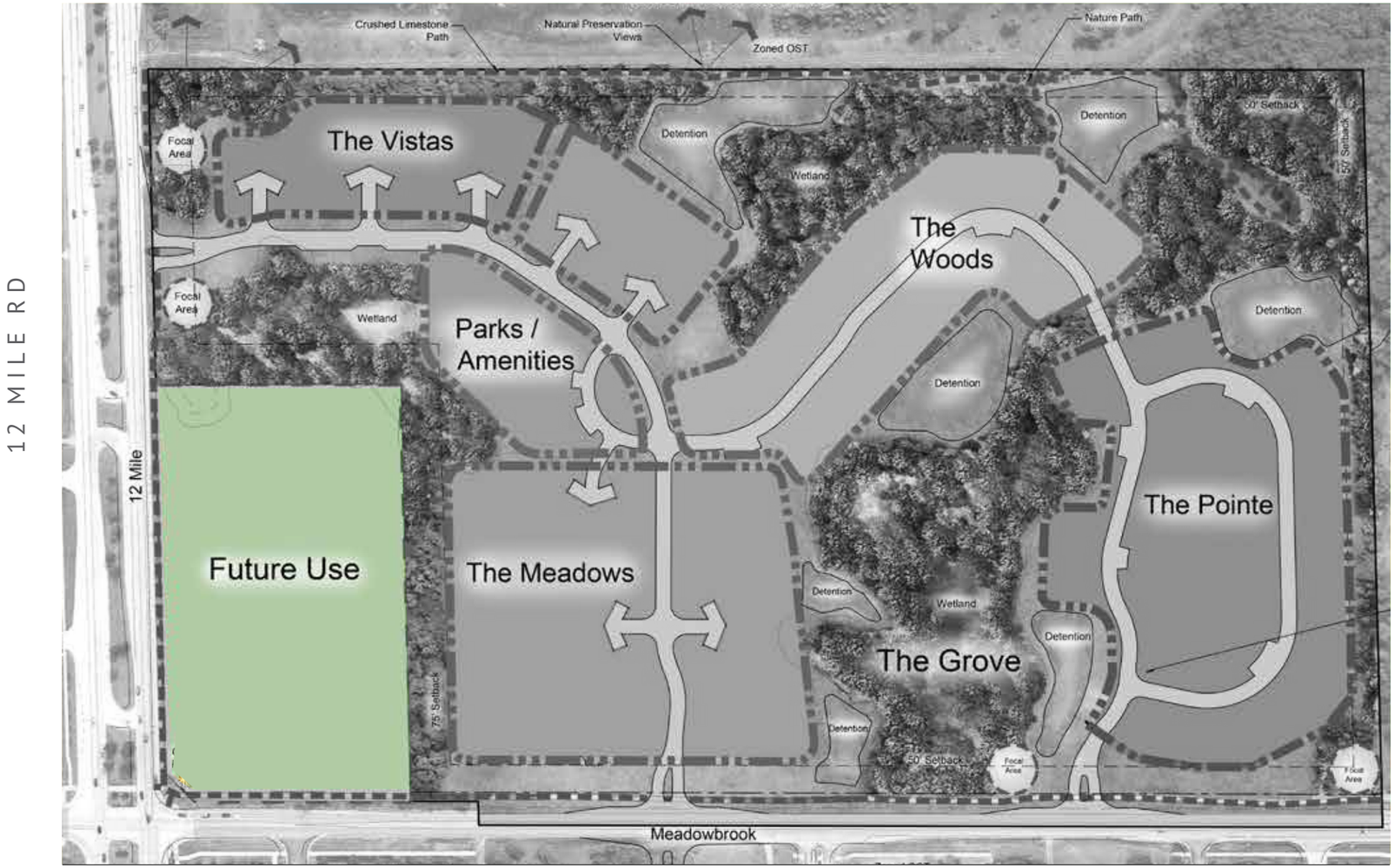


THE CORNER

a signature site

- 7.8-acre (18% of developable area for future business uses), user-ready site for a multitude of uses or demands for Trinity Health or future use.
- Flexibilty to address evolving market trends and land use typologies.

  - Corporate office
  - Commercial
  - Retail / shopping
  - Other headquarters use
  - Healthcare facility
  - Integrated mixed-use
  - Hotel
  - Other complementary uses



PUBLIC/PRIVATE OPEN SPACE & PATHWAYS PLAN

- **33.4 %** open space.
- Network of internal sidewalks, compacted stone walking trails, and natural hiking trails
- Central Park with amenities
- Three focal public places of interest and public bus stop
- Trail along the MDOT Pond and Conservation Easement to the east with scenic overlook.
- When combined with adjacent open space protected by conservation easements, our open space creates a large, contiguous habitat area.

Off-site bike paths
10 ft sidewalk

Compacted stone walking trails or natural hiking trails

Bus stop

OPEN SPACE CENTRAL PARK AMENITIES

- 5.5 acre central community park space
- Sidewalks, gravel walking trails, and natural hiking trails
- Clubhouse with pool and fitness center
- Outdoor parks and gathering areas
- Central Park includes many amenities:
  - Pocket parks
  - Pickleball courts
  - Playground
  - Dog park
  - Picnic areas
  - Natural features
  - EV charging stations
  - Bike racks

AMENITIES

clubhouse and central park

Clubhouse Views

Pool

HOBBS + BLACK ARCHITECTS

Artist renderings and floor plans are for illustration purposes only and are subject to change. These plans are not to be reproduced, changed, or copied in any form or manner whatsoever. Nor are they to be assigned to any third party without first obtaining the express written permission and consent of owner.

THE GROVE

" A placemaking destination "

THE VISTAS

3-story townhomes

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THE VISTAS

3-story townhomes

- Individual 3-story townhomes with private entries, work-at-home flex room and garages.
- 2 & 3 bedrooms with 2.5 bath for sale or rent.

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HOBBS + BLACK ARCHITECT

THE VISTAS

3-story townhomes

HOBBS + BLACK ARCHITECTS

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THE WOODS & THE POINTE

2-story condominiums

THE WOODS

THE POINTE

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GROVE

THE WOODS

2-story condominiums

12 MILE RD

MEADOWBROOK

- 2-story condominiums with library and first floor living and upstairs bedrooms.
- 2 to 4 bedrooms with attached two car garage.
- Envelopes for condominiums designed for flexibility.

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THE POINTE

2-story condominiums

12 MILE RD

MEADOWBROOK

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THE MEADOWS

residence flats

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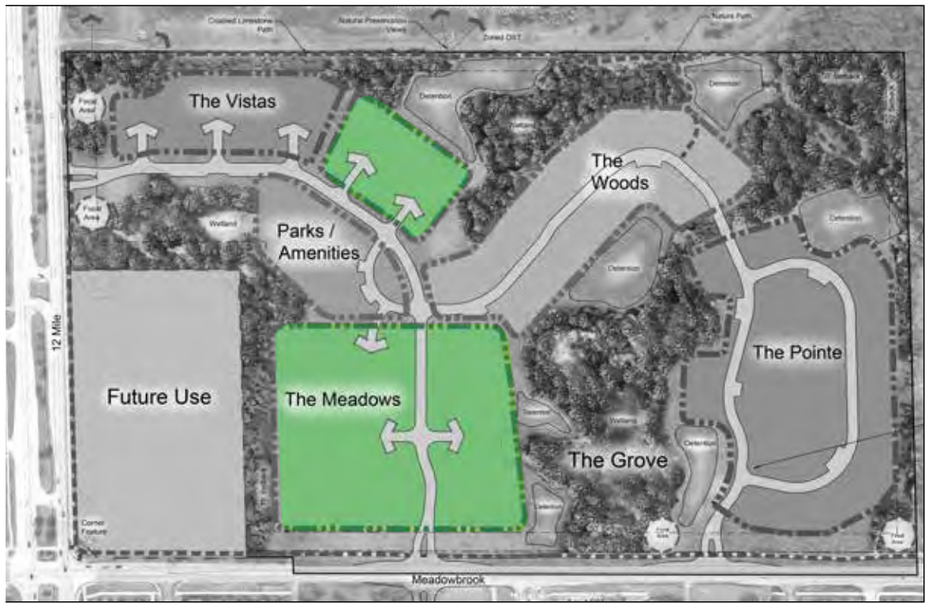
THE MEADOWS

residence flats



MEADOWBROOK

- Welcoming and individualized building entries with no common corridors
- Intimate building types with 29-32 units per building
- Residential, single-level flats with 1, 2 or 3 bedroom units for rent or sale, garage optional.

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THE MEADOWS

residence flats

residence fla ts - left entrance

residence fla ts - middle entrance

residence fla ts - right entrance

SCALE : NTS

HOBBS + BLACK ARCHITECTS

THE GROVE

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THE MEADOWS

residence flats

HOBBS + BLACK ARCHITECTS

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PRO BENEFITS

- More appropriate land use for the property than existing OST zoning
- Multigenerational and diverse housing options for both rent and sale within single integrated development area
- More residents in the market area for existing and planned commercial uses and future integrated OST and other business uses on remainder of property
- Lower density than RM-2 would allow- 926 allowed, 438 proposed
- Significantly less traffic than OST
- New tax base for the City

THE GROVE
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PRO BENEFITS (CONT.)

- Creative design intended to preserve and enhance natural features of the site, unlike OST zoning
- Conservation easement of wetlands and woodlands to create a large contiguous habitat with adjacent natural areas
- High quality landscaping to complement the character of the area
- Four public places of interest along 12 Mile Rd and Meadowbrook
- Off-site pathway improvements along 12 Mile, wider (10 feet) interior pathway
- Consistent with “Walkable Novi” and connects with non-motorized network
- Convenient to a SMART route, relocated bus stop
- 730 ft of new pathway along 12 Mile Rd on off-site corner parcel

CONCLUSION

- OST uses are not the best fit for this property
- Design is consistent with the evolving character of the area
- Retains OST zoning for the prime corner
- Meets the need for unique, diverse housing in the City
- Adds population into the existing commercial market area
- Residential nestled among the ample open space (33%) and wetlands

THE GROVE
" A placemaking destination "

THE VILLAGES

PLANNING COMMISSION MINUTES

EXCERPT 10/30/2024

PLANNING COMMISSION
MINUTES

CITY OF NOVI
Regular Meeting
October 30, 2024 7:00 PM

Council Chambers | Novi Civic Center
45175 Ten Mile Road, Novi, MI 48375 (248) 347-0475

CALL TO ORDER

The meeting was called to order at 7:00 PM.

ROLL CALL

Present:	Member Becker, Member Dismondy, Member Lynch, Chair Pehrson, Member Roney
Absent Excused:	Member Avdoulos, Member Verma
Staff:	Barbara McBeth, City Planner; Beth Saarela, City Attorney; Lindsay Bell, Senior Planner; Dan Commer, Planner; Humna Anjum, Plan Review Engineer; Rick Meader, Landscape Architect; Saumil Shah, Traffic Consultant; Jason DeMoss, Environmental Consultant

PLEDGE OF ALLEGIANCE

Member Lynch led the meeting attendees in the recitation of the Pledge of Allegiance.

APPROVAL OF AGENDA

Motion made by Member Lynch and seconded by Member Becker to approve the October 30, 2024 Planning Commission Agenda.

VOICE VOTE ON MOTION TO APPROVE THE OCTOBER 30, 2024 PLANNING COMMISSION AGENDA MOVED BY MEMBER LYNCH AND SECONDED BY MEMBER BECKER. *Motion carried 5-0.*

AUDIENCE PARTICIPATION

Chair Pehrson invited members of the audience who wished to address the Planning Commission during the first audience participation to come forward. Seeing no one, Chair Pehrson closed the first public audience participation.

CORRESPONDENCE

There was not any correspondence.

COMMITTEE REPORTS

There were no Committee reports.

CITY PLANNER REPORT

There was no City Planner Report.

CONSENT AGENDA - REMOVALS AND APPROVALS

1. **JSP17-37 ARMENIAN CULTURAL CENTER**

   Approval of the request of Zeimet Wozniak & Associates, on behalf of the Armenian Community Center of Greater Detroit, for the one-year extension of the Final Site Plan and Special Land Use approval. The subject property is located on the north side of Twelve Mile Road, east of

Meadowbrook Road, in the Residential Acreage (RA) zoning district. The project area is approximately 19.30 acres. A revised Special Land Use Permit was granted by the Planning Commission on October 14, 2020 to permit a Place of Worship, a daycare in a residential district, and a proposed Armenian Genocide Memorial structure within the courtyard.

Motion to approve a second one-year extension of the Final Site Plan and Special Land Use for JSP17-37 Armenian Cultural Center moved by Member Lynch and seconded by Member Dismondy.

In the matter of JSP17-37 Armenian Cultural Center, motion to approve a second one-year extension of the Final Site Plan approval.

ROLL CALL VOTE ON MOTION TO APPROVE A SECOND ONE-YEAR EXTENSION OF THE FINAL SITE PLAN AND SPECIAL LAND USE FOR JSP17-37 MOVED BY MEMBER LYNCH AND SECONDED BY MEMBER DISMONDY. *Motion carried 5-0.*

PUBLIC HEARINGS

1. **JZ24-31 THE GROVE PRO PLAN WITH REZONING 18.745**

   Public hearing at the request of Ivanhoe Development for initial submittal and eligibility discussion for a Zoning Map Amendment from Office Service Technology to High-Density Multiple Family with a Planned Rezoning Overlay. The subject site is approximately 62 acres and is located east of Meadowbrook Road, south of Twelve Mile Road (Section 13). The applicant is proposing to develop 438-unit multiple-family residential development.

Senior Planner Lindsay Bell stated the applicant is proposing to rezone approximately 62 acres using the Planned Rezoning Overlay (PRO) option. To the north of the subject parcel is largely vacant land but it is approved for a retail area and the Armenian Cultural Center. On the east side of Meadowbrook are some office buildings and the proposed Elm Creek PRO project which is residential townhomes. South of the property is the Meadowbrook Corporate Park, and to the east is a large area owned by MDOT with stormwater facilities and wetland mitigation, and the M-5 freeway.

The current zoning of the property is OST – Office Service Technology. The properties to the east, west and south are also zoned OST. The area to the north is B-3 and RA Residential Acreage. The Future Land Use Map identifies this property as Office, Research, Development and Technology, which is consistent with the current zoning. The area to the north single family and community commercial.

The natural features map shows there are significant wetland and woodland areas on this property as well as to the east and south. The tree and wetland surveys provided by the applicant confirm these features.

The applicant is proposing to utilize the Planned Rezoning Overlay to rezone the whole property to RM-2 High Density Multiple Family, except for about seven acres on the corner. The initial PRO plan shows 4 different villages offering different types of residential units. The Vistas are 3-bedroom townhome units – a total of 49 units in 3-story buildings. The Woods and The Point are 2-story townhome buildings with a total of 133 units, each with 3 bedrooms. The Meadows are residential apartment buildings with a total of 256 units. These would offer a mix of studio, 1-bed and 2-bed units. There is also a clubhouse building and central park area with amenities, including an outdoor pool, pickleball courts, a playground park and a dog park.

The development is accessed by two entrances off Meadowbrook Road, and one from Twelve Mile Road.

Rezoning to the RM-2 category would permit the use proposed, however the multifamily zoning is not in compliance with the current Master Plan designation as Office Research Development and Technology.

However the current update to the Master Plan is under review, and the land use designation for this area may change.

The public benefits offered by the applicant include:

1. Four focal areas – two along Meadowbrook Road and two along Twelve Mile Road, which would be publicly available from the sidewalk. These are seating areas with landscaping primarily. One of these could serve as a bus stop for the new SMART service along Twelve Mile.
2. A corner feature at the corner of Meadowbrook and Twelve Mile.
3. The usable open space and general open space significantly exceed the requirements.
4. Other conditions and benefits as listed in the Planning Commission report.

Given the size of the development proposed, additional benefits to the public could be considered to offset the negative impacts of the project.

As described in the Wetland Review, each of the delineated wetlands on the site meet the criteria of providing wildlife habitat as well as flood and storm control. Wetland review notes that the proposed development appears to result in a total permanent wetland impact area of 1.71 acres out of the total 9.64 acres present on site (about 18% impact). Approximately 1.4 acres of on-site mitigation area is noted on the plan, which is not likely to meet the full requirement for mitigation. The applicant should note that the City has determined that all wetlands on the site are regulated, and therefore should update the wetland impacts and mitigation calculation requirements accordingly.

For woodlands, the plan appears to remove about 75% of the regulated trees on the woodland survey.

As noted in the Façade Review, the façade materials proposed do not conform to the Ordinance requirements. The design of the building shows extensive use of vinyl siding, which is not permitted. Most of the building facades do not meet the 30% minimum brick requirement. The façade materials should be reconsidered to bring the units into substantial compliance.

Some other issues identified include questions of compatibility and buffering from the adjacent uses that will remain OST. Being adjacent to a residential development can require additional setbacks or other restrictions, which can be an added burden to surrounding non-residential landowners, however this would primarily be an issue to the south, but that parcel is largely developed. Dense landscaping is proposed in that area.

A residential development may result in smaller wetland and woodland impacts compared to an OST development due to the typical size of buildings and parking needs. OST permitted uses include offices, research and development, data processing, and hotels, which all have a larger footprint than the RM-2 uses proposed. The Traffic study notes that the number of residential units proposed would likely result in fewer vehicle trips compared to an OST development, but there is a net increase during peak hours.

Under the terms of the PRO ordinance, the Planning Commission will not make a formal recommendation to City Council at this meeting. Instead, the initial public hearing is an opportunity for the members of the Planning Commission to hear public comments, and to review and comment on whether the project meets the requirements of eligibility for Planned Rezoning Overlay proposal. Planning Commission members may offer feedback for the applicant to consider that would be an enhancement to the project and surrounding area, including suggesting site-specific conditions, revisions to the plans or the deviations requested, and other impressions.

Following the Planning Commission public hearing, the project would then go to City Council for its review and comment on the eligibility.

After this initial round of comments by the public bodies, the applicant may choose to make any changes, additions or deletions to the proposal based on the feedback received. The subsequent submittal would then be reviewed by City staff and consultants, and then the project would be scheduled for another public hearing before Planning Commission for a recommendation for approval or denial to City Council.

The applicant, Gary Shapiro from Ivanhoe, as well as Brad Strader with Cincar Consulting, are here representing the project tonight, along with other members of their team. Staff and consultants are also available to answer any questions.

Chair Pehrson invited the applicant to address the Planning Commission.

Gary Shapiro, Ivanhoe Companies, stated he has been developing multiple communities in Novi for 30 years. Ivanhoe takes a lot of pride in their reputation to deliver what they say they will. Environmental protection and environmental sensitivity integrated with their communities has been their calling card. They have won multiple awards around the state and take a lot of pride in maintaining that reputation.

This site has been vacant for a long time. It is owned by Trinity Hospital and Ivanhoe has now partnered with them. When Trinity purchased the site many years ago, they thought they had 70 developable acres, however the entire site cannot be developed since there are extensive natural features on the site. About a third of the site is wetlands so it needs some special attention and as such it has remained vacant.

Ivanhoe has been working on this plan for the past three years. Mr. Shapiro has developed over 100 communities and has never done so much upfront work to be proactive and come up with the best plan possible with an exemplary well thought out project. Two traffic studies have been done showing half the traffic at peak hours for the proposed residential project compared to OST development.

If the property were to remain OST, the only way it could be developed is if environmental impact is encouraged. To build OST type business uses, big floor plates and parking lots are needed and that is not appropriate for this site.

On the Ivanhoe team is Brad Strader, who is a municipal planner, and The Chesapeake Group, who is doing the marketing and is one of the same consultants that the City uses. Ivanhoe also took a lot of input during multiple meetings that Beckett & Raeder and the City had on the Master Plan, where this property was earmarked for a multiuse development. After approximately 25 years, there are only four buildings to the west on Meadowbrook. This site has never had any traction nor is it desirable for OST uses.

This proposal leaves 20 percent of the property at the northeast corner of the intersection as OST for a unique typography to come in the future. There is over half a mile of frontage on Meadowbrook and Twelve Mile. After many variations, the design has integrated connecting sidewalks at the corner. There were some great comments from Planning staff to widen the pedestrian path through the site to be multi-use. This project will transform the area, which right now has no identity. Multi-use areas are good for one another. This product near the OST uses will appreciate their value.

The Grove is designed with one circular pattern of roads for pedestrian/vehicular access. Ivanhoe has elected to request rezoning to RM-2 which would allow 950 units, but will limit the scope to 450 units. There are four distinct villages – townhouses, flats, and two condominium villages, and a fifth area that is a 5 ½ acre recreational space with hiking trails and natural features for all the other villages to use.

The Chesapeake market study relays there is a tremendous need for housing in Novi for generation X, Y, and Z. There are not many parcels left to provide it. To get the context of this parcel, it is adjacent to the MDOT property to the east, so this project was designed with wildlife habitat corridors, and a lot of unique

mitigation including rain gardens. Ivanhoe is really excited with the plan; it is a world class development. It is a multi-generational destination that will transform this corridor and finish it off.

Mr. Shapiro said this is where residential should be mixed in with business uses. That is the way developments are done now. Originally, Ivanhoe tried to get a relationship with MDOT and Novi to turn it into a park, but with state politics it didn't work out.

Mr. Shapiro invited the Planning Commission to look at the market study. It was used to develop these iterations and to hopefully answer any questions regarding the market.

Brad Strader, Cincar Consulting, stated he has been fortunate to work with Ivanhoe since 1998 when he was hired to help with their understanding of zoning and planning. He has been a community planner for 50 communities around Michigan and in 18 other states, and has worked with all the communities around Novi, including helping the City of Novi with an ordinance. Most of his work is in the public sector.

As Mr. Shapiro mentioned, the team has been looking at this site for the past three years. Mr. Strader has been involved for two years. They have had environmental specialists, architects, engineers, and market consultants looking at it since it is a very complicated piece of land. They have been studying different uses and layouts because of the complexity, mainly due to the wetlands, but also due to the market and location.

Mr. Shapiro narrated a slideshow depicting the project. About one-third of the site will be open space with wetlands, woodlands, parks, and the other two-thirds would be developed. There are four different residential types, with different architectural styles, the idea is to have some diversity. There are a lot of amenities, open space, and connected pathways. The natural features are what makes it unique. The units, parking, and roadways are integrated into the fabric of what is there now. There will be some consistency in terms of walkways and landscaping, but the units will be distinct.

The project site is less than a mile from Twelve Oaks Mall and the Novi Town Center. There is commercial on the east side of Haggerty and M-5, Beacon Hill on the north side of Twelve Mile. The site is in easy walking, biking, or SMART route distance along Twelve Mile. With the increase in online shopping, it is important to increase the population within the trade/market area of the commercial district. This will add population and benefit the existing commercial.

The site is in the northwest quadrant of Haggerty Road and I-96. The area has commercial offices, the future Armenian Church, recreation and open space, residential of various types, so the reality is it is already a mixed-use area with OST included.

Mr. Strader continued that there is a need for housing for the X, Y, and Z generations. This development is trying to appeal to the younger generation to keep them in the city or attract them to the city. There is also a segment of active adults that are looking to stay in Novi but maybe move out of their single-family home. There is broad appeal for these products.

There has been a change in the market since OST was envisioned in the Master Plan. When Trinity purchased the land, they probably had visions of a healthcare complex. The property is very complicated to develop because of the wetlands. It can't really be developed for OST uses due to the footprint of the buildings and the parking, it wouldn't be sustainable or practical. This proposal integrates the buildings, the views, and the walkability. When people move into the development, they will think it is very unique.

Mr. Strader attended some of the Master Plan workshops that Beckett & Raeder, the City's Master Plan consultant, conducted. They made a distinction for this property on their draft map. It is different from the OST on the other side of Haggerty, it is proposed to be a mixed-use area. Mr. Strader thinks The Grove

proposal for land use and layout is very consistent with City goals and policies.

The corner is important, so Trinity worked with Ivanhoe collaboratively to come up with the land uses. They made sure the buffer, the walkability, and the size of the 7.8-acre parcel Trinity retained is appropriate to have a variety of uses on the site. The land uses and design will be integrated, and Trinity is supportive of residential development for the remaining parcels.

The open space is about one-third of the site, more than required. Part of that is due to the wetlands, but work was done to integrate the 5 ½ acre central park, the pocket parks, the pathways, and hiking trails. An area of more concentrated walkability will have a ten-foot-wide pathway instead of the typical eight-foot wide pathway. The sidewalk will also be completed on the Trinity parcel. The central park will have a lot of amenities, a clubhouse and pool, pickleball courts, a playground, a dog park, a picnic area, and seating areas. This would be accessible to all residents of the development.

The Vistas residential units look out onto the natural features. Much of the open space abuts the MDOT open space which makes a great habitat. There is a pathway along the MDOT property boundary with viewpoints. The Vistas will be three-story townhouses, with garages and flex space on the first floor, 2-3 bedrooms, and 2 ½ baths. It has been carefully thought out to make sure it is a unique village within the overall project.

There are two condominium villages, The Woods and The Pointes, that will have similar floor plans, but the architectural styles and landscaping will be distinct. They will have 2-4 bedrooms, two stories, with garages attached. They could be for sale or for rent.

The Meadows are an upgrade of a standard apartment. There are some with garages and some with carports. What makes it unique is that it is called a flat. For active adults or others who want a single-story lifestyle, the first floor is like a ranch. Each has a separate doorway, there are no hallways. The second and third level is a separate unit accessed by a first-floor door. The flats were designed by Hobbs and Black. There are 29-32 units in the building. The Meadows is mostly abutting the Trinity parcel.

Mr. Strader concluded by saying Ivanhoe pays a lot of attention to parking, streetscapes, and variety in landscape with natural species. They put a lot of emphasis on not only protecting natural features but adding impressive landscaping along Meadowbrook, along Twelve Mile, and within the development.

Alan Greene, attorney representing The Grove, stated that he has been working with Mr. Shapiro for 30-35 years. They have worked on at least 30 projects together. Mr. Shapiro looks for environmentally sensitive, difficult properties to develop, even more so with The Grove. They are trying to create a sense of place. This development has a lot of amenities and natural features in and around the site.

Mr. Greene does a lot of work for major malls in terms of working with communities and redeveloping the malls, it is a challenge. The Novi community has the best shopping in in southeast Michigan and the best way to protect that is to have people, particularly in areas where there wouldn't otherwise be residential developments.

Mr. Greene is a lifelong pro-Michigan resident. He looked at stats today, Michigan is 47th in the nation in the last 12 years in population growth. We are stagnant as a state and the population is getting older. Young people are leaving for a variety of reasons. What The Grove aims to do is create an environment that allows all types of people, including seniors, empty nesters, active adults, along with young people, and professionals, to live in the same community in different kinds of units, enjoying the same amenities. Mr. Greene thinks The Grove development is consistent with the Master Plan. There are a host of reasons for additional housing. There are a lot of projects going on now, they are all a little bit different.

Trinity is excited because it will have an opportunity to have something special on the corner. The only thing Mr. Greene disagrees with planning staff on is the need to bring in more amenities to offset the negative effects of the rezoning. He thinks the rezoning will have a positive impact on the community. He is not opposed to working with staff to add amenities but disagrees with the negative aspect of rezoning. Mr. Greene does a lot of OST and industrial work; this is not a desirable site for OST use. His OST clients would never choose this site, it is too difficult and too expensive to develop.

Chair Pehrson opened the Public Hearing and invited members of the audience who wished to speak to approach the podium. Seeing no one, Chair Pehrson asked Member Lynch to read the correspondence received. Member Lynch stated there were two objections received from Mr. Carey on Meadowbrook Road and Mr. Hatcher on Meadowbrook Road.

Chair Pehrson closed the Public Hearing and turned the matter over to the Planning Commission for consideration.

Member Lynch stated he reads all information provided on a project and he visits the site. If an applicant is going to spend time and money putting a proposal together, he wants to make sure that he and his colleagues give a fair analysis.

Member Lynch is not opposed to rezoning OST to residential and the applicant makes a good argument. A similar project was recently tentatively approved to rezone OST to multi-family residential for Elm Creek, which is just across Meadowbrook. It was also a difficult piece of property to develop with wetlands on site. A lot of the same points were made by the Elm Creek developer, for 134 units on 37 heavily wooded acres with wetlands, which came out to about 3.6 units per acre. A minor side yard setback was approved. The Elm Creek development exceeded the 30% minimum brick requirement and there were very few deviations.

The Grove proposal is requesting 438 units on 62 acres, which is about 7.1 units per acre, with major deviations on side yard setbacks – 39% for the Vistas, and 58% deviation from the Ordinance for the Woods and Meadows. There is virtually no brick, it is all vinyl siding. The density and deviation from the facade ordinance are the two major areas that need to be addressed. It is so out of character with the area and Novi in general. Member Lynch thinks density should be no more than 5.4 units per acre maximum for the rezoning.

A minor concern is regarding the note about police calls going from OST to residential. Member Lynch would like to see an apples-to-apples comparison. He does not want to create a financial burden for the rest of the City in terms of additional police, fire, and equipment. Member Lynch would like to see in the next presentation what the expected police and fire calls are for OST versus residential.

The traffic study was fairly consistent with the Elm Creek traffic study and Member Lynch agrees that there would be an improvement going from OST to residential.

Member Becker stated for decades the subject parcels have been designated as the OST - Office Service Technology zoning, and as Office, Research, Development and Technology on the Future Land Use Plan and have contained regulated woodlands and regulated wetlands. When the previous owner, Trinity Health Services, bought the property it was zoned OST and contained all the current woodlands and wetlands. When Trinity sold the property to the applicant, it was zoned OST and contained all the current wetlands and woodlands. The Meadowbrook Road corridor has been planned for development to be nonresidential for that same time period. From Grand River north to Twelve Mile Road, there is not a single residential development with the direct access from Meadowbrook Road. The Twelve Mile corridor from Haggerty to Novi Road does not have a single residential development at this point with direct access to Twelve Mile Road.

The applicant is stating this is the time for the City to significantly change what had been planned for decades for this section of the Meadowbrook corridor because OST designations are no longer relevant to the way things are in Novi. The more City Council and the Planning Commission are asked to make dramatic changes to long established development plans, the more judicious we must be and in providing the rationale for doing so. The applicant has provided such rationale for us to consider, and that needs to be critically examined on behalf of every resident and business that calls Novi home.

The applicant's position in brief is that the subject parcels have remained undeveloped and now cannot be developed under the OST zoning restrictions because times have changed, there is no need for new OST development in Novi because there's no market for it. This is based on their position that many OST type companies have and will continue to shift their business operations to having employees work remotely and therefore don't need brick and mortar offices. That position is challenged by the reality that many businesses in the OST realm have discovered that employees working remotely have many negative consequences for the business, and a meaningful number are requiring employees to come back to the office to work.

Member Becker continued to say the applicant states that the unique conditions of the parcels, namely regulated wetlands and woodlands, make the parcels impractical, if not economically unfeasible to develop for OST prospects. Trinity Health Services and Ivanhoe Companies both bought these parcels knowing the Master Plan designation and current zoning, and the presence of regulated woodlands and wetlands. One has to wonder if their master plan all along was to get the City of Novi to change our Master Plan.

The applicant maintains the City of Novi is deficient and lacking affordable and diverse housing options for the missing middle, and that their request addresses this concern. In Member Becker's four years on the Planning Commission, the single most frequent development classification submitted has involved multifamily residential developments. The south side of the City West district and an approved development on Bond Street address this segment. The Gateway Townhouses near Meadowbrook and Grand River are in the midst of expanding this residential option. There are multifamily residences being built in the Sakura and Townes at Main Street developments. There are also multiple family developments proposed for Elm Creek, and there is a huge apartment development called Innova located on Haggerty north of Twelve Mile. The Novi-Ten proposal on the agenda this evening includes multiple family residences.

In Member Becker's opinion, the missing middle residential segment isn't missing in Novi, it's already been developed and continues to be developed. The Grove proposal is an example of a solution in search of a problem. What is missing in the City of Novi, and in this proposal, is single floor residential non-apartment options dedicated to our Senior citizens.

The applicant says the design of The Groves is to create something called placemaking, which is "to provide the city residents, meaning non-Grove residents with great views, open space and pathways available to the public". Are we to believe that some meaningful number of current Novi residents are going to make their way to the corner of Twelve Mile and Meadowbrook Road to take in scenic views and open spaces inside The Grove?

The applicant says that the addition of 438 families will bring new business to the stores and restaurants at Twelve Oaks, West Oaks, and Fountain Walk, and that this would definitely appeal to the residents of The Groves who will want to walk or bike a mile to the commercial development. It is in fact farther than that to the mall stores, and further still to Fountain Walk.

When deciding what justifies making a meaningful change in the Master Plan, we should stick to reality for what is likely and even feasible. To fit in the proposed 438 residential units, the applicant is asking for a

33% reduction in the building setback from Meadowbrook Road from the required 75 feet to a reduced 50 feet. With the one exception of a commercial building on the southwest corner of Meadowbrook and Twelve Mile, this request is completely out of alignment with the current character of the Meadowbrook Road corridor.

The proposed 438 three story buildings are primarily clad in vinyl siding, which is not permitted in RM-2.

The applicant wants us to accept their traffic study that says 438 residential units at the corner of Meadowbrook and Twelve Mile Road will actually create less new traffic on three lane Meadowbrook than if the parcels were all developed as OST businesses. The City's traffic consultant has some doubts about that being the case. Without knowing what those businesses are it is hard to state what their traffic pattern and flow would be like.

Finally, the applicant states that there is no possible way for the subject parcels to be developed except under RM-2 with the PRO designation. The applicant's justification of this belief is that companies don't need offices anymore. Even if that were true, there are other types of businesses that would be allowed and are already allowed under the OST zoning designation that wouldn't require rezoning and a PRO. Those include professional medical offices, a lot of which are being constructed with the graying of our population, data processing and computer centers, hotels like the one down Twelve Mile just to the east of this property, higher learning institutions, indoor/outdoor recreation facilities, daycare centers, and adult daycare. All of these could in fact be developed on that property and probably still mitigate some of the loss of the wetlands and woodlands.

Changing our Master Plan, our Future Land Use Plan, and our zoning classifications must always be something that can be justified and accomplished under the right conditions and relevant for the City, its current residents and businesses; a truly meaningful enhancement over what the guiding principles would currently allow. Member Becker is not persuaded that this project as proposed rises to that level of justification.

Member Dismondy stated he thinks the applicant did a great job with the layout and knows Ivanhoe develops great communities. It is a challenging piece of land. Elm Creek was approved because they were set back from Meadowbrook a good distance and are behind the existing OST uses so as not to detract from the adjacent OST feeling. They are also adjacent to other multi-family developments. Member Dismondy recommends the applicant look at addressing the setback from Meadowbrook.

Member Roney thanked the applicant for putting this proposal together. It is a really nice plan. The theme Member Roney is hearing is it justifiable to deviate from the Master Plan. There has to be a lot of benefit to the City to consider rezoning from OST to residential.

He stated the consultant's recommendation for this area and the timing of an updated Master Plan may be significant when the Planning Commission further reviews The Grove. There is a lot of work done in master planning for the City and on what it should look like in the future. If the Master Plan designation of this parcel is going to change, then this fits quite well. If it is not a change being made, then the Planning Commission needs to evaluate whether to deviate from the Master Plan. Member Roney noted that only feedback is being provided at this meeting, there is no vote being held.

Member Becker noted that 16 deviations requested is a lot, and the ordinances should be followed, they are there for a reason. He looks forward to seeing this project again, and hopefully more information on the Master Plan update will be flushed out at that time.

City Planner McBeth commented that the Master Plan Committee will be meeting, hopefully before the end of the year, to review the draft Master Plan. It will then be brought before the Planning Commission

as a whole for review, then goes on to City Council for distribution reasons and their comments. After that, it will come back to the City for potential adoption, probably in the middle of next year.

Chair Pehrson stated that there is nothing in Novi anymore that is simple as far as zoning, setbacks, easement regulations, or building height specifications. This proposal has provided another thought starter for the Planning Commission to think about relative to where OST was designated when the last Master Plan was adopted. The Master Plan is the document that looks into the crystal ball to determine what might fit in the future. When proposals come before the Planning Commission that are not in line with the designated zoning, a deep dive must be done to determine whether the Master Plan still currently reflects what is needed or requested from the community and how is that best made to fit.

Chair Pehrson agrees that the applicant put together a wonderful plan and spent much time trying to create what is best for the subject property relative to the natural features, which is evident in their layout of the site. The proposal is not quite refined enough yet though. If an applicant is going to come forward with the number of deviations that are being requested here, they should all be accounted for. There may be a few oddball one or two things relative to where the dumpster goes, or things that never quite fit a site that need to be addressed. Chair Pehrson is not comfortable with the setback deviations, or the density being requested. He would like to know what the parcel on the corner will be so setbacks there can be determined since it would now abut residential.

Chair Pehrson agrees with Member Becker in questioning the need for this type of housing. He believes if this were to be built, it would probably be fully occupied in a matter of years. He can speculate what the target prices might be based on economics and what the buildings look like, but what is missing in Novi is the single family, first floor residential units that address senior needs, not townhouses per se. This is missing the mark on that.

When the applicant comes back before the Planning Commission, they should take into account materials seen on other properties in Novi, and it is not vinyl siding. Chair Pehrson does not want to see vinyl siding in a development like this at the price point this will have. It does not fit the overall theme of what Novi is. The screening must be significantly different alongside both Meadowbrook and Twelve Mile. The green spaces are great, it does give walkability. There must be additional thought process given relative to the PRO benefits. Chair Pehrson does not agree with any benefits the applicant presented. Anyone bringing a development to the City will bring a tax base increase and bring people into the City, but that is not justification for a legitimate PRO benefit. This is where creativity has to come in to get the Planning Commission to understand why the development would benefit the City to change the OST to RM-2 zoning.

Chair Pehrson thinks the applicant has enough of the intent regarding the Planning Commissioners comments. He looks forward to the applicant coming back and going through the next round of reviews.

Mr. Shapiro stated he would like to give a brief response. He thanked the Planning Commissioners for thoroughly reviewing the submittal and acknowledging the work that's been done. He has heard the comments, and the team will address the issues brought up. Regarding the lack of brick and the use of vinyl siding, Ivanhoe works here and out of state with architectural designers who specify luxury vinyl siding. They believe it is more sustainable; it is attractive. Mr. Shapiro has clients who cannot tell the difference from four or five feet away, but that is not a boulder Mr. Shapiro is going to push uphill. Hobbs and Black is one of the finest national architects around, and times are changing on the use of vinyl siding, but if that is something the Planning Commission is adamant upon, it won't be a confrontational issue.

Regarding the setbacks, if this were under RM-1 zoning it wouldn't be an issue. Mr. Shapiro's team thought that there are only a few buildings on Meadowbrook so it was inconsequential. They can demonstrate that or look at it. He also is hearing that the Planning Commission wants the team to look at the number

of deviations and why they were there. A multitude of them are those that have been granted to other locations relative to the density.

Relative to density, this project was previously at 1,000 units under RM-2. The team takes pride in studying what has been going on in a community and redesigned a product that is less dense. The genesis of what they are trying to do is make a multi-generational community where one village was multi-family. The point is well taken, the Planning Commission wants to see what is being done across the street. What the team is trying to do here though is create something totally unique for Novi where there is multi-generational low-density apartment living in the Grove community. The project was previously at over 12 units per acre, so they have brought that down. Mr. Shapiro would like the Planning Commission to keep an open mind as the Ivanhoe team proceeds to the goal of having a diverse attainable community for future Novi residents.

Mr. Shapiro believes Ivanhoe has a creative multi-generational unique development. He and his team appreciate the comments and are going to digest what was discussed this evening. They look forward to moving ahead with the project. He invites the Planning Commission to reach out if they have any thoughts in the interim.

This agenda item was discussed, but a motion on the item was not required.

2. **JZ23-09 NOVI-TEN PRO WITH REZONING 18.740**
   Public hearing at the request of Novi-Ten Associates for Planning Commission's recommendation to City Council for a Zoning Map Amendment from Light Industrial and Office Service to Low Density Multiple Family and Community Business with a Planned Rezoning Overlay. The subject site is approximately 34-acres and is located east of Novi Road, south of Ten Mile Road (Section 26). The applicant is proposing to develop a 71-unit multiple-family townhome development on the RM-1 portion, and approximately 35,900 square feet of commercial space on the B-2 portion.

Senior Planner Bell stated the applicant is proposing to rezone about 34 acres utilizing the Planned Rezoning Overlay option. The site is currently vacant and was historically part of the original Erwin Orchard along with the area to the south. The Ridgeview of Novi development is now to the south, along with the Novi Athletic Club and Novi Ice Arena & Dog Park. The railroad tracks border the eastern property line. North of Ten Mile Road are industrial uses, and commercial uses are to the west.

The current zoning of the property is I-1 Light Industrial on the eastern side, and OS-1 Office Service on the western side. The adjacent parcels on the west are also OS-1. The Ridgeview development to the south is zoned RM-1 with a PRO, while the Athletic Club and ice area are I-1, as is the area east of the railroad tracks. North of Ten Mile is zoned I-2 and I-1.

The Future Land Use Map identifies this property as Community Office on the west and Industrial Research Development Technology on the east. To the south and east is planned for Industrial, north of the site is planned for industrial and heavy industrial, and on the western side is community office.

There is a floodplain area associated with Chapman Creek and Walled Lake Branch of the Middle Rouge along the southern property boundary and along the eastern side of the site extending down toward the dog park. The natural features map also indicates extensive wetland area within the floodplain, and regulated woodlands are present in most areas of the site.

The applicant is proposing to utilize the Planned Rezoning Overlay to rezone about 7 acres of the property to B-2 Community Business, and about 27 acres to RM-1 Low Density Multiple Family. The PRO plan shows a total of 71 attached 2-story townhome units on the site. The RM-1 residential portion is accessed by one entrance off Ten Mile Road, with a secondary emergency access drive to the commercial portion of the

COMMUNITY IMPACT STATEMENT

The Grove

Proposed Rezoning & PRO Concept Plan
Walkable Residential Development

Community Impact Statement
August 7, 2024

Prepared for:

Ivanhoe Companies
6689 Orchard Lake Road, Suite 314
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Prepared by:

Introduction

The Community Impact Statement for The Grove Planned Rezoning Overlay was prepared by a group of consultants based, in part, on information prepared by others on the Ivanhoe project design team. Some of the information noted in this report was provided by the City of Novi. Ivanhoe specialists who contributed information included civil engineers, landscape architects, architects, a woodlands and wetlands consulting firm, traffic engineers, local real estate experts, and a national marketing firm noted on the cover page. Many of those firms and individuals prepared separate reports that go into more detail.

Contents of this report are based on the City of Novi's requirements for a Community Impact Statement, as listed in the Zoning Ordinance. This report also responds to a series of City staff requests during a pre-application meeting and initial review comments.

Project Description

Ivanhoe proposes a unique master-planned residential community containing four villages with a mixture of for sale and rental housing options. The residential villages are integrated through a comprehensive pathway system, a large open space park, two pocket parks, woodland corridors and other natural features. (See Submittal Package, SP-3).

Per the City's Master Plan, an objective is to "*Attract new residents to the city by providing a full range of quality housing opportunities that meet the housing needs of all demographic groups including but not limited to singles, couples, first time home buyers, families and the elderly*." Some objectives to help accomplish this include "*hold[ing] current residents within Novi as they age, both Baby Boomers and young adults who grew up in the community*" and "*capture growth opportunities that will enhance short-and long-term viability of the community*." The plan for the Grove is guided by these Master Plan objectives and will be a unique multi-generational community. Our marketing plan is targeted to those types of residents – young residents and families and professionals.

Site and Relationship to the Adjacent Trinity Parcels

The subject property consists of the majority of the land owned by Trinity Health-Michigan located on 12 Mile and Meadowbrook Roads (the "Trinity Health Property"). The Trinity Health Property is currently zoned OST (Office Service Technology). Ivanhoe entered into an agreement with Trinity Health in November 2022 to acquire 62 acres of the Trinity Health Property, leaving an approximate eight-acre parcel at the corner of 12 Mile and Meadowbrook Roads for future business development for the creation of a compatible mixed-use development of the overall Trinity Health Property

While Trinity is retaining ownership of the corner, Ivanhoe has discussed options with Trinity during Ivanhoe's due diligence including the best complementary uses for the sites. Ivanhoe also conferred with Trinity during a review of use options, initial planning and design, evaluation of woodlands and wetlands, overall connectivity, and the setbacks/buffering needed. Ivanhoe's layout of residential buildings and landscaping buffers ensures that any future development of the corner parcel can be integrated to create a unified development. Based on those discussions, Trinity Health supports the uses and site plan layout, including the deviations Ivanhoe is requesting for the setbacks and landscaping that will separate the two properties Trinity agrees that our uses, open space

configuration, series of non-motorized pathways, and design features will be complementary to future users of the remainder of the Trinity Health Property.

Adjacent Land Uses

The Property is close to a variety of office, retail, recreation, entertainment, and residential land uses. The entire eastern boundary of the Property abuts approximately 32 acres of MDOT right-of-way adjacent to the M-5 expressway, which is an undeveloped open space natural area containing wetlands complex and woodlands corridor and which is used, in part, for storm drainage for the highway.

To the north, across 12 Mile Road is the Beacon Hill Mixed Use project (which contains residential, future commercial and a City park, which was also developed by Ivanhoe) and MSU's Tollgate Farms. Ivanhoe's site is linked by pathways anchored by a City of Novi trailhead and park, developed and previously deeded to the City by Ivanhoe as part of the Beacon Hill mixed-use project. There is also an older office/type building on the southwest corner of 12 Mile Road and Meadowbrook.

The property is located within easy biking or driving distance to many commercial uses, including Twelve Oaks Mall and Twelve Mile Crossing at Fountain Walk. A substantial amount of office/commercial is located to the east and across M-5 there is a small office park and the I-96/M-5 interchange.

Environmental Factors and Open Space

About one-third of the site, or 38 acres, will be green space. At least 20% of the site will useable open space, which is almost 10 times what the City's Zoning Ordinance requires. Other green areas that will be viewed as open space by our residents and visitors include 16 acres of natural forested areas, wetland areas and attractive detention areas. (See Submittal Package, SP-3.4).

The design of the Grove specifically included consideration of how the open spaces on the Property would relate to preserved open spaces on adjacent properties. Thus, The Grove's 38 acres of total green space, combined with the adjacent MDOT property to the east (34 acres) and land included in a conservation easement to the south (around 6 acres abutting The Grove), create 80 acres of connected natural wildlife habitat. In addition to the aesthetic appeal of this cumulative open space, it provides an extensive habitat for squirrels, raccoons, rabbits, other small mammals, and a variety of small birds. A pathway with observation areas on the Property adjacent to the MDOT wetland mitigation conservation easement will allow residents to appreciate this natural area.

Scattered small wetlands are located throughout the Property, in which invasive species are present. These wetlands have been flagged and were reviewed by the City's environmental consultant, who concurred that the highest quality wetlands are being conserved, with only the low-quality wetlands being disturbed by the proposed residential development. (See Submittal Package, Survey, SP-8).

As noted in the survey, the development will be saving high quality wetlands and impact low quality wetlands that contain invasive species. See the attached Wetland Survey for more information. The location, topography, and natural features present development challenges which is why it remains one of the larger pieces of undeveloped properties left in the City, particularly considering the size and configuration of buildings typically developed for OST uses. These challenges also provide

opportunities to create something unique, impactful, and synergistic with the key nearby, large-scale retail shopping areas in the City—Twelve Oaks Mall, Fountain Walk and Novi Town Center.

There is no known environmental contamination history of the site. There are also no known above or underground storage tanks of any kind. No hazardous or toxic chemicals will be stored on-site. No underground storage tanks, wells, or septic tanks are proposed and none will be permitted.

Storm Water Disposal
Stormwater will be collected by sewers and directed to a series of on-site forebays and detention basins. The water will be held in the basins and released to the on-site wetlands at a controlled rate.

Economic Benefit
There are many reasons that the Property has not been developed with OST uses in the past. On a site-specific basis, there are scattered wetlands and woodland corridors that significantly inhibit the area available for development of OST buildings and the large parking lots required. The need for additional office spaces in Novi, Southeast Michigan, and nationally have changed in the last few years. The office vacancy rate has increased, with more people working from home or virtually. Thus, the demand for office uses has decreased. And there is available land more suitably situated in the City to accommodate any future demand for OST uses. Conversely, as reflected in the marketing consultant reports submitted by Ivanhoe with its PRO application materials, the demand for different types of residential uses has increased.

The City's recent Land Use Planning Consultant, Beckett & Raeder, reached a similar conclusion during its work on the City's Master Plan update. Beckett & Raeder recommended that more flexible uses, including residential uses, would be appropriate for the Property in order to respond to these changing trends.

As noted in our marketing reports, the stress in recent years on brick-and-mortar stores is well documented. Many shopping malls around the country and in Michigan are failing and some have closed. Oversaturation of commercial lands and loss of on-site sales means that new residential areas are needed to support the existing and future retailers and restaurants. The Grove is perfectly positioned to provide easy access to Twelve Oaks Mall, Fountain Walk, Novi Town Center and other uses within a convenient walking, bike or driving distance (refer to the maps in the submittal booklet).

In addition to the substantial property tax revenue to be achieved from Property that has sat vacant for many years, there will also be an economic benefit to the City during construction. There will be jobs in the construction industry, and with businesses that provide supplies or support services. We anticipate hundreds of contractors on site at various times during each of the phases.

For more detail, see the separate economic market studies was prepared by CBRE (confirms the lack of office market), Berkadia and Village Green (confirms the demand for multiple family), and the nationally known The Chesapeake Group (highlights various market factors) provided with our submission.

Community and Social Impact

There are three key factors that drive this development. First, the size of the Property offers the opportunity to provide diverse, multi-generational, but integrated housing options in one

development. Second, the isolated location of the Property and the natural features on and around the site are ideal and attractive for a successful residential project. The Property is also currently vacant and undeveloped and therefore there is no relocation of existing uses or persons required as part of this development.

Moreover, the entire east side of the property—over 2,200 hundred feet—abuts the M/5 right-of-way which will remain undeveloped. That MDOT-controlled property contains a wetlands complex, woodland corridors, and storm drainage features. A pathway with observation areas on the Property adjacent to the MDOT wetland mitigation conservation easement will allow residents to appreciate the natural area. (See also our Mobility Plan section at the end of this report).

Finally, consistent with the City's objectives and goals for sustainable development and Ivanhoe's own development philosophy, the Project will include numerous sustainable design features that will create positive community impacts, such as: EV charging stations; bike racks and bike storage space; use of native vegetation and strategically placed canopy trees; applicable plumbing fixtures shall be Water Sense labeled or an equivalent standard; use of energy efficient exterior building materials, glass/glazing and insulation; installing smart scheduling technology for water use; and LED exterior lighting.

Demands on Police Services
Based on Police Department records, the per capita response was one Police Department response for every 2.63 persons. Based on the expected residential population of 650 to 800 persons, it is estimated that between 247 to 304 annual Police Department calls would be made from this project. These numbers are similar to other residential areas.

Demands on Fire Services
Between 2002 and 2017, the Novi Fire Department responded to 25-30 structure fires per year (for a population of roughly 60,000 persons). Based on the estimated Grove population in Novi of 650 to 800 persons (a small overall increase in population to the City), the total projected annual Fire Department responses is one or less calls based on previous data collected. The project is also located approximately 2.5 miles from Fire Station No. 1 at 42975 Grand River Avenue, Novi, Mi 48375. Due to the proximity of the fire station, response time is expected to be only a few minutes.

City Performance Standards
The proposed Grove development shall comply with all existing City Performance Standards found in Section 5.14 of the Novi Zoning Ordinance.

Utility Connections
It is anticipated that the project will require approximately 149 sewer and water taps. The Grove will connect to the existing 24" and 16" watermain at three locations and the existing 21" and 12" sanitary sewer at two locations. These facilities have adequate capacity to accommodate the increased demand. Detailed sanitary and water needs will be determined as the engineering design process evolves.

Refuse and Solid Waste Disposal
The Meadows will have refuse and solid waste locations located adjacent to each building. These locations will include recycling containers. The rest of the units will use individual receptacles which will be stored in the individual units' garage.

Traffic and Transportation Impacts

Ivanhoe's traffic engineers at Fleiss & VandenBrink compared the number of expected trips in the peak hours for a typical office use with the number of trips expected with the residential use. A typical OST development, for example, would generate far more traffic. Peak hour traffic differences are even more dramatic as shown in the table below (this Table 5 is from the separate Traffic Impact Study. The traffic benefits could be even greater if people walk or bike to nearby retail and restaurants in the area. Ultimately, the Grove development's close proximity to nearby commercial areas can slightly help reduce the overall Vehicle Miles Traveled (VMT) since there are established and proposed walking and biking trail connections.

Notably, the development combines 12 parcels, which could otherwise be developed into individual access points, into one unified destination and just three? access points. This means less conflicts with people traveling along the 12 Mile and Meadowbrook pathways, and less potential for crashes for all types of travelers.

Table 5: Rezoning Trip Generation Comparison

Zoning	Land Use	ITE Code	Amount	Units	Average Daily Traffic (vpd)	AM Peak Hour			PM Peak Hour		
						In	Out	Total	In	Out	Total
Existing Zoning (OST)	General Office Building	710	984,600	SF	8,487	1,053	144	1,197	188	920	1,108
Existing Zoning (OST)	General Office Building	710	738,450	SF	6,608	822	112	934	148	725	873
Existing Zoning (OST)	General Office Building	710	492,300	SF	4,643	580	79	659	106	517	623
Maximum for Existing Zoning			*984,600*	*SF*	*8,487*	*1,053*	*144*	*1,197*	*188*	*920*	*1,108*
Proposed Zoning (RM-2 w/ PRO)	Single-Family Attached Housing	215	182	DU	1,336	22	67	89	62	43	105
	Multi-Family Housing (Low-Rise)	220	256	DU	1,716	24	78	102	83	48	131
	Total for Proposed Zoning				*3,052*	*46*	*145*	*191*	*145*	*91*	*236*
Difference					**-5,435**	**-1,007**	**1**	**-1,006**	**-43**	**-829**	**-872**

Mobility Plan

The Grove will be a walkable and interconnected community consistent with the "Walkable Novi" Plan and the City's new Mobility Plan. The Grove will contribute to the completion of over 3,540 feet of bike and walking paths along 12 Mile Road and Meadowbrook Road. These pathways allow easy access to the Michigan Air Line Trail, M-5 Metro Trail as well as the I-275 Metro Trail (refer to the submittal booklet for a map). These pathway connections also provide access to the MSU's Tollgate Farms, and the Beacon Hill Park access trail, which was developed by Ivanhoe as part of the Beacon Hill mixed-use project on the north side of 12 Mile Road.

Internally, The Villages are tied together by an extensive pathway system and recreational and natural amenities, including an approximate 5.5-acre central gathering park, pocket parks, a nature area, clubhouse and pool facilities, pickleball courts and a dog park (See Submittal Package, SP-3.4). We have widened some of the pathways to 10 feet, instead of the typical 8-foot width, in the areas where we anticipate use to be highest. Those wider pathways are shown in the submittal booklet and on the plan sheets.

In addition to the walking and bicycling pathways, we are also promoting the use of transit. There will be access to a new bus stop for residents to connect to SMART's Route 740 along 12 Mile Road. If approved by SMART and the City, Ivanhoe will construct a new bus stop as part of its public contributions.

Noise Impact Statement (Waiver Request)

The development will not create additional levels of noise that are not otherwise normally associated with residential areas. The level of noise from the residential development will be much less in comparison to potential noise levels that would come from OST use of the Property. The noise generated from the residential area is also much less significant than noise from the nearby freeway. There are no other single family uses adjacent to the development. Therefore, we are requesting a waiver for the Noise Impact Statement that is required for Special Land Uses.

MARKET STUDY

COMMERCIAL REAL ESTATE SERVICES

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December 13, 2023

Gary,

Per your interest in an overview of OST zoned property in Novi including available land, please review my findings below. This is only my opinion based on my observations and years of experience in commercial real estate.

Overview of Novi OST Zoned Land- 12 Mile and Meadowbrook Road

The sum of Novi, MI, developed and undeveloped OST Zoned acres is +/- 535 (22,869,000 SF of Land). Attached #1 is a general outlined aerial outline map depicting most of the OST Zoned land in Novi.

Novi Michigan Office/OST Zoned Existing and Developed SF

There has been Negative Absorption to date in 2023. Attachment #2 is the CBRE third Quarter Repot substantiating the negative absorption.

Climbing Office vacancies in general in Metro Detroit (attachment #3) are increasing quarterly at historic rates and again are at historic negative absorption rates. This trend will continue remain for the foreseeable future as home related working with AI, Cloud and other Computer-Generated Systems enable this.

The redevelopment of Office buildings will be very long and tenuous process. Many of these buildings will be demolished and redeveloped into Data Centers and Residential Development.

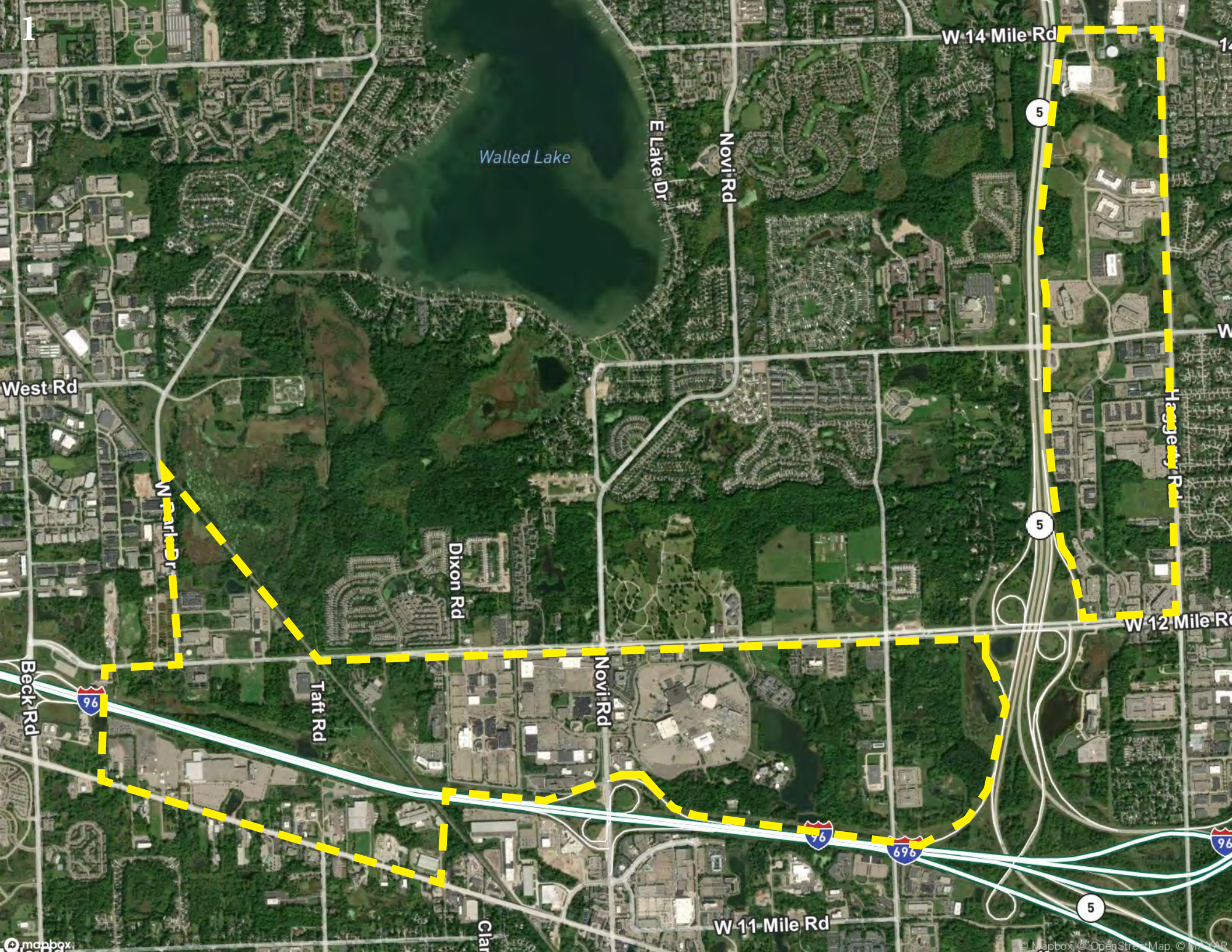
Summary

In my opinion, the balance of the OST undeveloped land, especially the larger tracts, will take years, if ever, to being absorbed under this current zoning.

The 12 Mile and Meadowbrook southeast corner is not ideal for OST zoning due to its location and geo-environmental features.

In my opinion, a high-density residential community coupled with a hard corner-12 and Meadowbrook special use would be the best use of the property.

Charles M. Ginster
Senior Vice President


1
W 14 Mile Rd
Walled Lake
E Lake Dr
Novi Rd
West Rd
W Park Dr
Dixon Rd
Taft Rd
Novi Rd
Beck Rd
W 12 Mile Rd
W 11 Mile Rd
5
96
696
mapbox
© Mapbox © OpenStreetMap © Maxar

FIGURES | DETROIT OFFICE | Q3 2023

Negative absorption continues as average lease size dips below 6K sq. ft.

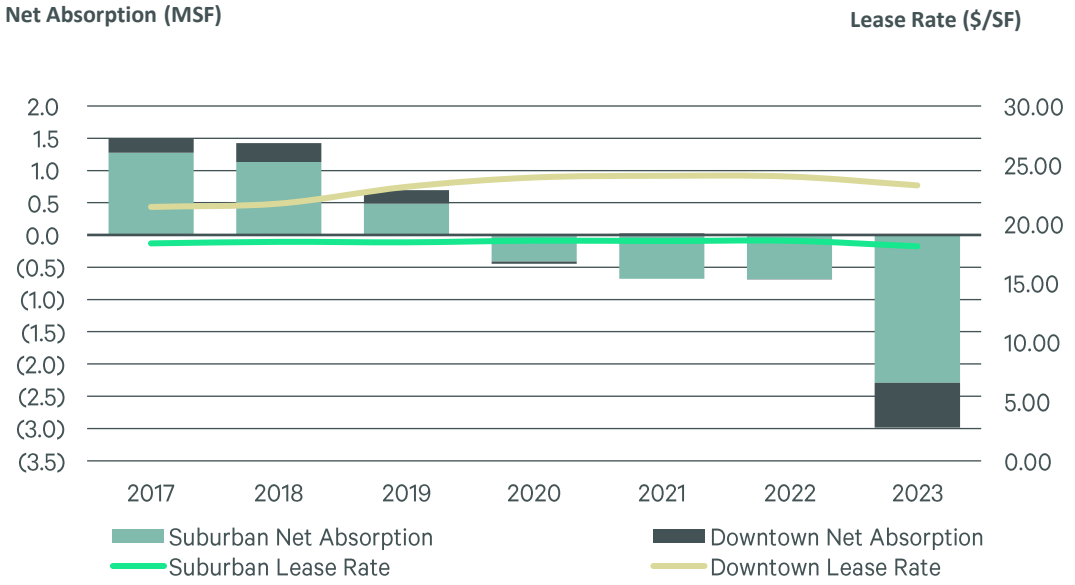
▲ 20.3%	▲ 26.8%	▼ (1,216,683)	▼ $19.09
Vacancy Rate	Availability Rate	SF Net Absorption	Lease Rate

Note: Arrows indicate change from previous quarter.

Market Summary

- Q3 leasing activity was comprised of smaller sized deals highly prevalent in the Southfield and Troy submarkets. Transactions in these submarkets consisted of Dinsmore & Shohl LLP occupying 19,400 sq. ft. at the PNC Center in Troy and Motor & Equipment Manufactures Association occupying 14,299 sq. ft. at the Riverside Center in Southfield.
- Negative absorption experienced an uptick for the 4th consecutive quarter. Several large tenants vacated or downsized significantly. The Detroit submarket was hit hardest with negative absorption in Q3 (-495,145 SF) as 1 Campus Martius saw Meridian and Compuware vacate space which combined for over 130,000 sq. ft. of negative absorption. Overall, Class A buildings experienced (-713,973 SF) of absorption, more negative absorption than Class B and Class C buildings combined.
- The construction pipeline consists of 4 buildings totaling 1,776,376 sq. ft. highlighted by the Hudson Site, scheduled to deliver in Q3 2024.
- Southfield, Troy and Detroit each displayed negative absorption over 150,000 sq. ft.
- Sublease availability saw repeated growth with over 2.3 million sq. ft. of space available on the market.

FIGURE 1: Net Absorption and Average Asking Lease Rate



Source: CBRE Research, Q3 2023

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Suburban

The suburban office market displayed 721,538 sq. ft. of negative net absorption. While still negative absorption, the suburban market experienced a positive increase in absorption compared to Q2 (-1,220,511 SF). Overall average asking lease rates for the suburban market continue to decline, as Q3 closed out with an average asking lease rate of $18.13/SF. Notably, Ann Arbor ($25.73/SF) and Birmingham/Bloomfield ($24.47) displayed the highest average asking lease rates which follows the historic trend for those respective submarkets. Available sublease space experienced another quarter of growth with just under 2 million sq. ft. of space available within the suburban market.

Downtown

Office vacancy in the downtown market continued to trend upwards in Q3, closing out at 19%. Available sublease space dropped for the 3rd consecutive quarter and direct asking lease rates fell to $23.28/SF. Downtown negative absorption totaling just under 500,000 sq. ft. in Q3 was largely due to big tenants such as Meridian and Compuware, vacating space at 1 Campus Martius. As tenants continue to navigate the return to office, the market has experienced downsizing office footprints, along with short-term leases as a post-pandemic trend.

FIGURE 2: Key Transactions

Transaction Type	Tenant / Buyer	Location	Transaction Size (SF)	Industry
Renewal	Umlaut	1225-1235 Spartan St, Madison Heights	35,497	Engineering
New Lease	Dinsmore & Shohl LLP	755 W Big Beaver Rd, Troy	19,400	Legal Services
Renewal	Motor & Equipment Manufacturers Association	25925 Telegraph Rd, Southfield	14,299	Manufacturing
Renewal	Entrega Systems Group	900 Wilshire Dr, Troy	13,190	Technology Systems
Renewal	Simons-Michelson-Zieve Inc.	1200 Kirts Blvd, Troy	11,706	Advertising

Source: CBRE Research, Q3 2023

FIGURE 3: Vacancy, Availability, and Average Asking Lease Rate

Source: CBRE Research, Q3 2023

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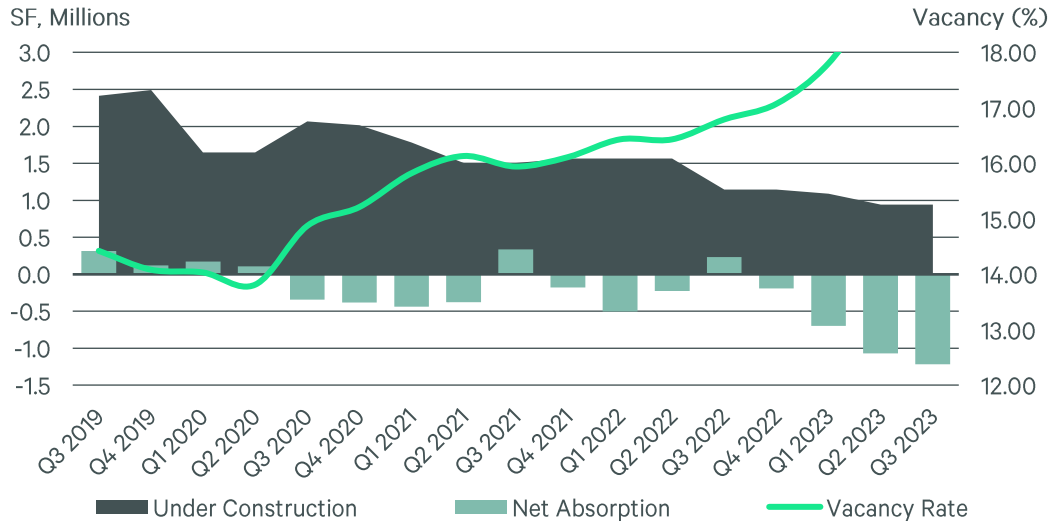
Construction

Q3 experienced no construction completions, and the construction pipeline consists of 4 buildings. Highlights within the construction pipeline include Ford Motor Company's Michigan Central Station, which is set to see first occupancy shortly after the beginning of 2024. Also, The Hudson Site at 1208 Woodward Avenue will add 655K SF to the market and is expected to deliver in Q3 2024. In total, the Detroit market closed out Q3 with 1,776,376 SF of space under construction.

Vacancy and Absorption

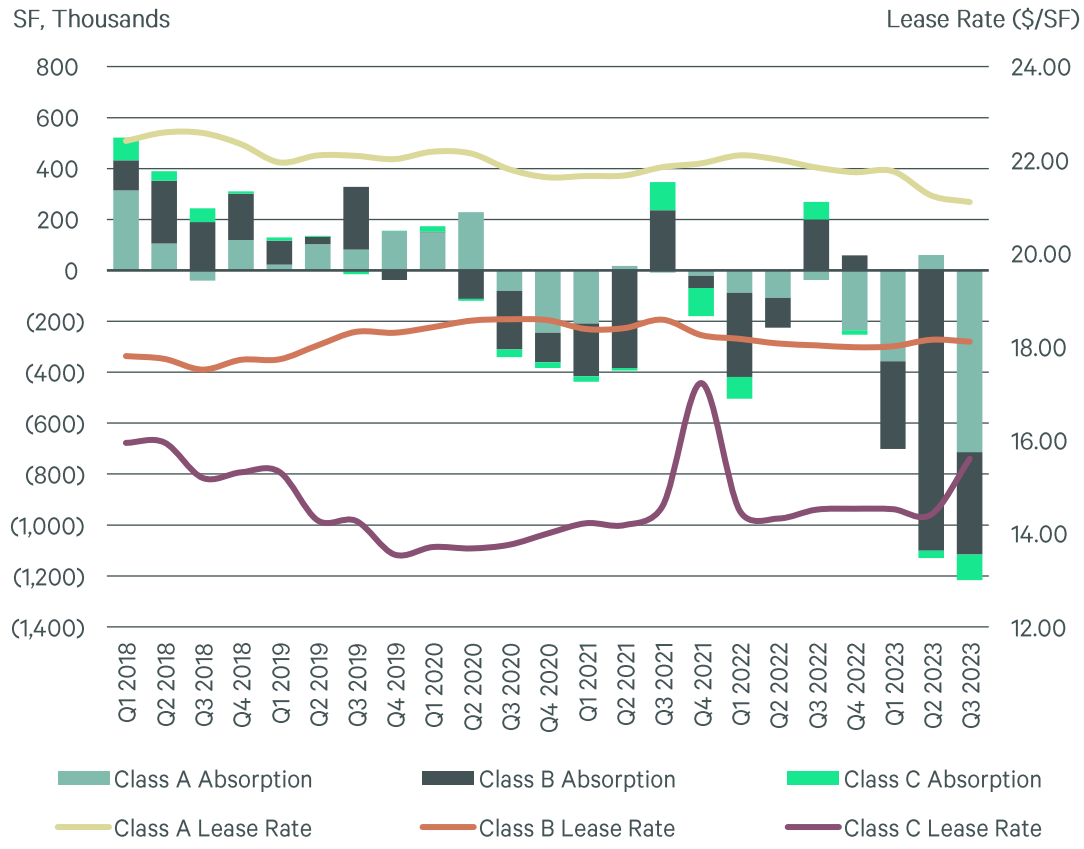
Vacancy rates saw an increase from 19.1% in Q2 to 20.3% in Q3. Net absorption remained in the red at (-1,216,683 SF). While employers continue to navigate what the future of office work looks like, the market continues to experience these trends. Although this is the 4th consecutive quarter of negative absorption in the Detroit market, the growing pace of these numbers appears to be slowing down.

FIGURE 4: Net Absorption, Under Construction Sq. Ft., and Vacancy Rate



Source: CBRE Research, Q3 2023

FIGURE 5: Net Absorption and Lease Rate by Class



Source: CBRE Research, Q3 2023

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FIGURE 6: Detailed Market Statistics by Submarket

Submarket	Market Size (SF)	Vac. Rate (%)	Avail. Rate (%)	Avail. Sublease (SF)	Q3 2023 Net Absorption (SF)	2023 Net Absorption (SF)	Gross Asking Lease Rate ($/SF)
Ann Arbor	5,800,735	17.4	22.2	258,504	(84,742)	(376,862)	$25.73
Auburn Hills	2,152,118	20.4	23.9	92,850	21,069	12,977	$19.14
Birmingham /Bloomfield	5,841,723	13.5	17.3	69,298	(45,698)	(8,056)	$24.47
*Birmingham	1,525,550	8.0	9.0	38,820	(6,150)	583	$32.38
Dearborn	4,120,297	21.8	24.5	0	(9,491)	(170,094)	$16.62
Farmington Hills/West Bloomfield	6,594,374	17.3	21.8	170,751	(33,944)	(249,020)	$17.77
I-275 Corridor	5,548,296	16.8	25.4	147,943	(44,970)	(86,745)	$18.27
Macomb	1,331,663	7.7	9.6	0	364	1,998	$16.25
Rochester	543,803	6.6	8.9	0	(12,419)	(19,313)	$15.80
Southfield	16,881,776	26.5	38.5	801,276	(183,908)	(864,375)	$16.35
Troy	12,836,496	22.7	30.9	424,300	(327,799)	(531,686)	$16.94
SUBURBAN TOTAL	**61,651,281**	**20.5**	**28.1**	**1,964,922**	**(721,538)**	**(2,291,203)**	**$18.13**
DOWNTOWN TOTAL	**18,954,779**	**19.0**	**22.4**	**371,358**	**(495,145)**	**(693,449)**	**$23.28**
METRO DETROIT TOTAL	**80,606,060**	**20.3**	**26.8**	**2,336,280**	**(1,216,683)**	**(2,984,652)**	**$19.09**

*Birmingham market is broken out from its primary submarket and its totals respectively are not included in the total at the bottom of the chart.

Source: CBRE Research, Q3 2023

FIGURE 7: Detailed Market Statistics by Index and Class

Index and Class	Market Size (SF)	Vac. Rate (%)	Avail. Rate (%)	Avail. Sublease (SF)	Q3 2023 Net Absorption (SF)	2023 Net Absorption (SF)	Gross Asking Lease Rate ($/SF)
Class A	23,173,809	18.8	24.9	868,968	(338,926)	(614,049)	$20.15
Class B	33,228,025	23.3	32.0	1,093,512	(334,002)	(1,658,331)	$17.30
Class C	5,249,447	12.1	17.2	2,442	(38,522)	(8,735)	$14.12
SUBURBAN TOTAL	**61,651,281**	**20.7**	**28.1**	**1,964,922**	**(721,538)**	**(2,281,115)**	**$18.13**
Class A	9,731,754	21.6	23.5	341,990	(375,047)	(397,427)	$24.21
Class B	7,139,750	18.1	23.4	20,124	(57,967)	(178,624)	$22.74
Class C	2,083,275	10.4	14.1	9,244	(62,131)	(117,398)	$20.68
DOWNTOWN TOTAL	**18,954,779**	**19.0**	**22.4**	**371,358**	**(495,145)**	**(693,449)**	**$23.28**
Class A	32,905,563	19.6	24.5	1,210,958	(713,973)	(1,011,476)	$21.10
Class B	40,367,775	22.4	30.5	1,113,636	(402,057)	(1,847,043)	$18.11
Class C	7,332,722	11.6	16.3	11,686	(100,653)	(126,133)	$15.60
METRO DETROIT TOTAL	**80,606,060**	**20.3**	**26.8**	**2,336,280**	**(1,216,683)**	**(2,984,652)**	**$19.09**

Source: CBRE Research, Q3 2023

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Market Area Overview

Definitions

Available Sq. Ft.: Space in a building, ready for occupancy within six months; can be occupied or vacant. Availability Rate: Total Available Sq. Ft. divided by the total building Area. Average Asking Lease Rate: A calculated average that includes net and gross lease rate, weighted by their corresponding available square footage. Building Area: The total floor area sq. ft. of the building, typically taken at the "drip line" of the building. Gross Activity: All sale and lease transactions completed within a specified time period. Excludes investment sale transactions. Gross Lease Rate: Rent typically includes real property taxes, building insurance, operating expenses, and common area maintenance. Net Absorption: The change in Occupied Sq. Ft. from one period to the next. Net Lease Rate: Rent excludes one or more of the "net" costs (real property taxes, building insurance, operating expenses, and common area maintenance) typically included in a Gross Lease Rate. Occupied Sq. Ft.: Building Area not considered vacant. Vacancy Rate: Total Vacant Sq. Ft. divided by the total Building Area. Vacant Sq. Ft.: Space that can be occupied within 30 days.

Survey Criteria

Includes office buildings 30,000 sq. ft. and greater in size. Excludes single-tenant owner-occupied buildings, government-owned-and-occupied buildings, and medical buildings. Buildings which have begun construction as evidenced by site excavation or foundation work.

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INVENTORY SF	UNDER CONSTRUCTION SF	12 MO NET ABSORPTION SF	VACANCY RATE	MARKET RENT/SF	MARKET SALE PRICE/SF	MARKET CAP RATE
7.7M +0.5%	0 -100.0%	90.8K +275.9%	11.8% -0.7%	$21.31 -0.4%	$146 -5.3%	9.9% +0.8%
Prior Period 7.6M	Prior Period 40.7K	Prior Period (51.6K)	Prior Period 12.5%	Prior Period $21.39	Prior Period $155	Prior Period 9.1%

Key Metrics

Availability	
Vacant SF	905K
Sublet SF	202K
Availability Rate	15.7%
Available SF Total	1.2M
Available Asking Rent/SF	$24.60
Occupancy Rate	88.2%
Percent Leased Rate	89.9%

Inventory	
Existing Buildings	218
Under Construction Avg SF	-
12 Mo Demolished SF	0
12 Mo Occupancy % at Delivery	6.4%
12 Mo Construction Starts SF	0
12 Mo Delivered SF	40.7K
12 Mo Avg Delivered SF	17.4K

Sales Past Year	
Asking Price Per SF	$155
Sale to Asking Price Differential	-41.8%
Sales Volume	$15.7M
Properties Sold	10
Months to Sale	3.4
For Sale Listings	13
Total For Sale SF	257K

Demand	
12 Mo Net Absorp % of Inventory	1.2%
12 Mo Leased SF	239K
Months on Market	14.9
Months to Lease	22.1
Months Vacant	2.3
24 Mo Lease Renewal Rate	59.6%
Population Growth 5 Yrs	2.1%

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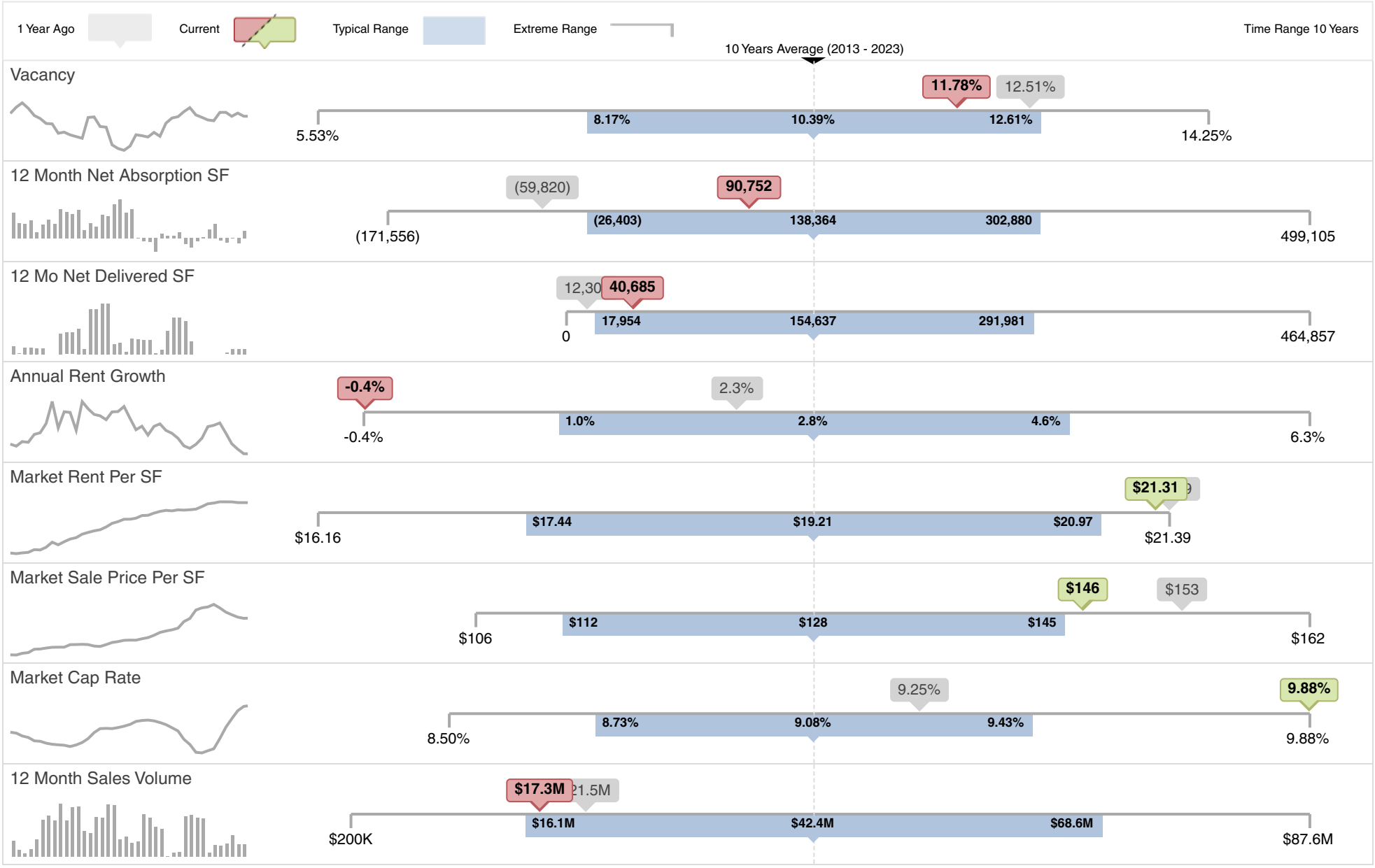
Search Analytics

Key Performance Indicators



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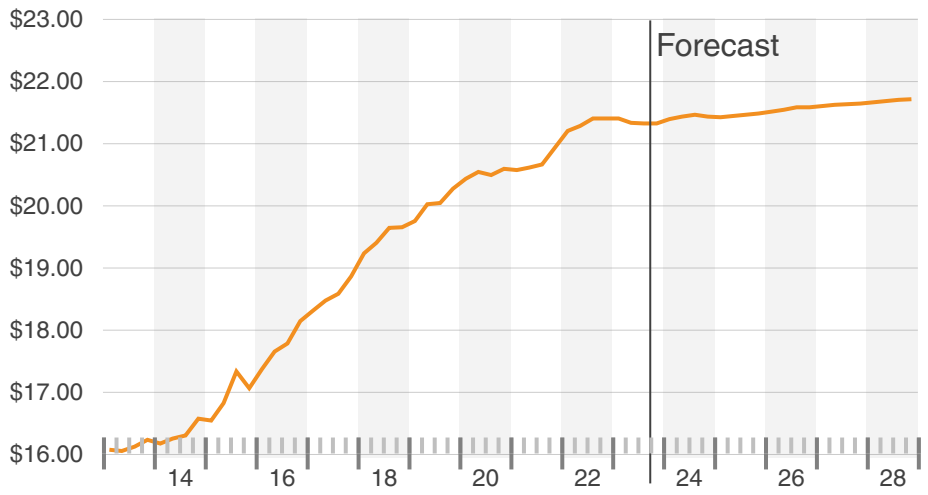
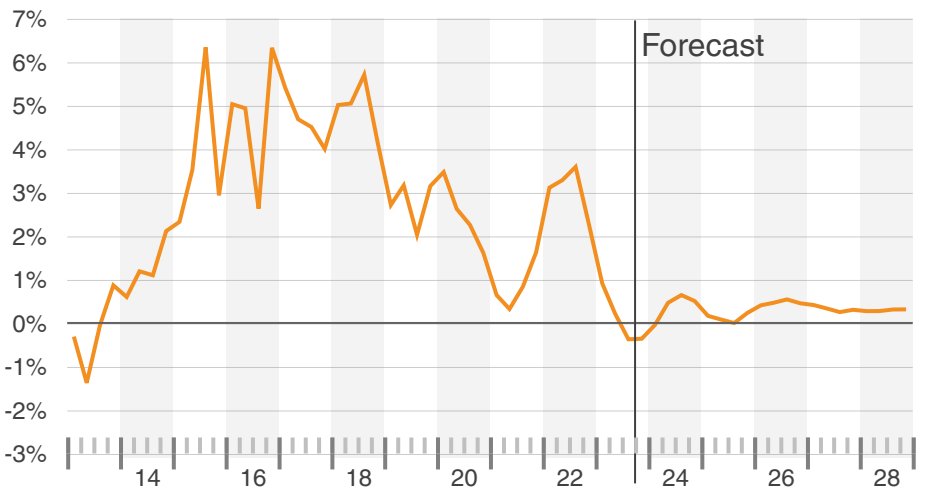
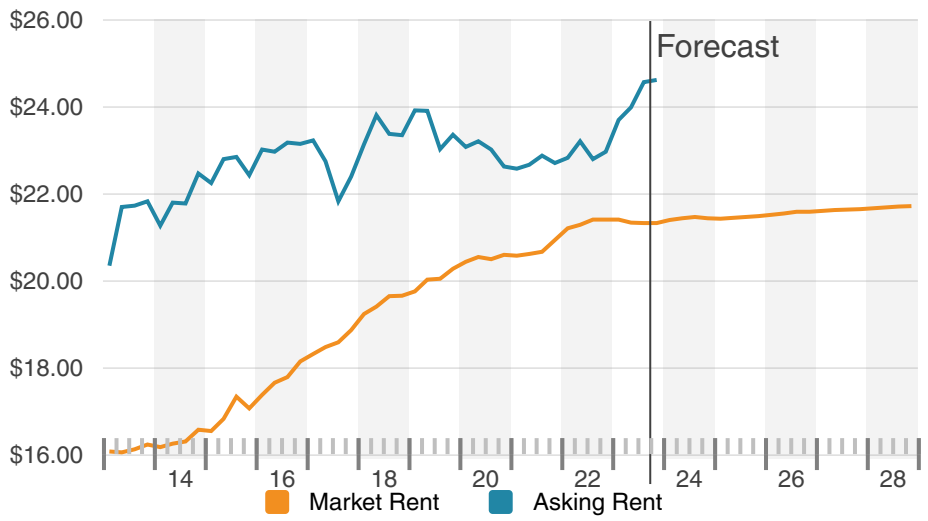
Market Rent Per SF



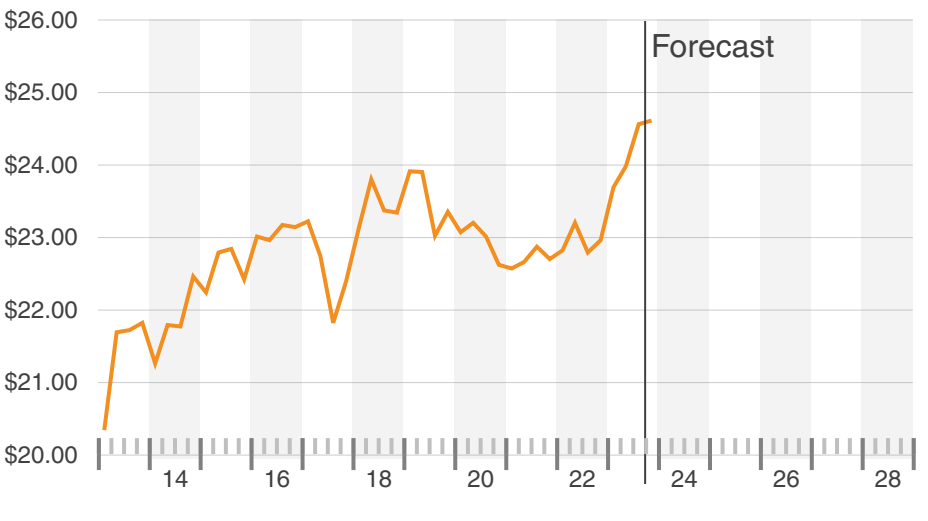
Market Rent Growth (YOY)



Market Rent & Asking Rent Per SF



Asking Rent Per SF



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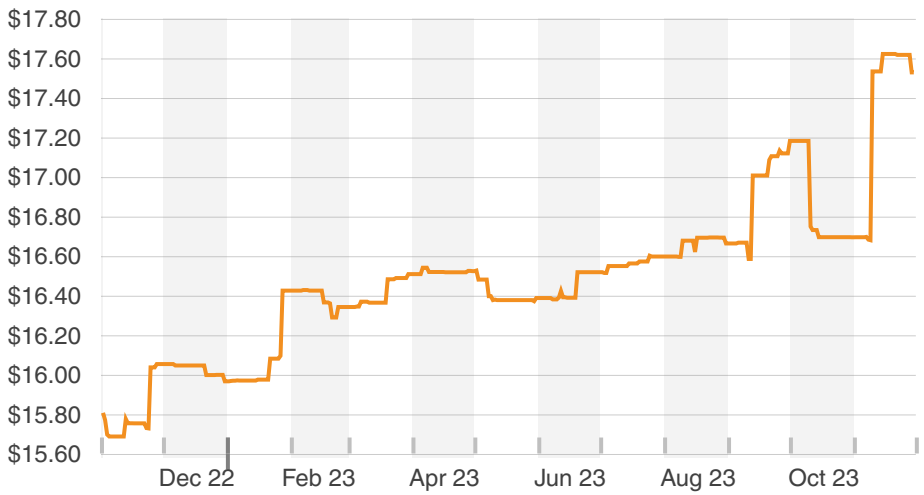
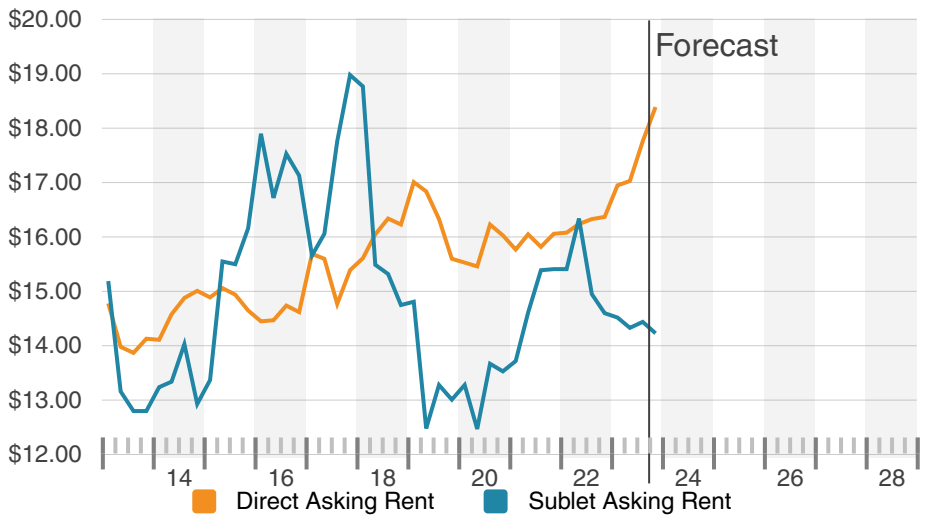
Search Analytics

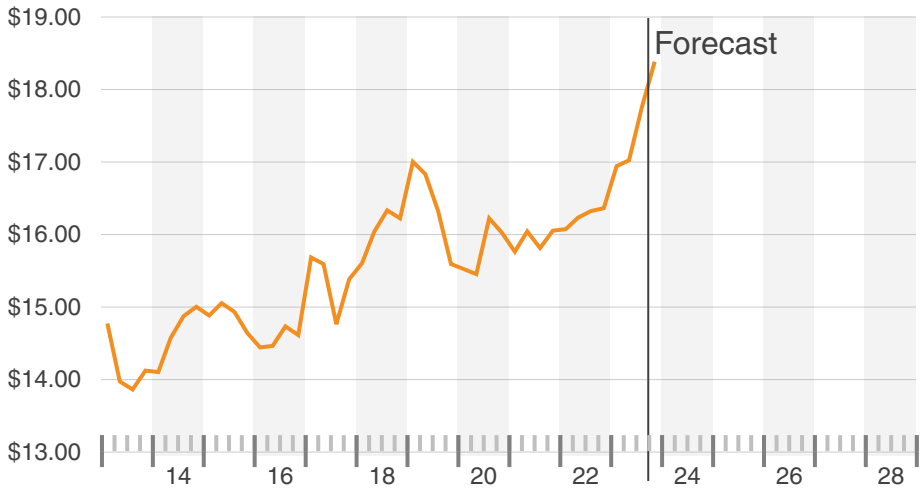
Daily Asking Rent Per SF



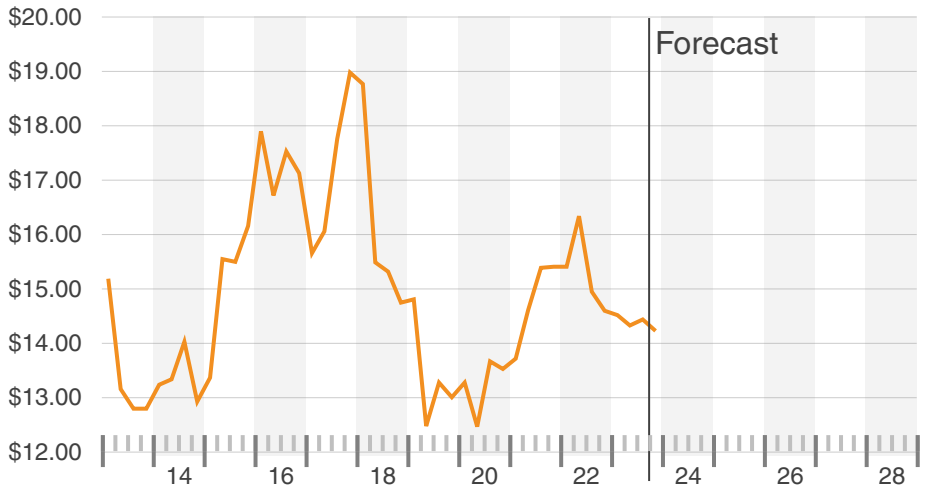
Direct & Sublet Rent Per SF



Direct Rent Per SF



Sublet Rent Per SF



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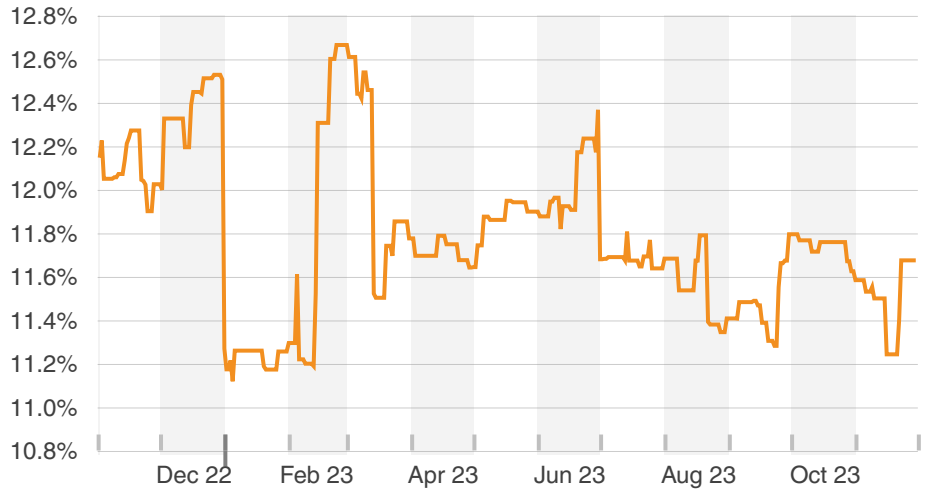
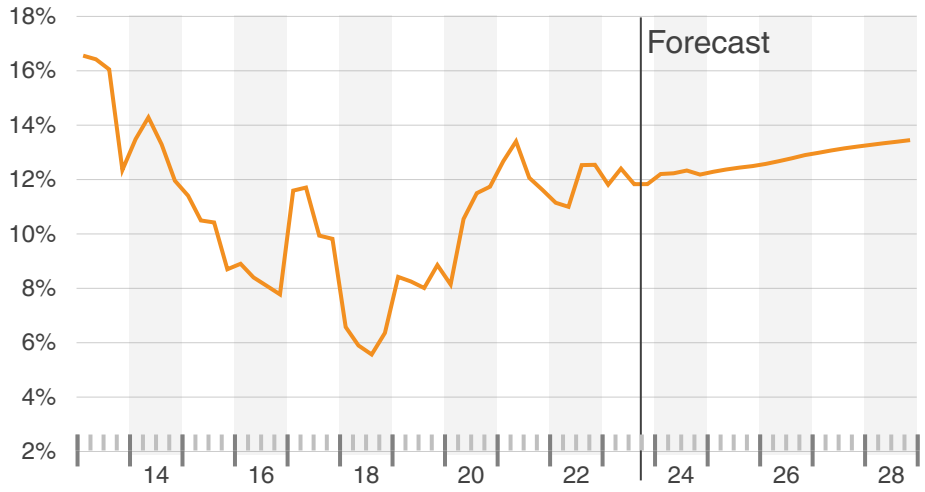
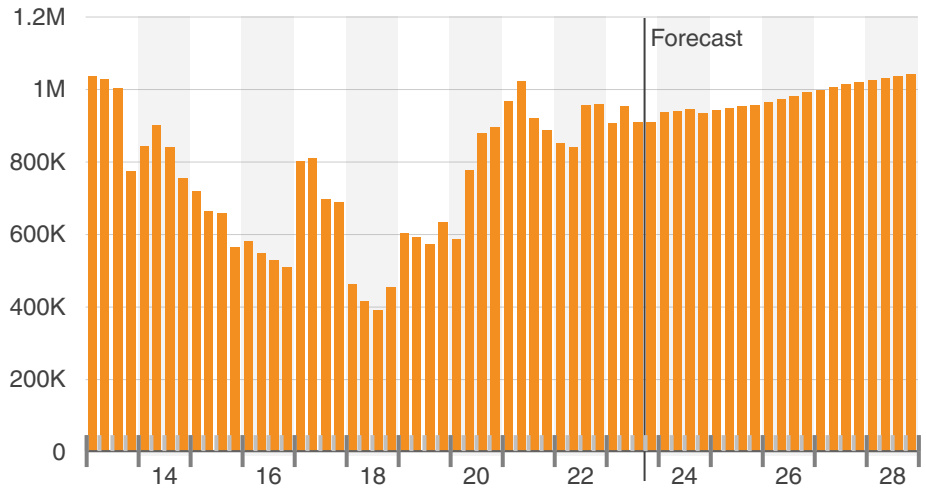
Daily Vacancy Rate



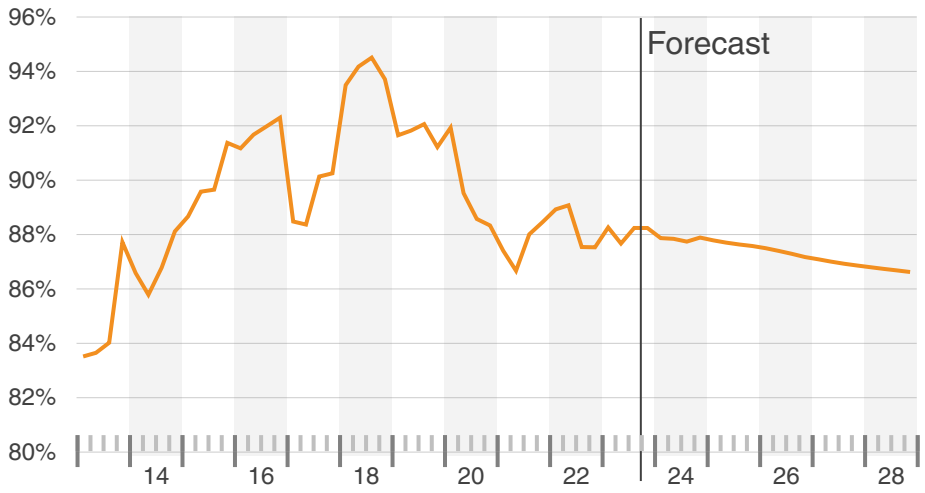
Vacancy Rate



Vacant SF



Occupancy Rate



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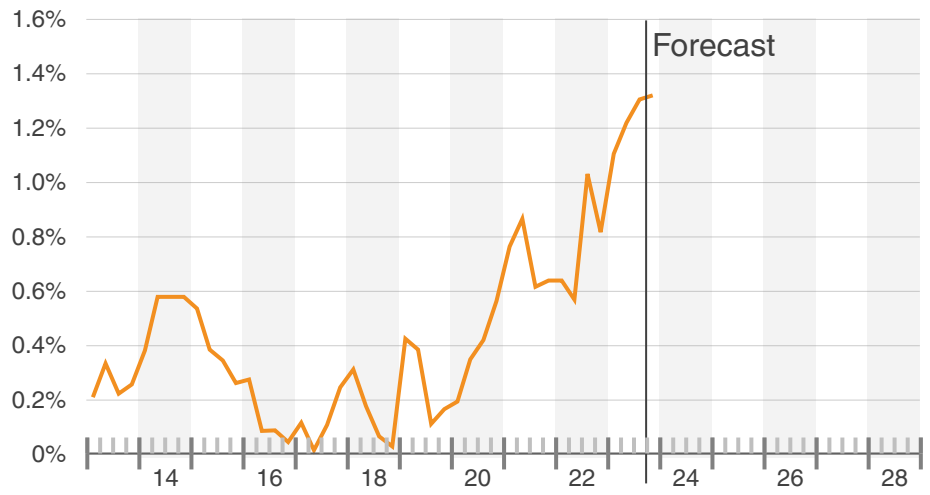
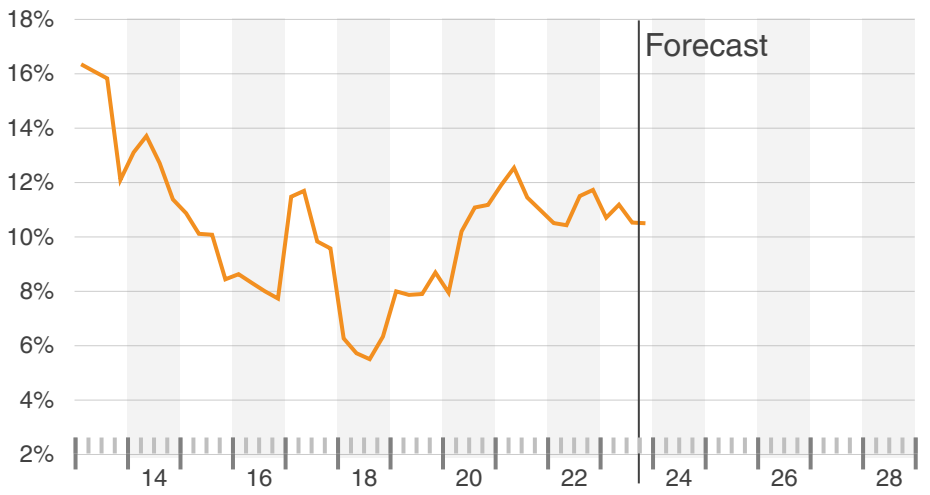
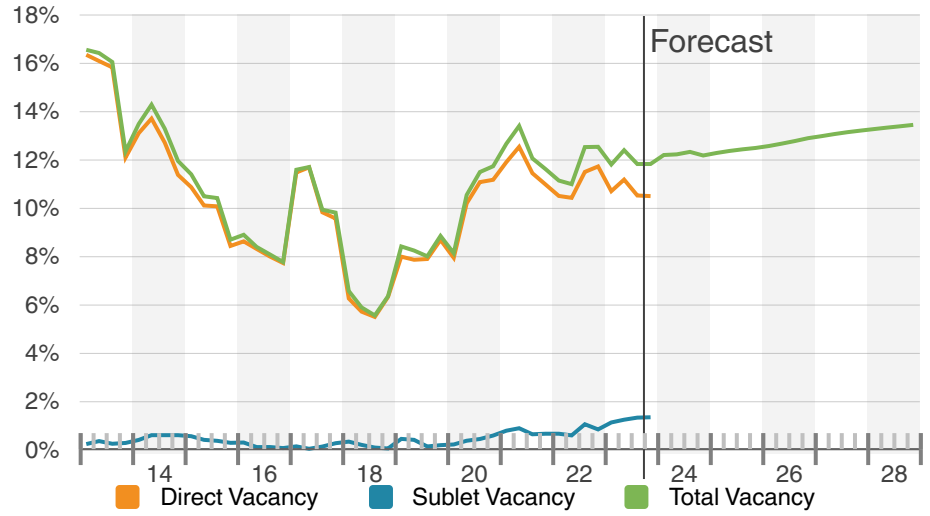
Sublet Vacancy Rate



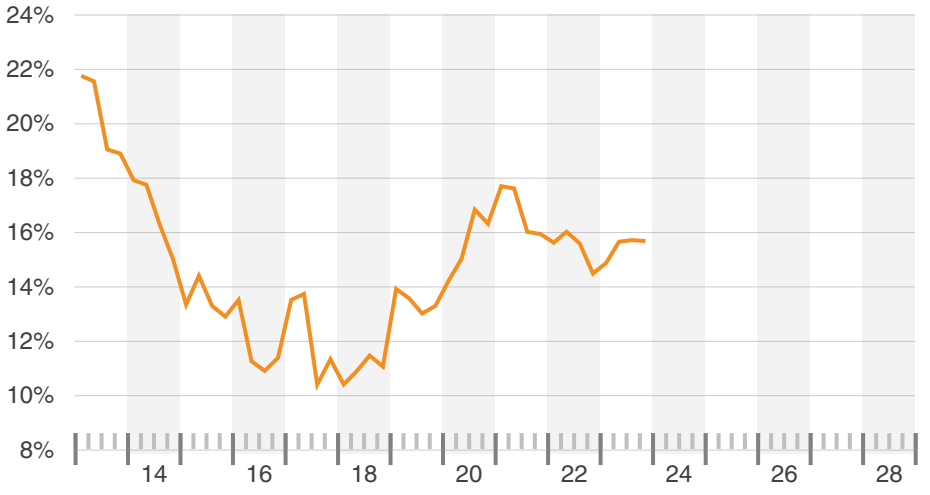
Direct Vacancy Rate



Direct, Sublet & Total Vacancy Rate



Availability Rate



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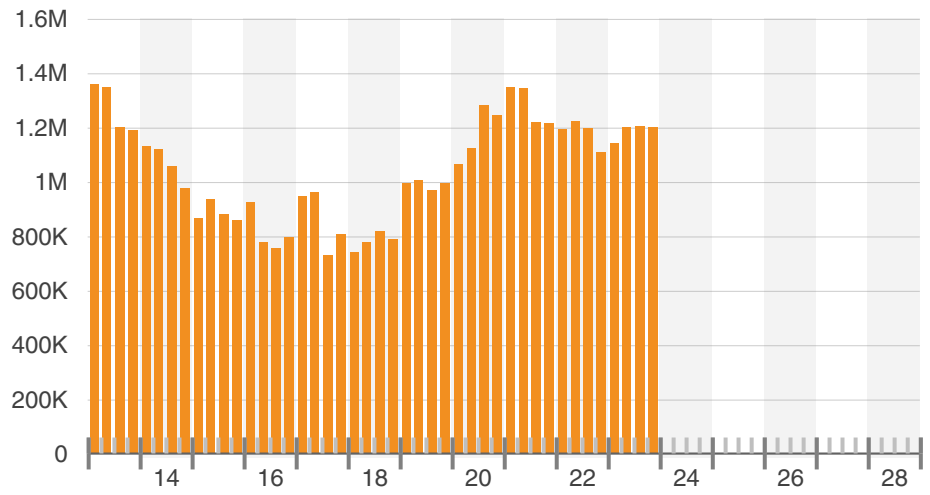
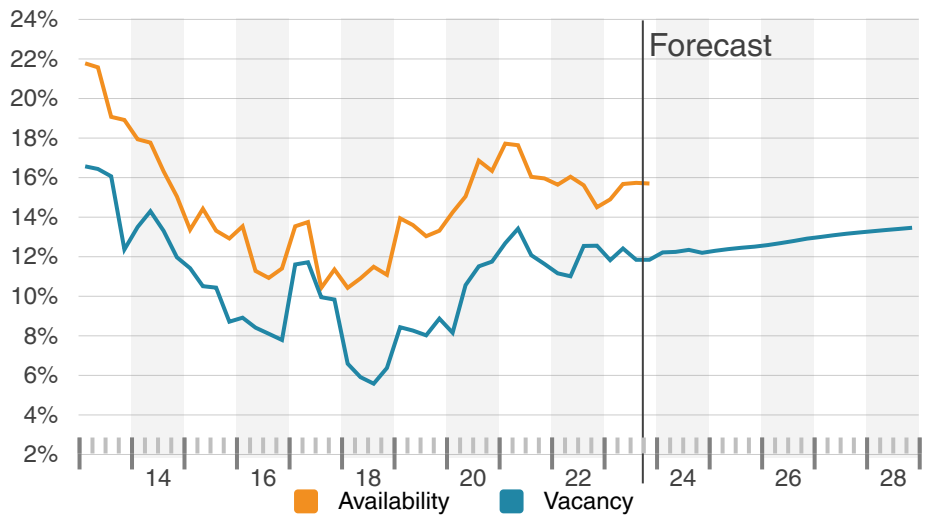
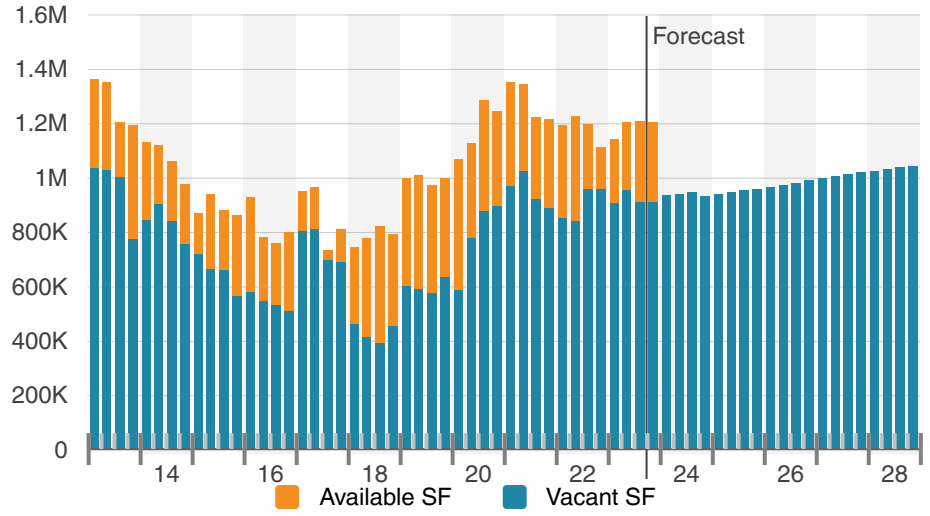
Available SF



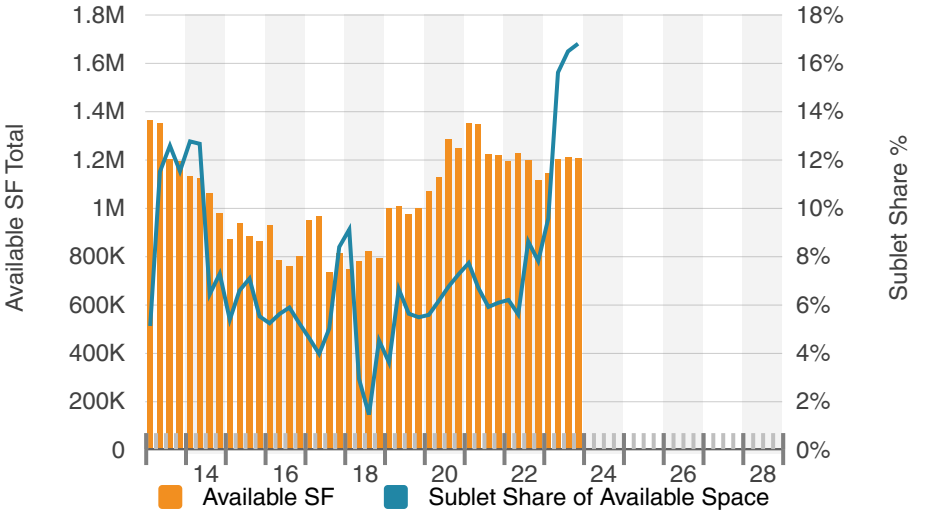
Availability & Vacancy Rate



Available & Vacant SF



Available SF Total & Sublet Share %



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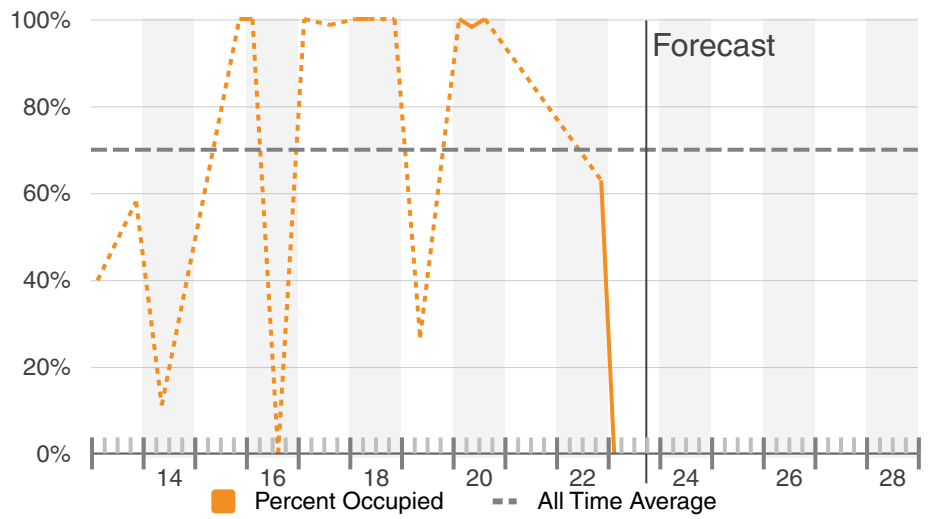
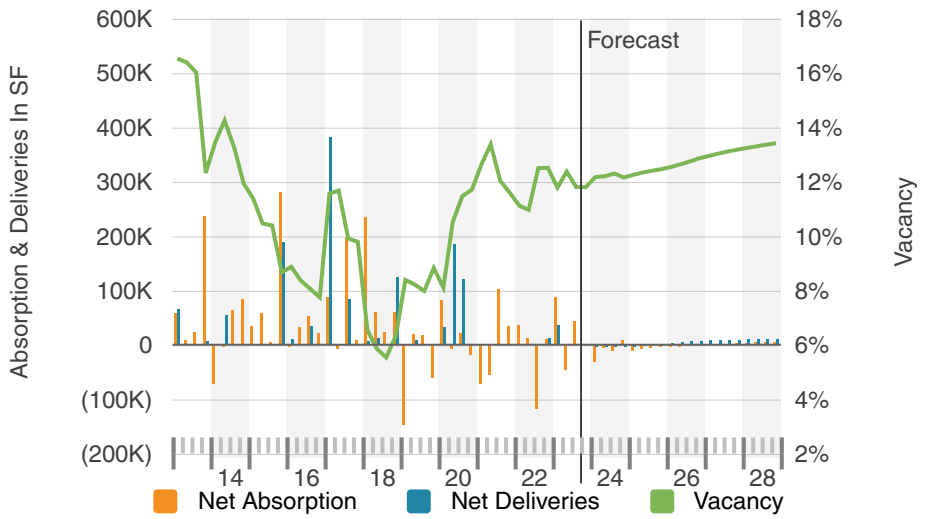
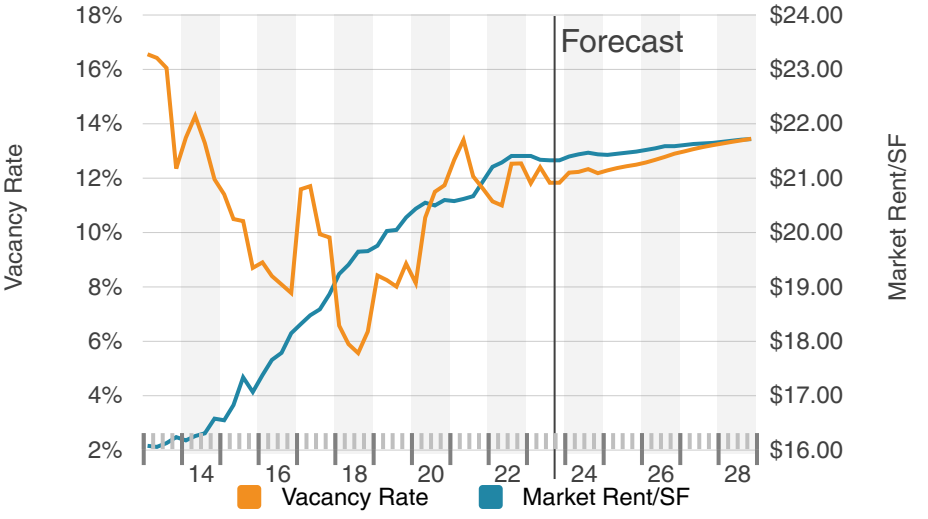
Occupancy At Delivery



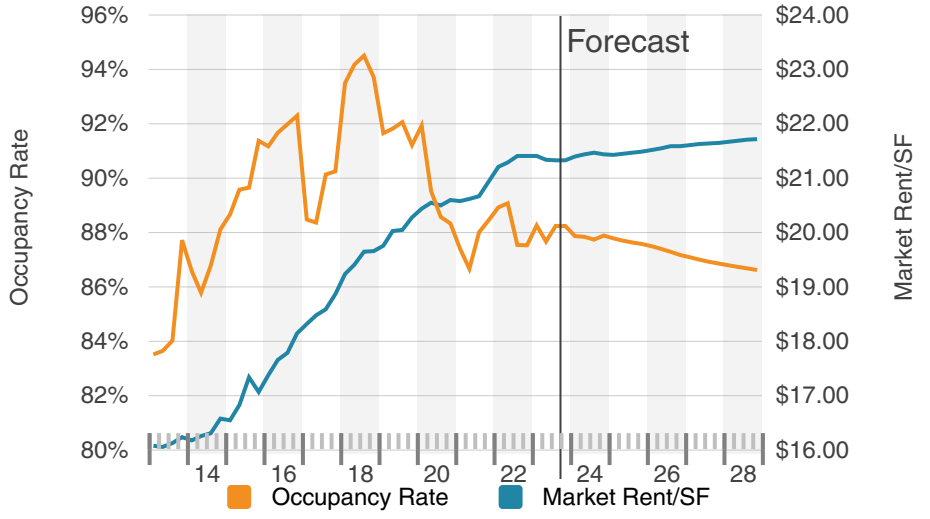
Net Absorption, Net Deliveries & Vacancy



Vacancy & Market Rent Per SF



Occupancy & Market Rent Per SF



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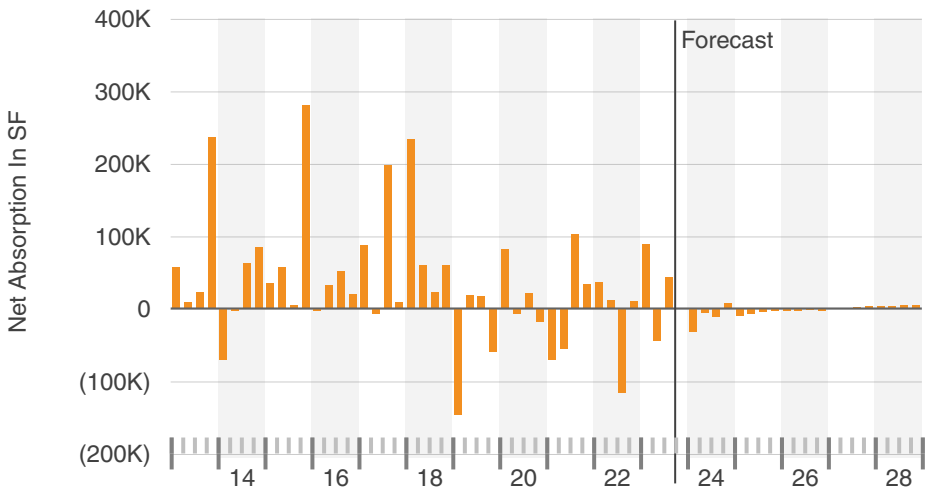
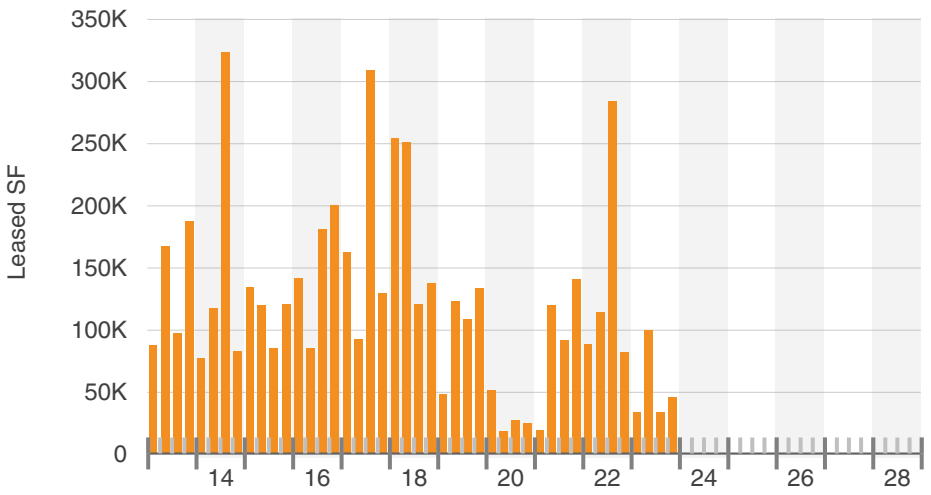
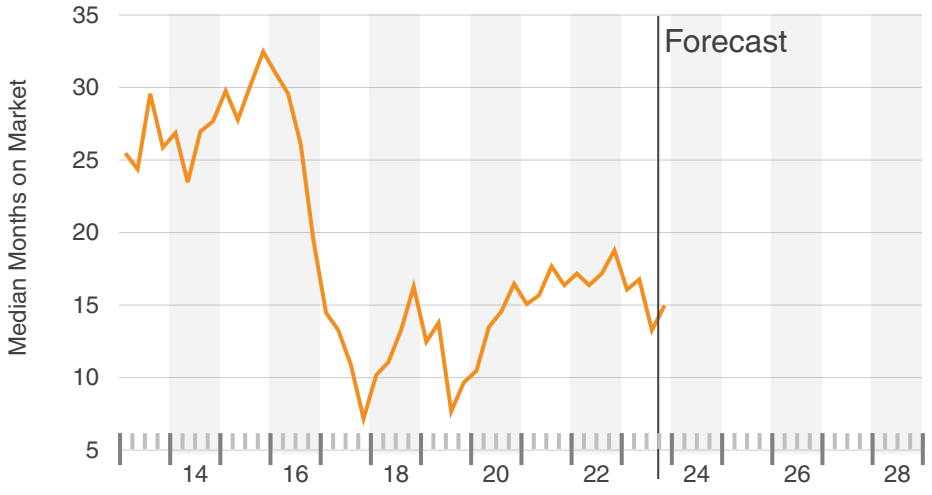
Net Absorption



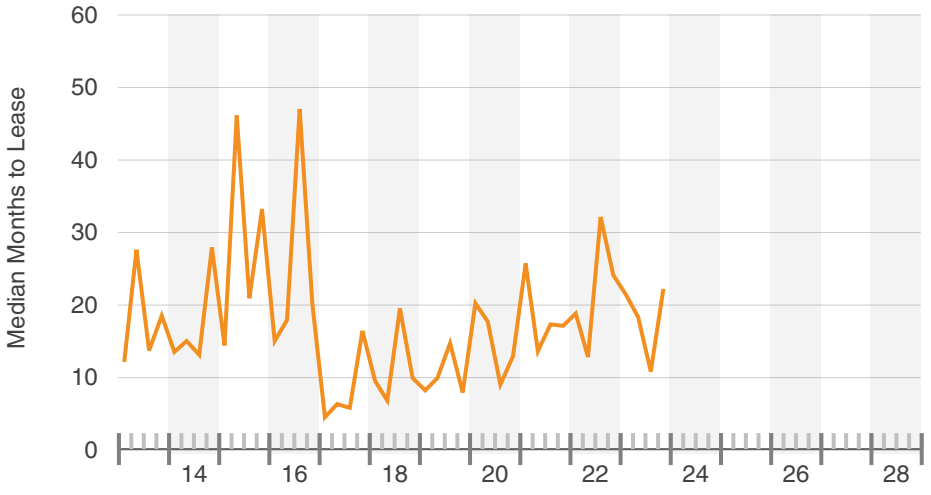
Leasing Activity



Months On Market



Months To Lease



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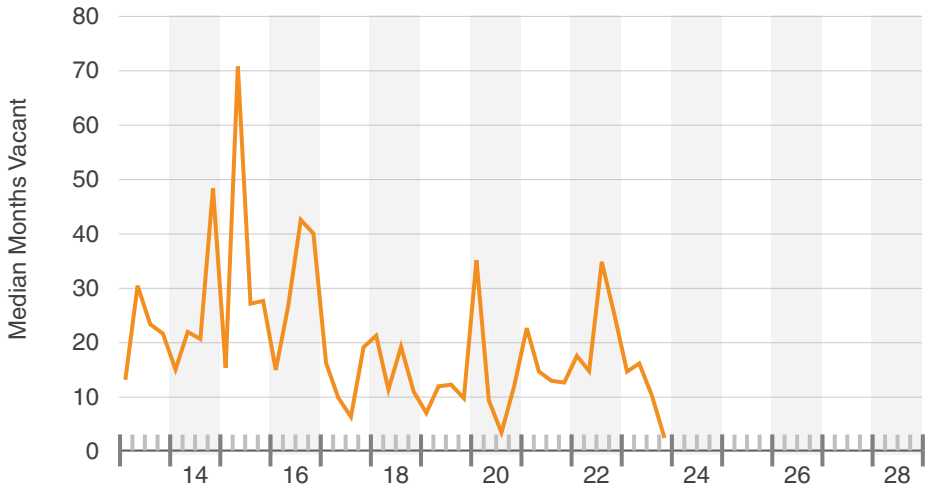
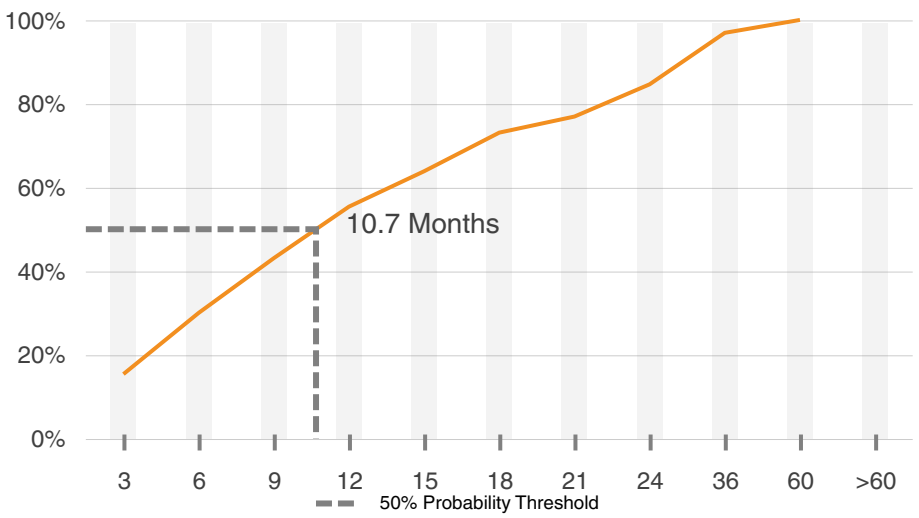
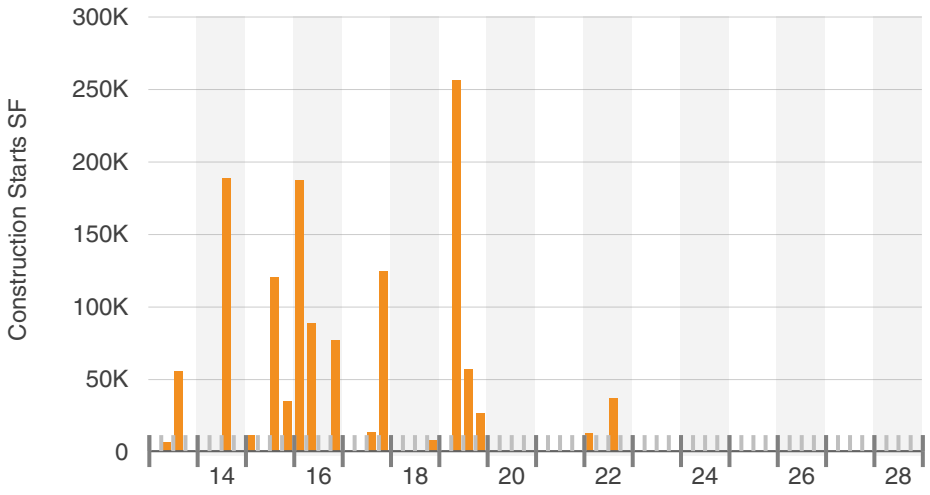
Months Vacant



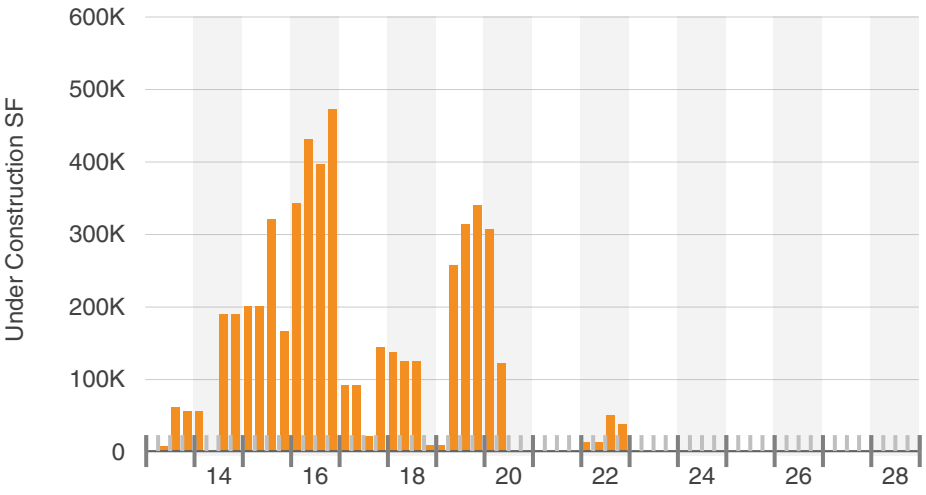
Probability Of Leasing In Months



Construction Starts



Under Construction



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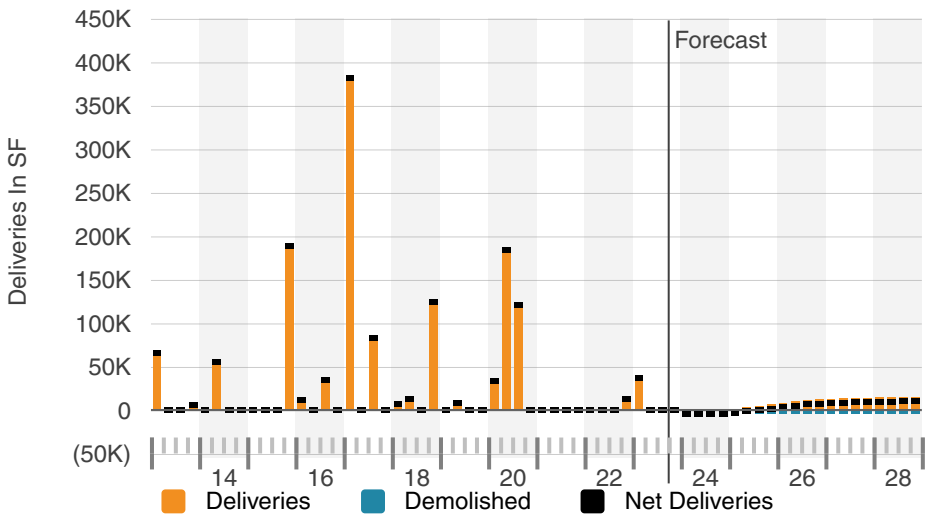
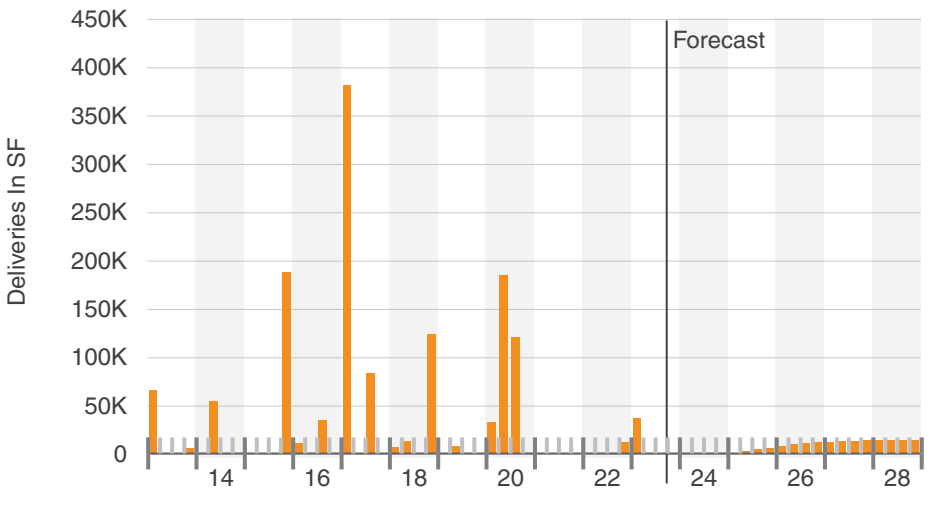
Deliveries & Demolitions



Deliveries



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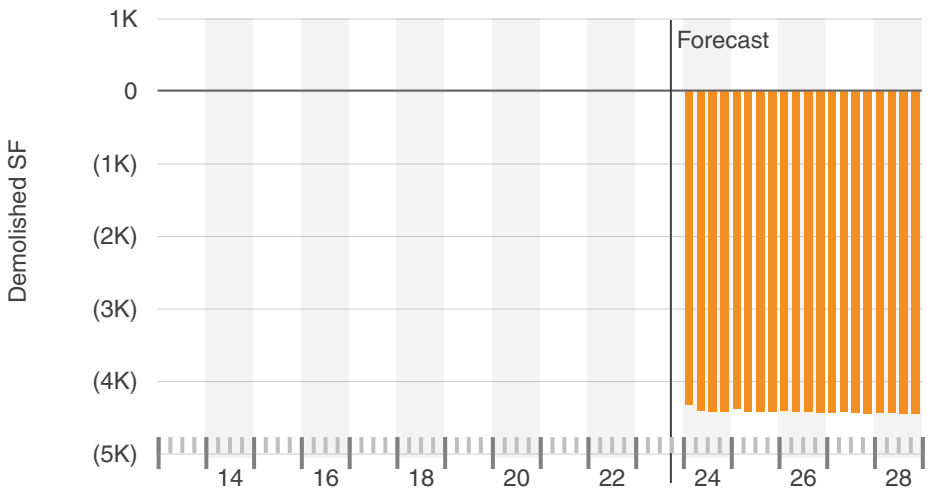
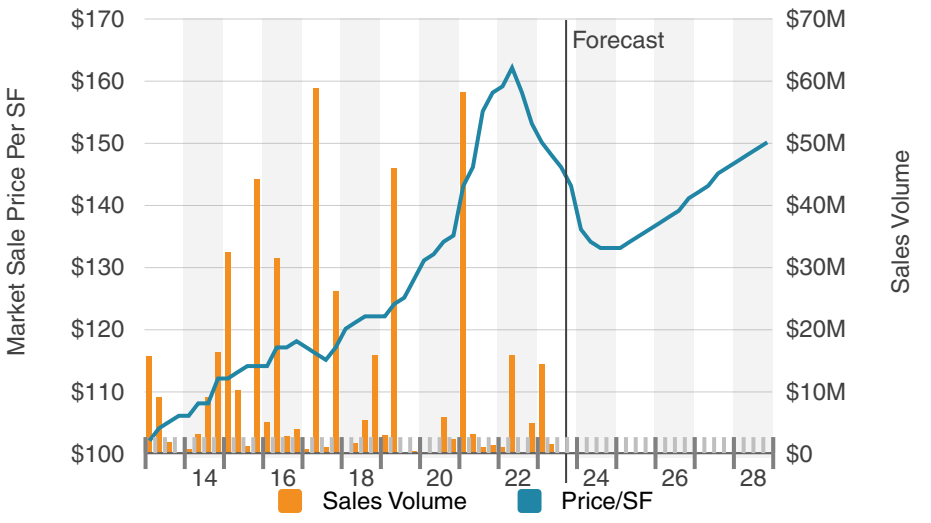


Sales Volume & Market Sale Price Per SF



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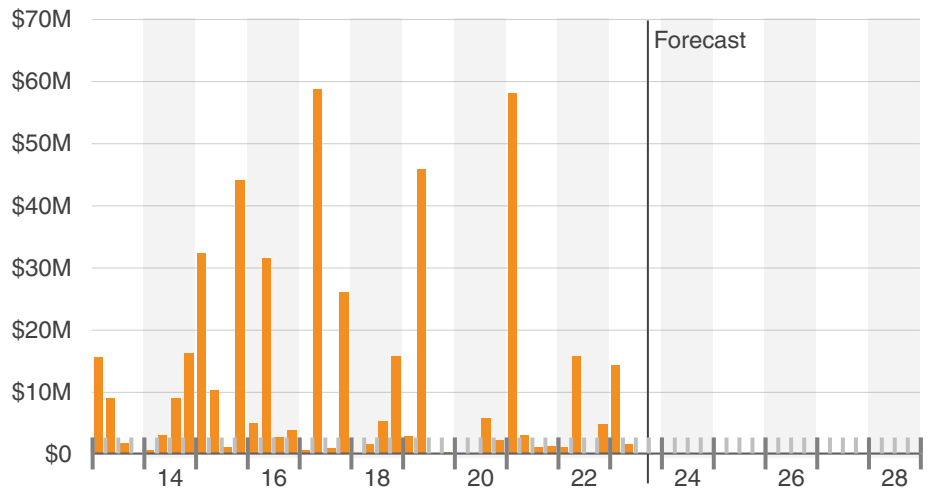
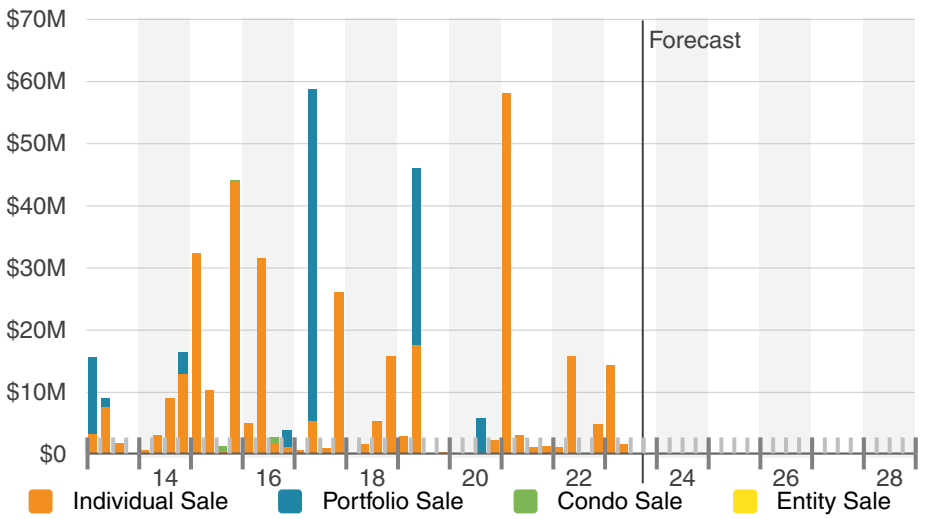
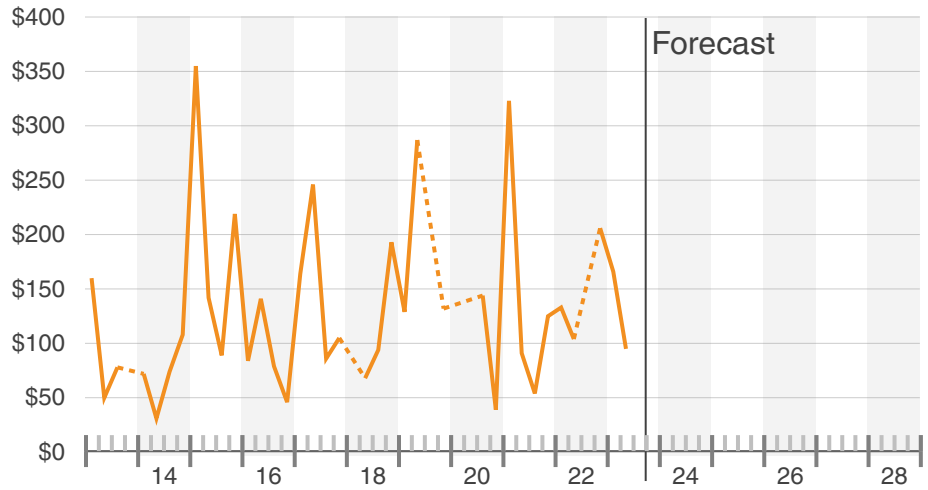
Sales Volume



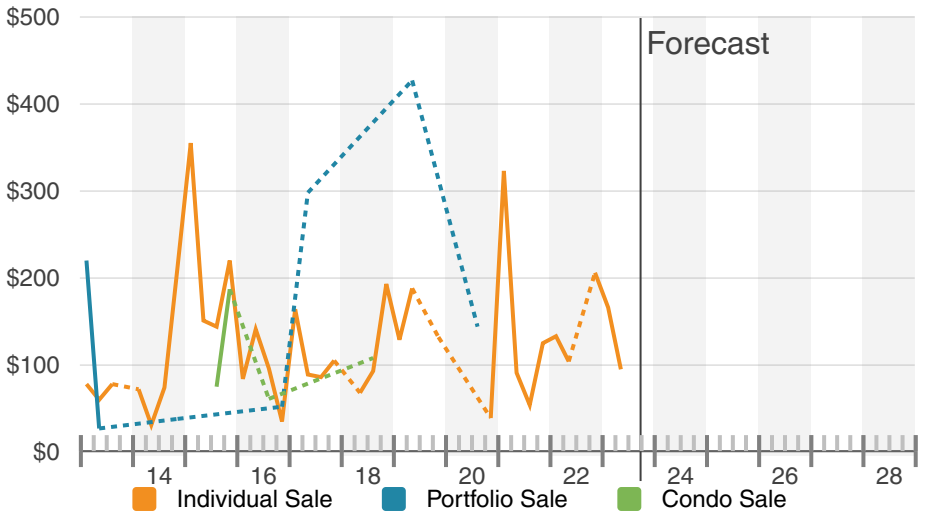
Sales Volume By Transaction Type



Sale Price Per SF



Sale Price Per SF By Transaction Type



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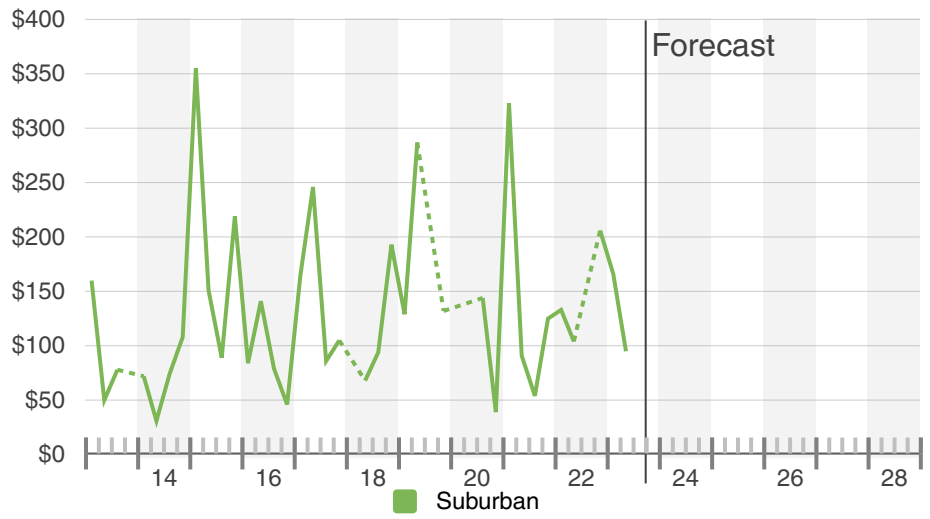
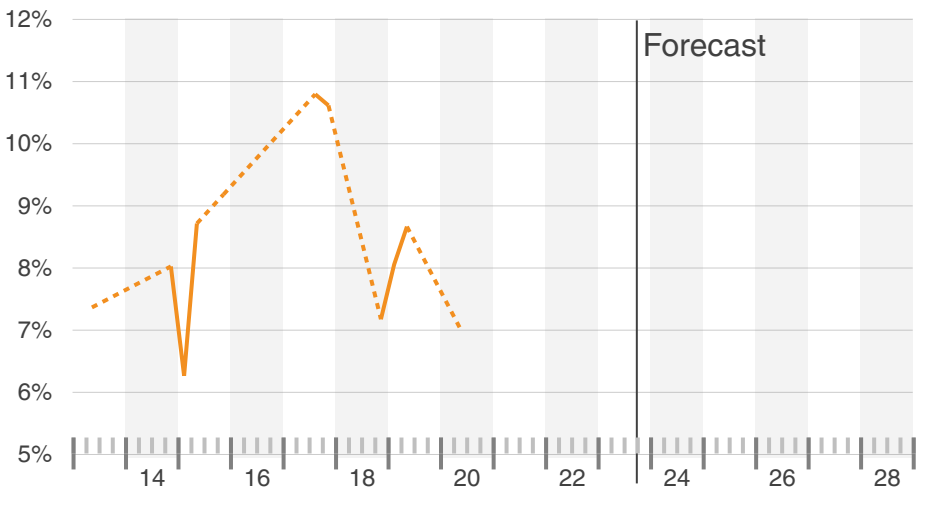
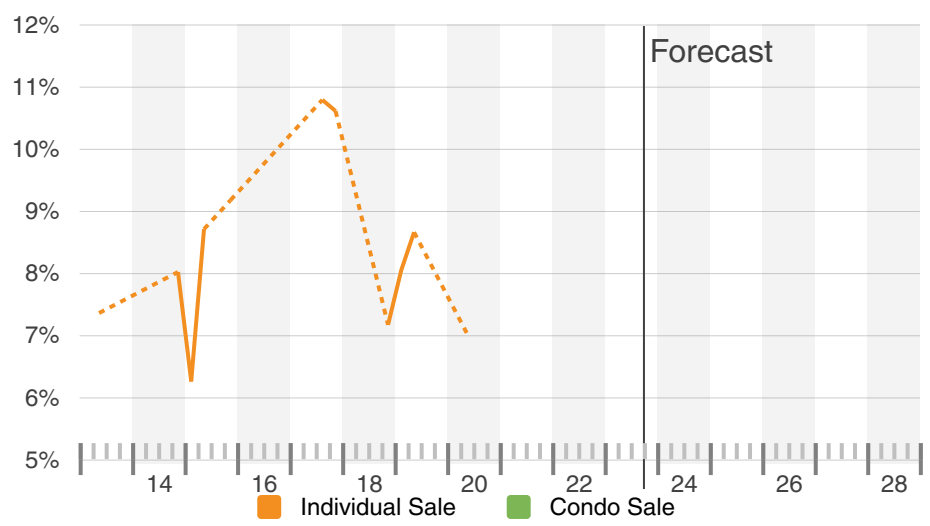
Sale Price Per SF By Location Type



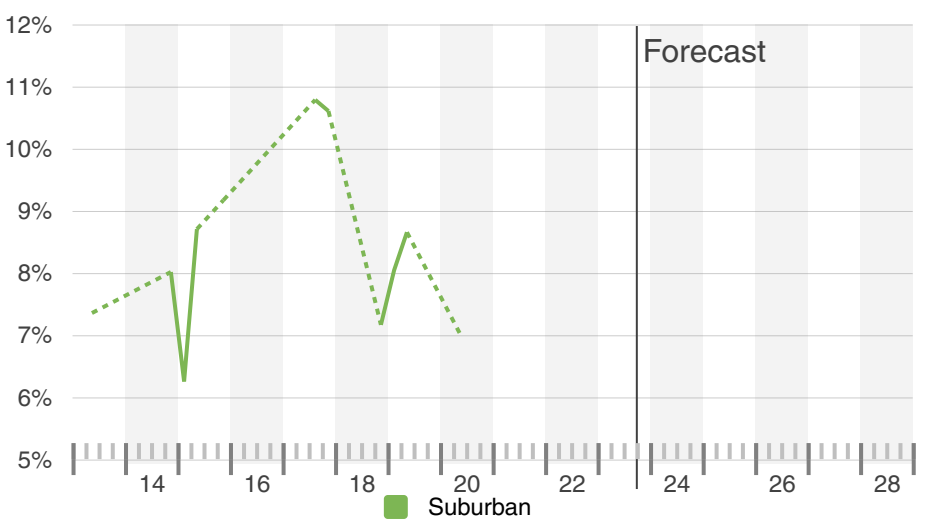
Cap Rate



Cap Rate By Transaction Type



Cap Rate By Location Type



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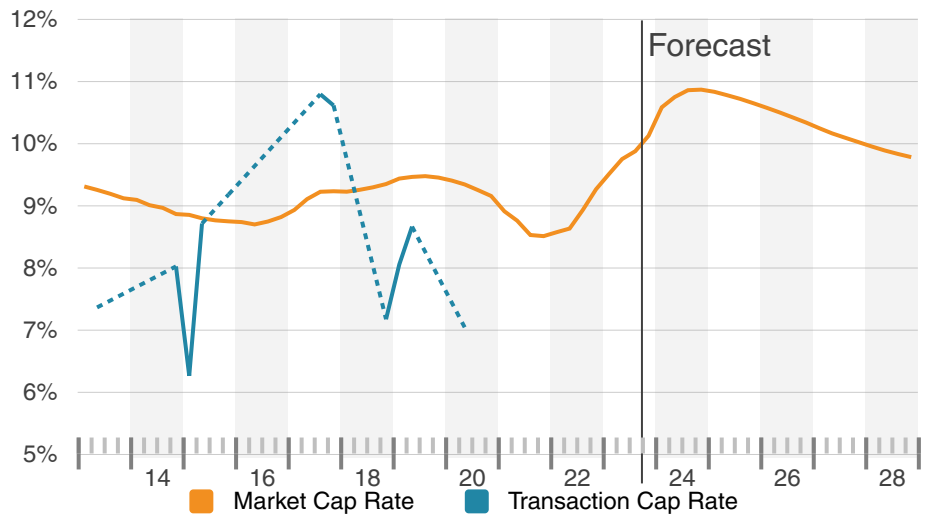
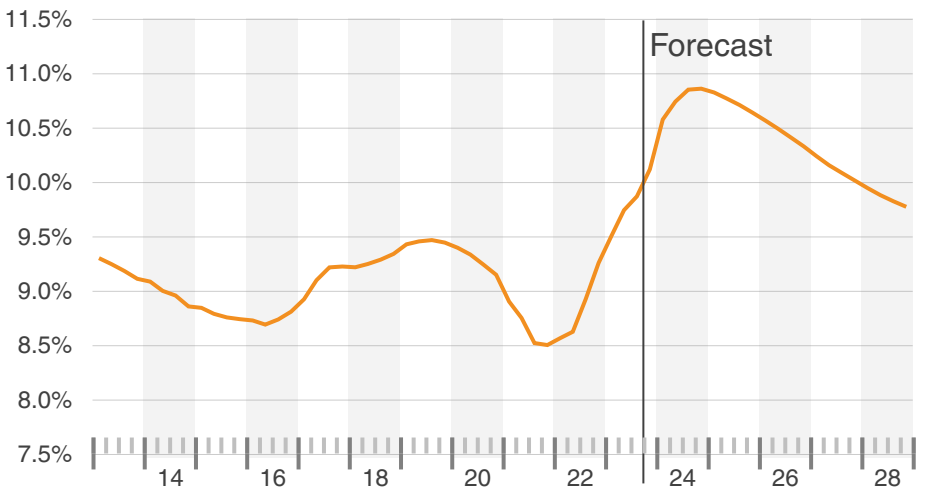
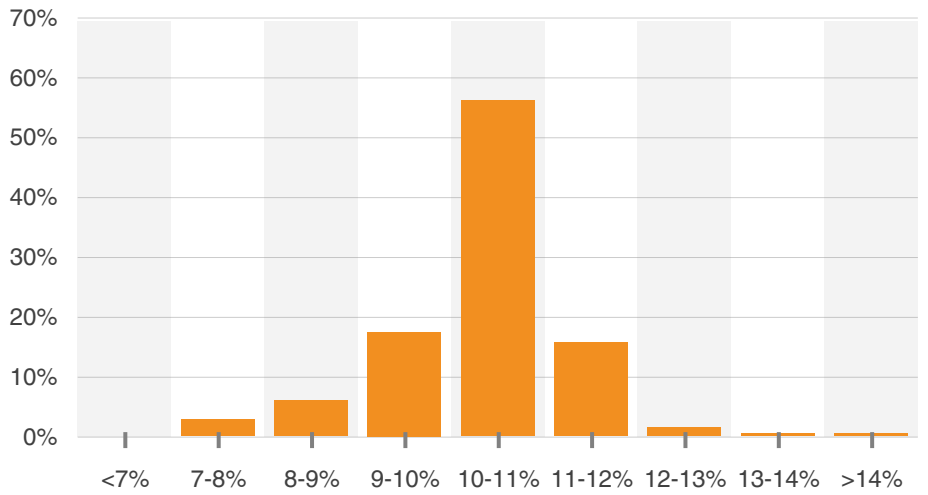
Market Cap Rate & Transaction Cap Rate



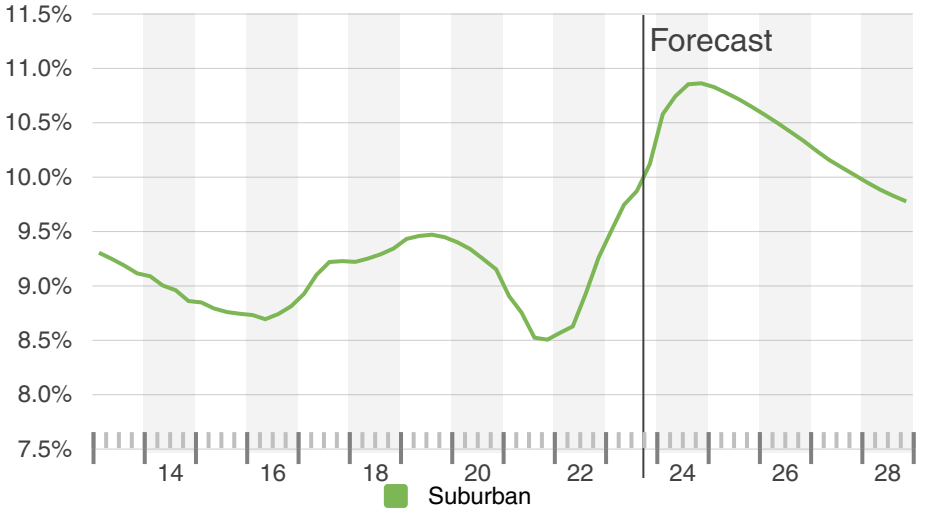
Market Cap Rate



Market Cap Rate Distribution



Market Cap Rate By Location Type



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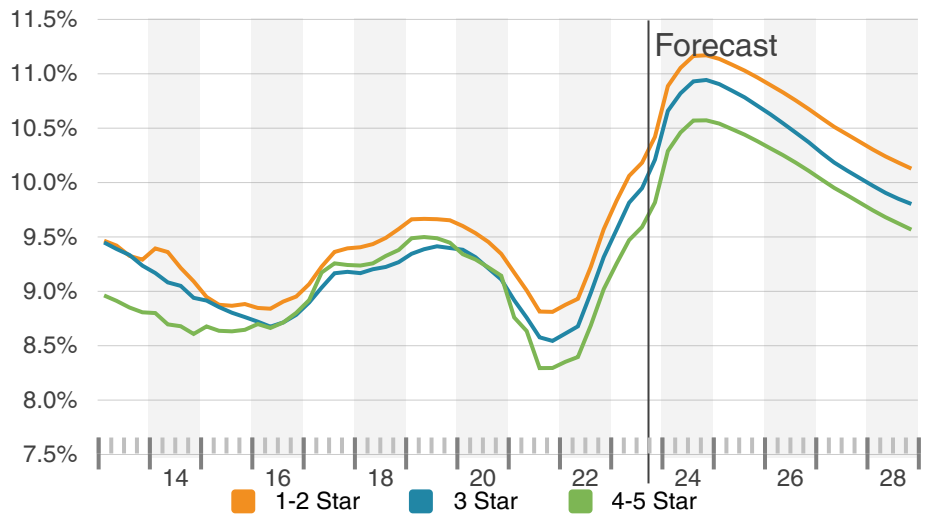
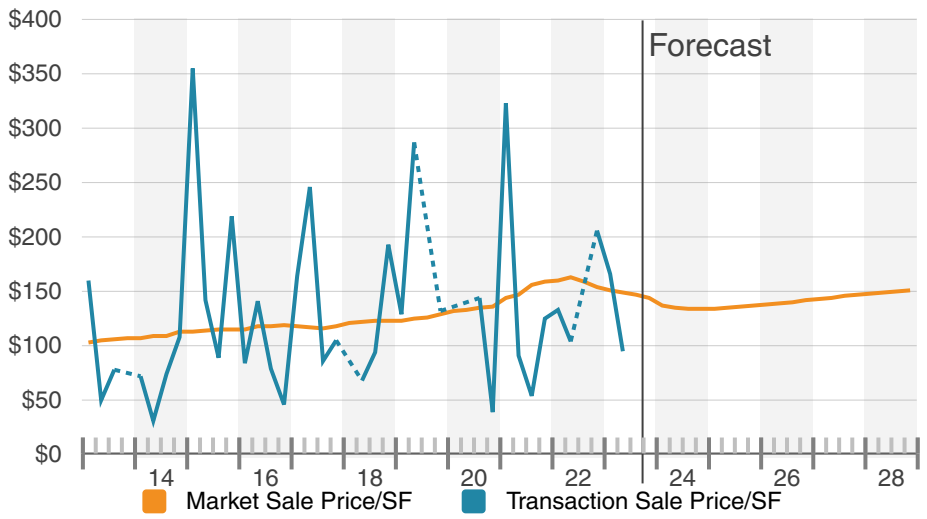
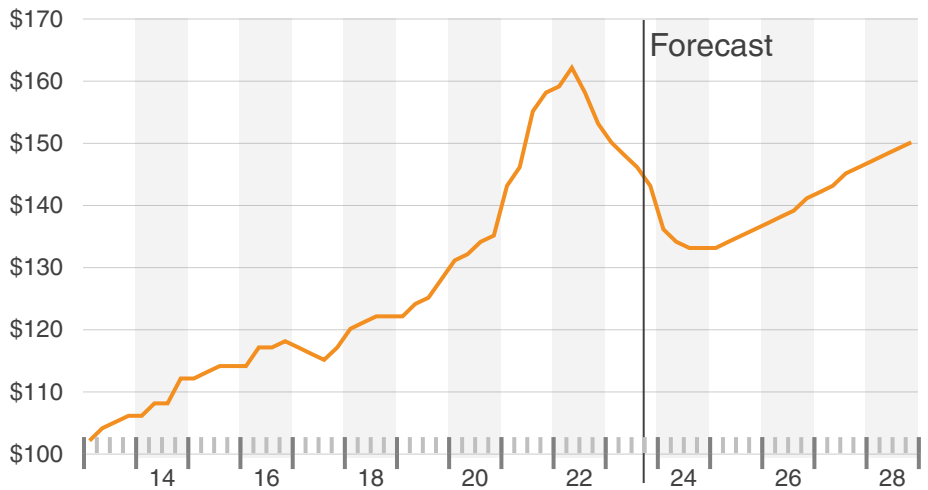
Market Cap Rate By Star Rating



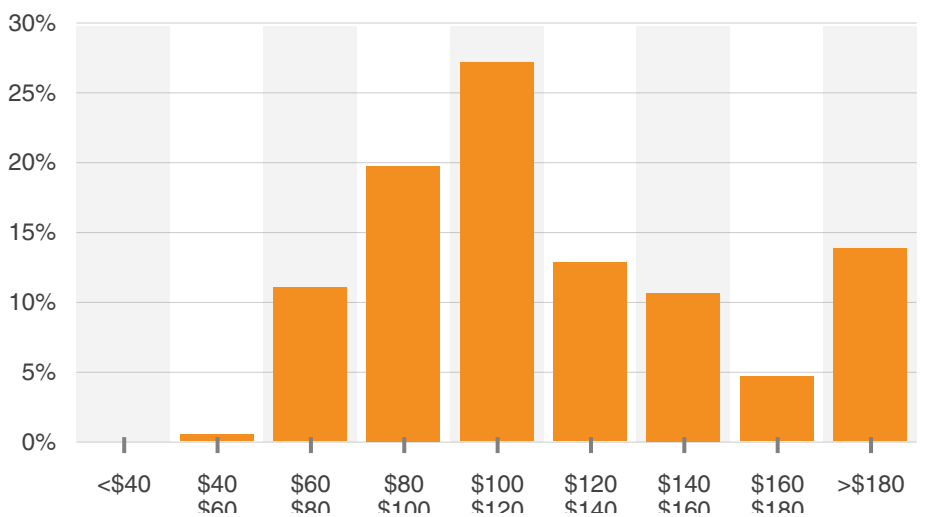
Market Sale Price & Transaction Sale Price Per SF



Market Sale Price Per SF



Market Sale Price Per SF Distribution



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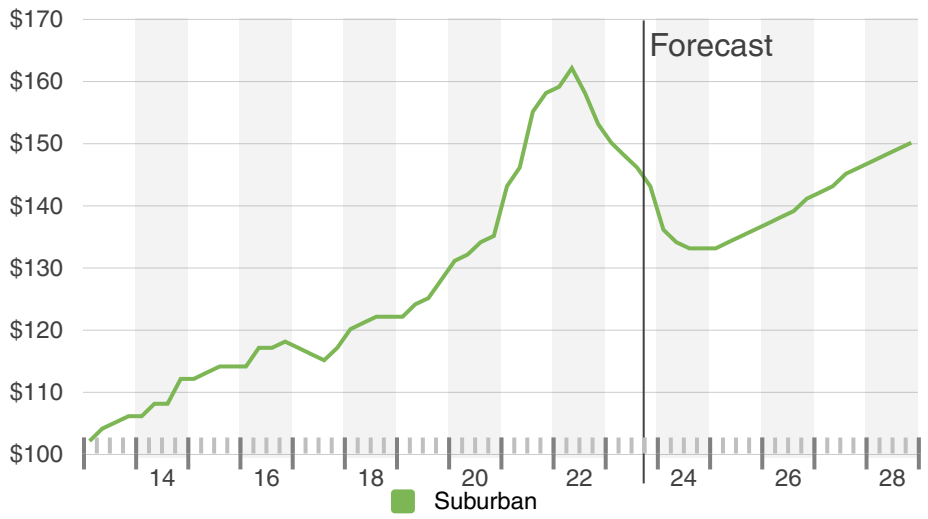
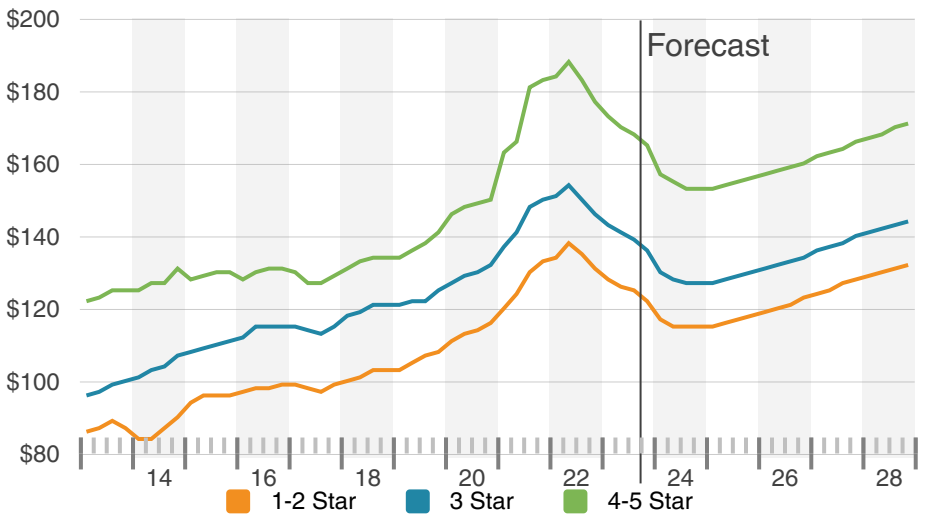
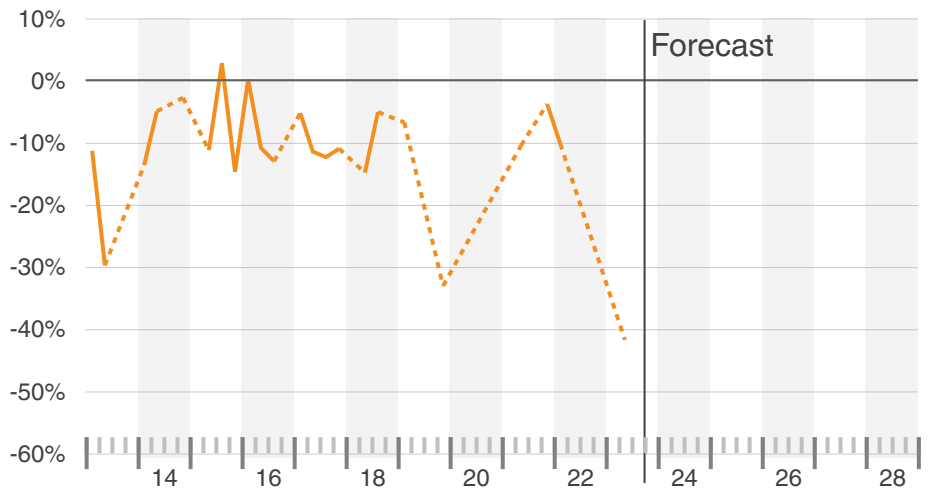
Market Sale Price Per SF By Location Type



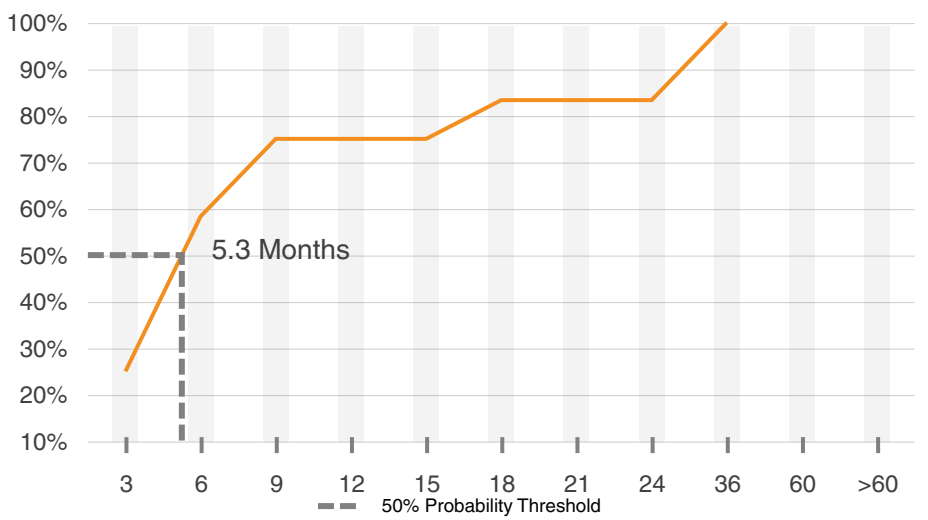
Market Sale Price Per SF By Star Rating



Sale To Asking Price Differential



Probability Of Selling In Months



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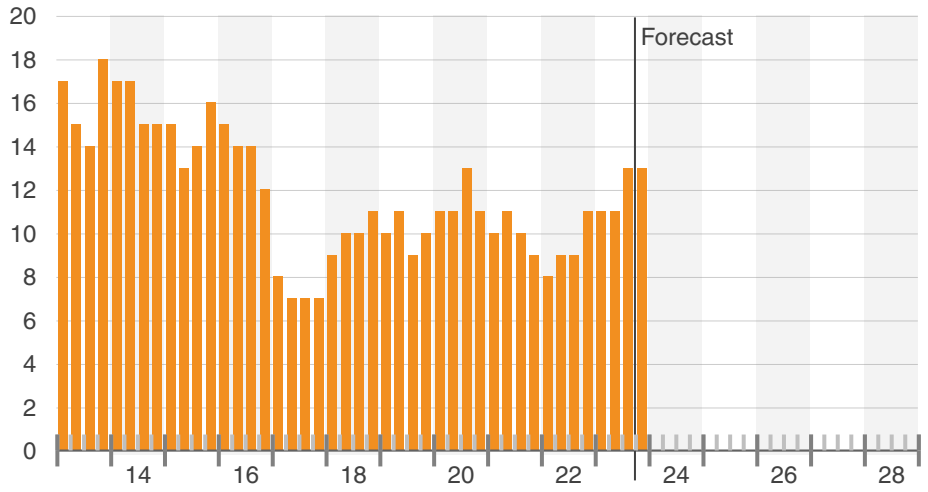
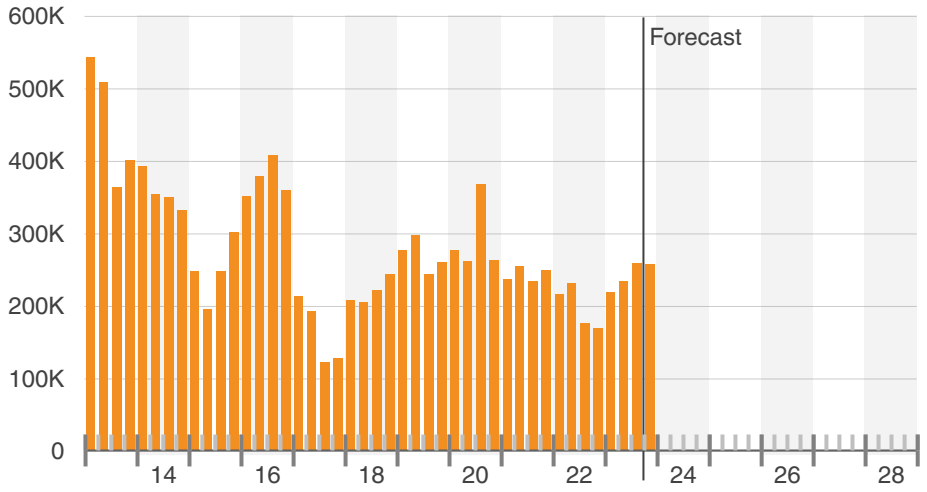
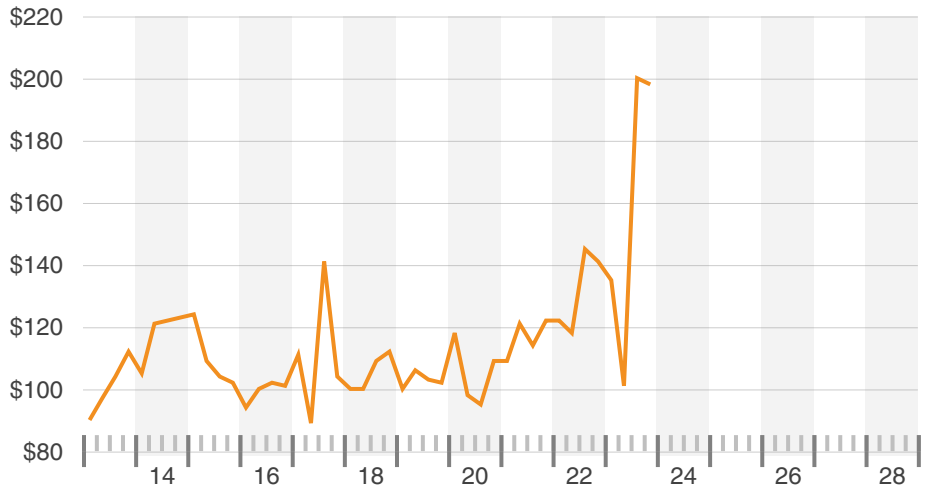
For Sale Total Listings



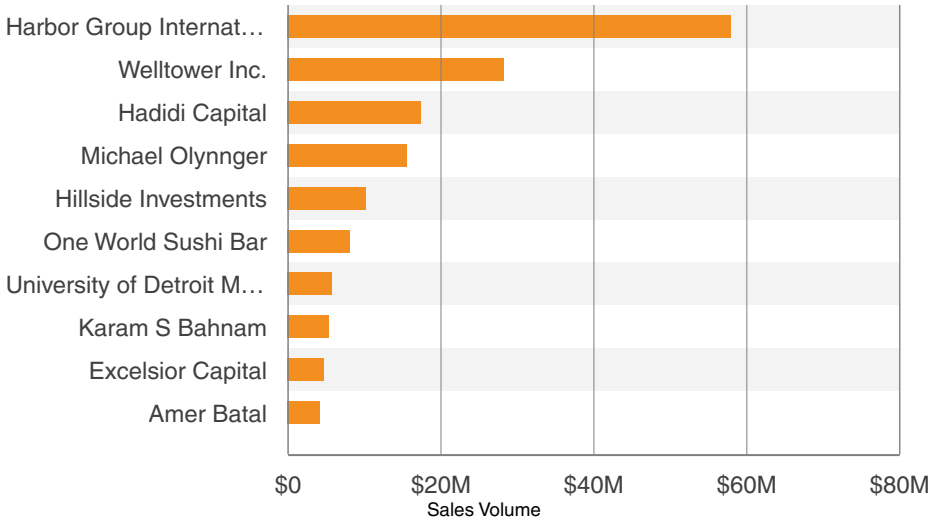
For Sale Total SF



For Sale Asking Price Per SF



Top Buyers



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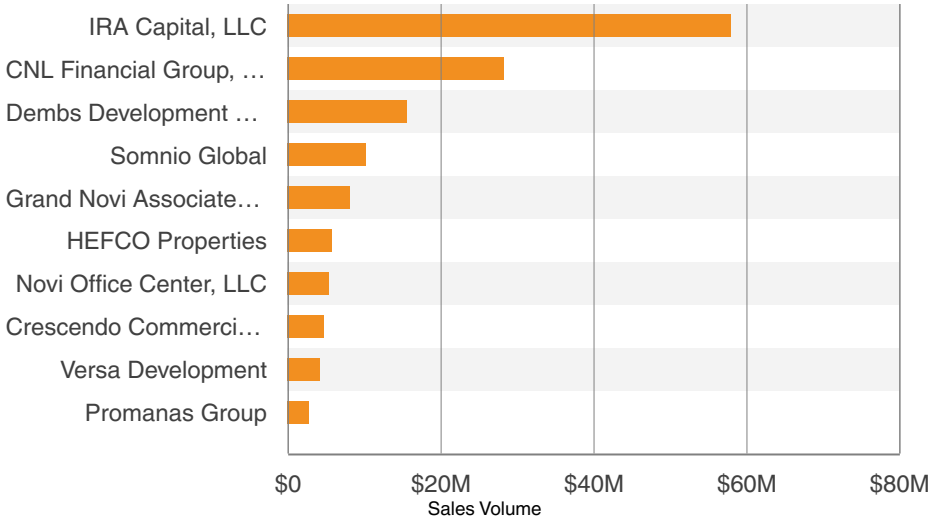
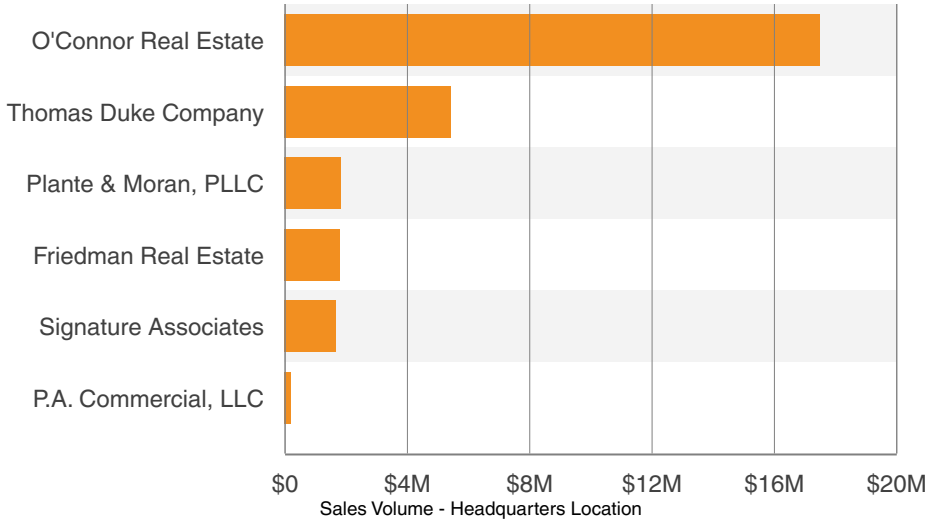
Top Sellers



Top Buyer Brokers



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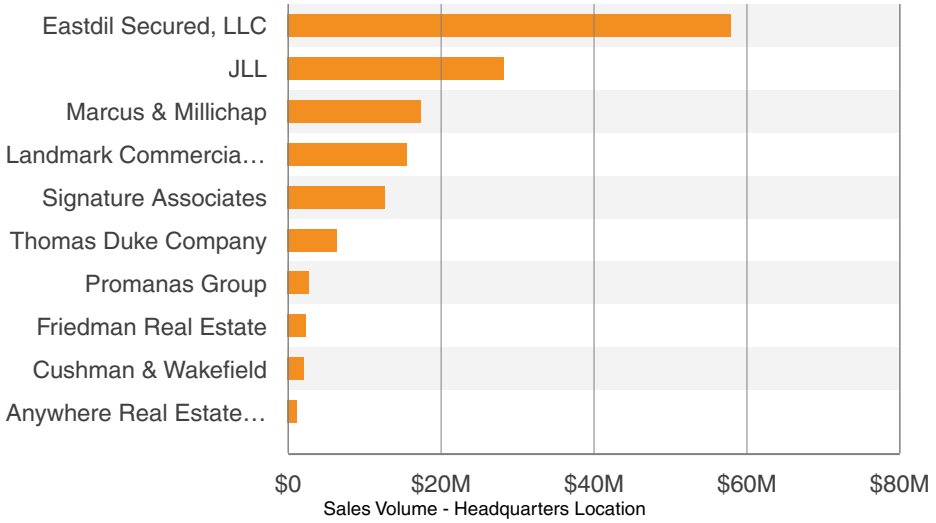
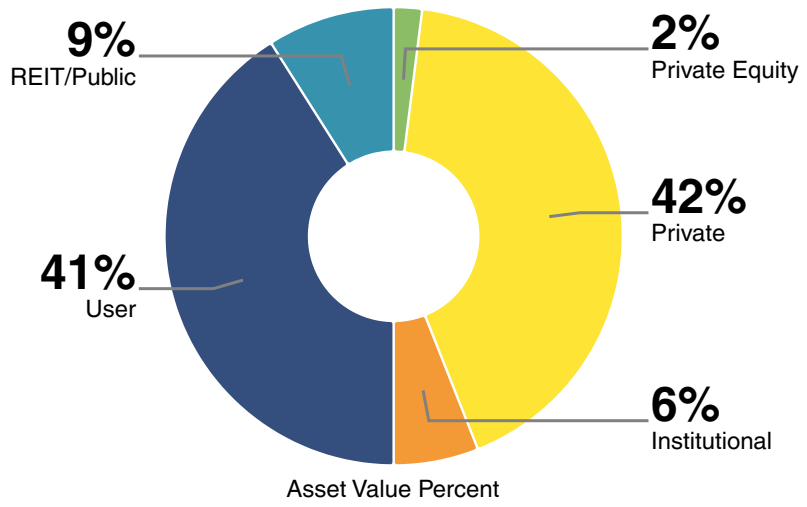


Asset Value By Owner Type



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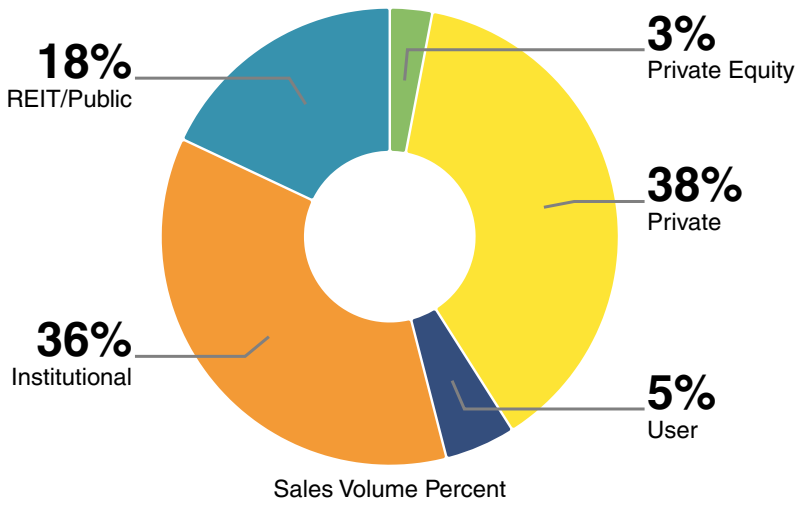
Sales By Buyer Type



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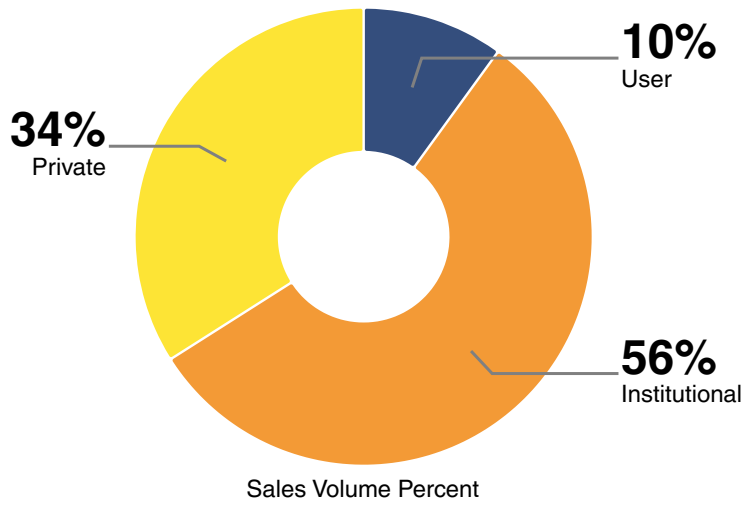

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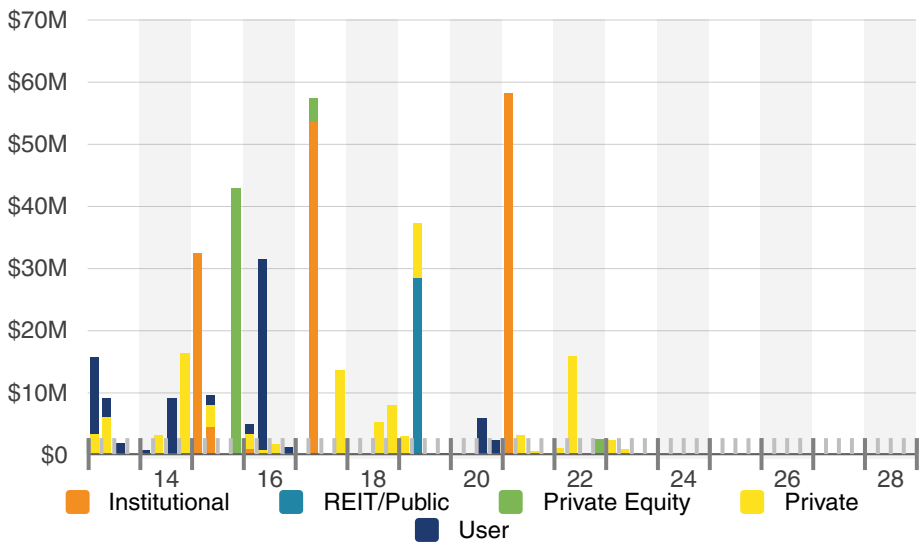

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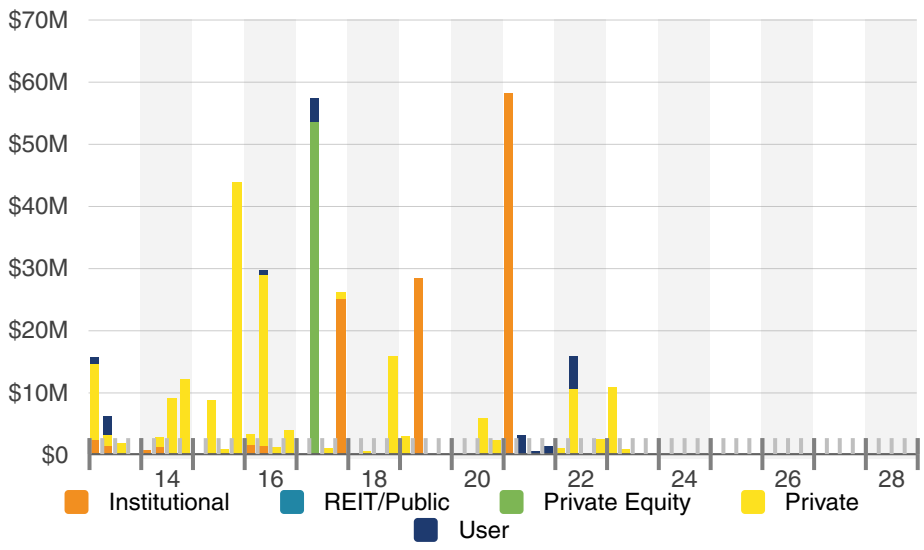

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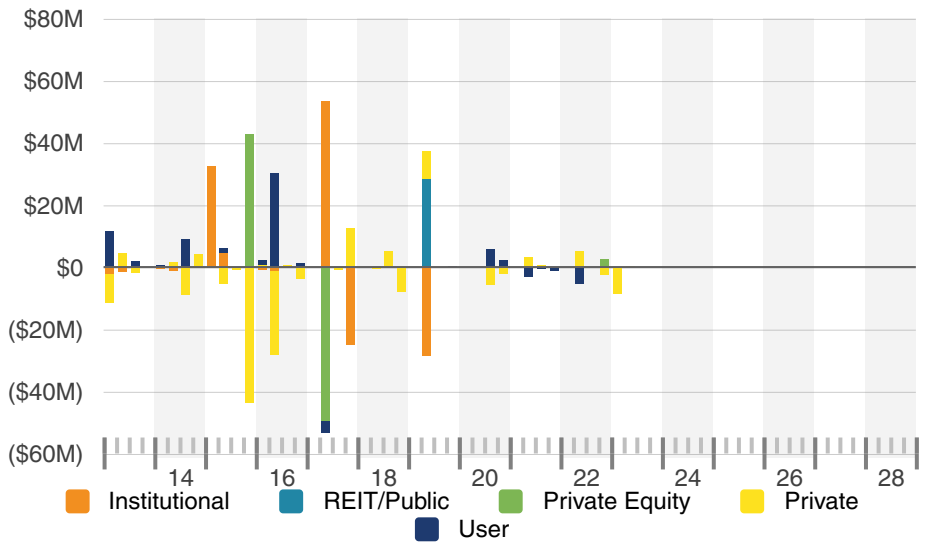
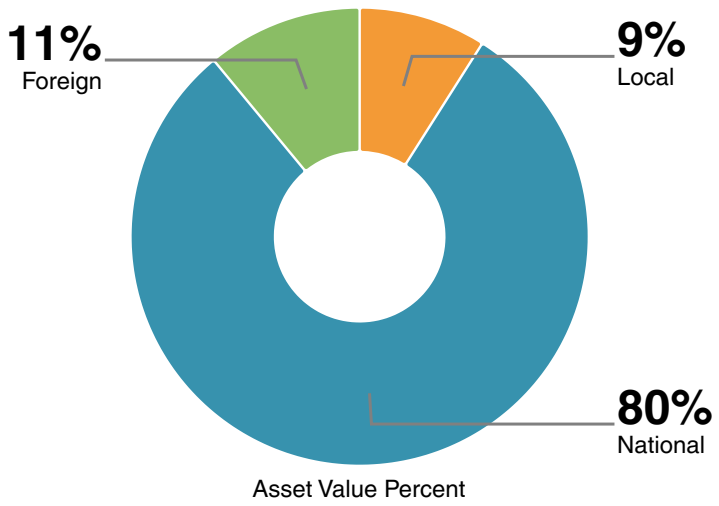
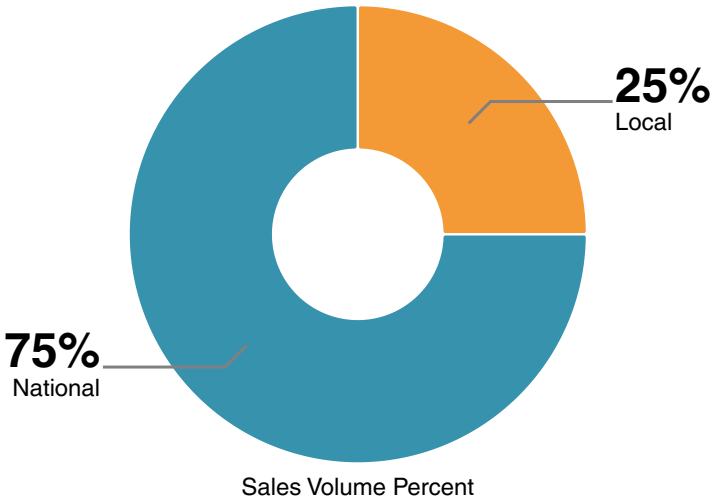
Net Buying & Selling By Owner Type



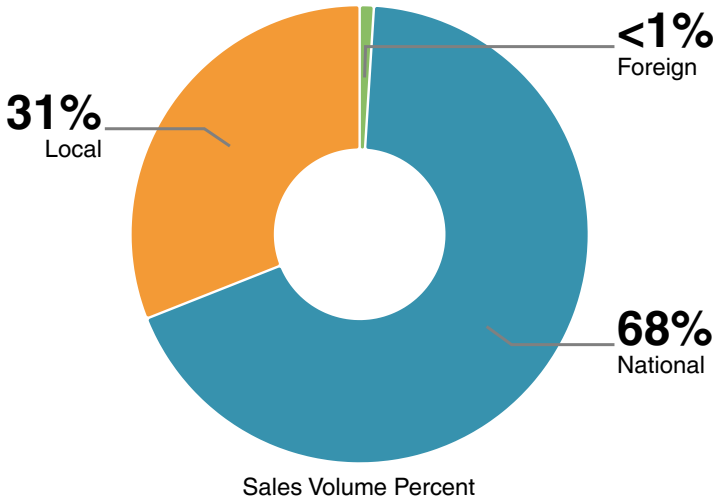
Asset Value By Owner Origin



Sales Volume By Buyer Origin



Sales Volume By Seller Origin



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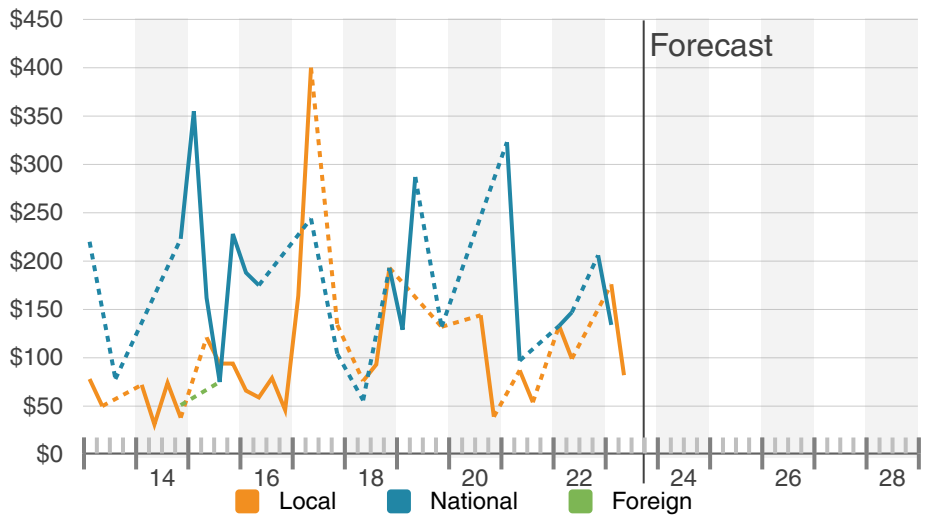
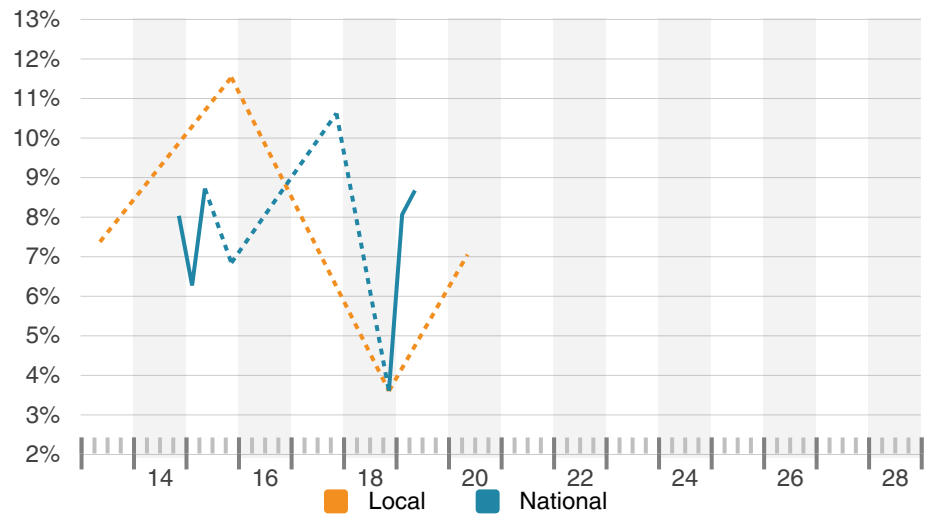
Average Price Per SF By Buyer Origin



Average Cap Rate By Buyer Origin



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Report Criteria

- 218 Properties / 182 Spaces
- Property Type: Office +1
- Construction Status: Existing
- City: Novi, MI

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THE CHESAPEAKE GROUP, INC
BUILDING A FOUNDATION FOR THE FUTURE

To: Gary Shapiro, The Ivanhoe Companies, LLC
From: Howard Kohn, The Chesapeake Group, Inc.
Re: Market Evaluation for The Grove Residential Project in Novi, Michigan
Dated: August 9, 2024

The following is a market evaluation for the development of the proposed Grove project along 12 Mile Road, west of M-5 and north of I-96, in Novi, Michigan As explained below, all of the data indicate that there is more than sufficient market demand for the specific kinds and mix of housing options proposed for the Grove project.

The proposed development consists of 438 residences in four distinct villages. Two villages are targeted for for-sale condominiums, and two are villages with a range of housing offered for rent or sale. The four villages of the development and the associated units follow:

- ✓ The Vista has 49 three bedroom residences available for rent with ownership options.
- ✓ The Woods has 56 three bedroom condominiums.
- ✓ The Pointe has 77 three bedroom condominiums.
- ✓ The Meadows has 256 units available for rent with ownership options, in 32 buildings:

  - 21 studios.
  - 86 one-bedroom.
  - 149 two-bedrooms.

This assessment was prepared by The Chesapeake Group (TCG). TCG is the premier economic analysis and development firm in the United States, having prepared more than 1,700 analyses and plans since its inception. TCG has established a national reputation for all residential, commercial, industrial, entrepreneurial, entertainment, arts, technology, and institutional development in established and emerging communities.

TCG's mission is to facilitate sustainable land use, business development, redevelopment, and expansion in rural, suburban, and urban settings. TCG has been involved in numerous projects in Michigan for more than twenty-five years and maintains an office in the state. Current public sector client efforts in Michigan are in Battle Creek, Oshtemo Township, Rochester Hills, Sterling Heights, Dearborn, Delhi Township, and Detroit. TCG has completed projects for cities, economic development organizations and developers in many other Michigan communities, including Novi.

TCG is also the only consultant engaged with the State of Michigan's Redevelopment Ready Community Certification Program for recent administrations and the former "Cool Cities Neighborhood Program" during previous administrations. TCG has been involved with this effort throughout its evolution, guiding the conceptual development from a market perspective and assisting with reaching a viable conclusion that serves the community's needs.

RECENT HISTORICAL HOUSING CONTEXT

Novi is one of the most dynamic cities with growing households in Oakland County. Investments made in building new housing units are one sign of a community's health.

Oakland County has seen substantial household growth since 2011, or the close of the Great Recession. The lowest number of units permitted was in 2011, and the largest number permitted in 2017.

*Table 1 - Oakland County Permitted New Homes from 2011 through 2023**

Oakland County	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011
Total Units	2,328	2,329	3,174	2,475	2,842	2,642	3,707	3,196	2,645	2,458	2,705	1,901	1,277
Units in Single-Family Structures	1764	1,797	2,044	1,935	1,976	2,482	2,744	2,143	2,180	2,114	2,296	1,880	1,266
Units in All Multi-Family Structures	564	532	1,130	540	866	160	963	1,053	465	344	409	21	11
Units in 2-unit Multi-Family Structures	8	14	20	14	0	16	4	60	58	16	14	6	0
Units in 3- and 4-unit Multi-Family Structures	26	98	127	111	83	71	105	49	44	49	60	15	11
Units in 5+ Unit Multi-Family Structures	530	420	983	415	783	73	854	944	363	279	335	0	0

*Developed by The Chesapeake Group, Inc., 2024. Based on the HUD database.

Over 33,600 new housing units were permitted in Oakland County between 2011 and 2023. About 26,600 were "single-family" or detached homes, and roughly 7,000 were attached multi-family units.

✓ Detached units accounted for 79% of the total, averaging about 2,200 units annually.

✓ Attached units accounted for 21% of the total, averaging about 590 units annually.

*Table 2 -Units Permitted, Share of Units Permitted, and Annual Average for Oakland County for 2011 to 2023**

Oakland County	Totals	% of County	Annual Average
Total Units	33,679	100%	2807
Units in Single-Family Structures	26,621	79%	2218
Units in All Multi-Family Structures	7,058	21%	588
Units in 2-unit Multi-Family Structures	230	1%	19
Units in 3- and 4-unit Multi-Family Structures	849	3%	71
Units in 5+ Unit Multi-Family Structures	5,979	18%	498

*Developed by The Chesapeake Group, Inc., 2024. Based on the HUD database.

Novi reported growth in housing units permitted between 2011 and 2021. A total of just over 2,750 new homes were permitted during those years. The increase represents about 9.5 percent of the Oakland County total.

Future growth in rooftops can be based on recent history. Utilizing the historical patterns indicates a range of new units for Oakland County and Novi. For Oakland County, the range in annual average units permitted is from about 2,640 to 2,780. Utilizing the lower estimate for future projects results in the potential growth by 2030 of about 23,760 new permitted units. Utilizing the lower figure allows short-term downturns due to fluctuating national and regional economic conditions.

For Novi, the average annual permits issued was 251 from 2011 through 2021, and the yearly average number permitted between 2018 and 2021 was 193. Employing the lesser number results in the potential for about an additional 1,740 units by 2030.

*Table 3 – Novi Permitted New Homes from 2011 through 2023**

Novi	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011
Total Units	63	46	114	321	190	147	516	184	289	203	197	322	275
Units in Single-Family Structures	63	46	114	218	190	147	181	184	173	198	197	316	275
Units in All Multi-Family Structures	0	0	0	103	0	0	335	0	116	5	0	6	0
Units in 2-unit Multi-Family Structures	0	0	0	0	0	0	0	0	0	0	0	6	0
Units in 3- and 4-unit Multi-Family Structures	0	0	0	0	0	0	32	0	0	0	0	0	0
Units in 5+ Unit Multi-Family Structures	0	0	0	103	0	0	303	0	116	5	0	0	0

*Developed by The Chesapeake Group, Inc., 2024. Based on the HUD database.

The patterns for Novi generally meshed with the County's pattern.

✓ Novi permitted 2,867 homes.

- ✓ Novi averaged over 230 homes yearly.
- ✓ Eighty percent of all homes permitted were detached units.
- ✓ Twenty percent of all permitted homes were attached.

*Table 4 -Units Permitted, Share of Units Permitted, and Annual Average for Novi for 2011 t0 2023**

Novi	Total	% Novi	Annual Average
Total Units	2867	100%	239
Units in Single-Family Structures	2302	80%	192
Units in All Multi-Family Structures	565	20%	47
Units in 2-unit Multi-Family Structures	6	0%	1
Units in 3- and 4-unit Multi-Family Structures	32	1%	3
Units in 5+ Unit Multi-Family Structures	527	18%	44

*Developed by The Chesapeake Group, Inc., 2024. Based on the HUD database.

As an established community, Novi naturally permitted a greater proportion of attached housing units than the County. On the other hand, Novi's share of the County's units permitted between 2011 and 2023 was the same proportion of attached units. One would have expected the share of attached units permitted in Novi to be greater if not for the potential need to "play catch-up."

*Table 5 – Share of the Type of Units Permitted in Novi and Oakland Count an, the Annual Number Permitted in Novi from 2011 through 2023**

Novi	% of Novi	% of County	Novi Annual Average
Total Units	100%	9%	239
Units in Single-Family Structures	80%	9%	192
Units in All Multi-Family Structures	20%	8%	47
Units in 2-unit Multi-Family Structures	0%	3%	1
Units in 3- and 4-unit Multi-Family Structures	1%	4%	3
Units in 5+ Unit Multi-Family Structures	18%	9%	44

*Developed by The Chesapeake Group, Inc., 2024. Based on the HUD database.

METRO DETROIT AREA HOUSING DATABASE AND HOUSING TRENDS

There are generally three market generators for new housing in Novi. These are internal movements of current residents to different homes, the internal generation of new households that results from the independence of youth raised by current residents or changes in household structure through divorce or other factors, and external movement or relocation of households from the county and beyond.

We have reviewed marketing, U.S. Census, demographic information, sales and rental figures, and permit data. Those data sets are covered in a separate Appendix attached to this report. In addition, we reviewed information on the recently submitted proposals for new multi-family residential in the City of Novi. Those projects will help fill the market need for more multiple-family housing in the City to bring better balance to the market. But The Grove project will add a different type of housing not available elsewhere, that will attract residents looking for a natural environment setting.

In addition to the market data analysis, The Chesapeake Group surveyed over 3,000 households in the Metro Detroit area since the end of the Covid pandemic and surveyed more than 4,000 additional households during the Covid pandemic. A large component of the housing market is the existing households and likelihood of moving. One community's goal should be to meet current residents' future needs. Key survey findings follow that have implications for the marketability of the proposed Grove project.

- ✓ At least 40% of the surveyed households note that they may or are likely to move to a different home in the next five years.
- ✓ While some will relocate outside of Michigan, the preponderance will move to a home within Michigan.
- ✓ The majority will prefer a location within the Metro area.
- ✓ If housing is available, many will prefer to stay within Novi.
- ✓ In addition to the relocation, a small proportion (less than 10%) will internally generate a new household requiring an additional housing unit.
- ✓ The most common factors for the moves are the desire to downsize, diminished desire to maintain housing units, and future flexibility in housing.
- ✓ The overwhelming majority will seek homes smaller or the same size as their current units.
- ✓ One, two, and some three-bedroom units will be sought, with the majority being two-bedrooms or less.
- ✓ The two dominant factors in determining where they will choose to live are safety and walkability. (Schools are no longer the major factor for those households even with primary income earners 25 years or younger.)

NATIONAL FACTORS AND TRENDS

Michigan and national trends contribute to the potential long-term marketability of the proposed Grove development as follows.

- ✓ Pre-dating Covid but continuing housing market forces are factors including declining birth, fertility, and marriage rates and changing desires of both younger and aging households, which make up much of the housing market in the country.
- ✓ In addition to the surveys of Metro area households, TCG has performed more than 15,000 household surveys in many communities in the past four years. Fifteen years ago, safety and schools were the primary factors driving where people lived or wanted to live, and today's primary factors are safety and walkability.

- ✓ Pre-Covid, the home office was not yet the majority but was the most rapidly growing office "space" market. The market growth resulted from a growing number of employees working part or full-time from home, technological advances, and home-based business activity.
  Many companies adopted hybrid or fully remote working arrangements. This shift has significantly impacted lifestyles including where renters choose to live. This trend is expected to continue as the prevalence of hybrid-work arrangements allows renters more flexibility in their living arrangements. According to the US News 2024-2028 Housing Market Predictions report, hybrid-work schedules are here to stay. Novi's geographic setting within Michigan's southeastern sphere of major employers will be an attractive and desired magnet for employees with hybrid-working arrangements who desire rental housing.
- ✓ Costs for all types of construction have risen dramatically over the past couple of years. Return-On-Investment is often impacted, and demand has somewhat diminished to a level that costs cannot be pushed to the buyer.
- ✓ Interest rates have increased substantially the past two years, impacting all borrowing forms, including construction and mortgages. While rates have risen, they remain low by historical standards but not by recent standards. The short-term shock is apparent.
- ✓ Many move after being located in one home for ten or more years having built equity in their current homes. This equity can often best be employed in other investments, resulting in a higher demand to rent now and in the future. Even in the "Baby Boomer" market segments the desire for renting has increased substantially.
- ✓ Few people under 50 have careers with one company. Employment opportunities often result in moves from one geographic area to another, even if moves are lateral with the same entity or company.
- ✓ Outstanding debt, often from lifestyle or education, makes accumulating financial resources difficult. The debt hinders the ability to purchase homes. Generation X, Y, and Z often do not wish to own a home as that diminishes their flexibility. This pattern will prevail in the future for generation A or Alpha as they leave their parents' homes.
- ✓ Many of those in the 30 years and under category extend their stay at home with their parents. They lack the capital needed to purchase homes, do not believe they will live in the same area for more than a few years until a "better" opportunity arises, and can ill-afford down payments to purchase homes.
- ✓ In many non-urban settings, the proportion of detached "single-family" homes not owner occupied is over 40% and rising.
- ✓ The proportion of "Baby Boomer" renters, even in the second-home markets of Arizona, North and South Carolina, and Florida, is growing substantially. "Baby Boomers" now often rent in one location for a few years and then "try" another location.

SHORT AND LONGER-TERM MARKETABILITY OF THE GROVE

Short and long-term successful development of the site will be dependent upon having a diverse form and type of housing. The Grove's four distinct villages will help meet that need. Two villages are targeted for

There are no comparables, existing or proposed, with rental occupants' potential to own attached or similar units.

condominiums, and two are villages with a range of housing offered for rent or sale. A comprehensive review of existing and proposed housing options indicates the Grove will be successful by providing an integrated blend of dwelling types, designs, and appointments unique to current and future Novi residents. No comparables existing or proposed will have rental occupants' with the potential to own attached or similar units.

The information presented in this evaluation indicates the following.

1. Based on historical permitting patterns current sales, and current rent levels, the development's absorption will most likely occur over five or six years.

2. There is a growing demand for the walkable project with a range of housing to meet current Novi residents' future needs and attract others beyond the city limits.

3. Downsizing opportunities with no more than two-bedrooms are needed to meet current residents' future needs.

4. It will meet the needs of all age groups, from current and future households with primary income earners below 25 to active adults 55 and beyond. The Grove will offer various flexible housing options catering to diverse, multi-generational residents, ranging from "Baby Boomers" through generations X, Y, and X, and future generation A (Alpha).

5. The Grove's housing mix, walkability, ownership-rental options, and proximity to the region's amenities are consistent with the market's desires. Inclusion of townhomes provides attainable housing even for those who want to purchase. The Grove's longer-term success is extremely probable due to the variety of options.

6. The Grove will meet the growing demand for rental units based on the many household factors previously mentioned such as flexibility related to employment, education, education expense debt, other investments achieving greater returns, diminished ability for mortgage down payments, etc.

   The rental market growth is well documented by others as well. According to a June 4, 2024, CNN Money article, owning a home is no longer the American dream for all. The article is quoted as stating that nearly two-thirds of Americans, or 64 percent, believe they are less likely to build wealth by buying a home today than they were 20 or 30 years ago, according to a survey sponsored by the non-profit MacArthur Foundation. A majority of respondents said they believe renting can be more appealing than buying and that renters are just as likely to be successful financially as someone who owns a home.

   A June 28, 2024, article appearing in Financial Times, an international publication focusing on business and economic affairs, states that younger Americans are gravitating towards rental housing verses homeownership since the prices of homes coupled with the cost of borrowing money far exceed rental market rate prices. Per the article, young people also want the benefits that rental housing often provides. Among

these include no down payment, having greater disposable income for other desired lifestyle preferences, flexibility to relocate if needed or desired, and access to amenities.

7. The proposed density of development enhances walkability. The density affords the necessary diversity in housing sizes and structures to meet Novi's residents changing needs and desires for housing, creating proper sizes, payment structures, and proximity to commercial services.

8. The Grove's development will allow internal movement of households, freeing existing housing stock for that segment of the population that can afford and desires larger existing detached housing units.
   According to the USNews 2024-2028 Housing Market Predictions report, hybrid-work schedules are here to stay. Novi's geographic setting within Michigan's southeastern sphere of major employers will be an attractive and desired magnet for employees with hybrid-working arrangements who desire apartment housing.

9. The residents of The Grove will likely pump an additional $17.5 million in sales of Novi businesses annually. The Grove will be essential to the long-term viability of the continued evolution of Twelve Oaks Mall and Fountain Park retail clusters.

The site's current office zoning is inappropriate both now and in the foreseeable future from a market perspective. A metamorphosis in the office market continues throughout this country for many reasons including those that follow:

- ✓ Continued popularity of hybrid work.
- ✓ Tenants' desires for shorter-term leases.
- ✓ Too many dated buildings that once stored paper files and hosted server rooms.
- ✓ Too few single-tenant buildings that meet changing needs.
- ✓ Declines in the amount of square footage needed per worker.
- ✓ Increases in virtual meetings.
- ✓ Increases in medical patient virtual meetings.
- ✓ Digital replacement of book libraries in law offices and other professional offices.
- ✓ Difficulties with landlords getting returns if they put a lot of capital into a reconfiguration and are unable to get terms and a rental rate that reflects the costs of those improvements.

A study done by JLL indicates that office vacancy rates in "suburban" markets is growing nationally as of the reporting on July 12, 2024,

The "bottom line" from a market perspective, the four village Grove concepts as proposed will enhance Novi's ability to meet current and future multi-generational resident needs. The flexibility of the four Villages will also allow Ivanhoe to adjust to the market if conditions change.

Market Conclusion -
The Grove's four village concept will enhance Novi's ability to meet residents' needs.

The new housing types in The Grove will offer a different housing

types compared the projects in the City that have been recently approved. This project hits the "sweet spot" between a single-family home and living in a larger, mid-rise multiple-family development. These homes will appeal to a segment of the market that wishes to live in a natural setting, with a host of amenities and non-motorized connections, near what people are seeking – top municipal services, convenience to commercial, parks, access to freeways and quality schools.

Respectfully submitted

Howard Kohn, President (*Howard Kohn electronic)*

The Chesapeake Group, Inc. (TCG)

APPENDIX

MARKET RATE SALES AND RENTALS

Current sales and rental rates in and around the Novi area were reviewed. The data was developed using online sources such as Zillow.com, Realtor.com, Trulia.com, and a range of local Real Estate agency office sites. The websites of the apartment developments and rental agencies were also examined for rental units.

The following is a synopsis of current housing market patterns by zip code area and the number of bedrooms. Information is provided where the number of listings was sufficiently large enough to offer meaningful data. The price data reflects listing prices.

Detached Dwelling Units

The following summarizes the findings for Zip Code 48374.

- ✓ The range listing price per-square-foot for all units was between $241 and $524.
- ✓ The average listing price ranged from about $646,000 to $1.54 million.
- ✓ For two-bedroom units, the average listing price ranged from about $1.3 million to $1.7 million.
- ✓ For two-bedroom units, the average per-square-foot listing price was $524.
- ✓ For three-bedroom units, the average listing price ranged from about $450,000 to $1.3 million.
- ✓ The range in listing price per-square-foot for three-bedroom units was $160 and $514.
- ✓ The average listing price per-square-foot was $374 for three-bedroom homes.
- ✓ For four-bedroom units, the average listing price ranged from about $600,000 to $860,000.
- ✓ The listing price per-square-foot ranged from $187 to $302 for four- or more-bedroom units.
- ✓ For four or more bedroom units, the average listing price per-square-foot was $241.

*Table 6 - Listing Information for Detached Homes in Zip Code 48374 by the Number of Bedrooms**

Bedrooms	Listing Price Range	Average Listing Price	Listing Price Range Per-square-foot	Average Listing Price Per-square-foot
2	$1,295,000 - $1,695,000	$1,545,125	$484 - $590	$524
3	$449,900 - $1,279,000	$645,160	$160 - $514	$374
4	$596,000 – $858,000	$718,090	$187 - $302	$241

*Developed by The Chesapeake Group, Inc., 2024.

The following summarizes the findings for Zip Code 48375.

- ✓ The listing price per-square-foot for all units was between $131 and $293.
- ✓ The average listing price ranged from about $385,000 to $864,000.
- ✓ For three-bedroom units, the average listing price ranged from about $385,000 to $600,000.
- ✓ The range in listing price per-square-foot for three-bedroom units was $193 and $208.
- ✓ The average listing price per-square-foot was $201 for three-bedroom homes.
- ✓ For four-bedroom units, the average listing price ranged from about $480,000 to $864,000.
- ✓ The range in listing price per-square-foot was from $131 to $293 for four- or more-bedroom units.
- ✓ For four or more bedroom units, the average listing price per-square-foot was $252.

*Table 7 - Listing Information for Detached Homes in Zip Code 48375 by the Number of Bedrooms**

Bedrooms	Listing Price Range	Average Listing Price	Listing Price Range Per-square-foot	Average Listing Price Per-square-foot
3	$385,000 - $599,999	$492,500	$193 - $208	$201
4	$480 000 – $863,585	$634,717	$131 - $293	$252

*Developed by The Chesapeake Group, Inc., 2024.

The following summarizes the findings for Zip Code 48377.

- ✓ For four-bedroom units, the average listing price ranged from about $350,000 to $700,000.
- ✓ The listing price per-square-foot ranged from $141 to $281 for four- or more-bedroom units.
- ✓ For four or more bedroom units, the average listing price per-square-foot was $209.

*Table 8 - Listing Information for Detached Homes in Zip Code 48377 by the Number of Bedrooms**

Bedrooms	Listing Price Range	Average Listing Price	Listing Price Range Per-square-foot	Average Listing Price Per-square-foot
4	$350,000 - $700,000	$559,650	$141 - $281	$209

*Developed by The Chesapeake Group, Inc., 2024.

Condominiums

Condominiums are a form of ownership but are often viewed differently than detached or attached units. The following is a synopsis of condominiums on the market. Construction years are post-1972, when the Michigan Building Code was first established under the State Construction Code Act.

The following summarizes the findings for the condominiums by zip code.

Zip Code 48374

- ✓ The listing price for three-bedroom units ranged between $435,000 and $550,000.
- ✓ The average listing price per-square-foot was $175 for three-bedroom units.
- ✓ The average monthly condo or homeowner association fee is $538.

*Table 9 – Condominium Information for Zip Code 48374**

Bedrooms	Listing Price Range	Average Listing Price	Listing Price Range Per-square-foot	Average Listing Price Per-square-foot	Monthly Association Fee
3	$435,000 - $549,900	$492,450	$166 -$184	$175	$538

*Developed by The Chesapeake Group, Inc., 2024.

Zip Code 48375

- ✓ The listing price for two-bedroom units ranged between $240,000 and $370,000.
- ✓ The average listing price per-square-foot was $210 for two-bedroom units.
- ✓ The average monthly condo or homeowner association fee is $382.

*Table 10 – Condominium Information for Zip Code 48375**

Bedrooms	Listing Price Range	Average Listing Price	Listing Price Range Per-square-foot	Average Price Per-square-foot	Monthly Association Fee
2	$239,900 - $369,000	$279,900	$167 - $244	$210	$382

*Developed by The Chesapeake Group, Inc., 2024.

Zip Code 48377

- ✓ The listing price for two-bedroom units ranged between $196,000 and $330,000.
- ✓ The average listing price per-square-foot was $151 for two-bedroom units.
- ✓ The average monthly condo or homeowner association fee is $495.
- ✓ The listing price for three-bedroom units ranged between $300,000 and $349,000.
- ✓ The average listing price per-square-foot was $210 for three-bedroom units.
- ✓ The average monthly condo or homeowner association fee is $382.

*Table 11 – Condominium Information for Zip Code 48377**

Bedrooms	Listing Price Range	Average Listing Price	Listing Price Range Per-square-foot	Average Listing Price Per-square-foot	Monthly Association Fee
2	$199,900 - $330,000	$265,675	$116 - $198	$151	$495
3	$300,000 - $349,000	$319,633	$181 - $246	$210	$382

*Developed by The Chesapeake Group, Inc., 2024.

Rental Units

As with single-family housing, information for rental units was reviewed based on rental rates in and around Novi. Once again, online sources such as Zillow.com, Realtor.com, Trulia.com, Rent.com, and a range of local real estate apartment sites were employed in developing the data. The 6,000 rental unit complexes in Zip Codes 48374, 48375, and 48377 were examined to ascertain market conditions.

The information summaries generated for each zip code area follow. The vacancy rate is extremely low, less than 3.5 percent for established developments.

Zip Code 48374 - Rental Units

The following summarizes the findings for Zip Code 48374.

- ✓ Apartments range in size from 1,065 to 1,189 square feet.
- ✓ Monthly rental rates range from $1,872 to $1,950.

*Table 12 - Rental Information for Units in Zip Code Area 48374**

Bedrooms	Unit Size Range Square Feet	Average Size Square Feet	Unit Rent Range Monthly	Average Rent Monthly
1	1,065	1,065	$1,872	$1,872
2	1,189	1,189	$1,950	$1,950

*Developed by The Chesapeake Group, Inc., 2024.

Zip Code 48375 - Rental Units

The following summarizes the findings for Zip Code 48375.

- ✓ One-bedroom apartments range in size from 727 to 980 square feet, with the average being 849 square feet.
- ✓ Monthly rental rates for one-bedroom apartments range from $1,185 to $2,500, with the average of $1,710.
- ✓ Two-bedroom apartments range in size from 900 to 1,700 square feet, with the average being 1,180 square feet.
- ✓ Monthly rental rates for two-bedroom apartments range from $1,500 to $3,000, with an average of $2,000.
- ✓ Three-bedroom apartments range in size from 1,800 to 2,600 square feet, with an average of 2,140 square feet.
- ✓ Monthly rental rates for three-bedroom apartments range from $2,875 to $3,600, with an average of $3,330.

*Table 13 - Rental Information for Units in Zip Code Area 48375**

Bedrooms	Unit Size Range Square Feet	Average Size Square Feet	Unit Rent Range Monthly	Average Rent Monthly
1	727 – 980	849	$1,185 - $2,495	$1,710
2	903 – 1,698	1,179	$1,505 - $2,999	$1,992
3	1,820 – 2,600	2,136	$2,875 - $3,595	$3,328
4	1,525	1,525	$2,560	$2,560

*Developed by The Chesapeake Group, Inc., 2024.

Zip Code 48377 - Rental Units

The following summarizes the findings for Zip Code 48377.

- ✓ One-bedroom apartments range from 650 to 1,140 square feet, averaging 855 square feet.
- ✓ Monthly rental rates for one-bedroom apartments range from $1,050 to $2,300, with an average of $1,650.
- ✓ Two-bedroom apartments range in size from 800 to 1,500 square feet, with the average being 1,000 square feet.
- ✓ Monthly rental rates for two-bedroom apartments range from $1,200 to $2,600, with an average of $1,750.
- ✓ Three-bedroom apartments range in size from 1,560 to 2,000 square feet, with the average being 1,800 square feet.
- ✓ Monthly rental rates for three-bedroom apartments range from $2,400 to $3,300, with an average of $2,900.

*Table 14 - Rental Information for Units in Zip Code Area 48377**

Bedrooms	Unit Size Range Square Feet	Average Size Square Feet	Unit Rent Range Monthly	Average Rent Monthly
1	650 – 1,140	855	$1,050 - $2,300	$1,649
2	800 – 1,491	1,007	$1,196 - $2,590	$1,754
3	1,554 – 1,980	1,801	$2,368 - $3,325	$2,911

*Developed by The Chesapeake Group, Inc., 2024.

Combined - Rental Information

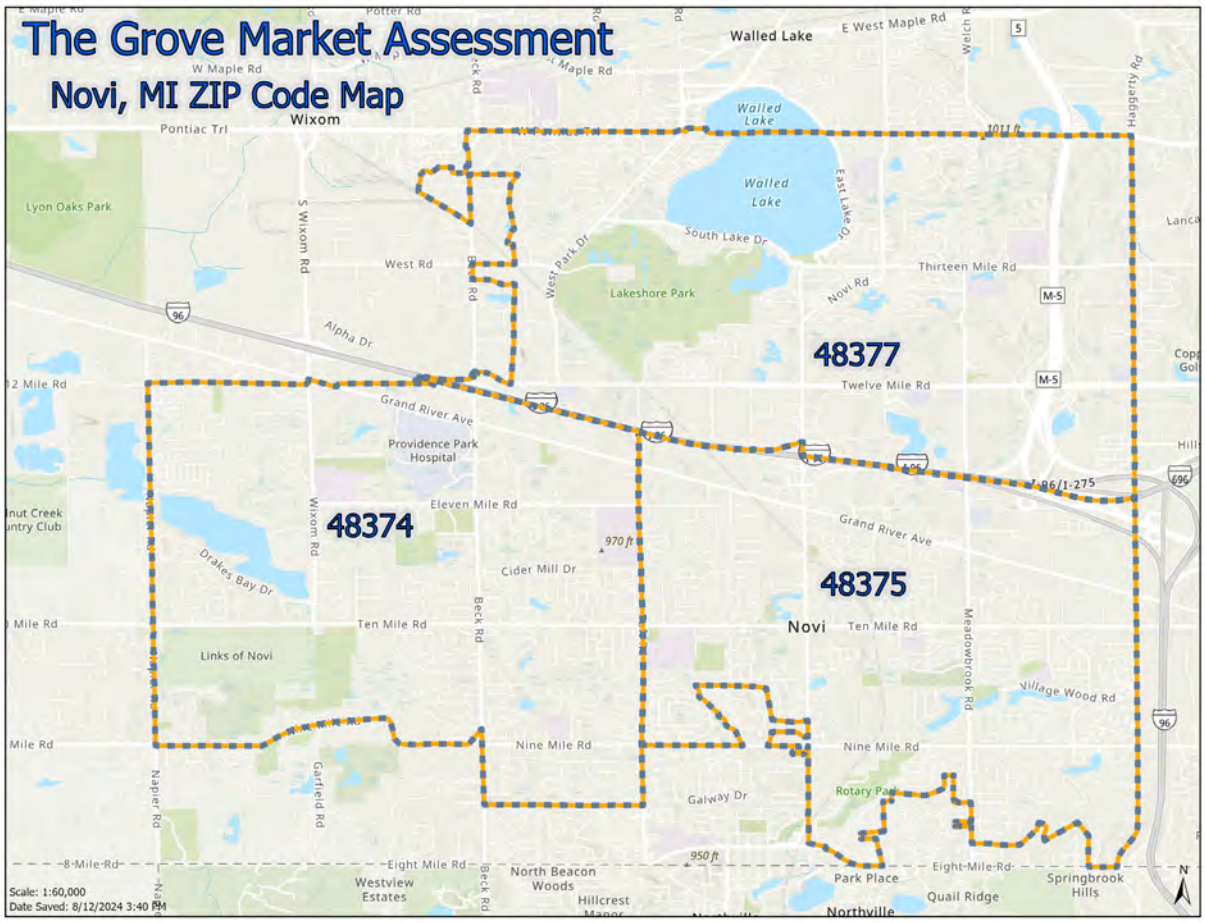
The following summarizes the rental information for Novi's one- and two-bedroom units.

*Table 15 - Rental Information for the Novi Area**

Zip Code	Unit Size Range Square Feet	Average Size Square Feet	Unit Rent Range Monthly	Average Rent Monthly
48374 – 1-bd	1,065	1,065	$1,872	$1,872
48375 – 1-bd	727 - 980	849	$1,185 - $2,495	$1,710
48377-1-bd	650 – 1,140	855	$1,050 - $2,300	$1,649
Novi Area	650 – 1,140	923	$1,050 - $2,495	$1,744
Zip Code	Unit Size Range	Average Size	Unit Rent Range	Average Rent

	Square Feet	Square Feet	Monthly	Monthly
48374 – 2-bd	1,189	1,189	$1,950	$1,950
48375-2-bd	903 – 1,698	1,179	$1,505 - $2,999	$1,992
48377-2bd	800 – 1,491	1,007	$1,196 - $2,590	$1,754
Novi Area	800 – 1,698	1,125	$1,196 - $2,999	$1,899

*Developed by The Chesapeake Group, Inc., 2024.



REZONING TRAFFIC IMPACT STUDY

MEMO

FLEIS&VANDENBRINK
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VIA EMAIL: gshapiro@ivanhoecompanies.com

To:	**Ivanhoe Companies**
From:	**Julie M. Kroll, PE, PTOE** **Salman Ahmad** **Fleis & VandenBrink**
Date:	**July 16, 2024** **Revised October 11, 2024**
Re:	**The Grove Residential Development** **Novi, Michigan** **Traffic Impact Study**

1 INTRODUCTION

This memorandum presents the results of the Traffic Impact Study (TIS) for the proposed residential development in Novi, Michigan. The project site is located generally in the southeast quadrant of the 12-Mile Road & Meadowbrook Road intersection, as shown on the attached **Figure 1**. The proposed development includes the construction of a residential development on property that is currently vacant.

The project site is currently zoned OST (Office Service Technology) and is proposed to be rezoned RM-2 (High-Density Multiple-Family), with a Planned Rezoning Overlay (PRO). Site access is proposed via one (1) right-in right-out (RIRO) driveway on 12-Mile Road and two (2) full-access driveways on Meadowbrook Road. 12-Mile Road is under the jurisdiction of Road Commission for Oakland County (RCOC) and Meadowbrook Road is under the jurisdiction of the City of Novi. A TIS is required for this project as part of the site plan and rezoning review process with the City of Novi and for permitting of site access.

This TIS has been completed to evaluate the impact of the proposed development on the adjacent roadway network. The scope of work for this study was developed based on Fleis & VandenBrink's (F&V) knowledge of the study area, understanding of the development program, accepted traffic engineering practices, and information published by Institute of Transportation Engineers (ITE). Additionally, the City of Novi and their traffic engineering consultant (AECOM) provided input regarding the scope of work included herein. The study analyses were completed using Synchro/SimTraffic (Version 11) & HCS2024 traffic analysis software. Sources of data for this study include F&V subconsultant Quality Counts, LLC (QC), RCOC, the City of Novi, the Southeast Michigan Council of Governments (SEMCOG), the Michigan Department of Transportation (MDOT), and ITE.

2 BACKGROUND

2.1 EXISTING ROAD NETWORK

Vehicle transportation for the study area is provided via 12-Mile Road and Meadowbrook Road, with regional transportation provided via M-5. Information on study roadways is attached and summarized in **Table 1** and the lane use and traffic control are shown on the attached **Figure 2**. For the purposes of this study, all minor streets and driveways were assumed to have an operating speed of 25 miles per hour (mph), unless otherwise noted. Additional information for the study roadways is described below.

Meadowbrook Road runs in the north / south directions, adjacent to the west side of the project site.

- North of 12-Mile Road, Meadowbrook Road provides a typical two-lane cross-section, with one (1) lane of travel in each direction.
- South of 12-Mile Road, adjacent to the project site, Meadowbrook Road provides a typical three-lane cross-section, with one (1) lane of travel in each direction and a center two-way left-turn lane (TWLTL).

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- Meadowbrook Road widens at the signalized study intersection with 12-Mile Road, in order to provide exclusive right-turn lanes in both the northbound and southbound directions.

12-Mile Road runs in the east / west directions, adjacent to the north side of the project site. The study section of 12-Mile Road provides a median divided, six-lane cross-section, with three (3) lanes of travel in each direction; left-turn movements are accommodated via median U-turn (crossovers) intersections. Additionally, 12-Mile Road widens at the signalized study intersection with Meadowbrook Road, in order to provide exclusive right-turn lanes in both the eastbound and westbound directions.

M-5 generally runs in the north / south directions, east of the project site. At the signalized study intersection with 12-Mile Road, the SB M-5 Exit-Ramp provides dual (2) right-turn lanes and dual (2) left-turn lanes.

Table 1: Roadway Information

Roadway Segment	12-Mile Road	Meadowbrook Road	M-5
National Functional Classification	Other Principal Arterial	Minor Arterial	Other Freeway
Posted Speed Limit	45-mph	35-mph (N. of 12-Mile Rd) 40-mph (S. of 12-Mile Rd)	70-mph
Road Jurisdiction	RCOC	City of Novi	MDOT
Daily Traffic Volumes (MDOT 2023)	26,000 vpd	5,050 vpd (N. of 12-Mile Road)	79,400 vpd
Roadway Improvement Projects	None	Water Main Installation & Street Reconstruction (8-Mile to 14-Mile)	None

2.2 EXISTING TRAFFIC VOLUMES

F&V subconsultant QC, collected existing Turning Movement Count (TMC) data on Tuesday, June 11, 2024, during the AM (7:00 AM to 9:00 AM) and PM (4:00 PM to 6:00 PM) peak periods at the study intersections[1]:

- 12-Mile Road & Meadowbrook Road
- WB-to-EB X/O, West of Meadowbrook Road
- WB-to-EB X/O, East of Meadowbrook Road
- EB-to-WB X/O, East of Meadowbrook Road
- WB-to-EB X/O, West of Summit Drive

At the time the data collection was performed, there was ongoing detours due to construction on M-5/I-696 Meadowbrook Road. Therefore, the available historical traffic counts from RCOC's Sydney Coordinated Adaptive Traffic System (SCATS) database were obtained for Tuesday, January 11, 2022, prior to the detours and construction. The SCAT counts were obtained at the following intersections for use in the study:

- 12-Mile Road & Meadowbrook Road
- 12-Mile Road & SB M-5 Exit-Ramp

The SCATS peak hour traffic volumes were projected at a 0.5% annual growth rate at these intersections to calculate the expected 2024 traffic volumes (without detours) and were utilized in the study. The through volumes on 12-Mile Road were balanced upwards through the roadway network...During collection of the turning movement counts, Peak Hour Factors (PHFs), pedestrian and bicycle volumes, and commercial truck percentages were recorded and used in the traffic analysis. The weekday AM and PM peak hours for the adjacent roadway network were observed to generally occur between 8:00 AM to 9:00 AM and 4:00 PM to 5:00 PM, respectively. F&V collected an inventory of existing lane use and traffic controls, as shown on the attached **Figure 2**. Additionally, F&V obtained the current signal timing permits from RCOC for the signalized study intersections within the study roadway network.

The existing 2024 peak hour traffic volumes used in the analysis are shown on the attached **Figure 3**. These volumes shown on the exhibit are the balance traffic volumes used in the analysis, and therefore will not match

[1] The adjacent intersections of EB 12-Mile Road & WB-to-EB X/O, East of 12 Oaks Mall Road and EB 12-Mile Road & SB M-5 On-Ramp were included in the Synchro model to consider the impact of vehicle progression/platooning and for the distribution of traffic to/from the proposed development. Traffic volume assumptions were made based on the collected traffic volumes, available historical traffic volume data, and consideration of the nearby land uses utilizing these intersections.

the raw data collection collected or obtained from SCATS. All applicable background data used in this analysis is attached.

3 EXISTING CONDITIONS (2024)

Existing peak hour vehicle delays and Levels of Service (LOS) were calculated at the study intersections using Synchro/SimTraffic (Version 11) traffic analysis software. This analysis was based on the existing lane use and traffic control shown on the attached **Figure 2**, the existing peak hour traffic volumes shown on the attached **Figure 3**, and the methodologies presented in the *Highway Capacity Manual, 6th Edition* (HCM6). Descriptions of LOS "A" through "F" as defined in the HCM6, are attached. Typically, LOS D is considered acceptable, with LOS A representing minimal delay and LOS F indicating failing conditions.

Note: The clustered signal operations are not supported by the HCM6 methodology; therefore, HCM 2000 was determined to be more appropriate for the evaluation of the signalized study intersections.

The signalized study intersections also operate on RCOC's SCATS; therefore, the signal timings were optimized for each scenario studied, in order to reflect the true signal operations and real time optimizations made to accommodate the traffic volumes observed by the approach lane detectors. The results of the existing conditions analysis are attached and shown in **Table 2**.

Table 2: Existing Intersection Operations

Intersection		Control	Approach	Existing Conditions (2024)			
				AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS
10	EB 12-Mile Road & WB-to-EB X/O, West of Meadowbrook Road	Stop (Minor)	EB	Free			
			SBL	13.1	B	12.3	B
20	12-Mile Road & Meadowbrook Road	Signalized	EBT	12.9	B	11.0	B
			EBR	8.5	A	5.8	A
			WBT	20.6	C	21.7	C
			WBR	36.1	D	30.3	C
			NBT	26.4	C	32.8	C
			NBR	26.6	C	38.9	D
			SBT	27.6	C	33.8	C
			SBR	26.5	C	31.0	C
			Overall	21.9	C	22.8	C
30	EB 12-Mile Road & WB-to-EB X/O, East of Meadowbrook Road	Stop (Minor)	EB	Free			
			SBL	0.0*	A	10.1	B
40	WB 12-Mile Road & EB-to-WB X/O, East of Meadowbrook Road	Stop (Minor)	WB	Free			
			NBL	11.5	B	26.5	D
50	EB 12-Mile Road & WB-to-EB X/O, West of Summit Drive	Stop (Minor)	EB	Free			
			SBL	10.3	B	12.6	B
60	12-Mile Road & SB M-5 Exit-Ramp	Signalized	EB	18.0	B	18.8	B
			WB	16.7	B	25.1	C
			SBL	25.4	C	24.5	C
			SBR	24.8	C	31.9	C
			Overall	19.9	B	26.9	C

** Indicates no vehicle volume present.*

The results of the existing conditions analysis indicates that all approaches and movements at the study intersections are currently operating acceptably, at LOS D or better, during both the AM and PM peak hours. Review of SimTraffic network simulations also indicates acceptable operations throughout the study roadway

network during both peak periods. Occasional periods of vehicle queues were observed at the signalized study intersections during the peak periods; however, these queues were observed to be serviced within each cycle lengths, leaving no residual vehicle queueing.

4 Background Conditions (2030)

4.1 Background Growth

Historical population and employment community profile data was obtained for the City of Novi from the Southeast Michigan Council of Government (SEMCOG), in order to calculate a background growth rate to project the existing 2024 traffic volumes to the site buildout year of 2030. Population and employment projections from 2020 to 2050 were reviewed and indicate average annual growth rates of 0.37% and 0.39%, respectively. Therefore, a conservative annual background growth rate of **0.5%** per year was utilized for this study, in order to project the existing 2024 peak hour traffic volumes to buildout year of 2030.

In addition to the background traffic growth, it is important to account for traffic that will be generated by approved developments within the vicinity of the study area that are currently under construction or will be within the buildout year. At the time of this study, the following developments were identified by the City of Novi and were included within the study as background traffic:

- Griffin Novi I
- Griffin Novi II
- Elm Creek

Information regarding the proposed background developments and trip generation included within the attachments for reference. The vehicular trips generated by the proposed background development were assigned to the study roadway network based on the existing peak hour traffic patterns in the adjacent roadway network and the methodologies published by ITE. After applying the background growth rate to the existing 2024 traffic volumes shown on the attached **Figure 3**, the site-generated traffic volumes from the background development were added to the study roadway network, in order to determine the background peak hour traffic volumes ***without the proposed development***, as shown on the attached **Figure 4**.

4.2 Background Conditions Analysis

Background peak hour vehicle delays and LOS ***without the proposed development*** were calculated at the study intersections based on the existing lane use and traffic control shown on the attached **Figure 2**, the background peak hour traffic volumes shown on the attached **Figure 4**, and the methodologies presented in the HCM. Results of the background conditions analysis are attached and summarized in **Table 3**.

Table 3: Background Intersection Operations

Intersection		Control	Approach	Existing Conditions (2024)				Background Conditions (2030)				Difference			
				AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
10	EB 12-Mile Road & WB-to-EB X/O, W. of Meadowbrook	Stop (Minor)	EB	Free				Free				Free			
			SBL	13.1	B	12.3	B	13.8	B	13.3	B	0.7	-	1.0	-
20	12-Mile Road & Meadowbrook Road	Signal	EBT	12.9	B	11.0	B	13.5	B	11.1	B	0.6	-	0.1	-
			EBR	8.5	A	5.8	A	9.0	A	5.7	A	0.5	-	-0.1	-
			WBT	20.6	C	21.7	C	21.3	C	23.4	C	0.7	-	1.7	-
			WBR	36.1	D	30.3	C	35.6	D	24.1	C	-0.5	-	-6.2	-
			NBT	26.4	C	32.8	C	25.8	C	32.9	C	-0.6	-	0.1	-
			NBR	26.6	C	38.9	D	26.3	C	43.0	D	-0.3	-	4.1	-
			SBT	27.6	C	33.8	C	27.0	C	34.1	C	-0.6	-	0.3	-
			SBR	26.5	C	31.0	C	26.1	C	31.0	C	-0.4	-	0.0	-
			Overall	21.9	C	22.8	C	22.2	C	23.1	C	0.3	-	0.3	-
30	EB 12-Mile Road & WB-to-EB X/O, E. of Meadowbrook	Stop (Minor)	EB	Free				Free				Free			
			SBL	0.0*	A	10.1	B	0.0*	A	10.3	B	0.0*	-	0.2	-

Intersection		Control	Approach	Existing Conditions (2024)				Background Conditions (2030)				Difference			
				AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
40	WB 12-Mile Road & EB-to-WB X/O, E. of Meadowbrook	Stop (Minor)	WB	Free				Free				Free			
			NBL	11.5	B	26.5	D	11.9	B	32.1	D	0.4	-	5.6	-
50	EB 12-Mile Road & WB-to-EB X/O, W. of Summit Dr.	Stop (Minor)	EB	Free				Free				Free			
			SBL	10.3	B	12.6	B	10.5	B	12.9	B	0.2	-	0.3	-
60	12-Mile Road & SB M-5 Exit-Ramp	Signal	EB	18.0	B	18.8	B	18.3	B	19.7	B	0.3	-	0.9	-
			WB	16.7	B	25.1	C	16.9	B	26.1	C	0.2	-	1.0	-
			SBL	25.4	C	24.5	C	25.4	C	24.5	C	0.0	-	0.0	-
			SBR	24.8	C	31.9	C	24.8	C	33.3	C	0.0	-	1.4	-
			Overall	19.9	B	26.9	C	20.0	B	27.9	C	0.1	-	1.0	-

** Indicates no vehicle volume present. Decreased delays are the result of SCATS optimizations, improved progression and/or HCM methodologies*

The results of the background conditions analysis indicates that all approaches and movements at the study intersections are expected to continue operating acceptably, at LOS D or better during both peak periods, in a manner similar to the existing conditions analysis, with minor increases in delays. Review of SimTraffic network simulations also indicates acceptable operations during both peak periods, similar to those observations made during existing conditions.

5 TRIP GENERATION

5.1 SITE TRIP GENERATION

The number of weekday peak hour (AM and PM) and daily vehicle trips that would be generated by the proposed development were forecasted based on data published in the ITE *Trip Generation Manual, 11th Edition*. The proposed development includes the construction residential units. Site trip generation forecast utilized in this analysis was reviewed and approved by the City of Novi's traffic engineering consultant (AECOM) prior to use in this TIS; the trip generation is summarized in **Table 4**.

Table 4: Site Trip Generation

Land Use	ITE Code	Amount	Units	Average Daily Traffic (vpd)	AM Peak Hour (vph)			PM Peak Hour (vph)		
					In	Out	Total	In	Out	Total
Single-Family Attached Housing	215	182	DU	1,336	22	67	89	62	43	105
Multi-Family Housing (Low-Rise)	220	256	DU	1,716	24	78	102	83	48	131
			Total	3,052	46	145	191	145	91	236

5.2 REZONING TRIP GENERATION ANALYSIS

As part of the development plan for this project, the subject property is proposed to be rezoned from the existing OST to RM-2, with a PRO. A trip generation comparison was performed to evaluate the maximum potential development that would be permitted under the existing OST zoning classification, as compared to the proposed development under RM-2 with a PRO. The PRO zoning option permits only that land use which is proposed and approved; therefore, the uses that are permitted under the existing OST zoning were reviewed and matched to representative land uses within the ITE Trip Generation Manual.

Existing Zoning OST (Office Service Technology)

The City of Novi Ordinance definition of uses permitted under the OST zoning includes: professional office buildings, data processing and computer centers, laboratories, hotels and business motels, colleges, universities, and other such secondary institutions, etc.

Review of the ITE land use description indicates that the General Office Building (LUC 710) use generates the highest trips and best matches the uses defined by the City of Novi Ordinance and permitted by right under the existing OST zoning. As part of the proposed project, a parallel development plan was developed for what could be permitted under the existing OST zoning, which consist of office uses; the parallel plan is attached for reference. Additional options for the office building also included various sizes for this development plan, with the maximum development ranging from approximately 500kSF to approximately 1MSF.

Proposed Zoning RM-2 with PRO

The City of Novi Ordinance defines a PRO as a site-specific use authorization to accomplish the objectives of the zoning ordinance through a land development project review process. Therefore, the proposed development plan that will be approved within the PRO Agreement would be the only development that would be permitted within the proposed zoning.

Therefore, an analysis was performed in order to compare the site trip generation potential currently permitted by right under the existing OST zoning and the trip generation associated with the proposed development plan. The number of weekday peak hour (AM and PM) and daily vehicle trips that would be generated were calculated based on the rates and equations published by ITE in the *Trip Generation Manual, 11th Edition*. The results of the trip generation comparison are summarized in **Table 5**.

Table 5: Rezoning Trip Generation Comparison

Zoning	Land Use	ITE Code	Amount	Units	Average Daily Traffic (vpd)	AM Peak Hour			PM Peak Hour		
						In	Out	Total	In	Out	Total
Existing (OST)	General Office Building	710	984,600	SF	8,487	1,053	144	1,197	188	920	1,108
Existing (OST)	General Office Building	710	738,450	SF	6,608	822	112	934	148	725	873
Existing (OST)	General Office Building	710	492,300	SF	4,643	580	79	659	106	517	623
Maximum for Existing Zoning			*984,600*	*SF*	*8,487*	*1,053*	*144*	*1,197*	*188*	*920*	*1,108*
Proposed (RM-2 w/ PRO)	Single-Family Attached Housing	215	182	DU	1,336	22	67	89	62	43	105
	Multi-Family Housing (Low-Rise)	220	256	DU	1,716	24	78	102	83	48	131
Total for Proposed Zoning					*3,052*	*46*	*145*	*191*	*145*	*91*	*236*
Difference					-5,435	-1,007	1	-1,006	-43	-829	-872

The results of the trip generation comparison indicates that the proposed RM-2 with a PRO zoning will generate *less* trips than the potential trip generation that is currently permitted under the existing OST zoning classifications. Therefore, the proposed development plan is expected to have a lower impact on adjacent roadway network, as compared to the potential use(s) of the project site, based on the current zoning.

6 SITE TRIP DISTRIBUTION

The vehicular trips that would be generated by the proposed development were assigned to the study roadway network based on the proposed site access plan, the existing peak hour traffic patterns in the adjacent roadway network, and the methodologies published by ITE. The ITE trip distribution methodology assumes that new trips will enter the network and access the development, then leave the development and return to their direction of origin. The site trip distributions used in this analysis were reviewed by the City of Novi's traffic engineering consultant (AECOM) prior to use in this TIS and are summarized in **Table 6**.

Table 6: Site Trip Distribution

To/From	Via	AM	PM
North	Meadowbrook Road	5%	4%
South	Meadowbrook Road	16%	9%
East	12-Mile Road	23%	29%
West	12-Mile Road	22%	16%
North	M-5	8%	13%
South	M-5	26%	29%
Total		100%	100%

The site-generated vehicular traffic volumes shown in **Table 4** were distributed to the study roadway network according to the distribution shown in **Table 6**. The site-generated trips shown on the attached **Figure 5** were added to the background peak hour traffic volumes shown on the attached **Figure 4**, in order to calculate the future peak hour traffic volumes, with the addition of the proposed development. Future peak hour traffic volumes are shown on the attached **Figure 6**.

7 Future Conditions (2030 Buildout)

7.1 Future Conditions Analysis

Future peak hour vehicle delays and LOS ***with the proposed development*** were calculated based on the proposed lane use and traffic controls shown on the attached **Figure 2**, the future peak hour traffic volumes shown on the attached **Figure 6**, and the methodologies presented in the HCM. The results of the future conditions analysis are attached and summarized in **Table 7**.

The results of the future conditions analysis indicates that all study intersection approaches and movements are expected to continue operating acceptably, at LOS D or better during both peak periods, in a manner similar to the background conditions analysis. Review of SimTraffic network simulations also indicates acceptable operations throughout the study roadway during both peak periods. The majority of vehicle queues at the signalized study intersections were observed to be serviced within each cycle length, leaving minimal residual vehicle queueing. Additionally, review of SimTraffic microsimulations indicates that vehicles at the stop-controlled proposed site driveways were able to find adequate gaps within the through traffic, without experiencing significant delays or excessive vehicle queueing during both peak hours.

Table 7: Future Intersection Operations

Intersection		Control	Approach	Background Conditions (2030)				Future Conditions (2030)				Difference			
				AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
10	EB 12-Mile Road & WB-to-EB X/O, W. of Meadowbrook	Stop (Minor)	EB	Free				Free				Free			
			SBL	13.8	B	13.3	B	14.0	B	13.7	B	0.2	-	0.4	-
20	12-Mile Road & Meadowbrook Road	Signal	EBT	13.5	B	11.1	B	14.6	B	11.7	B	1.1	-	0.6	-
			EBR	9.0	A	5.7	A	9.9	A	6.1	A	0.9	-	0.4	-
			WBT	21.3	C	23.4	C	21.8	C	24.9	C	0.5	-	1.5	-
			WBR	35.6	D	24.1	C	33.8	C	20.7	C	-1.8	D→C	-3.4	-
			NBT	25.8	C	32.9	C	24.6	C	32.3	C	-1.2	-	-0.6	-
			NBR	26.3	C	43.0	D	25.2	C	44.1	D	-1.1	-	1.1	-
			SBT	27.0	C	34.1	C	25.7	C	33.4	C	-1.3	-	-0.7	-
			SBR	26.1	C	31.0	C	24.9	C	30.3	C	-1.2	-	-0.7	-
			Overall	22.2	C	23.1	C	22.2	C	23.7	C	0.0	-	0.6	-
30	EB 12-Mile Road & WB-to-EB X/O, E. of Meadowbrook	Stop (Minor)	EB	Free				Free				Free			
			SBL	0.0*	A	10.3	B	0.0*	A	10.3	B	0.0*	-	0.0	-
40	WB 12-Mile Road & EB-to-WB X/O, E. of Meadowbrook	Stop (Minor)	WB	Free				Free				Free			
			NBL	11.9	B	32.1	D	12.3	B	34.3	D	0.4	-	2.2	-
50	EB 12-Mile Road & WB-to-EB X/O, W. of Summit Drive	Stop (Minor)	EB	Free				Free				Free			
			SBL	10.5	B	12.9	B	10.8	B	15.0	C	0.3	-	2.1	B→C
60	12-Mile Road & SB M-5 Exit-Ramp	Signal	EB	18.3	B	19.7	B	18.0	B	19.5	B	-0.3	-	-0.2	-
			WB	16.9	B	26.1	C	15.9	B	26.4	C	-1.0	-	0.3	-
			SBR	25.4	C	24.5	C	26.1	C	35.3	D	0.7	-	10.8	C→D
			SBL	24.8	C	33.3	C	26.8	C	25.2	C	2.0	-	-8.1	-
			Overall	20.0	B	27.9	C	19.8	B	28.6	C	-0.2	-	0.7	-

Intersection		Control	Approach	Background Conditions (2030)				Future Conditions (2030)				Difference			
				AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
70	EB 12-Mile Road & Site Drive #1	Stop (Minor)	EB	N/A				Free				N/A			
			NB					13.8	B	20.8	C				
80	Meadowbrook Road & Elm Creek Drive / Site Drive #2	Stop (Minor)	EB	15.7	C	21.8	C	17.1	C	25.7	D	1.4	-	3.9	C→D
			WB	N/A				12.0	B	15.2	C	N/A			
			NBL	8.3	A	8.2	A	8.4	A	8.2	A	0.1	-	0.0	-
			SBL	Free				7.7	A	8.7	A	N/A			
90	Meadowbrook Road & Site Drive #3	Stop (Minor)	WB	N/A				11.0	B	12.9	B	N/A			
			NB					Free							
			SBL					7.7	A	8.7	A				

** Indicates no vehicle volume present. Decreased delays are the result of SCATS optimizations, improved progression, and/or HCM methodologies.*

7.2 Weaving Analysis

A weaving analysis was conducted using HCS2024 software for the crossovers adjacent to the east and west of Site Drive # 1 on EB 12-Mile Road. This analysis was performed to ensure that there is adequate distance between the cross-overs to accommodate the projected weaving to/from the site access driveway on 12-Mile Road. The results of the analysis are attached and summarized in **Table 8**.

Table 8: Future Conditions Weaving Analysis

EB 12-Mile Road Segment	Future Conditions			
	AM Peak		PM Peak	
	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS
WB-to-EB X/O, West of Summit Drive to Site Drive # 1	7.1	A	12.9	B
Site Drive # 1 to EB-to-WB X/O, West of M-5	7.2	A	12.0	A

- The results of the weaving analysis indicates that there is adequate distance between the proposed Site Drive #1 and the existing crossover locations to accommodate the projected traffic volumes

8 Access Management

8.1 Auxiliary Turn Lane Evaluation

Site access is proposed via one (1) right-in right-out (RIRO) driveway on 12-Mile Road and two (2) full-access driveways on Meadowbrook Road. 12-Mile Road is under the jurisdiction of RCOC and Meadowbrook Road is under the jurisdiction of the City of Novi. The RCOC & City of Novi auxiliary turn lane charts were utilized, in order to determine the need for auxiliary turn lanes at the proposed site driveways. There is currently an existing center two-way left-turn lane (TWLTL) on Meadowbrook Road, adjacent to the project site, and 12-Mile Road is median divided, with left-turns accommodated via median U-turns (crossovers) intersections. Therefore, only the right-turn treatment criteria was evaluated at the proposed site driveways. This analysis was based on the future peak hour traffic volumes shown on the attached **Figure 6**. The results of the analysis are shown on the attached RCOC & City of Novi warrant charts and summarized in **Table 9**.

- The results of the auxiliary turn lane evaluation indicates that a right-turn deceleration lane is recommended on 12-Mile Road at the proposed Site Drive #1.

Table 9: Auxiliary Right-Turn Lane Analysis Summary

Site Driveway Intersection	AM Peak Hour	PM Peak Hour	Recommendation
12-Mile Road & Site Drive #1	Right-Turn Taper	Right-Turn Lane	Right-Turn Lane
Meadowbrook Road & Site Drive #2	No Treatment	No Treatment	No Treatment
Meadowbrook Road & Site Drive #3	No Treatment	No Treatment	No Treatment

8.2 INTERSECTION SIGHT DISTANCE

The horizontal sight distance was evaluated at the proposed site driveway along 12-Mile Road, in order to determine if there will be adequate clear vision triangles at the proposed location. The study section of 12-Mile Road is median divided, and the proposed site driveway provides right-in right-out (RIRO) only access. Therefore, the RCOC criteria was utilized to evaluate sight distance at the proposed site driveway for a vehicle making a right-turn from a complete stop. The RCOC intersection sight distance requirements require 500-feet of clearance for a 45-mph roadway. For all sight distance calculations, the height of the driver's eye is considered to be 3.5 feet above the road surface and the height of the object is considered to be 3.5 feet above the road surface.

The results of the sight distance analysis indicate that a driver waiting to egress the proposed site driveway onto 12-Mile Road will not experience any visual obstruction, provided the sight distance triangle area shown in the attached site plan is free of vegetation and a clear line of sight is provided.

9 CONCLUSIONS

The conclusions of this TIS are as follows:

1. Existing Conditions (2024)

- The results of the existing conditions analysis indicates that all approaches and movements at the study intersections are currently operating acceptably, at LOS D or better during both the AM and PM peak hours. Additionally review of SimTraffic network simulations indicates acceptable operations throughout the study roadway network during both peak periods.

2. Background Conditions (2030)

- A conservative annual background growth rate of **0.5%** per year was utilized to project the existing 2024 traffic volumes to the buildout year of 2030. In addition to background traffic growth, the following background developments were identified and were included within the background traffic volumes.
    - Griffin Novi I
    - Griffin Novi II
    - Elm Creek
- The results of the background conditions analysis indicates that the study intersections are expected to continue operating acceptably, at LOS D or better during both peak periods, in a manner similar to the existing conditions analysis. Review of SimTraffic microsimulations also indicates acceptable operations and minimal vehicle queueing during both peak periods.

3. Future Conditions (2030)

- The results of the future conditions analysis indicates that all study intersection approaches and movements are expected to continue operating acceptably, at LOS D or better during both peak periods, in a manner similar to the background conditions analysis. Review of SimTraffic microsimulations also indicates acceptable operations throughout the study roadway network; additionally, vehicles at the stop-controlled proposed site driveways were able to find adequate gaps within the through traffic, without experiencing significant delays or excessive vehicle queueing.
- The results of the weaving analysis indicates that there is adequate distance between the proposed Site Drive #1 and the existing crossover locations to accommodate the projected traffic volumes.

4. Access Management

- The need for auxiliary turn lane at the proposed site driveways on 12-Mile Road and Meadowbrook Road were evaluated and indicate that right-turn lane is recommended on 12-Mile Road at the proposed Site Drive #1.
- The results of the sight distance analysis indicate that a driver waiting to egress the proposed site driveway onto 12-Mile Road will not experience any visual obstruction, provided the sight distance triangle area remain free of vegetation and a clear line of sight is provided.

10 RECOMMENDATIONS

The recommendations of this TIS are as follows:

- Provide a right-turn deceleration lane along eastbound 12-Mile Road at the proposed Site Drive # 1.

Any questions related to this memorandum, study, analysis, and results should be addressed to Fleis & VandenBrink.

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Michigan.

Julie M. Kroll
2024.10.11
16:20:02 -04'00'

Attachments: Figures 1 – 6
Proposed Site Plan
Parallel Development Plan
Traffic Volume Data
Signal Timing Permits
SEMCOG Data
Synchro / SimTraffic Results
HCS2024 Results
Auxiliary Turn Lane Warrants

F&V

FIGURE 1

SITE LOCATION MAP

THE GROVE TIS - NOVI, MI

LEGEND

SITE — SITE LOCATION

NORTH

SCALE: NOT TO SCALE

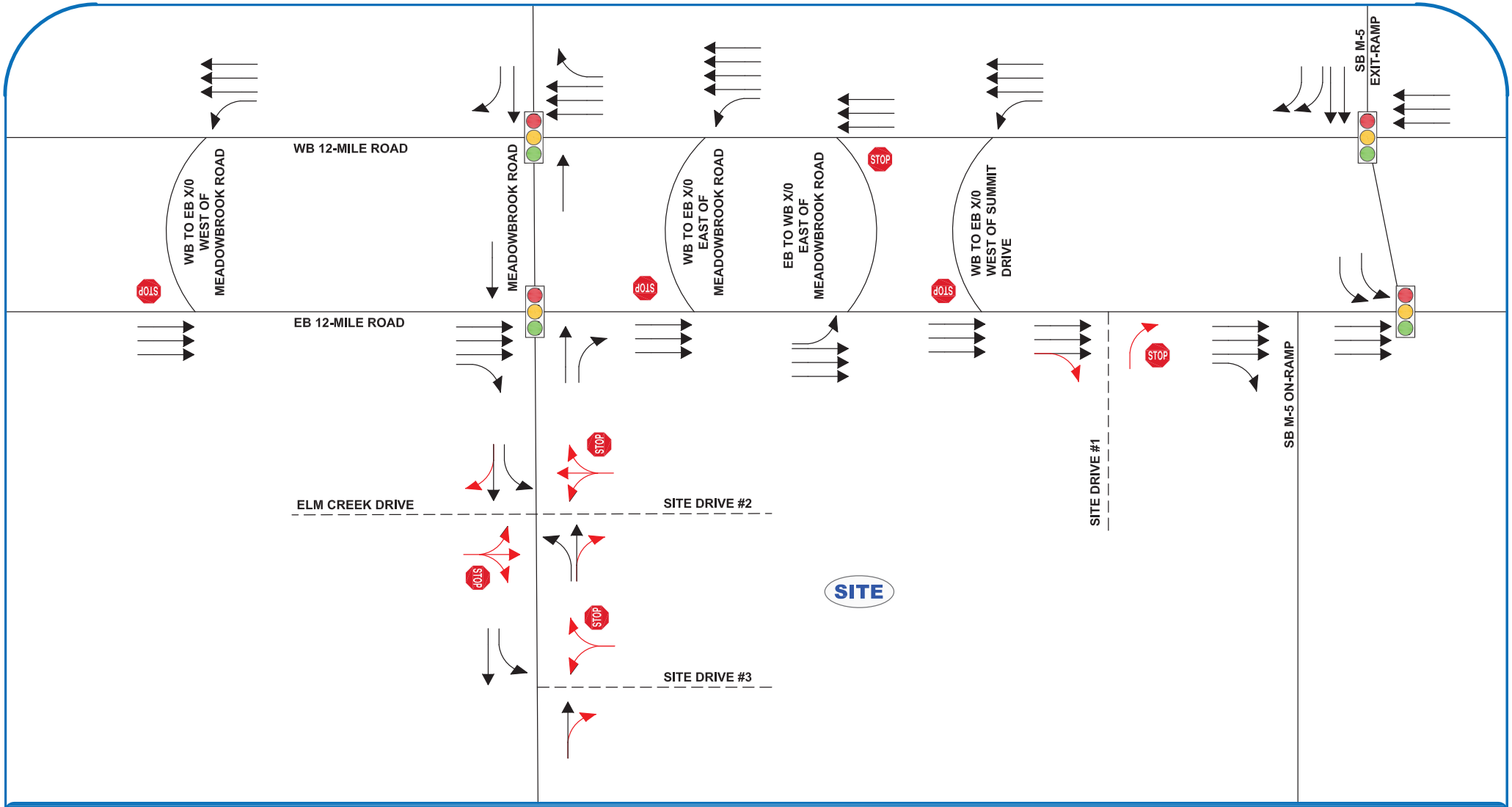

FIGURE 2

LANE USE AND TRAFFIC CONTROL

THE GROVE TIS - NOVI, MI

LEGEND

- ROADS
- PROPOSED ROADS
- LANE USE
- PROPOSED LANE USE
- SIGNALIZED INTERSECTION
- UNSIGNALIZED INTERSECTION

NORTH

SCALE: NOT TO SCALE

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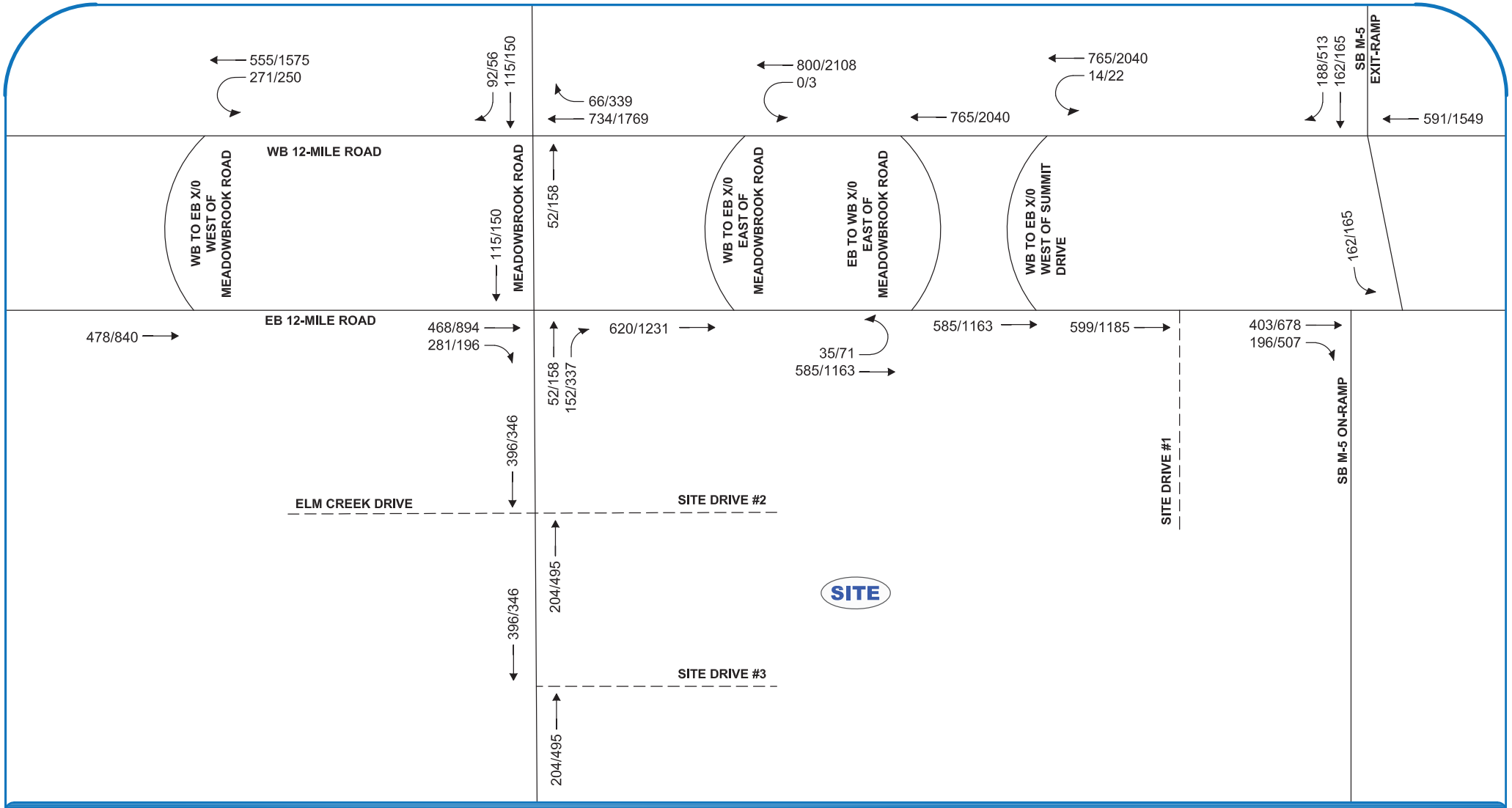


FIGURE 3

EXISTING (2024) TRAFFIC VOLUMES

THE GROVE TIS - NOVI, MI

LEGEND

ROADS

PROPOSED ROADS

TRAFFIC VOLUMES (AM/PM)

NORTH

SCALE: NOT TO SCALE

F&V

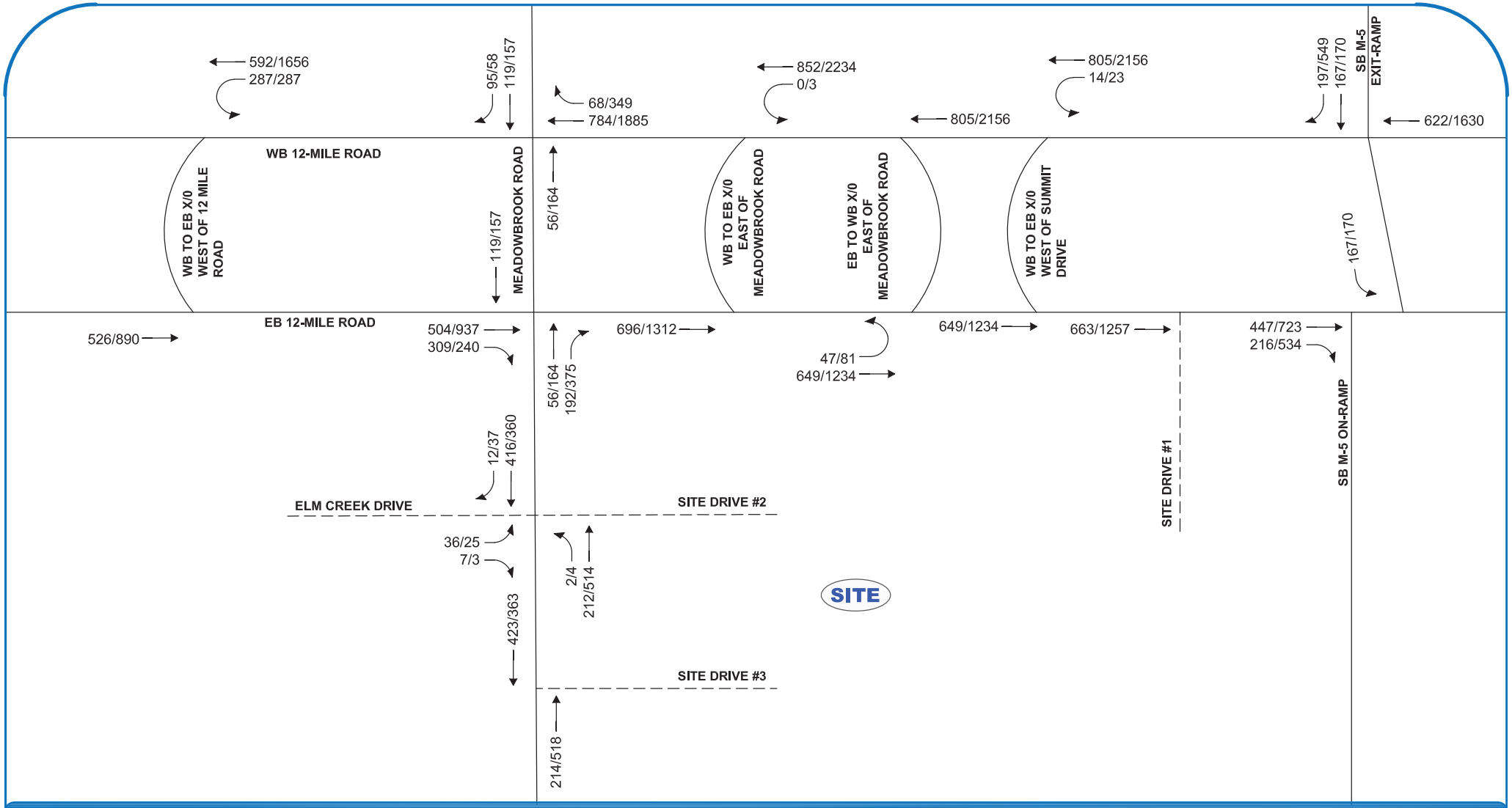


FIGURE 4
BACKGROUND (2030) TRAFFIC VOLUMES

THE GROVE TIS - NOVI, MI

LEGEND

ROADS

PROPOSED ROADS

TRAFFIC VOLUMES (AM/PM)

NORTH

SCALE: NOT TO SCALE

F&V

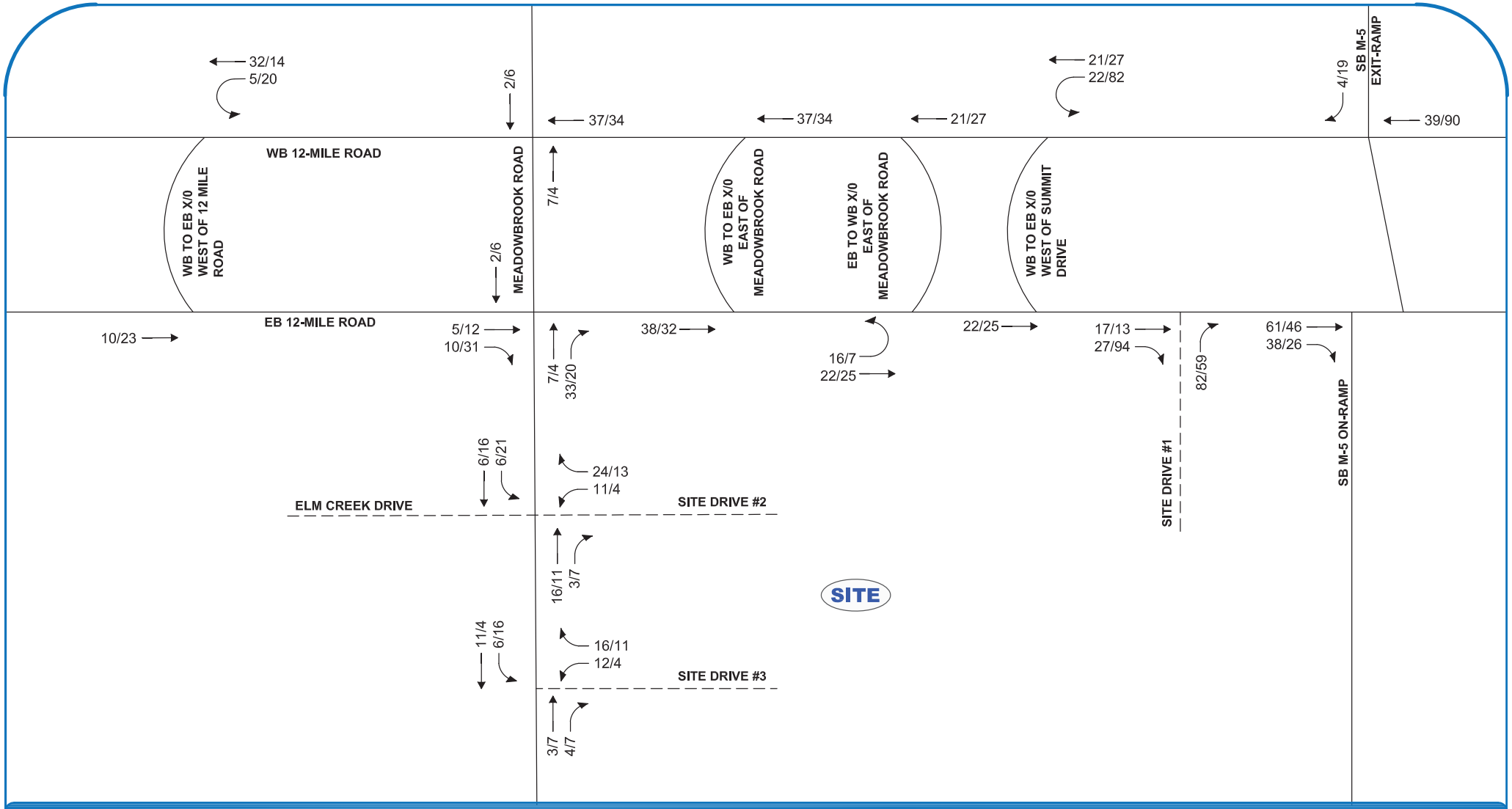


FIGURE 5
SITE-GENERATED TRAFFIC VOLUMES

THE GROVE TIS - NOVI, MI

LEGEND

ROADS

PROPOSED ROADS

TRAFFIC VOLUMES (AM/PM)

NORTH

SCALE: NOT TO SCALE

F&V

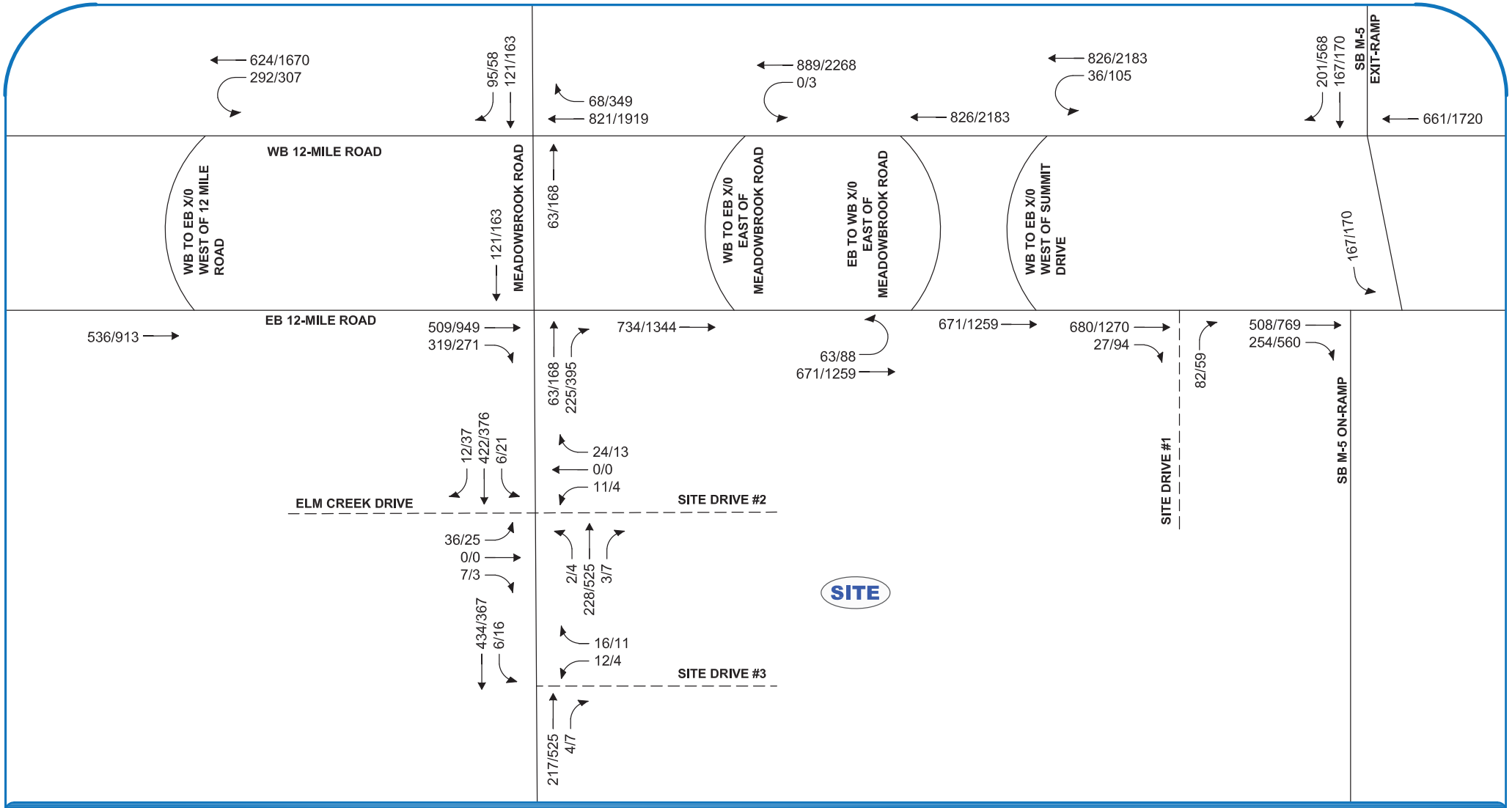


FIGURE 6

FUTURE (2030) TRAFFIC VOLUMES

THE GROVE TIS - NOVI, MI

LEGEND

ROADS

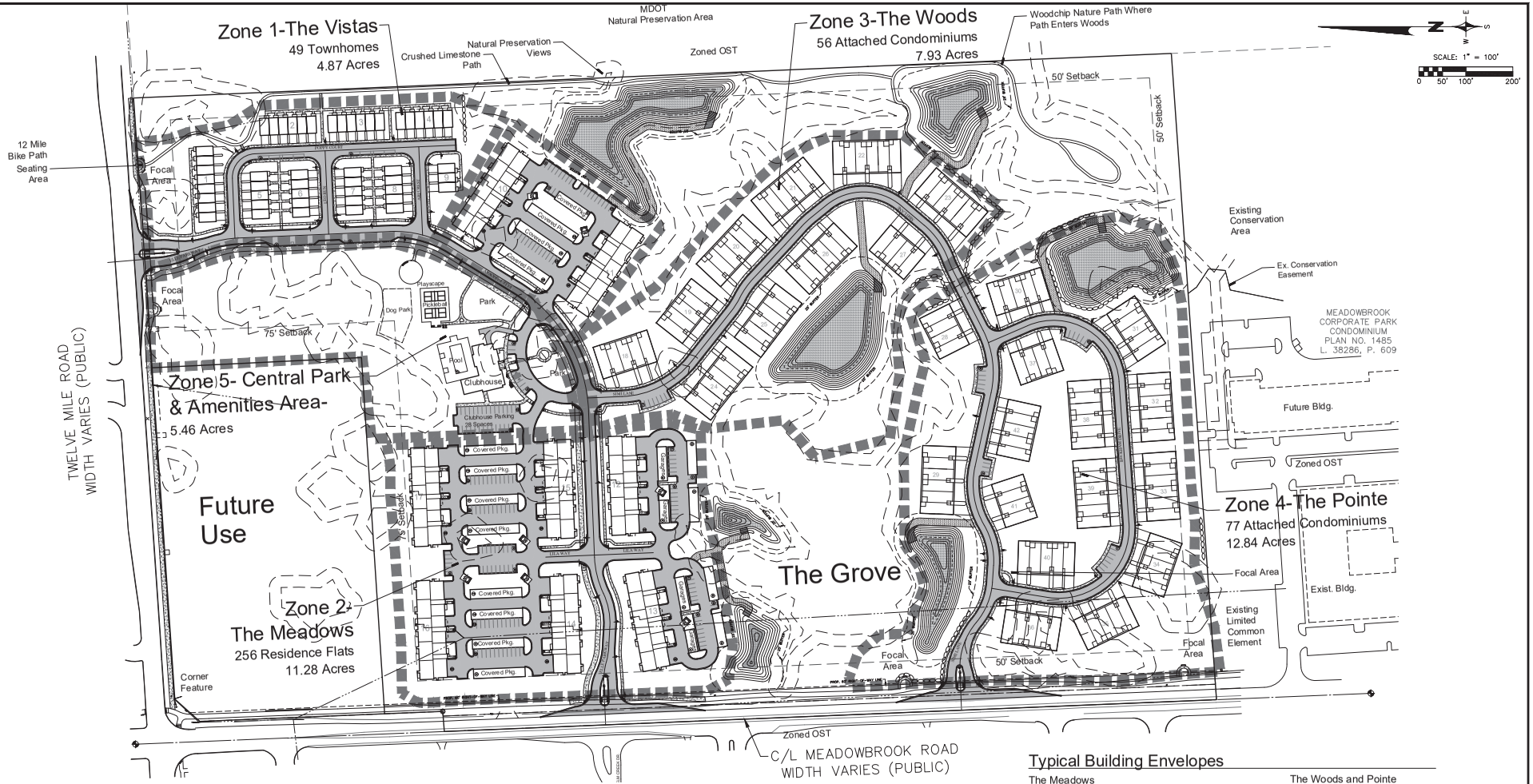
PROPOSED ROADS

TRAFFIC VOLUMES (AM/PM)

NORTH

SCALE: NOT TO SCALE

F&V



Site Summary

Existing Zoning	OST			
Proposed Zoning	PRO RM-2			
Gross Site Area	69.66 Acres			
Less ROW	2.48 Ac			
Net Site Area	67.18 Acres			
Parcel Breakdown				
Future Use				
Site Area	7.8 Acres			
Less ROW	0.16 Acres			
Net Site Area	7.64 Acres			
The Grove				
Site Area	61.86 Acres			
Less Wetlands 2 ac+	4.69 Acres			
Less ROW	2.32 Acres			
Net Site Area	54.85 Acres			

Unit Breakdown			
The Meadows	256 Units	(3.32 du/ac.)	
The Vistas	49 Units	(0.43 du/ac)	
The Woods	56 Units	(1.45 du/ac)	
The Pointe	77 Units	(2.77 du/ac.)	
Total	438 Units		
Gross Density	7.08 Du/Ac (438 Units / 61.86 Acres)		
Net Density	7.97 Du/ac (438 Units / 54.85 Acres)		

The Meadows Unit Breakdown	Bldgs 10-14	Bldgs 15-17	Total
Studio	2 Units	3 Units	21 Units (4.79% of total units)
1 Bedroom	12 Units	10 Units	86 Units (19.63% of total units)
2 Bedroom	18 Units	19 Units	149 Units
Total	32 Units	32 Units	256 Units
Attached Garages	10	10	80

Room Breakdown	
The Meadows	83 Rooms per Building
Studio (458 s.f. min.)	2 Rooms (42 Rooms)
1 Bedroom (658 s.f. min.)	2 Rooms (172 Rooms)
2 Bedroom (861 s.f. min.)	3 Rooms (447 Rooms)
The Vistas - 3 bdrm.(1,905 s.f.)	4 Rooms (196 Rooms)
The Woods - 3 bdrm. (1,958 s.f.)	4 Rooms (224 Rooms)
The Pointe - 3 bdrm.(1,958 s.f.)	4 Rooms 308 Rooms
Rooms Proposed	1,389
Rooms Allowed	1,195 Rooms (2,389,266 s.f. / 2,000)

Parking		
The Meadows		
Parking Required	512 Spaces (2 per 1 and 2 bedroom)	
Parking Provided	479 Spaces	
The Vistas		
Parking Required	123 Spaces (2.5 per Unit)	
Parking Provided	212 Spaces	
On-Street Spaces	16 Spaces	
Garage and Drives	196 Spaces	
The Woods and Pointe		
Parking Required	333 Spaces (2.5 per Unit)	
Parking Provided	562 Spaces	
Off-Street Parking	30 Spaces	
Garage and Drives	532 Spaces	
Clubhouse		
Parking Provided	36 Spaces	
Bicycle Parking		
Units		
Parking Required	88 Spaces	
Parking Provided	129 Spaces	
Clubhouse		
Parking Required	4 Space	
Parking Provided	4 Spaces	

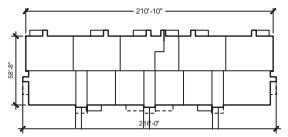
Open Space Summary		
Total Green Space Provided	38.92 Acres	(70.9%)
Usable Open Space Required	2.01 Acres	(3.8%: 438 units x 200 s.f.)
Usable Open Space Provided	11.0 Acres	(20.0%)
Additional Open Space Provided	7.36 Acres	(13.4%)
Total Open Space Provided	18.36 Acres	(33.4%)

Typical Minimum Setbacks Provided	
Front Yard Min.	25'
Side to Side	25'
Side to Rear	35'
Rear to Rear	50'

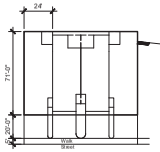
Building Lot Coverage
Allowed 45%
Proposed 16% 382,398 s.f. / 2,389,266 s.f. (54.85 Acres)

Typical Building Envelopes

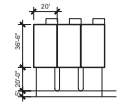
The Meadows



The Woods and Pointe



The Vistas



Clubhouse

Notes for all Residential Envelopes:
1. Building Envelopes will Accommodate Various Unit Widths, Depths and Options, Which are Subject to Change.
2. Decks are Located within the Building Envelope in the Woods and Pointe.
3. Decks are Located Outside of Building Envelopes in the Meadows and Vistas and May Extend a Maximum 10' into the Perimeter Setbacks.
4. Minimum Building Width is 20'.
5. Maximum Building Depth is 71'.
6. Minimum Driveway Length is 20' from Sidewalks.

ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE
SUBMITTAL	7/26/24								

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OVERALL SITE PLAN
THE GROVE
NOVI, MICHIGAN

FIELD BOOK	DATE 1/14/24	SCALE	HOR: 1" = 100' VER: 1" = N/A
	DESIGNED BY SRB	JOB NO.	22149
	DRAWN BY DAB	SHEET	SP-3

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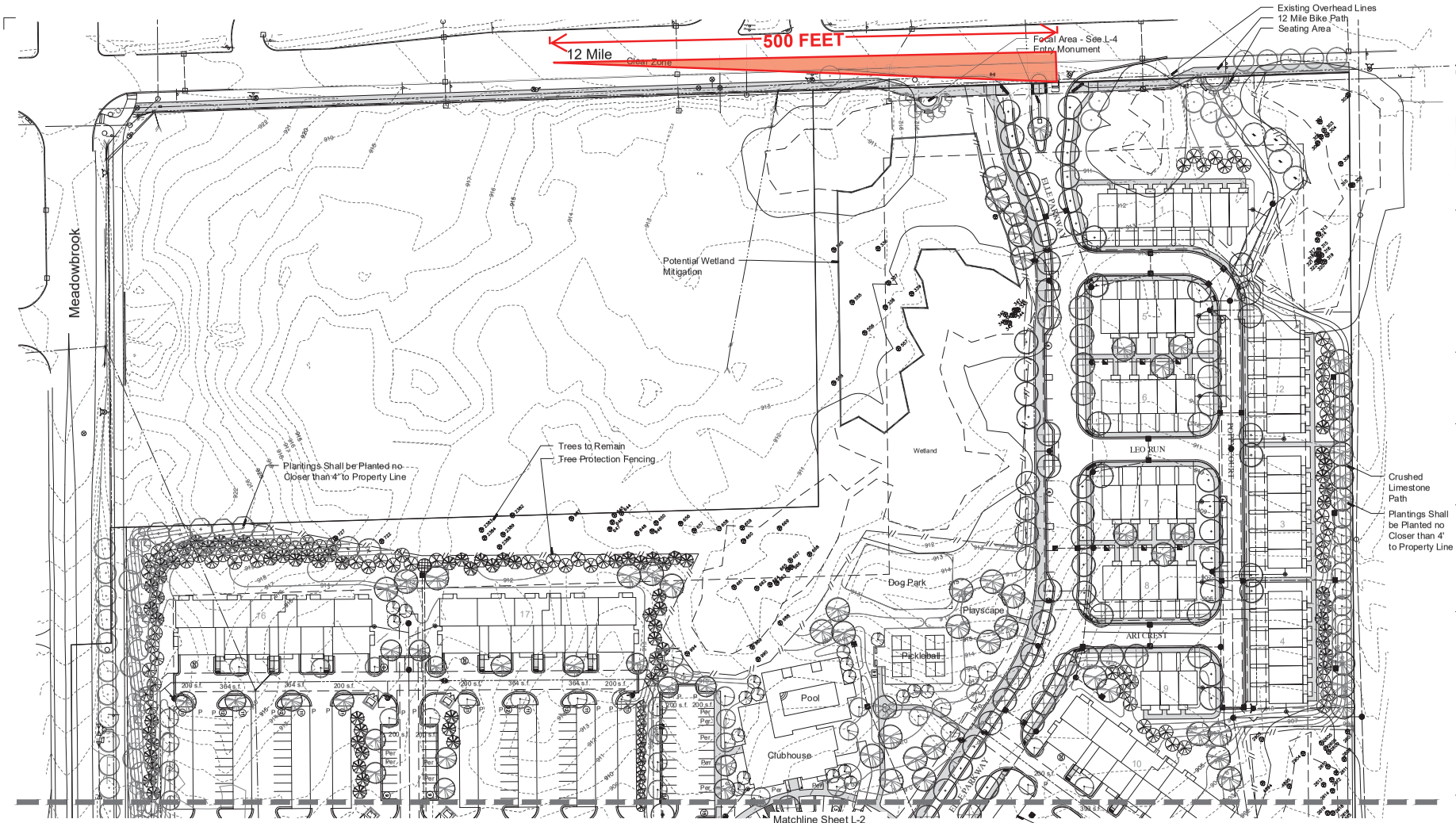

Location Map

North

Landscape Summary

Street Trees

Street Frontage		11,744 l.f.
Less Drives	3,444 l.f.	
Net Frontage		8,300 l.f.
Trees Required		237 Trees (8,300 / 35)
Trees Provided		237 Trees
Sheet L-1	78 Trees	
Sheet L-2	84 Trees	
Sheet L-3	75 Trees	

Multi-Family Trees

Total Units		278 Units
The Meadows	96 Units	
The Vistas	49 Units	
The Woods	56 Units	
The Pointe	77 Units	
Trees Required		834 Trees (278 x 3)
Trees Provided		834 Trees
Sheet L-1	286 Trees	
Sheet L-2	267 Trees	
Sheet L-3	281 Trees	

Woodland Replacement

Replacement Required		3,254 Trees
Trees Provided		265 Trees
Sheet L-1	12 Trees	
Sheet L-2	141 Trees	
Sheet L-3	112 Trees	
Trees to be Paid into Fund		2,989 Trees

Parking Lot Landscaping

Parking Lot Perimeter - Visitor		403 l.f.
Trees Required		11.5 Trees (403 / 35)
Trees Provided		12 Trees
"Per" Sheet L-1	3 Trees	
Sheet L-2	2 Trees	
Sheet L-3	7 Trees	

Parking Lot Landscaping - Buildings 10-17

Vehicular Use Area		53,028 s.f.
Landscape Area Required		3,750 s.f. (50,000 s.f. x 7.5%) 3 s.f. (3,028 s.f. x 1%) 3,753 s.f.
Landscape Area Provided		13,087 s.f.
Canopy Trees Required		18.8 Trees (3,753 / 200)
Canopy Trees Provided		19 Trees
"P" Sheet L-1	17 Trees	
Sheet L-2	2 Trees	

Parking Lot Perimeter - Buildings 10-17

Perimeter		1,335 l.f.
Trees Required		38.1 Trees (1,335 l.f. / 35')
Trees Provided		39 Trees
"Per" Sheet L-1	11 Trees	
Sheet L-2	28 Trees	

Parking Lot Landscaping - Clubhouse

Vehicular Use Area	12,034 s.f.
Landscape Area Required	903 s.f. (12,034 s.f. x 7.5%)
Landscape Area Provided	2,218 s.f.
Canopy Trees Required	4.5 Trees (903 / 200)
Canopy Trees Provided	5 Trees

Parking Lot Perimeter - Clubhouse

Perimeter	344 l.f.
Trees Required	9.8 Trees (344 l.f. / 35')
Trees Provided	10 Trees

Notes:

- Soils Information is Shown on SP-2.
- Trees Shall be Planted no Closer than 10' to Sanitary Sewer, Utility Structures Including Hydrants and 5' from Utility Lines. Trees Shall be Planted 4' from Curbs.
- Tree Shall not Be Planted within 4' of Property Lines.
- Snow Shall be Deposited Adjacent to Drives and within the Curb Lawn. Any Damaged Trees Shall be Replaced as Needed. If Walks are Adjacent to the Street, Snow will be Stored in Nearby Islands or Lawn Areas.
- All Utility Boxes Shall be Screen per Detail on Sheet L-11. Approximately 10 Shrubs will be Required per Box.
- Overhead Lines Exist Along the 12 Mile and Meadowbrook Frontages.
- Phragmites Exists in Wetland Areas (See Sheet L-2). Japanese Knotweed is not Present on this Site.
- An Irrigation Plan will be Provided for Stamping Sets.

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ALLEN DESIGN
LAND PLANNING / LANDSCAPE ARCHITECTURE
557 Carpenter
Northville, Michigan 48167
e. jca@wideopenwest.com
t. 248.467.4668

THE GROVE

Seal:

Title:
Landscape Plan

Project:
The Grove
Novi, Michigan

Prepared for:
Ivanhoe Companies
6689 Orchard Lake Road, Suite 314
West Bloomfield, Michigan 48322
248.626.6114

Revision:	Issued:
Review	March 28, 2024
Revised	July 26, 2024

Job Number:
21-054

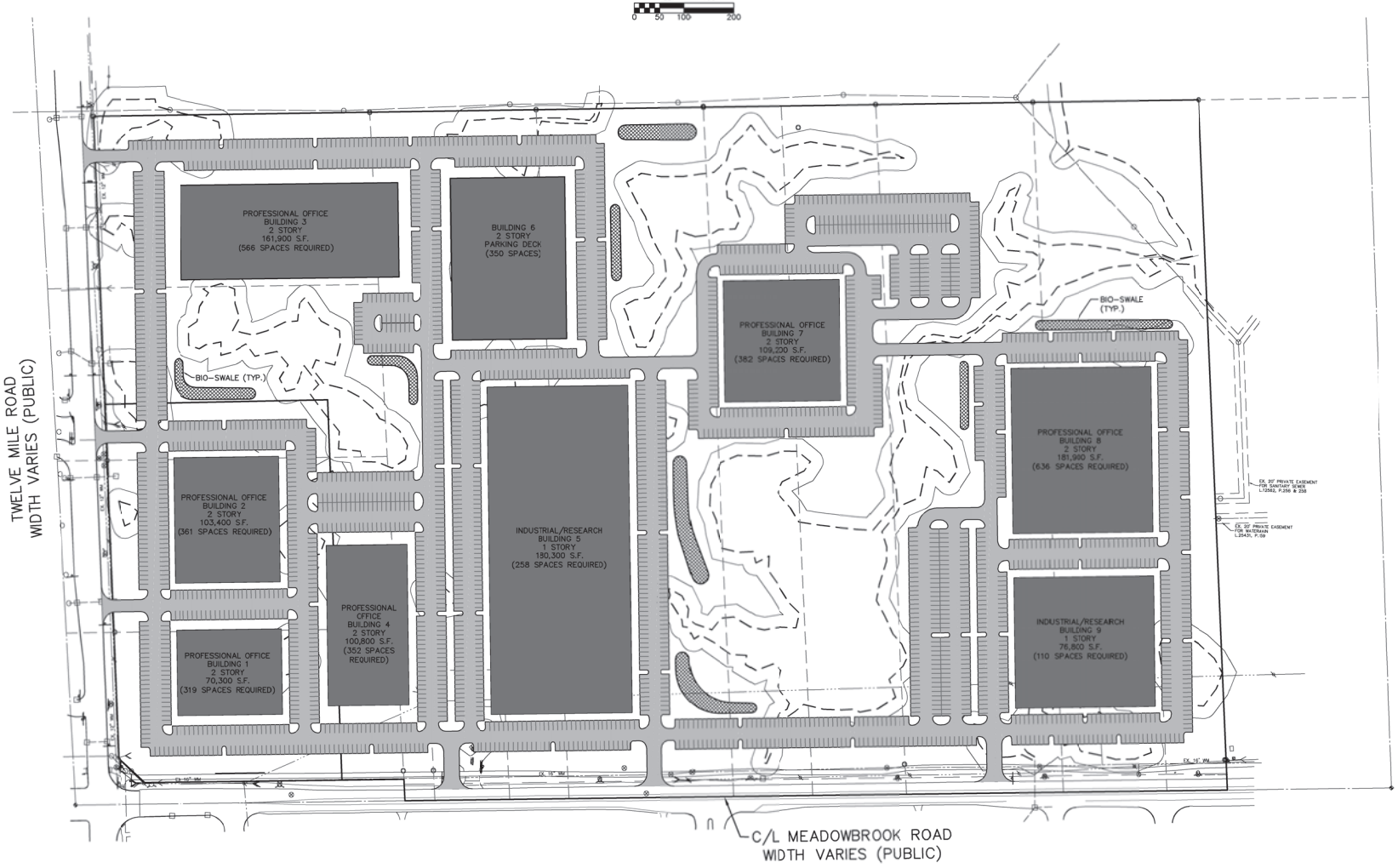
Drawn By:	Checked By:
jca	jca

0' 25' 50'

NORTH
1"=50'

Sheet No.
L-1

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



LOCATION MAP
NOT TO SCALE

LEGEND

BUILDING 1	70,300 S.F.
BUILDING 2	103,400 S.F.
BUILDING 3	161,900 S.F.
BUILDING 4	100,800 S.F.
BUILDING 5	180,300 S.F.
BUILDING 7	109,200 S.F.
BUILDING 8	181,900 S.F.
BUILDING 9	76,800 S.F.
TOTAL	984,600 S.F.

PARKING REQUIRED 2,984 SPACES
PARKING PROVIDED 2,998 SPACES

STORMWATER MANAGEMENT PROVIDED BY UNDERGROUND DETENTION AND BIO-SWALES.

USEABLE OPEN SPACE 4.48 AC.

ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE	ISSUED FOR	DATE

ZEIMET WOZNIAK & ASSOCIATES
Consulting Civil Engineers
55800 GRAND RIVER AVE., SUITE 103
NEW HUDSON, MICHIGAN 48165
P: (248) 437-5099 F: (248) 437-5222 www.zeimetwozniak.com

MISS DIG SYSTEM, INC. 1-800-482-7171
THREE FULL WORKING DAYS BEFORE YOU DIG, CALL THE MISS DIG SYSTEM

PROJECT SPONSOR:
IVANHOE COMPANIES
6689 ORCHARD LAKE ROAD, SUITE 314
WEST BLOOMFIELD, MI 48322 (248) 626-6114

OST PARALLEL PLAN
THE GROVE
NOVI, MICHIGAN

FIELD BOOK: BMS

DATE 1/14/24
DESIGNED BY SRB
DRAWN BY DAB
SCALE HOR: 1" = 100' VER: 1" = N/A
JOB NO. 22149
SHEET 1OF1

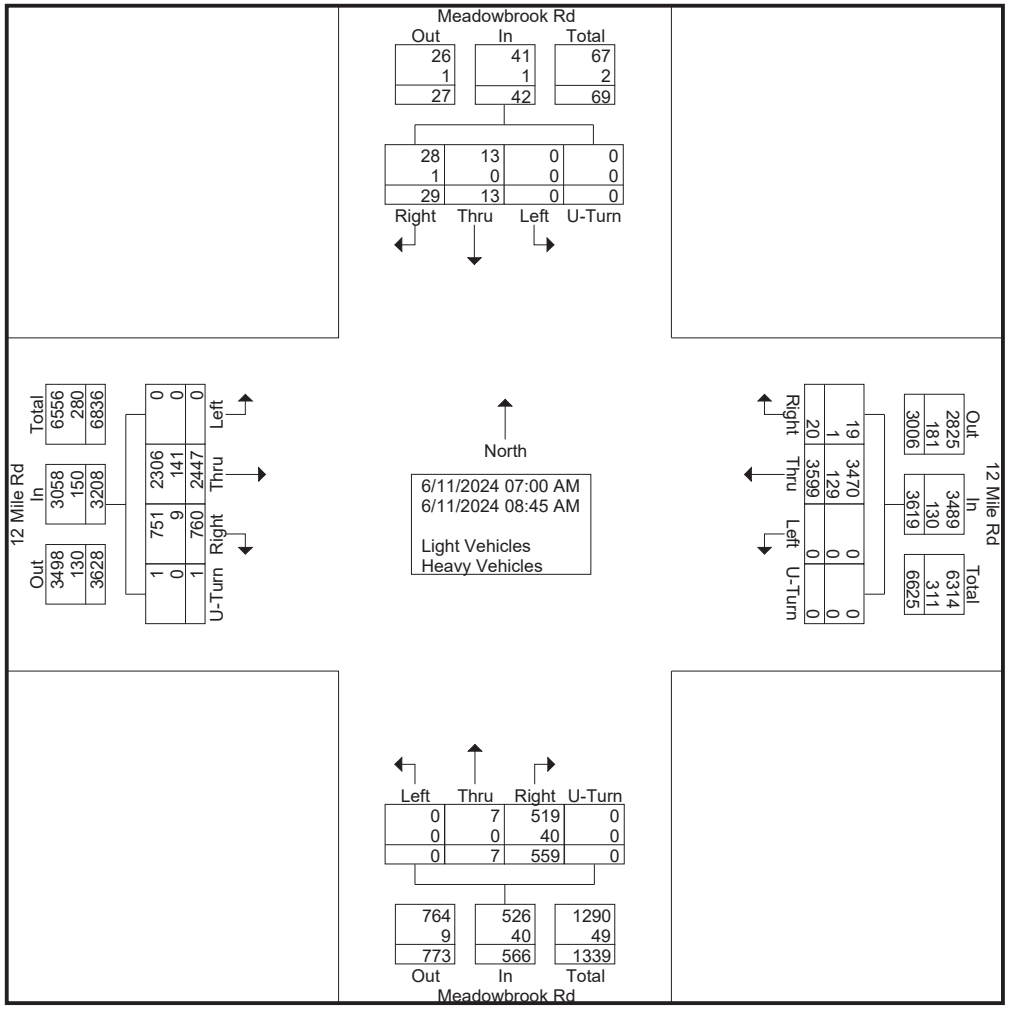
Z:\Projects\22149\DWG\CONCEPTUAL\22149 CONCEPTUAL COMMERCIAL SITE PLAN 8-4-24.dwg, 1of1 CONCEPTUAL COMMERCIAL SITE PLAN, 8/11/2024 9:23:37 AM, pgannon

TRUE DATA TO IMPROVE MOBILITY

File Name : 16651601 - Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651601
Start Date : 6/11/2024
Page No : 1

Groups Printed- Light Vehicles - Heavy Vehicles

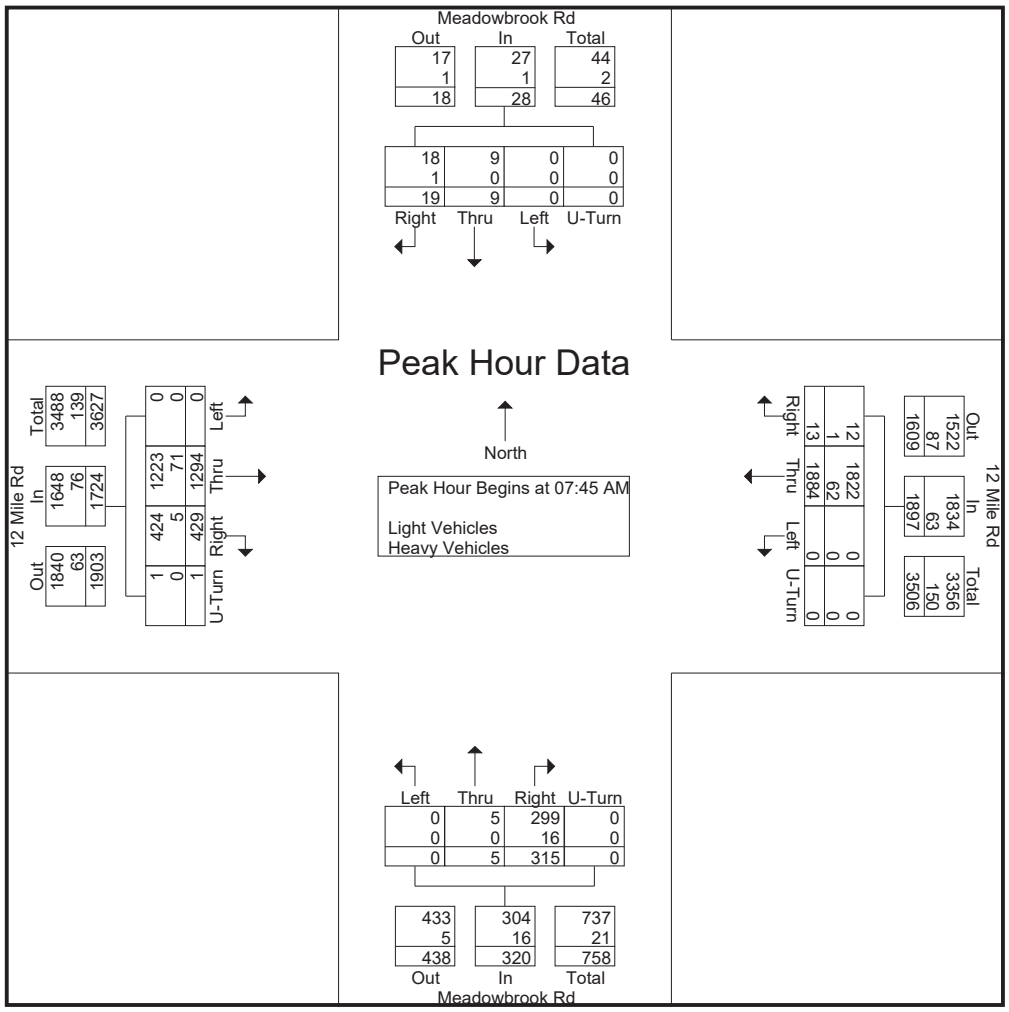
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Meadowbrook Rd Northbound					Meadowbrook Rd Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
07:00 AM	0	230	54	0	284	0	346	0	0	346	0	0	34	0	34	0	0	1	0	1	665
07:15 AM	0	261	63	0	324	0	405	1	0	406	0	1	47	0	48	0	0	0	0	0	778
07:30 AM	0	328	83	0	411	0	437	2	0	439	0	0	60	0	60	0	1	6	0	7	917
07:45 AM	0	356	133	0	489	0	547	2	0	549	0	2	80	0	82	0	2	3	0	5	1125
Total	0	1175	333	0	1508	0	1735	5	0	1740	0	3	221	0	224	0	3	10	0	13	3485
08:00 AM	0	307	109	0	416	0	440	5	0	445	0	0	82	0	82	0	1	5	0	6	949
08:15 AM	0	327	96	0	423	0	429	3	0	432	0	2	71	0	73	0	5	3	0	8	936
08:30 AM	0	304	91	1	396	0	468	3	0	471	0	1	82	0	83	0	1	8	0	9	959
08:45 AM	0	334	131	0	465	0	527	4	0	531	0	1	103	0	104	0	3	3	0	6	1106
Total	0	1272	427	1	1700	0	1864	15	0	1879	0	4	338	0	342	0	10	19	0	29	3950
Grand Total	0	2447	760	1	3208	0	3599	20	0	3619	0	7	559	0	566	0	13	29	0	42	7435
Apprch %	0	76.3	23.7	0		0	99.4	0.6	0		0	1.2	98.8	0		0	31	69	0		
Total %	0	32.9	10.2	0	43.1	0	48.4	0.3	0	48.7	0	0.1	7.5	0	7.6	0	0.2	0.4	0	0.6	
Light Vehicles	0	2306	751	1	3058	0	3470	19	0	3489	0	7	519	0	526	0	13	28	0	41	7114
% Light Vehicles	0	94.2	98.8	100	95.3	0	96.4	95	0	96.4	0	100	92.8	0	92.9	0	100	96.6	0	97.6	95.7
Heavy Vehicles	0	141	9	0	150	0	129	1	0	130	0	0	40	0	40	0	0	1	0	1	321
% Heavy Vehicles	0	5.8	1.2	0	4.7	0	3.6	5	0	3.6	0	0	7.2	0	7.1	0	0	3.4	0	2.4	4.3



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651601 - Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651601
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					Meadowbrook Rd Northbound					Meadowbrook Rd Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	**356**	**133**	0	**489**	0	**547**	2	0	**549**	0	**2**	80	0	82	0	2	3	0	5	**1125**
08:00 AM	0	307	109	0	416	0	440	**5**	0	445	0	0	**82**	0	82	0	1	5	0	6	949
08:15 AM	0	327	96	0	423	0	429	3	0	432	0	2	71	0	73	0	**5**	3	0	8	936
08:30 AM	0	304	91	**1**	396	0	468	3	0	471	0	1	82	0	**83**	0	1	**8**	0	**9**	959
Total Volume	0	1294	429	1	1724	0	1884	13	0	1897	0	5	315	0	320	0	9	19	0	28	3969
% App. Total	0	75.1	24.9	0.1		0	99.3	0.7	0		0	1.6	98.4	0		0	32.1	67.9	0		
PHF	.000	.909	.806	.250	.881	.000	.861	.650	.000	.864	.000	.625	.960	.000	.964	.000	.450	.594	.000	.778	.882
Light Vehicles	0	1223	424	1	1648	0	1822	12	0	1834	0	5	299	0	304	0	9	18	0	27	3813
% Light Vehicles	0	94.5	98.8	100	95.6	0	96.7	92.3	0	96.7	0	100	94.9	0	95.0	0	100	94.7	0	96.4	96.1
Heavy Vehicles	0	71	5	0	76	0	62	1	0	63	0	0	16	0	16	0	0	1	0	1	156
% Heavy Vehicles	0	5.5	1.2	0	4.4	0	3.3	7.7	0	3.3	0	0	5.1	0	5.0	0	0	5.3	0	3.6	3.9

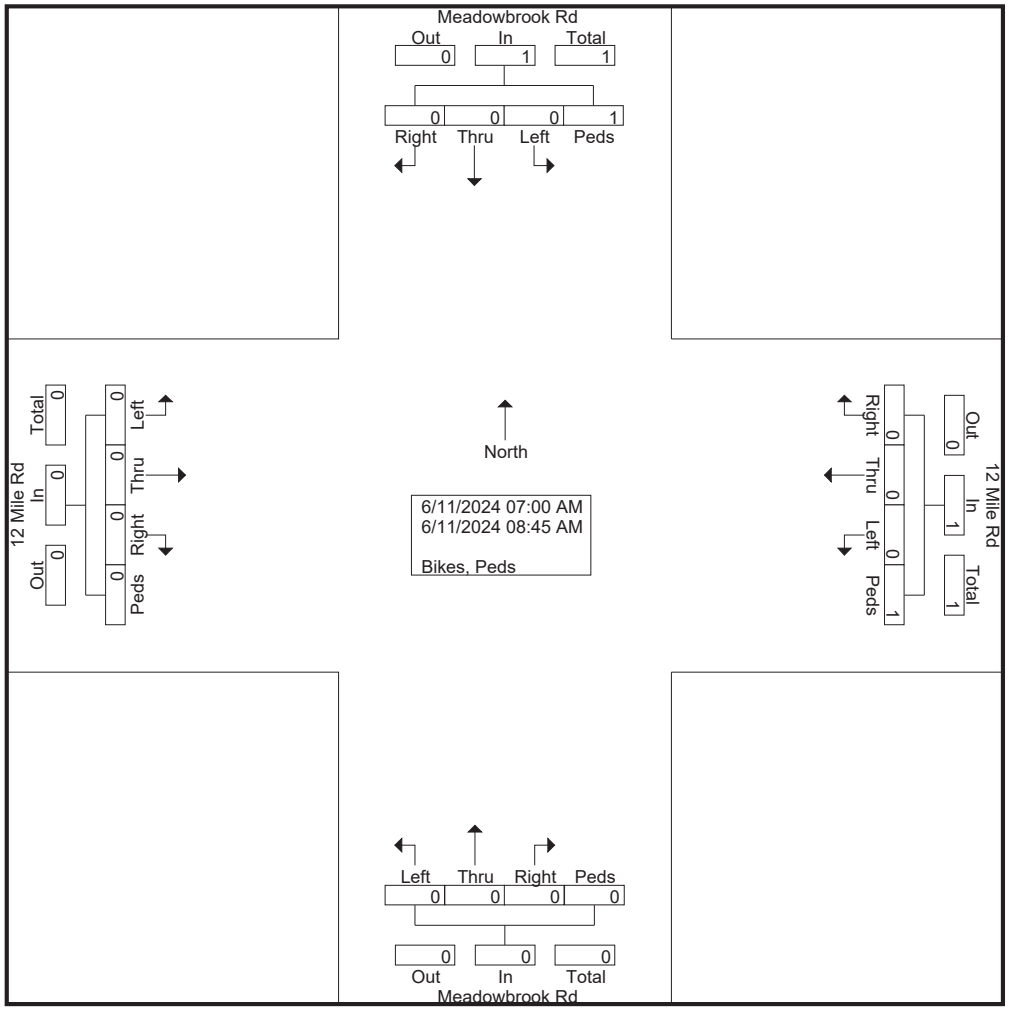


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651601 - Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651601
Start Date : 6/11/2024
Page No : 1

Groups Printed- Bikes, Peds

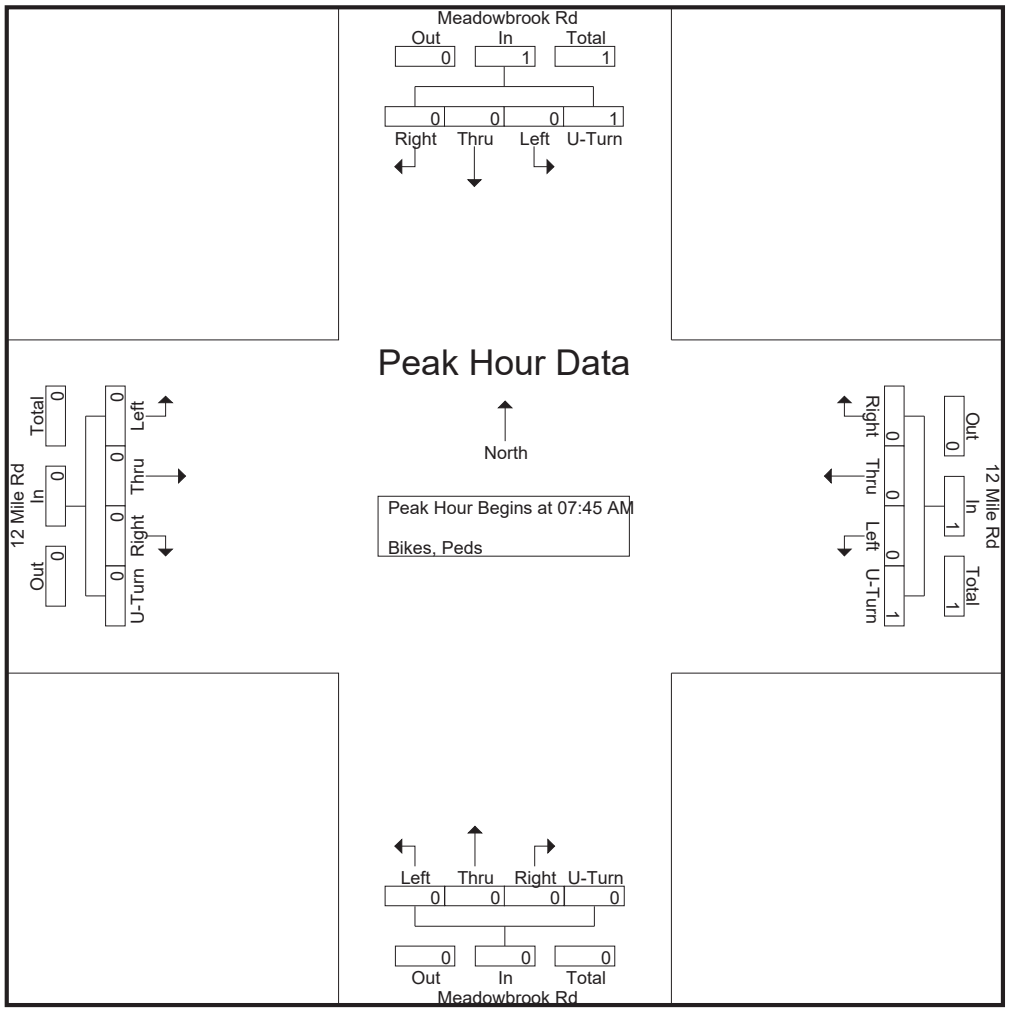
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Meadowbrook Rd Northbound					Meadowbrook Rd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
08:30 AM	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	2
Grand Total	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	2
Apprch %	0	0	0	0		0	0	0	100		0	0	0	0		0	0	0	100		
Total %	0	0	0	0	0	0	0	0	50	50	0	0	0	0	0	0	0	0	50	50	



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651601 - Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651601
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					Meadowbrook Rd Northbound					Meadowbrook Rd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	**1**
08:30 AM	0	0	0	0	0	0	0	0	**1**	**1**	0	0	0	0	0	0	0	0	0	0	1
Total Volume	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	2
% App. Total	0	0	0	0		0	0	0	100		0	0	0	0		0	0	0	100		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.250	.250	.000	.000	.000	.000	.000	.000	.000	.000	.250	.250	.500

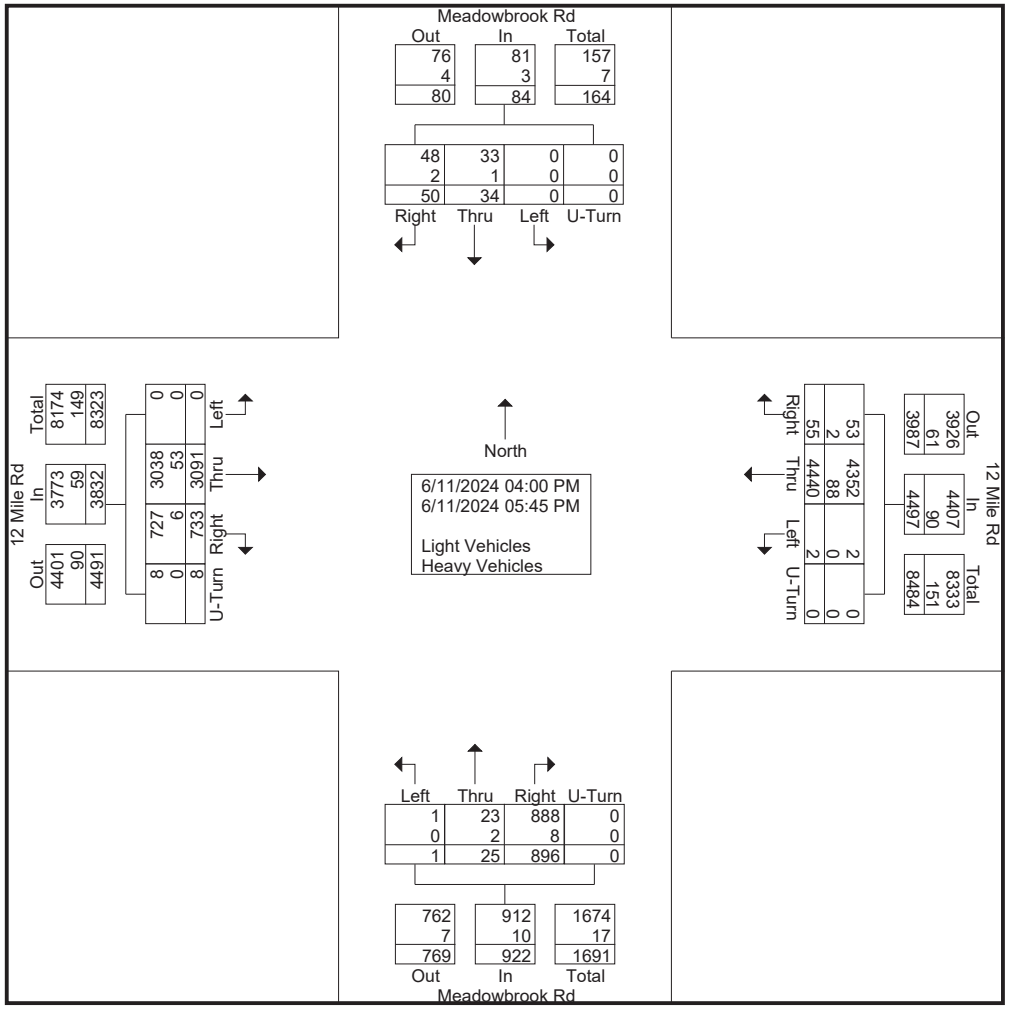


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651602 - Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651602
Start Date : 6/11/2024
Page No : 1

Groups Printed- Light Vehicles - Heavy Vehicles

	12 Mile Rd Eastbound					12 Mile Rd Westbound					Meadowbrook Rd Northbound					Meadowbrook Rd Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
04:00 PM	0	364	80	1	445	0	548	10	0	558	0	2	109	0	111	0	2	9	0	11	1125
04:15 PM	0	412	75	1	488	1	547	5	0	553	0	2	106	0	108	0	2	5	0	7	1156
04:30 PM	0	380	92	1	473	0	532	1	0	533	0	6	93	0	99	0	1	6	0	7	1112
04:45 PM	0	392	96	3	491	1	547	3	0	551	1	1	135	0	137	0	7	7	0	14	1193
Total	0	1548	343	6	1897	2	2174	19	0	2195	1	11	443	0	455	0	12	27	0	39	4586
05:00 PM	0	430	104	0	534	0	553	4	0	557	0	2	112	0	114	0	4	5	0	9	1214
05:15 PM	0	392	87	1	480	0	508	8	0	516	0	5	123	0	128	0	3	6	0	9	1133
05:30 PM	0	374	96	0	470	0	607	9	0	616	0	2	126	0	128	0	3	10	0	13	1227
05:45 PM	0	347	103	1	451	0	598	15	0	613	0	5	92	0	97	0	12	2	0	14	1175
Total	0	1543	390	2	1935	0	2266	36	0	2302	0	14	453	0	467	0	22	23	0	45	4749
Grand Total	0	3091	733	8	3832	2	4440	55	0	4497	1	25	896	0	922	0	34	50	0	84	9335
Apprch %	0	80.7	19.1	0.2		0	98.7	1.2	0		0.1	2.7	97.2	0		0	40.5	59.5	0		
Total %	0	33.1	7.9	0.1	41	0	47.6	0.6	0	48.2	0	0.3	9.6	0	9.9	0	0.4	0.5	0	0.9	
Light Vehicles	0	3038	727	8	3773	2	4352	53	0	4407	1	23	888	0	912	0	33	48	0	81	9173
% Light Vehicles	0	98.3	99.2	100	98.5	100	98	96.4	0	98	100	92	99.1	0	98.9	0	97.1	96	0	96.4	98.3
Heavy Vehicles	0	53	6	0	59	0	88	2	0	90	0	2	8	0	10	0	1	2	0	3	162
% Heavy Vehicles	0	1.7	0.8	0	1.5	0	2	3.6	0	2	0	8	0.9	0	1.1	0	2.9	4	0	3.6	1.7



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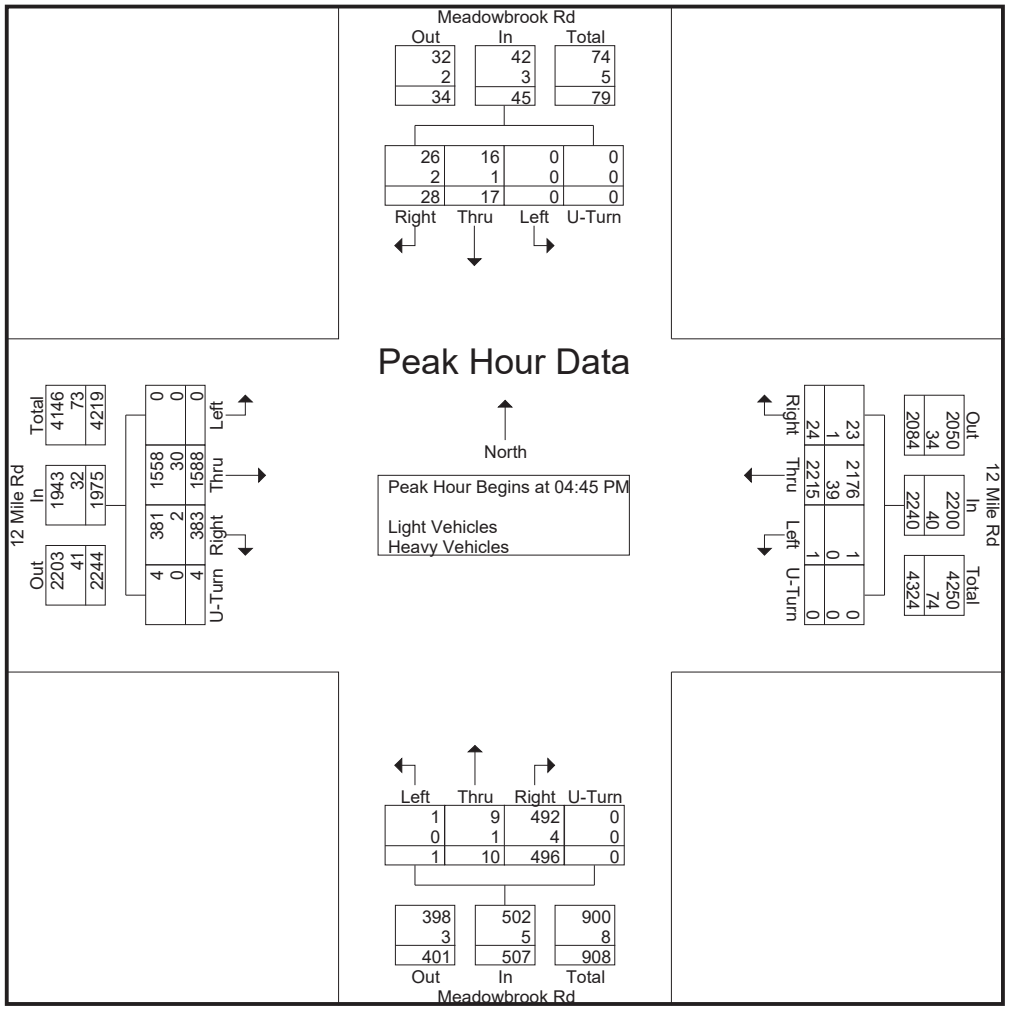
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	392	96	**3**	491	**1**	547	3	0	551	**1**	1	**135**	0	**137**	0	**7**	7	0	**14**	1193
05:00 PM	0	**430**	**104**	0	**534**	0	553	4	0	557	0	2	112	0	114	0	4	5	0	9	1214
05:15 PM	0	392	87	1	480	0	508	8	0	516	0	**5**	123	0	128	0	3	6	0	9	1133
05:30 PM	0	374	96	0	470	0	**607**	**9**	0	**616**	0	2	126	0	128	0	3	**10**	0	13	**1227**
Total Volume	0	1588	383	4	1975	1	2215	24	0	2240	1	10	496	0	507	0	17	28	0	45	4767
% App. Total	0	80.4	19.4	0.2		0	98.9	1.1	0		0.2	2	97.8	0		0	37.8	62.2	0		
PHF	.000	.923	.921	.333	.925	.250	.912	.667	.000	.909	.250	.500	.919	.000	.925	.000	.607	.700	.000	.804	.971
Light Vehicles	0	1558	381	4	1943	1	2176	23	0	2200	1	9	492	0	502	0	16	26	0	42	4687
% Light Vehicles	0	98.1	99.5	100	98.4	100	98.2	95.8	0	98.2	100	90.0	99.2	0	99.0	0	94.1	92.9	0	93.3	98.3
Heavy Vehicles	0	30	2	0	32	0	39	1	0	40	0	1	4	0	5	0	1	2	0	3	80
% Heavy Vehicles	0	1.9	0.5	0	1.6	0	1.8	4.2	0	1.8	0	10.0	0.8	0	1.0	0	5.9	7.1	0	6.7	1.7



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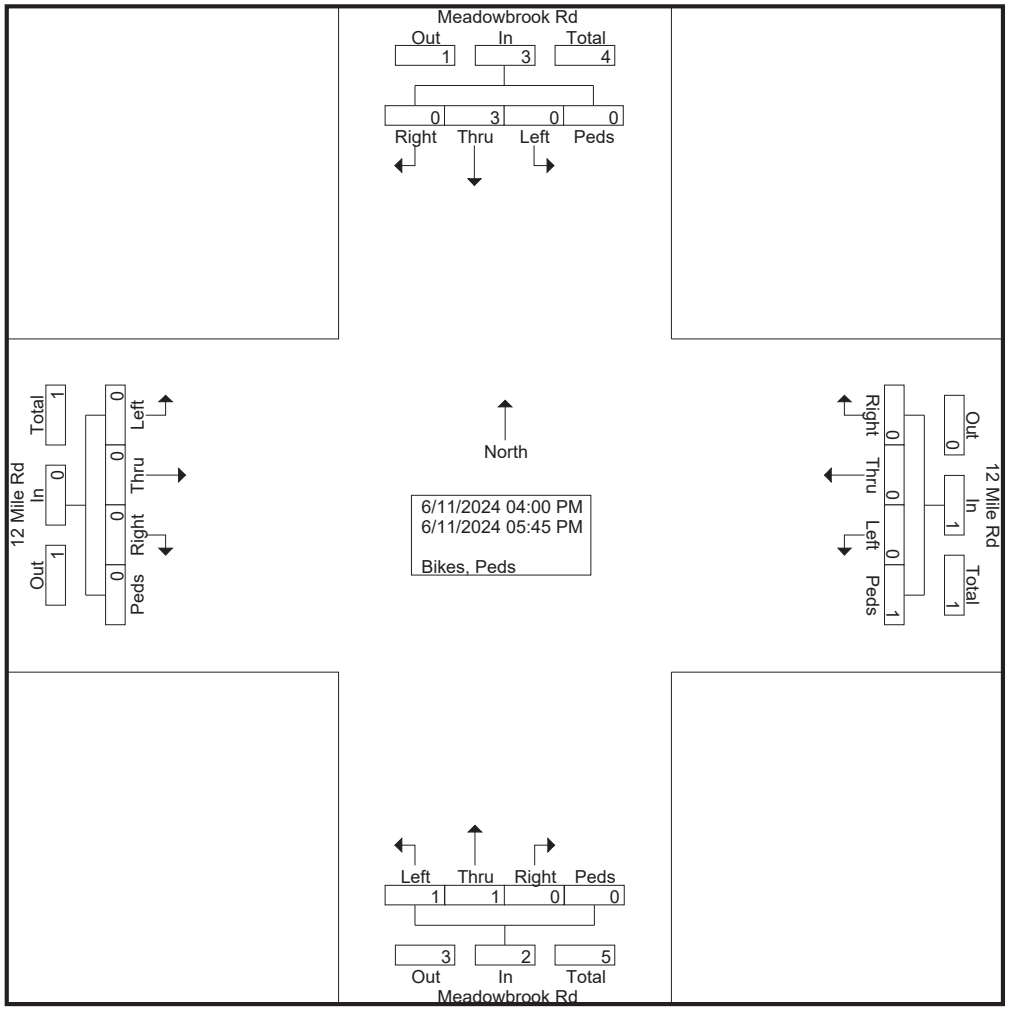
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	2
04:45 PM	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	1	2
Total	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	2	0	0	2	4
05:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	1	2
Grand Total	0	0	0	0	0	0	0	0	1	1	1	1	0	0	2	0	3	0	0	3	6
Apprch %	0	0	0	0		0	0	0	100		50	50	0	0		0	100	0	0		
Total %	0	0	0	0	0	0	0	0	16.7	16.7	16.7	16.7	0	0	33.3	0	50	0	0	50	



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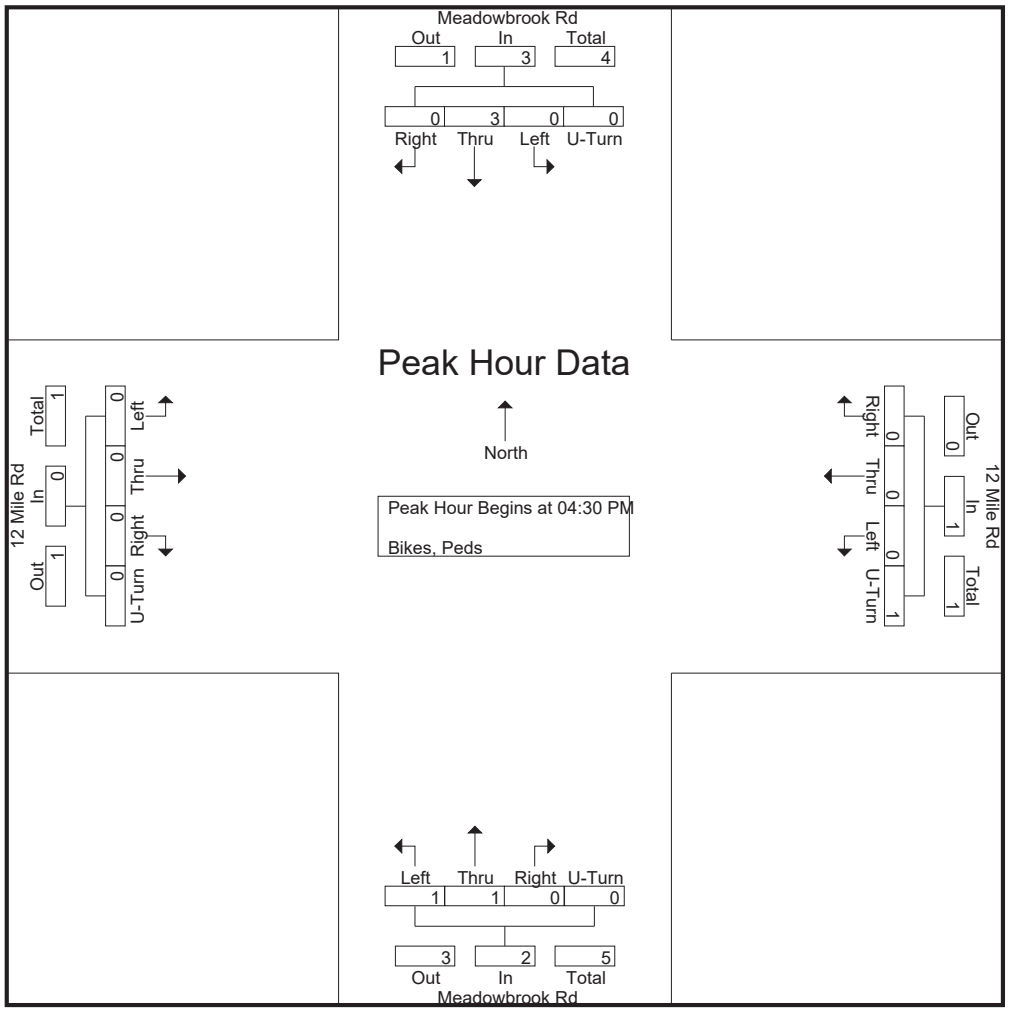
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Meadowbrook Rd Northbound					Meadowbrook Rd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	**1**	0	**1**	0	0	**1**	**2**
04:45 PM	0	0	0	0	0	0	0	0	**1**	**1**	0	0	0	0	0	0	1	0	0	1	2
05:00 PM	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	1	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
Total Volume	0	0	0	0	0	0	0	0	1	1	1	1	0	0	2	0	3	0	0	3	6
% App. Total	0	0	0	0		0	0	0	100		50	50	0	0		0	100	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.250	.250	.250	.250	.000	.000	.500	.000	.750	.000	.000	.750	.750

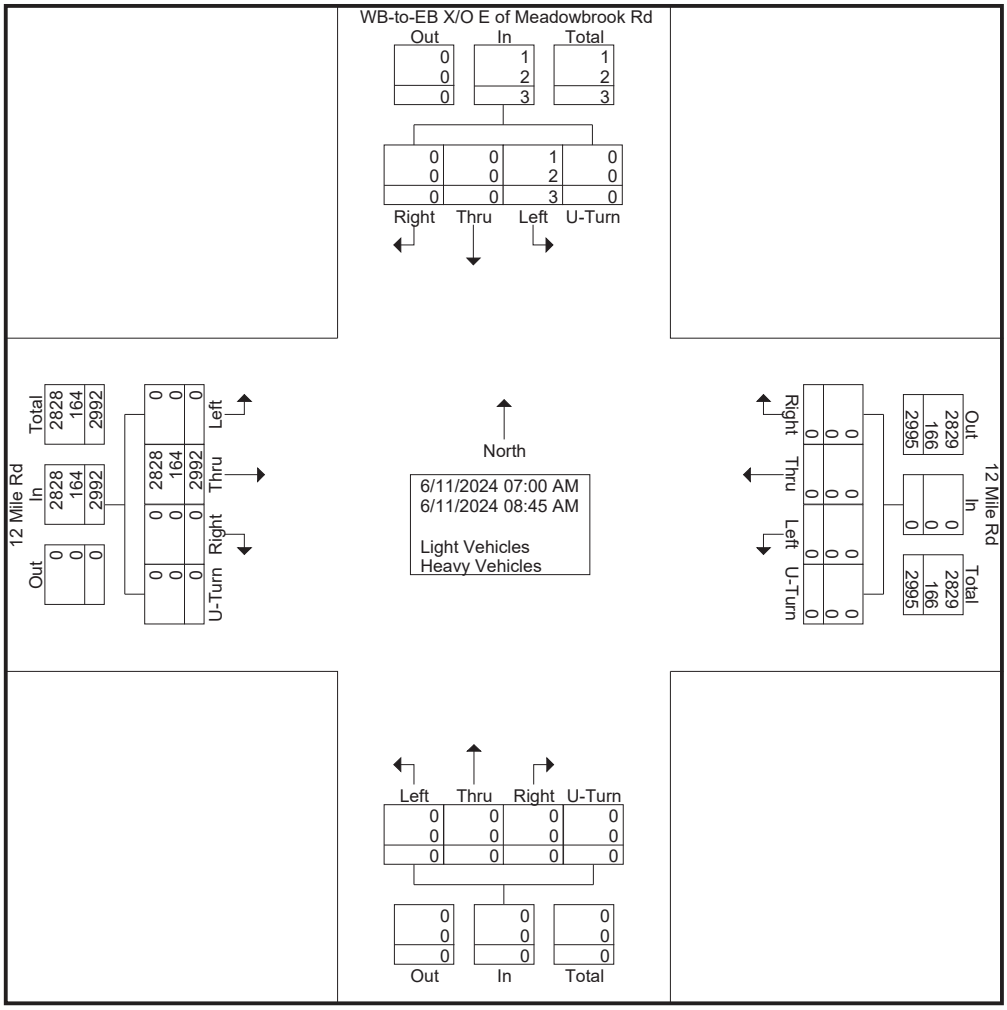


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651603 - WB-to-EB X_O E of Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651603
Start Date : 6/11/2024
Page No : 1

Groups Printed- Light Vehicles - Heavy Vehicles

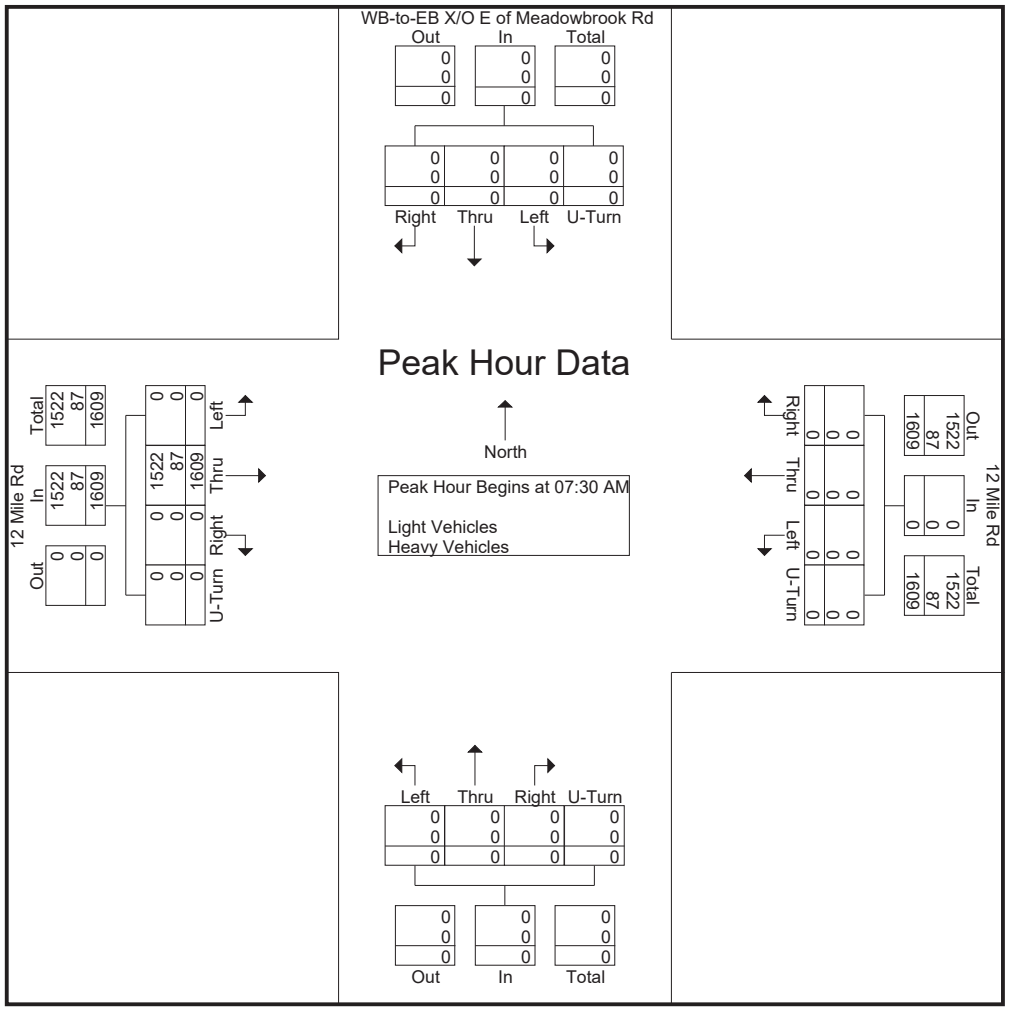
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O E of Meadowbrook Rd Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
07:00 AM	0	262	0	0	262	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	262
07:15 AM	0	304	0	0	304	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	305
07:30 AM	0	392	0	0	392	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	392
07:45 AM	0	430	0	0	430	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	430
Total	0	1388	0	0	1388	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1389
08:00 AM	0	390	0	0	390	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	390
08:15 AM	0	397	0	0	397	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	397
08:30 AM	0	385	0	0	385	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	386
08:45 AM	0	432	0	0	432	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	433
Total	0	1604	0	0	1604	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	1606
Grand Total	0	2992	0	0	2992	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	2995
Apprch %	0	100	0	0		0	0	0	0		0	0	0	0		100	0	0	0		
Total %	0	99.9	0	0	99.9	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1	
Light Vehicles	0	2828	0	0	2828	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2829
% Light Vehicles	0	94.5	0	0	94.5	0	0	0	0	0	0	0	0	0	0	33.3	0	0	0	33.3	94.5
Heavy Vehicles	0	164	0	0	164	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	166
% Heavy Vehicles	0	5.5	0	0	5.5	0	0	0	0	0	0	0	0	0	0	66.7	0	0	0	66.7	5.5



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651603 - WB-to-EB X_O E of Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651603
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O E of Meadowbrook Rd Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	392	0	0	392	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	392
07:45 AM	0	**430**	0	0	**430**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**430**
08:00 AM	0	390	0	0	390	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	390
08:15 AM	0	397	0	0	397	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	397
Total Volume	0	1609	0	0	1609	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1609
% App. Total	0	100	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.935	.000	.000	.935	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.935
Light Vehicles	0	1522	0	0	1522	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1522
% Light Vehicles	0	94.6	0	0	94.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	94.6
Heavy Vehicles	0	87	0	0	87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	87
% Heavy Vehicles	0	5.4	0	0	5.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.4

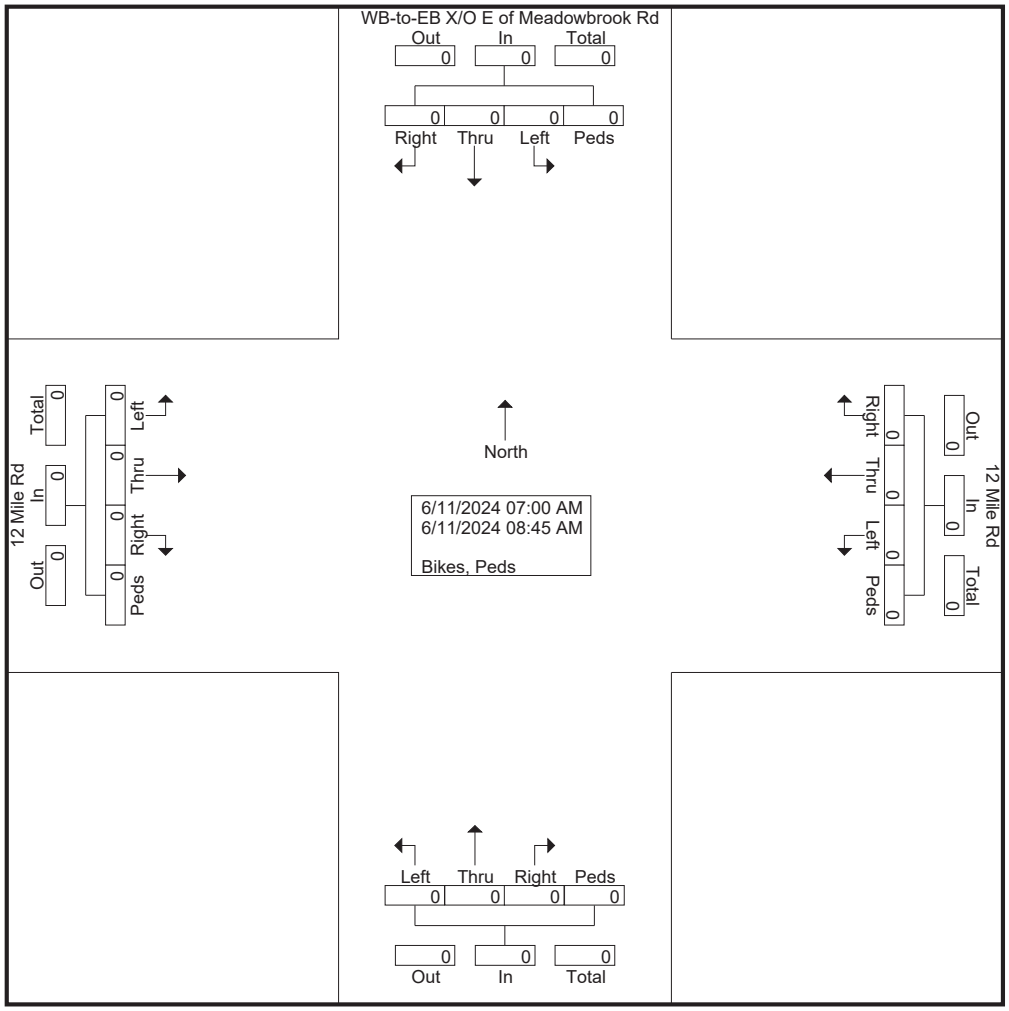


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651603 - WB-to-EB X_O E of Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651603
Start Date : 6/11/2024
Page No : 1

Groups Printed- Bikes, Peds

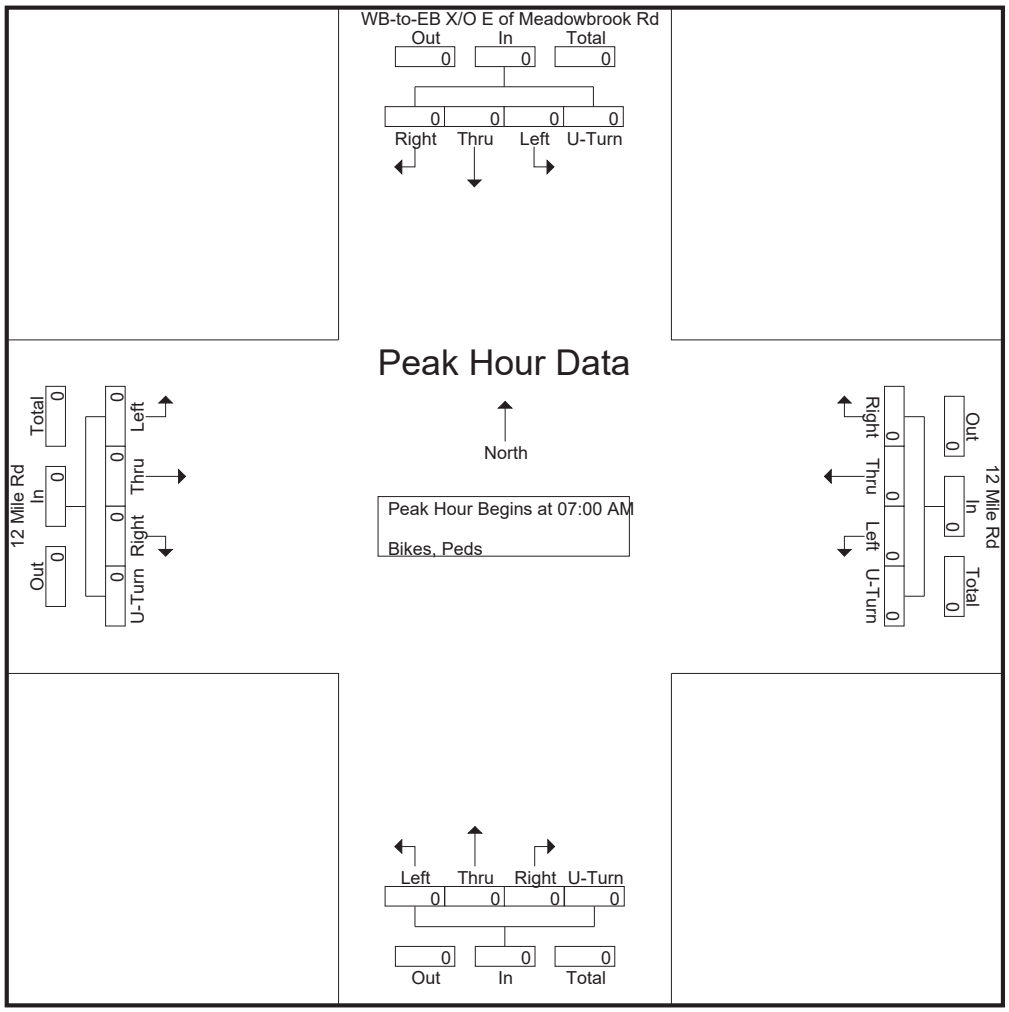
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O E of Meadowbrook Rd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651603 - WB-to-EB X_O E of Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651603
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O E of Meadowbrook Rd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

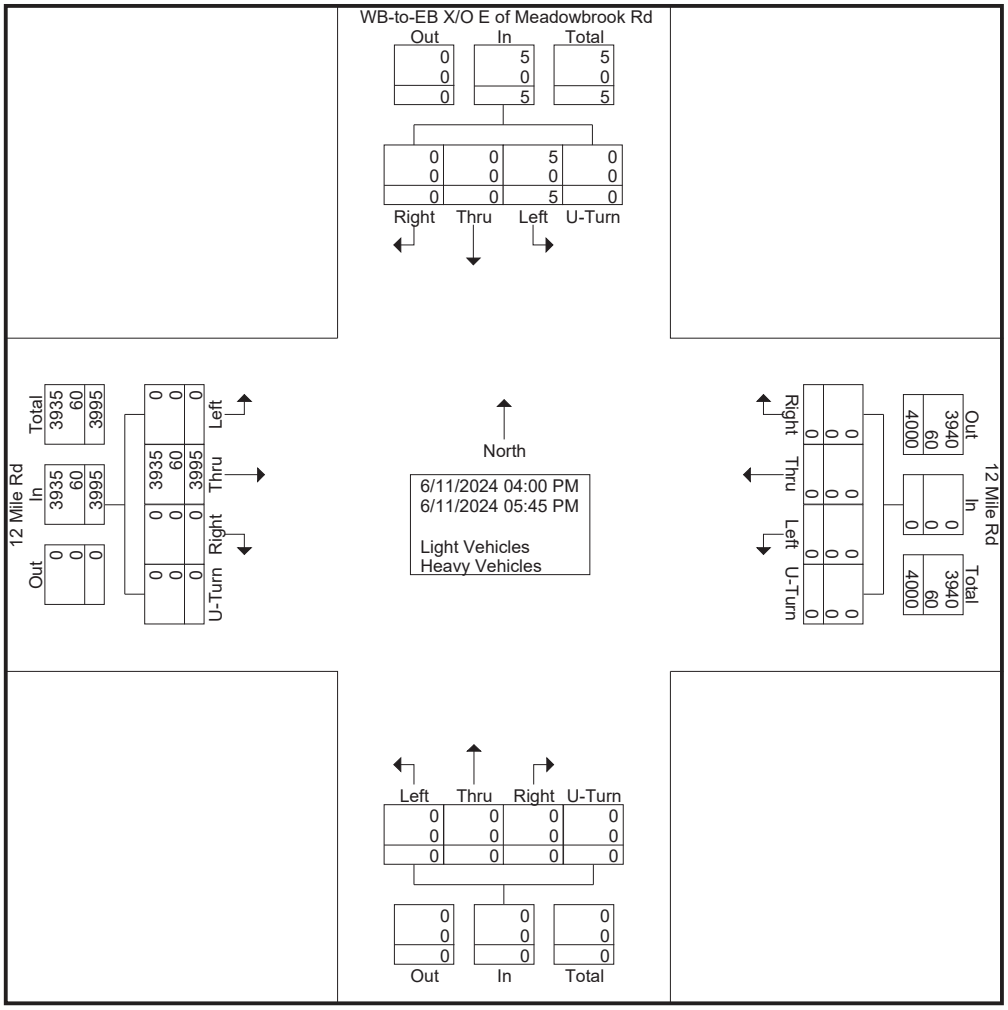


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651604 - WB-to-EB X_O E of Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651604
Start Date : 6/11/2024
Page No : 1

Groups Printed- Light Vehicles - Heavy Vehicles

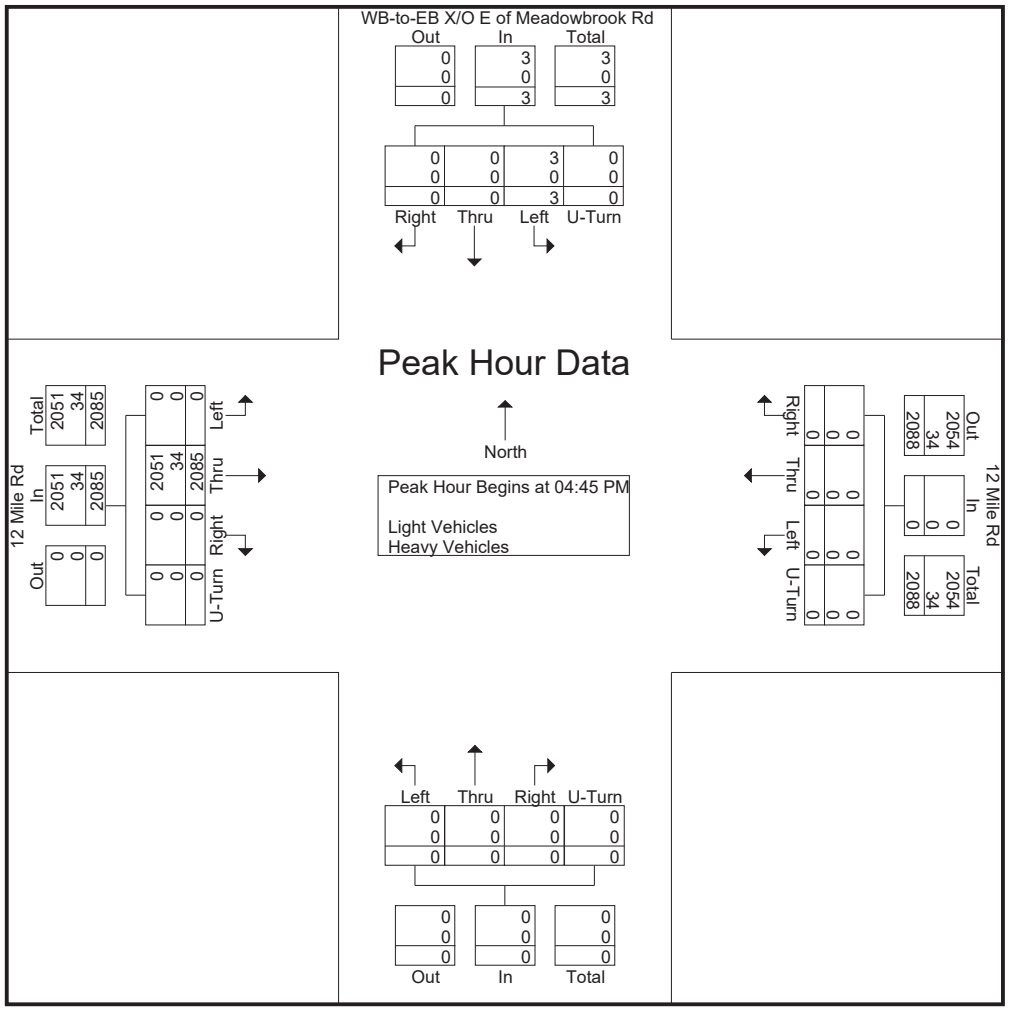
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O E of Meadowbrook Rd Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
04:00 PM	0	472	0	0	472	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	473
04:15 PM	0	519	0	0	519	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	519
04:30 PM	0	474	0	0	474	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	475
04:45 PM	0	529	0	0	529	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	529
Total	0	1994	0	0	1994	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	1996
05:00 PM	0	542	0	0	542	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	542
05:15 PM	0	517	0	0	517	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	517
05:30 PM	0	497	0	0	497	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	500
05:45 PM	0	445	0	0	445	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	445
Total	0	2001	0	0	2001	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	2004
Grand Total	0	3995	0	0	3995	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	4000
Apprch %	0	100	0	0		0	0	0	0		0	0	0	0		100	0	0	0		
Total %	0	99.9	0	0	99.9	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1	
Light Vehicles	0	3935	0	0	3935	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	3940
% Light Vehicles	0	98.5	0	0	98.5	0	0	0	0	0	0	0	0	0	0	100	0	0	0	100	98.5
Heavy Vehicles	0	60	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60
% Heavy Vehicles	0	1.5	0	0	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.5



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651604 - WB-to-EB X_O E of Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651604
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O E of Meadowbrook Rd Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	529	0	0	529	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	529
05:00 PM	0	**542**	0	0	**542**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**542**
05:15 PM	0	517	0	0	517	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	517
05:30 PM	0	497	0	0	497	0	0	0	0	0	0	0	0	0	0	**3**	0	0	0	**3**	500
Total Volume	0	2085	0	0	2085	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	2088
% App. Total	0	100	0	0		0	0	0	0		0	0	0	0		100	0	0	0		
PHF	.000	.962	.000	.000	.962	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.000	.000	.250	.963
Light Vehicles	0	2051	0	0	2051	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	2054
% Light Vehicles	0	98.4	0	0	98.4	0	0	0	0	0	0	0	0	0	0	100	0	0	0	100	98.4
Heavy Vehicles	0	34	0	0	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
% Heavy Vehicles	0	1.6	0	0	1.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.6

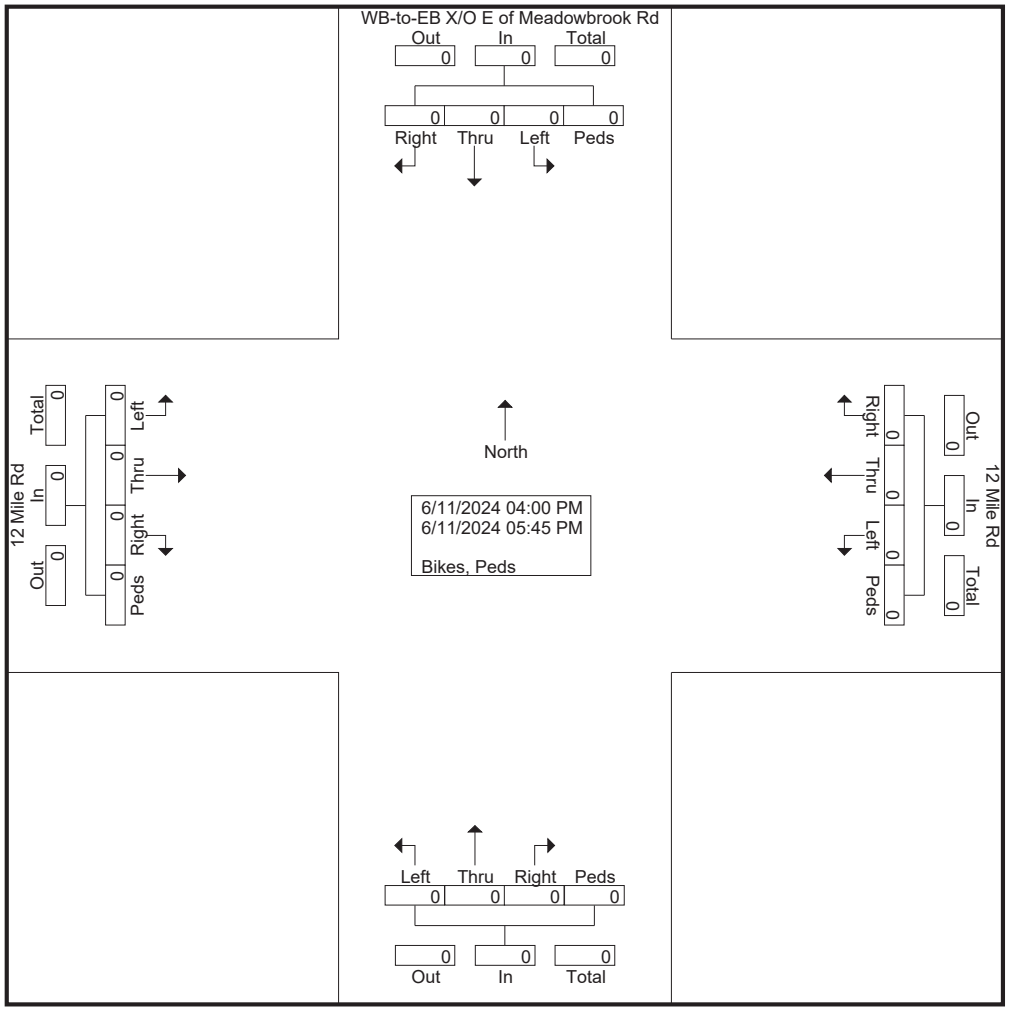


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651604 - WB-to-EB X_O E of Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651604
Start Date : 6/11/2024
Page No : 1

Groups Printed- Bikes, Peds

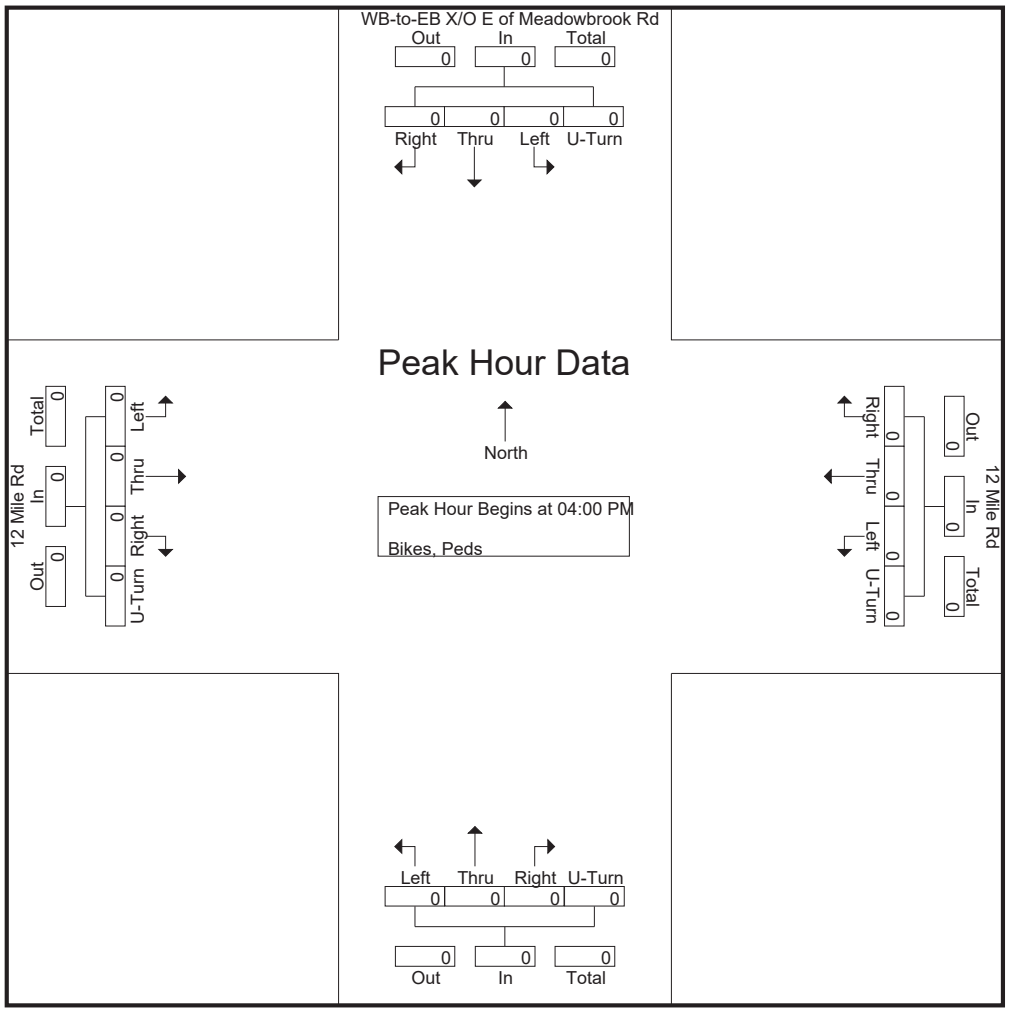
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O E of Meadowbrook Rd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651604 - WB-to-EB X_O E of Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651604
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O E of Meadowbrook Rd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

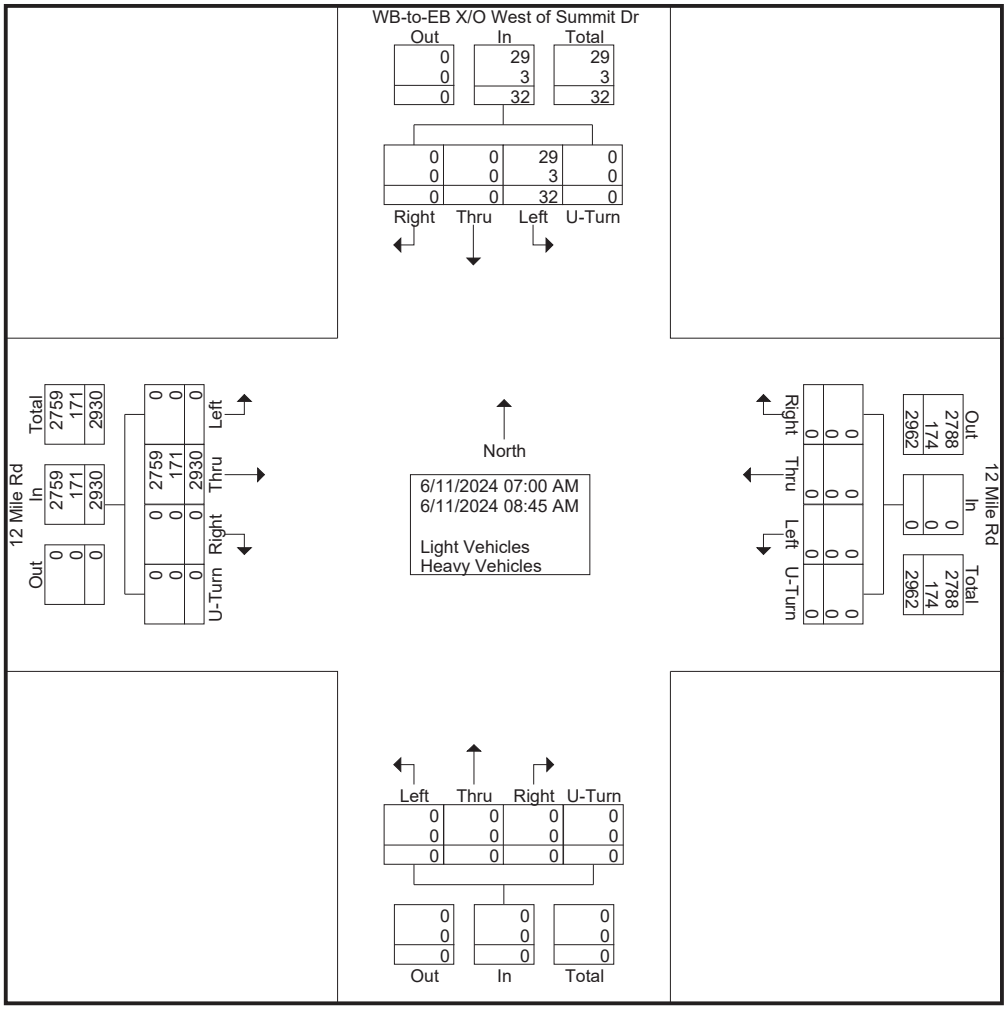


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651605 - WB-to-EB X_O West of Summit Dr -- 12 Mile Rd
Site Code : 16651605
Start Date : 6/11/2024
Page No : 1

Groups Printed- Light Vehicles - Heavy Vehicles

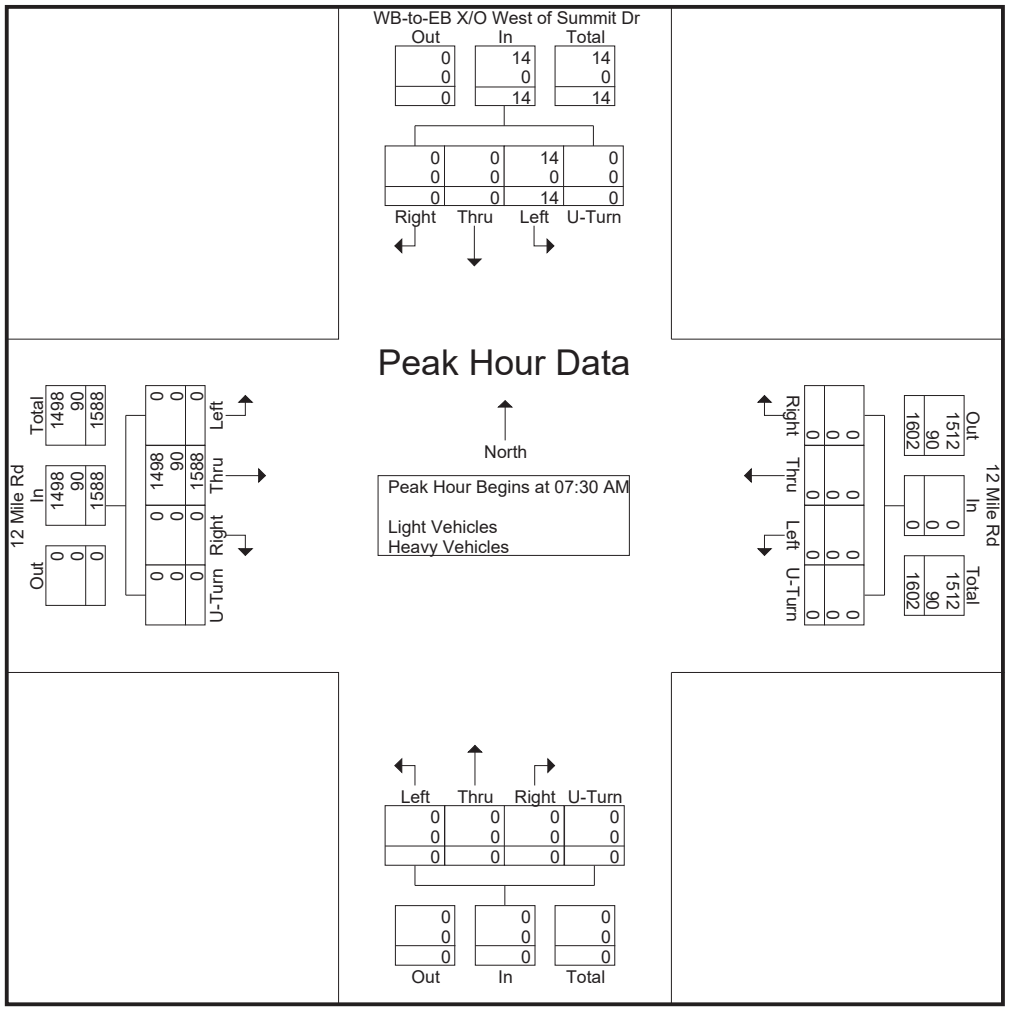
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O West of Summit Dr Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
07:00 AM	0	259	0	0	259	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	262
07:15 AM	0	289	0	0	289	0	0	0	0	0	0	0	0	0	0	7	0	0	0	7	296
07:30 AM	0	396	0	0	396	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	398
07:45 AM	0	405	0	0	405	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	410
Total	0	1349	0	0	1349	0	0	0	0	0	0	0	0	0	0	17	0	0	0	17	1366
08:00 AM	0	396	0	0	396	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	397
08:15 AM	0	391	0	0	391	0	0	0	0	0	0	0	0	0	0	6	0	0	0	6	397
08:30 AM	0	381	0	0	381	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	383
08:45 AM	0	413	0	0	413	0	0	0	0	0	0	0	0	0	0	6	0	0	0	6	419
Total	0	1581	0	0	1581	0	0	0	0	0	0	0	0	0	0	15	0	0	0	15	1596
Grand Total	0	2930	0	0	2930	0	0	0	0	0	0	0	0	0	0	32	0	0	0	32	2962
Apprch %	0	100	0	0		0	0	0	0		0	0	0	0		100	0	0	0		
Total %	0	98.9	0	0	98.9	0	0	0	0	0	0	0	0	0	0	1.1	0	0	0	1.1	
Light Vehicles	0	2759	0	0	2759	0	0	0	0	0	0	0	0	0	0	29	0	0	0	29	2788
% Light Vehicles	0	94.2	0	0	94.2	0	0	0	0	0	0	0	0	0	0	90.6	0	0	0	90.6	94.1
Heavy Vehicles	0	171	0	0	171	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	174
% Heavy Vehicles	0	5.8	0	0	5.8	0	0	0	0	0	0	0	0	0	0	9.4	0	0	0	9.4	5.9



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651605 - WB-to-EB X_O West of Summit Dr -- 12 Mile Rd
Site Code : 16651605
Start Date : 6/11/2024
Page No : 2

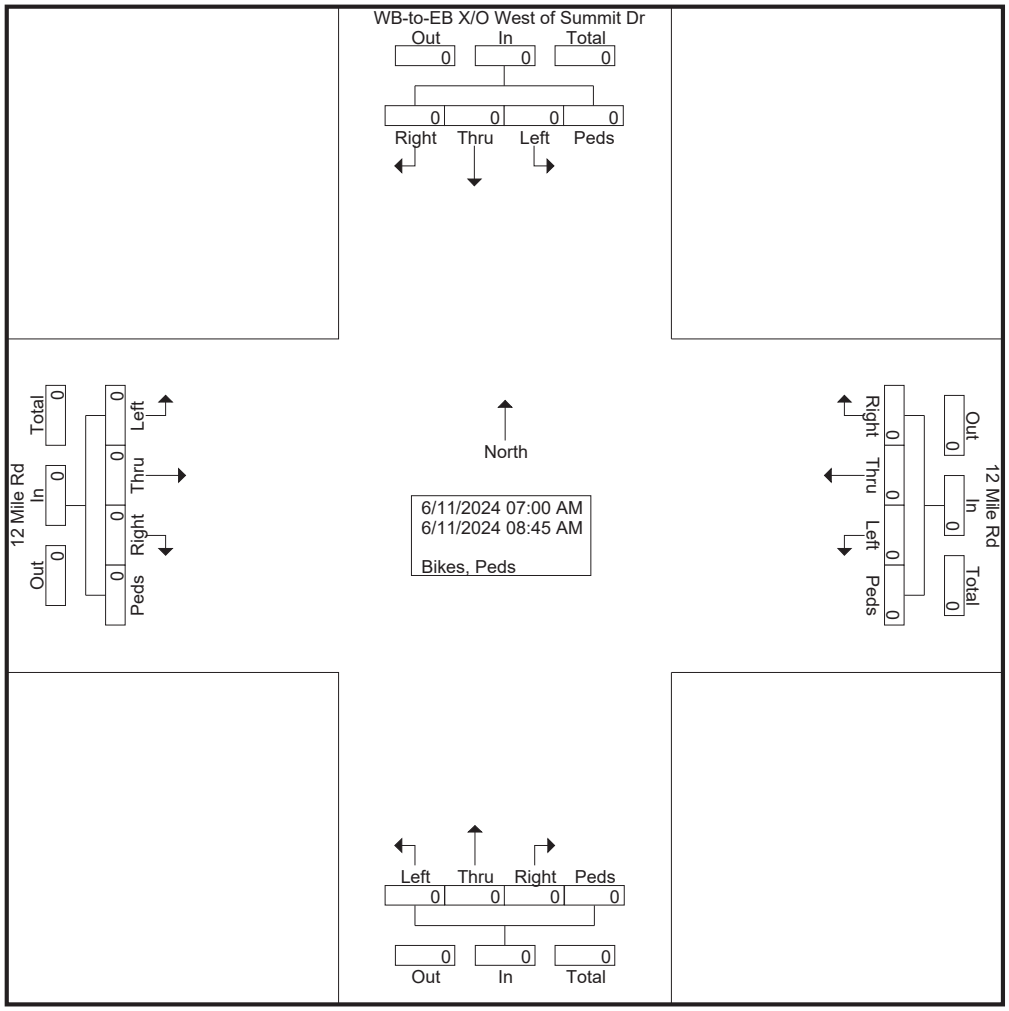
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O West of Summit Dr Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	396	0	0	396	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	398
07:45 AM	0	**405**	0	0	**405**	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	**410**
08:00 AM	0	396	0	0	396	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	397
08:15 AM	0	391	0	0	391	0	0	0	0	0	0	0	0	0	0	**6**	0	0	0	**6**	397
Total Volume	0	1588	0	0	1588	0	0	0	0	0	0	0	0	0	0	14	0	0	0	14	1602
% App. Total	0	100	0	0		0	0	0	0		0	0	0	0		100	0	0	0		
PHF	.000	.980	.000	.000	.980	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.583	.000	.000	.000	.583	.977
Light Vehicles	0	1498	0	0	1498	0	0	0	0	0	0	0	0	0	0	14	0	0	0	14	1512
% Light Vehicles	0	94.3	0	0	94.3	0	0	0	0	0	0	0	0	0	0	100	0	0	0	100	94.4
Heavy Vehicles	0	90	0	0	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90
% Heavy Vehicles	0	5.7	0	0	5.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.6



File Name : 16651605 - WB-to-EB X_O West of Summit Dr -- 12 Mile Rd
Site Code : 16651605
Start Date : 6/11/2024
Page No : 1

Groups Printed- Bikes, Peds

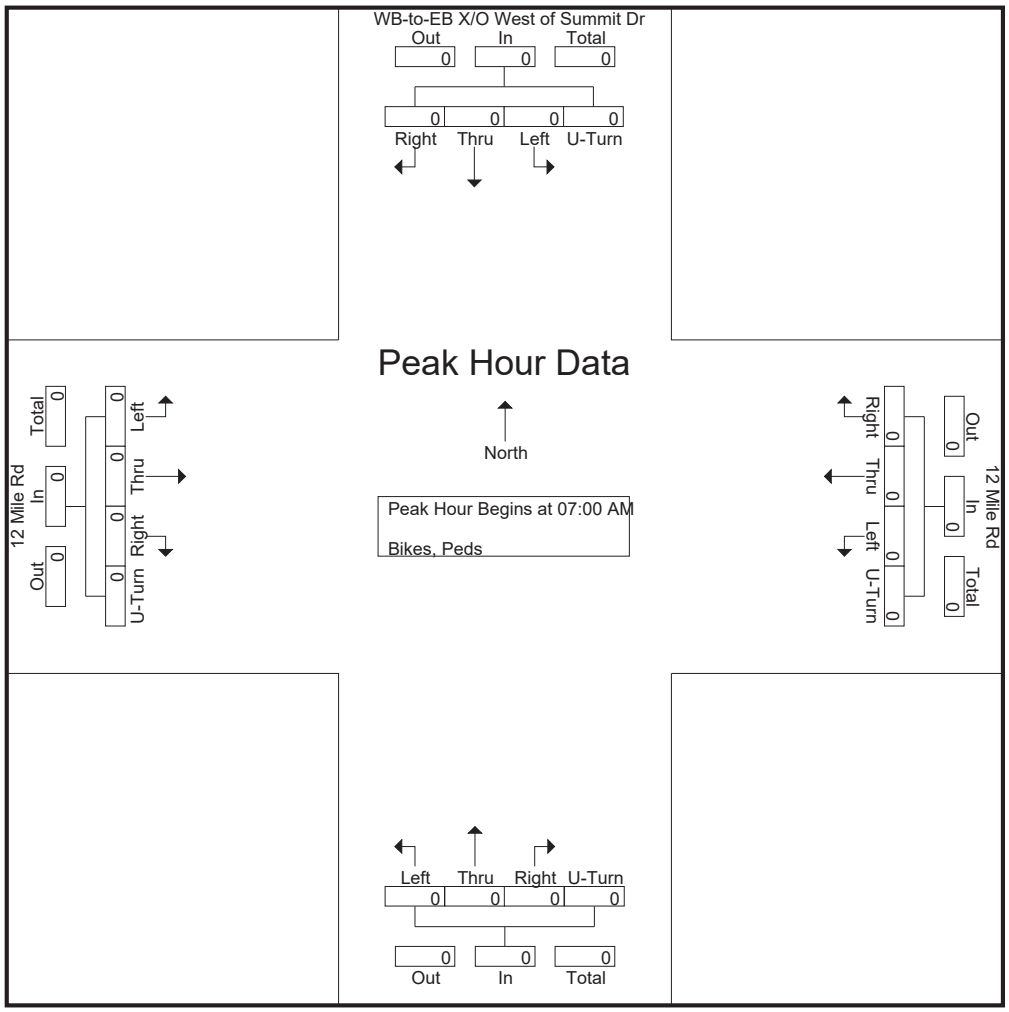
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O West of Summit Dr Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651605 - WB-to-EB X_O West of Summit Dr -- 12 Mile Rd
Site Code : 16651605
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O West of Summit Dr Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

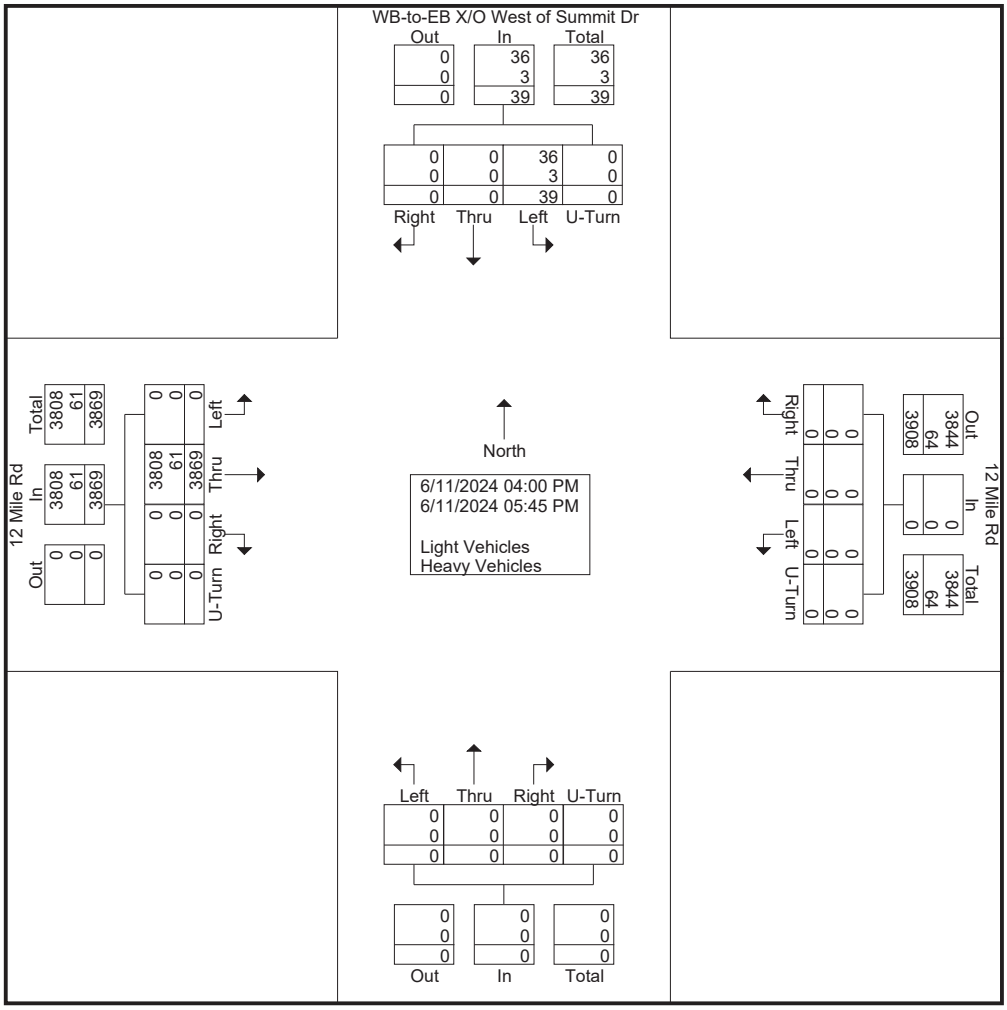


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651606 - WB-to-EB X_O West of Summit Dr -- 12 Mile Rd
Site Code : 16651606
Start Date : 6/11/2024
Page No : 1

Groups Printed- Light Vehicles - Heavy Vehicles

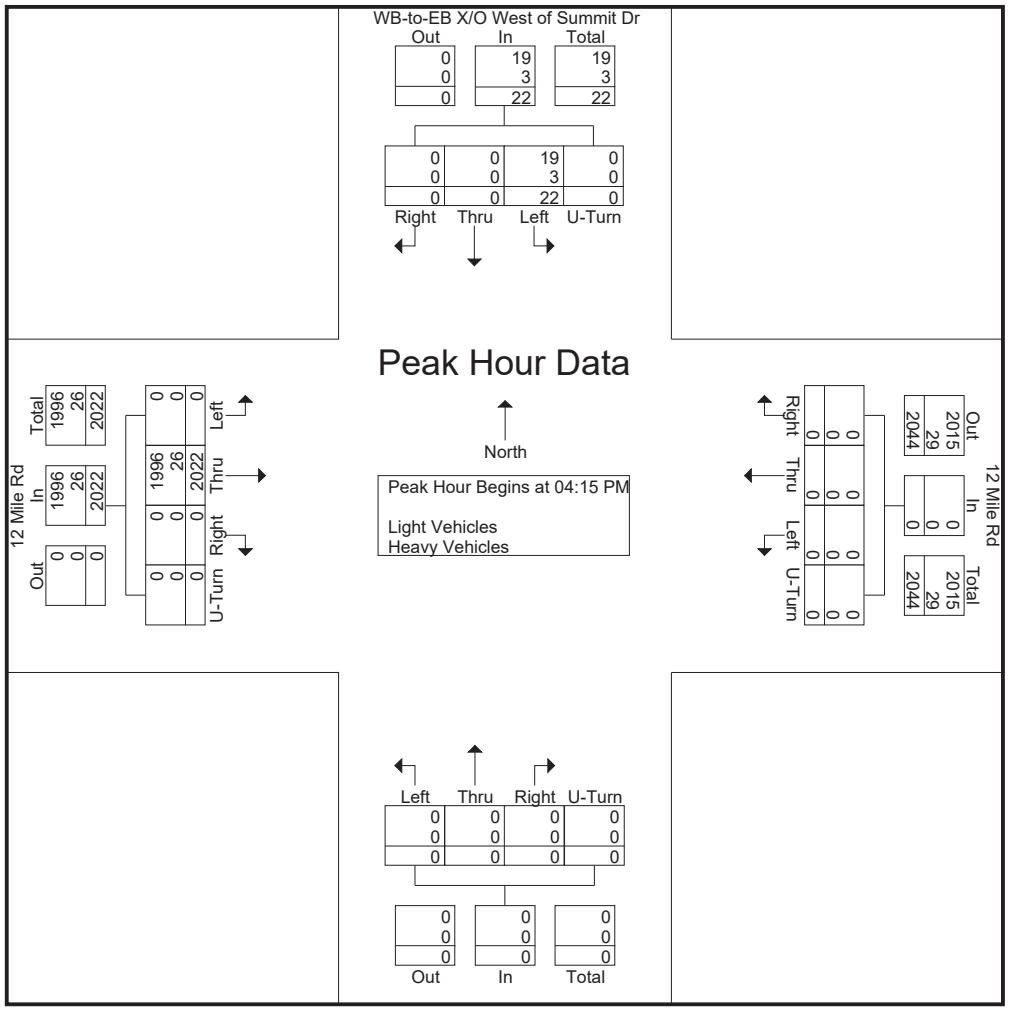
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O West of Summit Dr Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
04:00 PM	0	445	0	0	445	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	450
04:15 PM	0	518	0	0	518	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	523
04:30 PM	0	462	0	0	462	0	0	0	0	0	0	0	0	0	0	6	0	0	0	6	468
04:45 PM	0	511	0	0	511	0	0	0	0	0	0	0	0	0	0	6	0	0	0	6	517
Total	0	1936	0	0	1936	0	0	0	0	0	0	0	0	0	0	22	0	0	0	22	1958
05:00 PM	0	531	0	0	531	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	536
05:15 PM	0	503	0	0	503	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	507
05:30 PM	0	463	0	0	463	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	466
05:45 PM	0	436	0	0	436	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	441
Total	0	1933	0	0	1933	0	0	0	0	0	0	0	0	0	0	17	0	0	0	17	1950
Grand Total	0	3869	0	0	3869	0	0	0	0	0	0	0	0	0	0	39	0	0	0	39	3908
Apprch %	0	100	0	0		0	0	0	0		0	0	0	0		100	0	0	0		
Total %	0	99	0	0	99	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
Light Vehicles	0	3808	0	0	3808	0	0	0	0	0	0	0	0	0	0	36	0	0	0	36	3844
% Light Vehicles	0	98.4	0	0	98.4	0	0	0	0	0	0	0	0	0	0	92.3	0	0	0	92.3	98.4
Heavy Vehicles	0	61	0	0	61	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	64
% Heavy Vehicles	0	1.6	0	0	1.6	0	0	0	0	0	0	0	0	0	0	7.7	0	0	0	7.7	1.6



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651606 - WB-to-EB X_O West of Summit Dr -- 12 Mile Rd
Site Code : 16651606
Start Date : 6/11/2024
Page No : 2

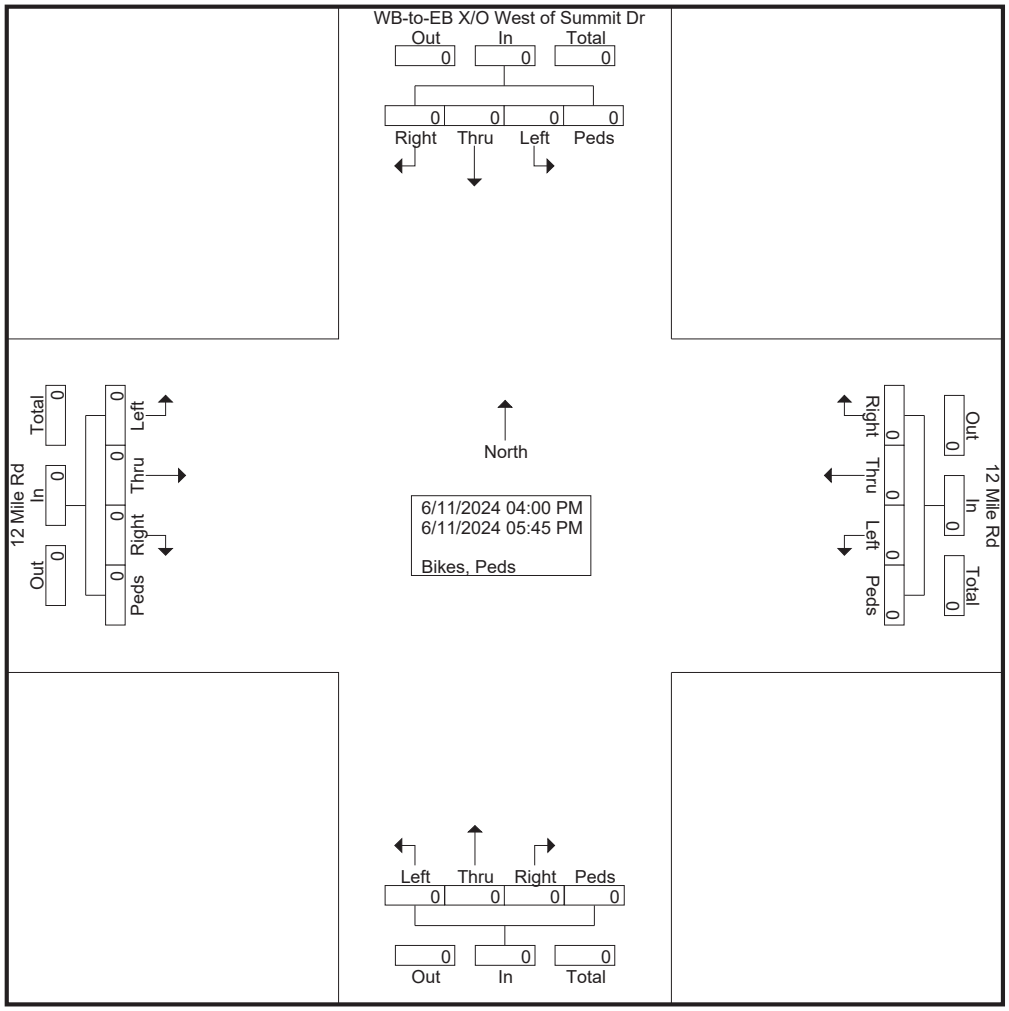
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O West of Summit Dr Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	518	0	0	518	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	523
04:30 PM	0	462	0	0	462	0	0	0	0	0	0	0	0	0	0	**6**	0	0	0	**6**	468
04:45 PM	0	511	0	0	511	0	0	0	0	0	0	0	0	0	0	6	0	0	0	6	517
05:00 PM	0	**531**	0	0	**531**	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	**536**
Total Volume	0	2022	0	0	2022	0	0	0	0	0	0	0	0	0	0	22	0	0	0	22	2044
% App. Total	0	100	0	0		0	0	0	0		0	0	0	0		100	0	0	0		
PHF	.000	.952	.000	.000	.952	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.917	.000	.000	.000	.917	.953
Light Vehicles	0	1996	0	0	1996	0	0	0	0	0	0	0	0	0	0	19	0	0	0	19	2015
% Light Vehicles	0	98.7	0	0	98.7	0	0	0	0	0	0	0	0	0	0	86.4	0	0	0	86.4	98.6
Heavy Vehicles	0	26	0	0	26	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	29
% Heavy Vehicles	0	1.3	0	0	1.3	0	0	0	0	0	0	0	0	0	0	13.6	0	0	0	13.6	1.4



File Name : 16651606 - WB-to-EB X_O West of Summit Dr -- 12 Mile Rd
Site Code : 16651606
Start Date : 6/11/2024
Page No : 1

Groups Printed- Bikes, Peds

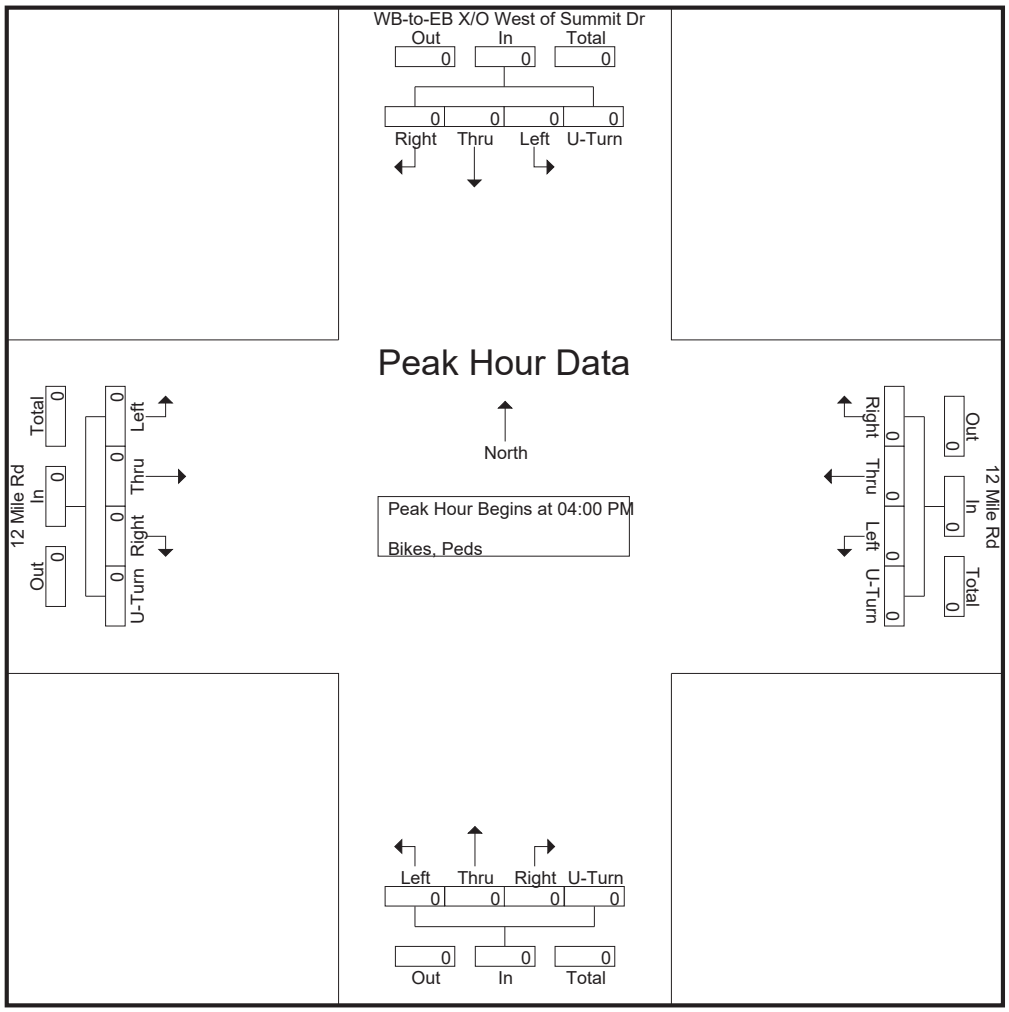
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O West of Summit Dr Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651606 - WB-to-EB X_O West of Summit Dr -- 12 Mile Rd
Site Code : 16651606
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O West of Summit Dr Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

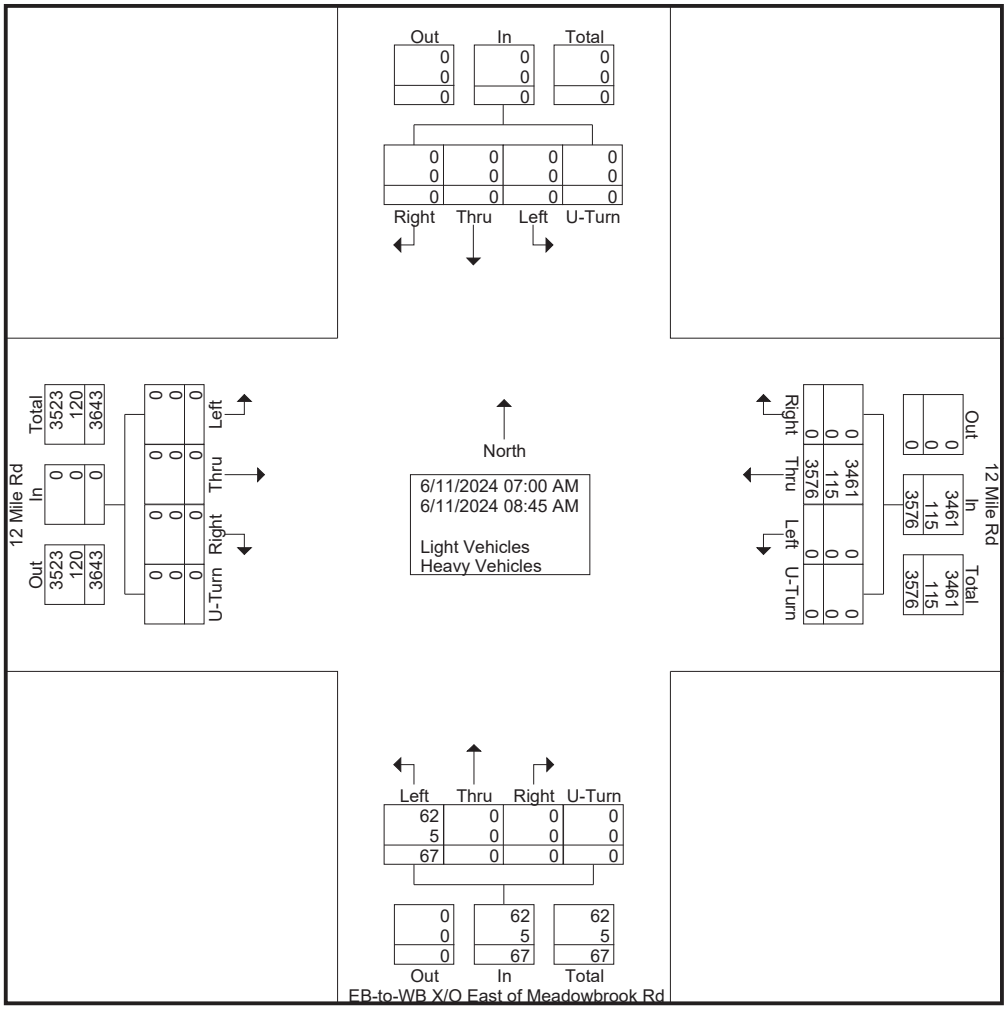


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651607 - EB-to-WB X_O East of Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651607
Start Date : 6/11/2024
Page No : 1

Groups Printed- Light Vehicles - Heavy Vehicles

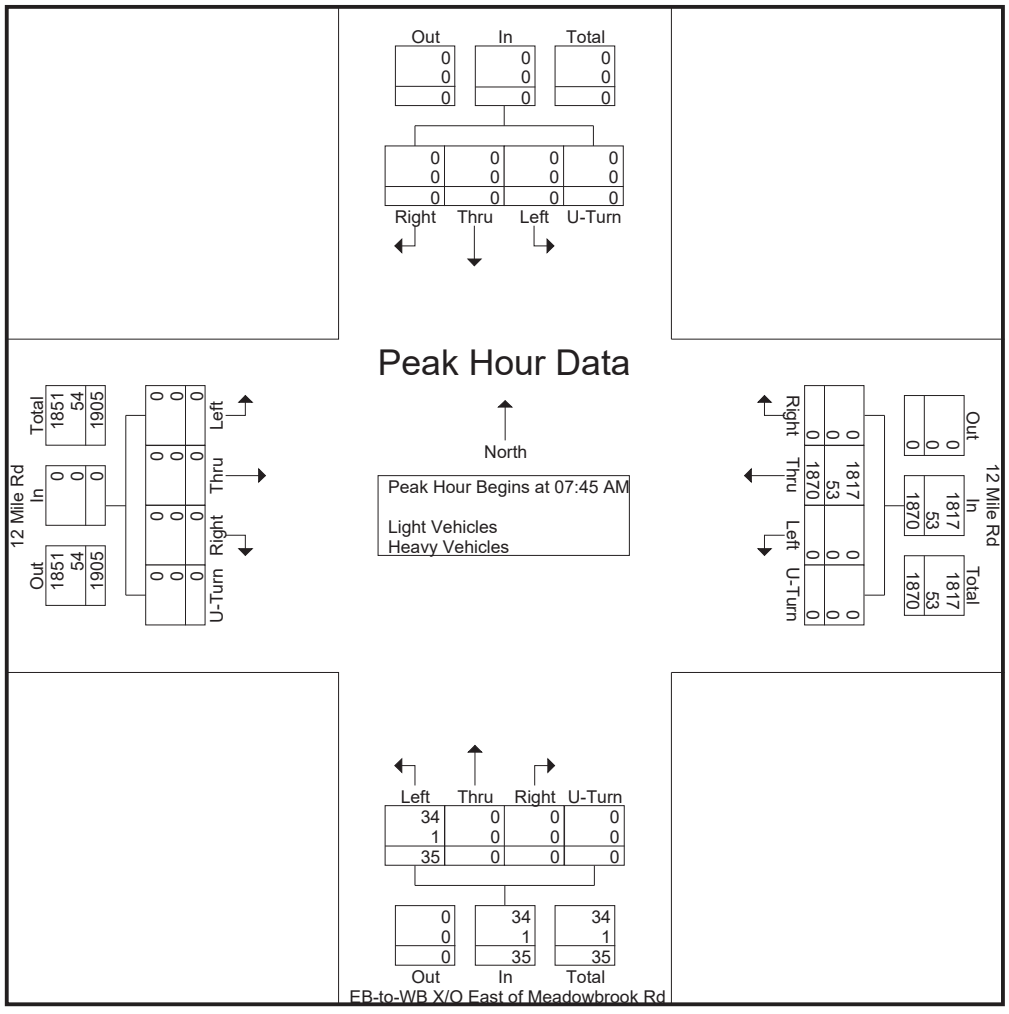
	12 Mile Rd Eastbound					12 Mile Rd Westbound					EB-to-WB X/O East of Meadowbrook Rd Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	352	0	0	352	4	0	0	0	4	0	0	0	0	0	356
07:15 AM	0	0	0	0	0	0	406	0	0	406	4	0	0	0	4	0	0	0	0	0	410
07:30 AM	0	0	0	0	0	0	458	0	0	458	8	0	0	0	8	0	0	0	0	0	466
07:45 AM	0	0	0	0	0	0	518	0	0	518	11	0	0	0	11	0	0	0	0	0	529
Total	0	0	0	0	0	0	1734	0	0	1734	27	0	0	0	27	0	0	0	0	0	1761
08:00 AM	0	0	0	0	0	0	459	0	0	459	11	0	0	0	11	0	0	0	0	0	470
08:15 AM	0	0	0	0	0	0	411	0	0	411	4	0	0	0	4	0	0	0	0	0	415
08:30 AM	0	0	0	0	0	0	482	0	0	482	9	0	0	0	9	0	0	0	0	0	491
08:45 AM	0	0	0	0	0	0	490	0	0	490	16	0	0	0	16	0	0	0	0	0	506
Total	0	0	0	0	0	0	1842	0	0	1842	40	0	0	0	40	0	0	0	0	0	1882
Grand Total	0	0	0	0	0	0	3576	0	0	3576	67	0	0	0	67	0	0	0	0	0	3643
Apprch %	0	0	0	0		0	100	0	0		100	0	0	0		0	0	0	0		
Total %	0	0	0	0	0	0	98.2	0	0	98.2	1.8	0	0	0	1.8	0	0	0	0	0	
Light Vehicles	0	0	0	0	0	0	3461	0	0	3461	62	0	0	0	62	0	0	0	0	0	3523
% Light Vehicles	0	0	0	0	0	0	96.8	0	0	96.8	92.5	0	0	0	92.5	0	0	0	0	0	96.7
Heavy Vehicles	0	0	0	0	0	0	115	0	0	115	5	0	0	0	5	0	0	0	0	0	120
% Heavy Vehicles	0	0	0	0	0	0	3.2	0	0	3.2	7.5	0	0	0	7.5	0	0	0	0	0	3.3



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651607 - EB-to-WB X_O East of Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651607
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					EB-to-WB X/O East of Meadowbrook Rd Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	0	0	0	0	0	**518**	0	0	**518**	**11**	0	0	0	**11**	0	0	0	0	0	**529**
08:00 AM	0	0	0	0	0	0	459	0	0	459	11	0	0	0	11	0	0	0	0	0	470
08:15 AM	0	0	0	0	0	0	411	0	0	411	4	0	0	0	4	0	0	0	0	0	415
08:30 AM	0	0	0	0	0	0	482	0	0	482	9	0	0	0	9	0	0	0	0	0	491
Total Volume	0	0	0	0	0	0	1870	0	0	1870	35	0	0	0	35	0	0	0	0	0	1905
% App. Total	0	0	0	0		0	100	0	0		100	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.903	.000	.000	.903	.795	.000	.000	.000	.795	.000	.000	.000	.000	.000	.900
Light Vehicles	0	0	0	0	0	0	1817	0	0	1817	34	0	0	0	34	0	0	0	0	0	1851
% Light Vehicles	0	0	0	0	0	0	97.2	0	0	97.2	97.1	0	0	0	97.1	0	0	0	0	0	97.2
Heavy Vehicles	0	0	0	0	0	0	53	0	0	53	1	0	0	0	1	0	0	0	0	0	54
% Heavy Vehicles	0	0	0	0	0	0	2.8	0	0	2.8	2.9	0	0	0	2.9	0	0	0	0	0	2.8

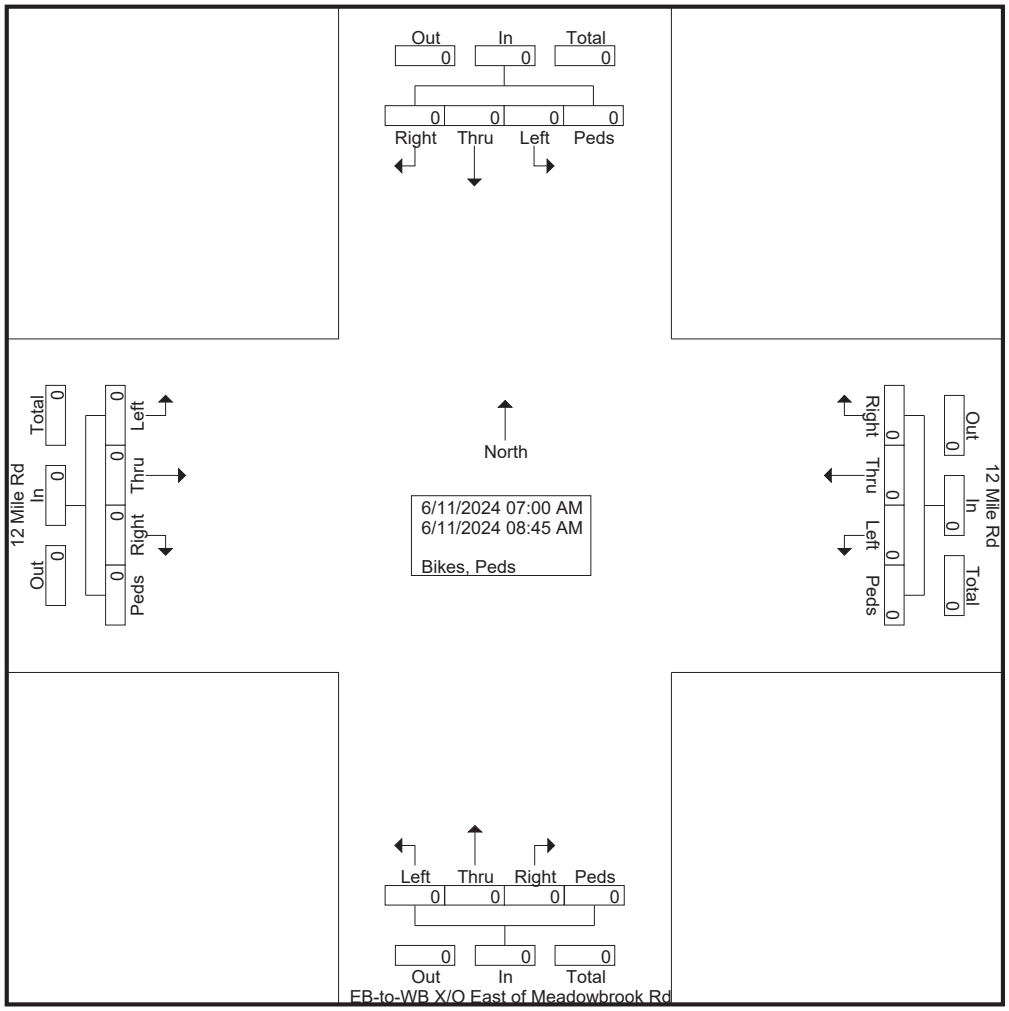


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651607 - EB-to-WB X_O East of Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651607
Start Date : 6/11/2024
Page No : 1

Groups Printed- Bikes, Peds

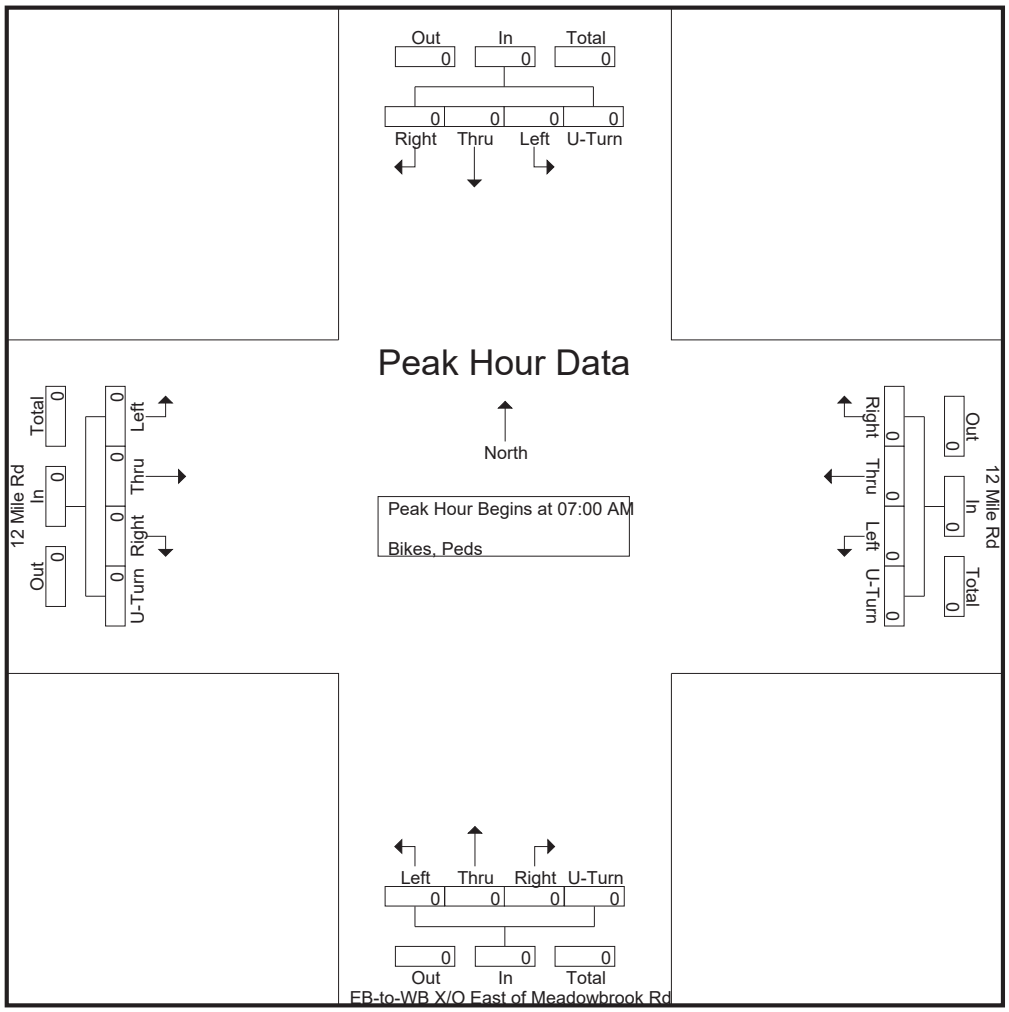
	12 Mile Rd Eastbound					12 Mile Rd Westbound					EB-to-WB X/O East of Meadowbrook Rd Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651607 - EB-to-WB X_O East of Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651607
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					EB-to-WB X/O East of Meadowbrook Rd Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

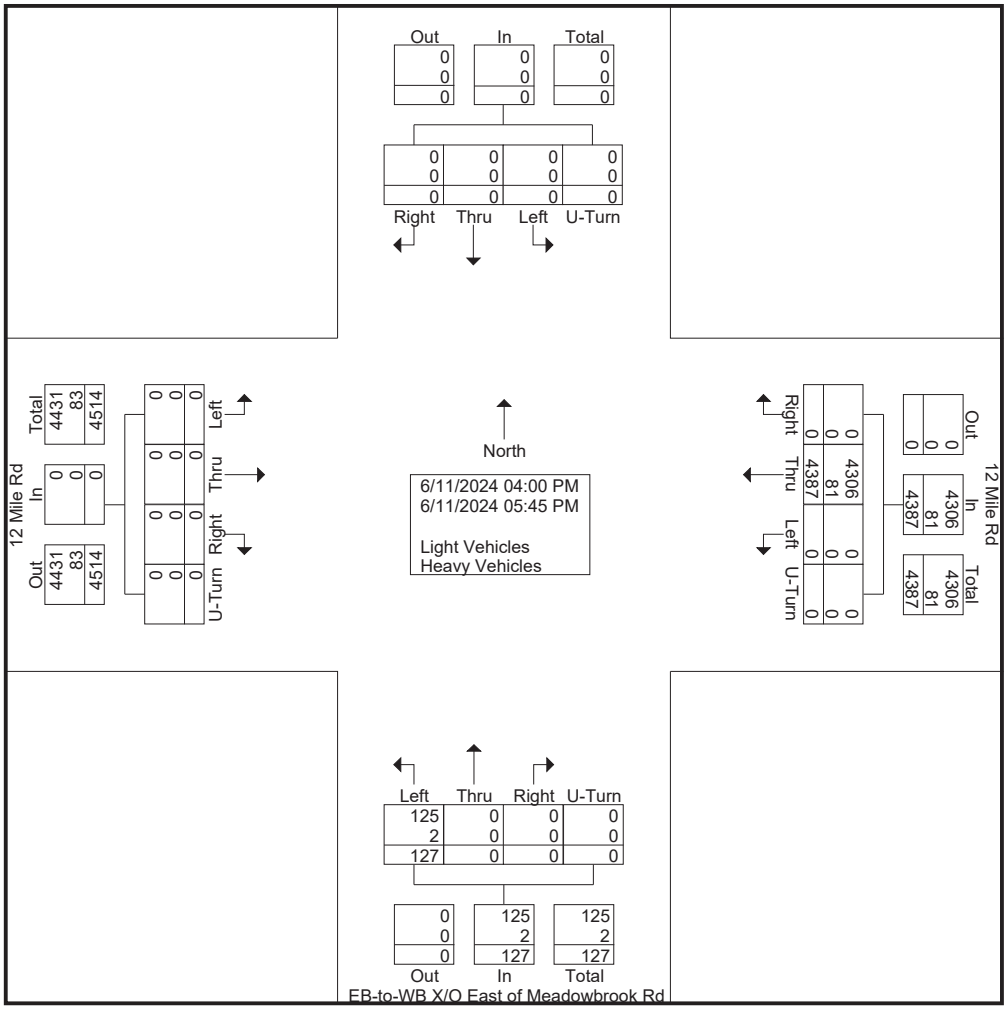


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651608 - EB-to-WB X_O East of Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651608
Start Date : 6/11/2024
Page No : 1

Groups Printed- Light Vehicles - Heavy Vehicles

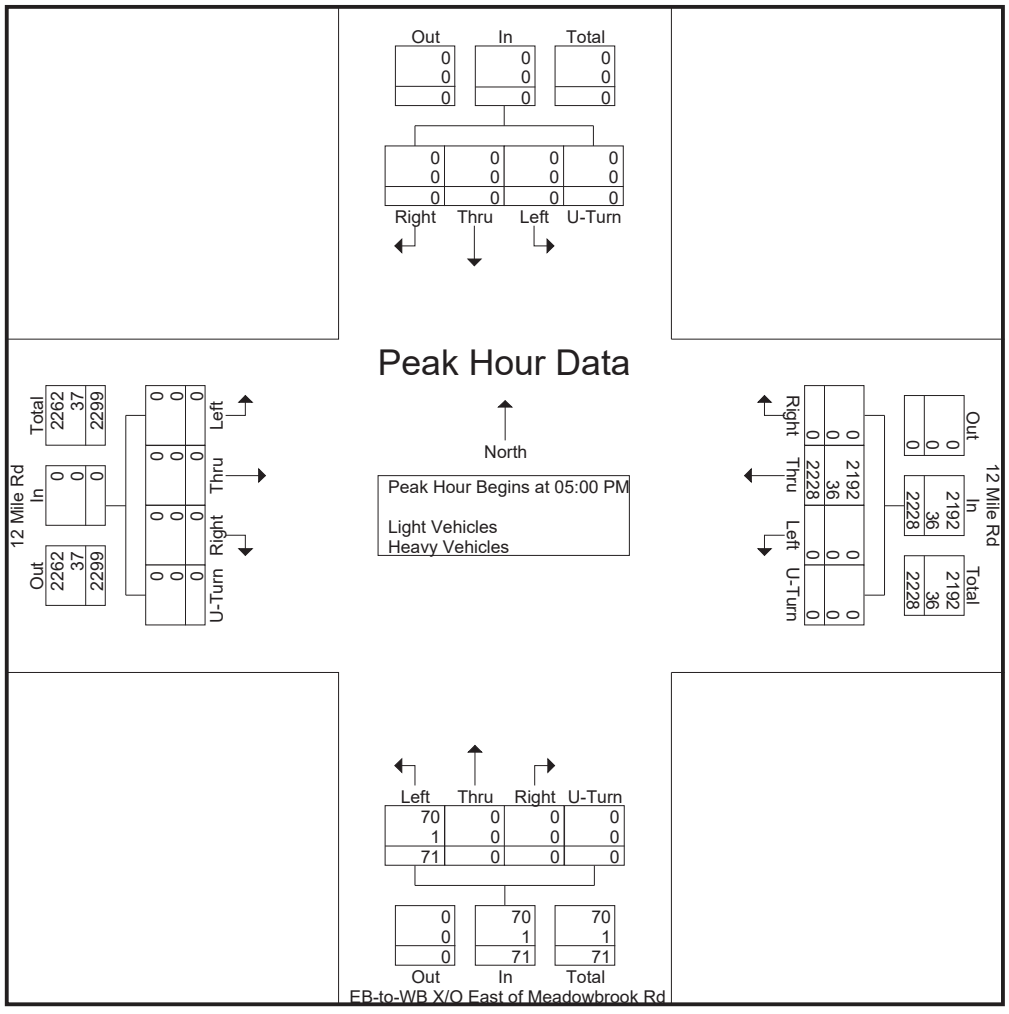
	12 Mile Rd Eastbound					12 Mile Rd Westbound					EB-to-WB X/O East of Meadowbrook Rd Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	533	0	0	533	17	0	0	0	17	0	0	0	0	0	550
04:15 PM	0	0	0	0	0	0	539	0	0	539	10	0	0	0	10	0	0	0	0	0	549
04:30 PM	0	0	0	0	0	0	539	0	0	539	15	0	0	0	15	0	0	0	0	0	554
04:45 PM	0	0	0	0	0	0	548	0	0	548	14	0	0	0	14	0	0	0	0	0	562
Total	0	0	0	0	0	0	2159	0	0	2159	56	0	0	0	56	0	0	0	0	0	2215
05:00 PM	0	0	0	0	0	0	520	0	0	520	11	0	0	0	11	0	0	0	0	0	531
05:15 PM	0	0	0	0	0	0	508	0	0	508	14	0	0	0	14	0	0	0	0	0	522
05:30 PM	0	0	0	0	0	0	600	0	0	600	18	0	0	0	18	0	0	0	0	0	618
05:45 PM	0	0	0	0	0	0	600	0	0	600	28	0	0	0	28	0	0	0	0	0	628
Total	0	0	0	0	0	0	2228	0	0	2228	71	0	0	0	71	0	0	0	0	0	2299
Grand Total	0	0	0	0	0	0	4387	0	0	4387	127	0	0	0	127	0	0	0	0	0	4514
Apprch %	0	0	0	0		0	100	0	0		100	0	0	0		0	0	0	0		
Total %	0	0	0	0	0	0	97.2	0	0	97.2	2.8	0	0	0	2.8	0	0	0	0	0	
Light Vehicles	0	0	0	0	0	0	4306	0	0	4306	125	0	0	0	125	0	0	0	0	0	4431
% Light Vehicles	0	0	0	0	0	0	98.2	0	0	98.2	98.4	0	0	0	98.4	0	0	0	0	0	98.2
Heavy Vehicles	0	0	0	0	0	0	81	0	0	81	2	0	0	0	2	0	0	0	0	0	83
% Heavy Vehicles	0	0	0	0	0	0	1.8	0	0	1.8	1.6	0	0	0	1.6	0	0	0	0	0	1.8



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651608 - EB-to-WB X_O East of Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651608
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					EB-to-WB X/O East of Meadowbrook Rd Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	0	0	0	0	0	520	0	0	520	11	0	0	0	11	0	0	0	0	0	531
05:15 PM	0	0	0	0	0	0	508	0	0	508	14	0	0	0	14	0	0	0	0	0	522
05:30 PM	0	0	0	0	0	0	**600**	0	0	**600**	18	0	0	0	18	0	0	0	0	0	618
05:45 PM	0	0	0	0	0	0	600	0	0	600	**28**	0	0	0	**28**	0	0	0	0	0	**628**
Total Volume	0	0	0	0	0	0	2228	0	0	2228	71	0	0	0	71	0	0	0	0	0	2299
% App. Total	0	0	0	0		0	100	0	0		100	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.928	.000	.000	.928	.634	.000	.000	.000	.634	.000	.000	.000	.000	.000	.915
Light Vehicles	0	0	0	0	0	0	2192	0	0	2192	70	0	0	0	70	0	0	0	0	0	2262
% Light Vehicles	0	0	0	0	0	0	98.4	0	0	98.4	98.6	0	0	0	98.6	0	0	0	0	0	98.4
Heavy Vehicles	0	0	0	0	0	0	36	0	0	36	1	0	0	0	1	0	0	0	0	0	37
% Heavy Vehicles	0	0	0	0	0	0	1.6	0	0	1.6	1.4	0	0	0	1.4	0	0	0	0	0	1.6

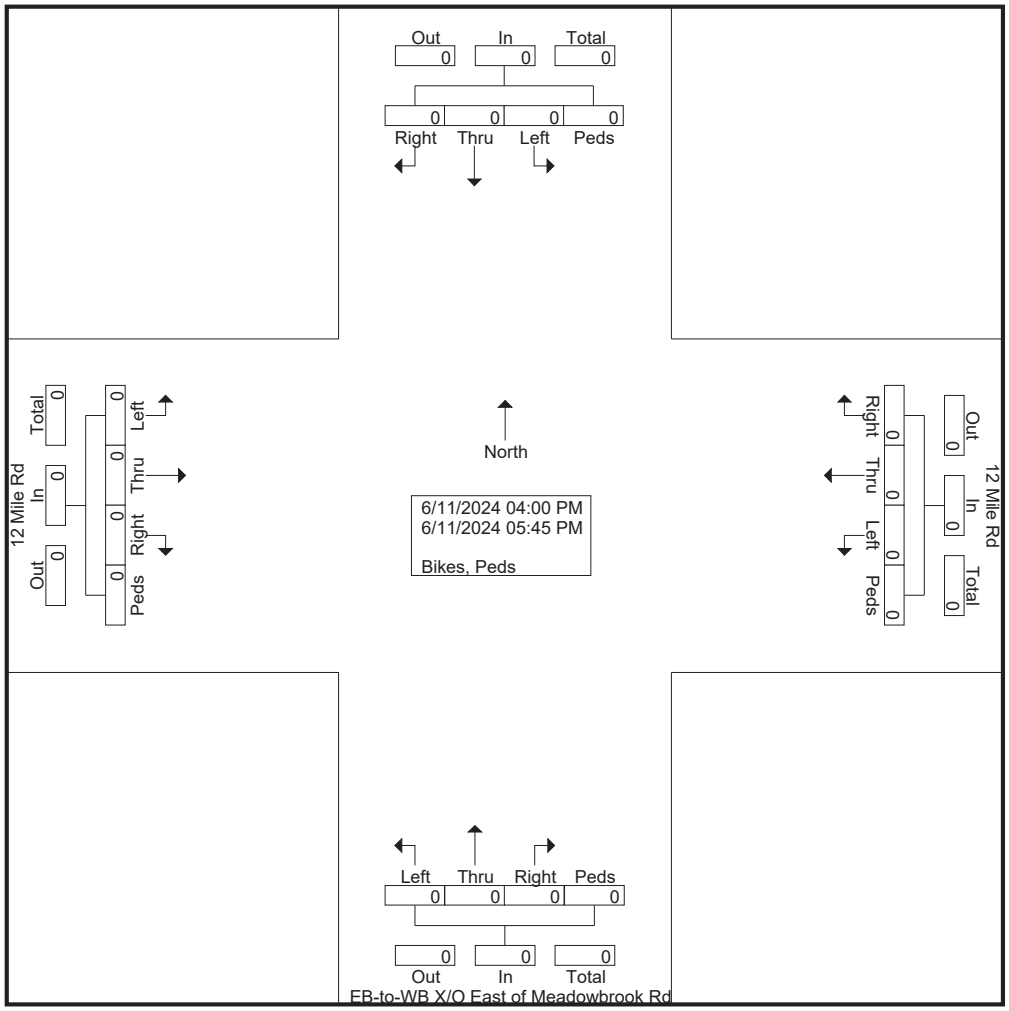


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651608 - EB-to-WB X_O East of Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651608
Start Date : 6/11/2024
Page No : 1

Groups Printed- Bikes, Peds

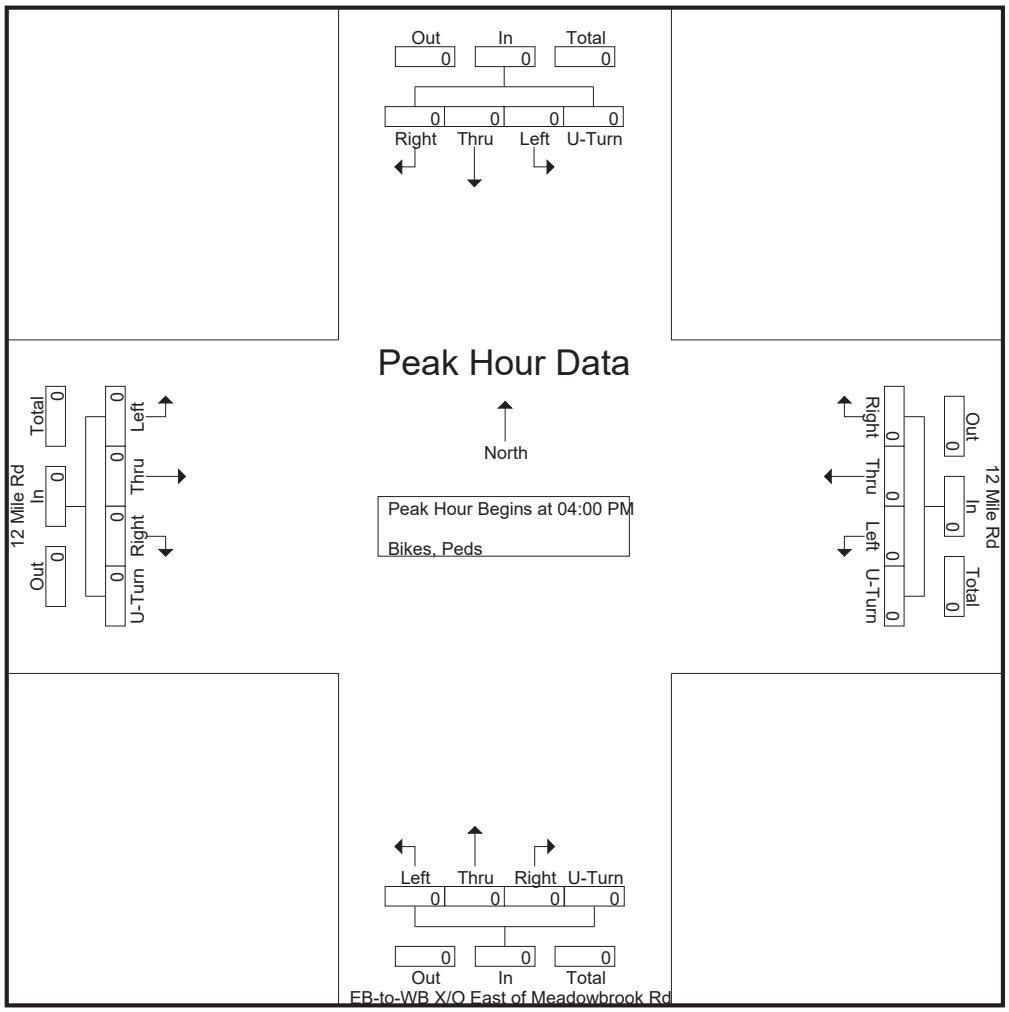
	12 Mile Rd Eastbound					12 Mile Rd Westbound					EB-to-WB X/O East of Meadowbrook Rd Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651608 - EB-to-WB X_O East of Meadowbrook Rd -- 12 Mile Rd
Site Code : 16651608
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					EB-to-WB X/O East of Meadowbrook Rd Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

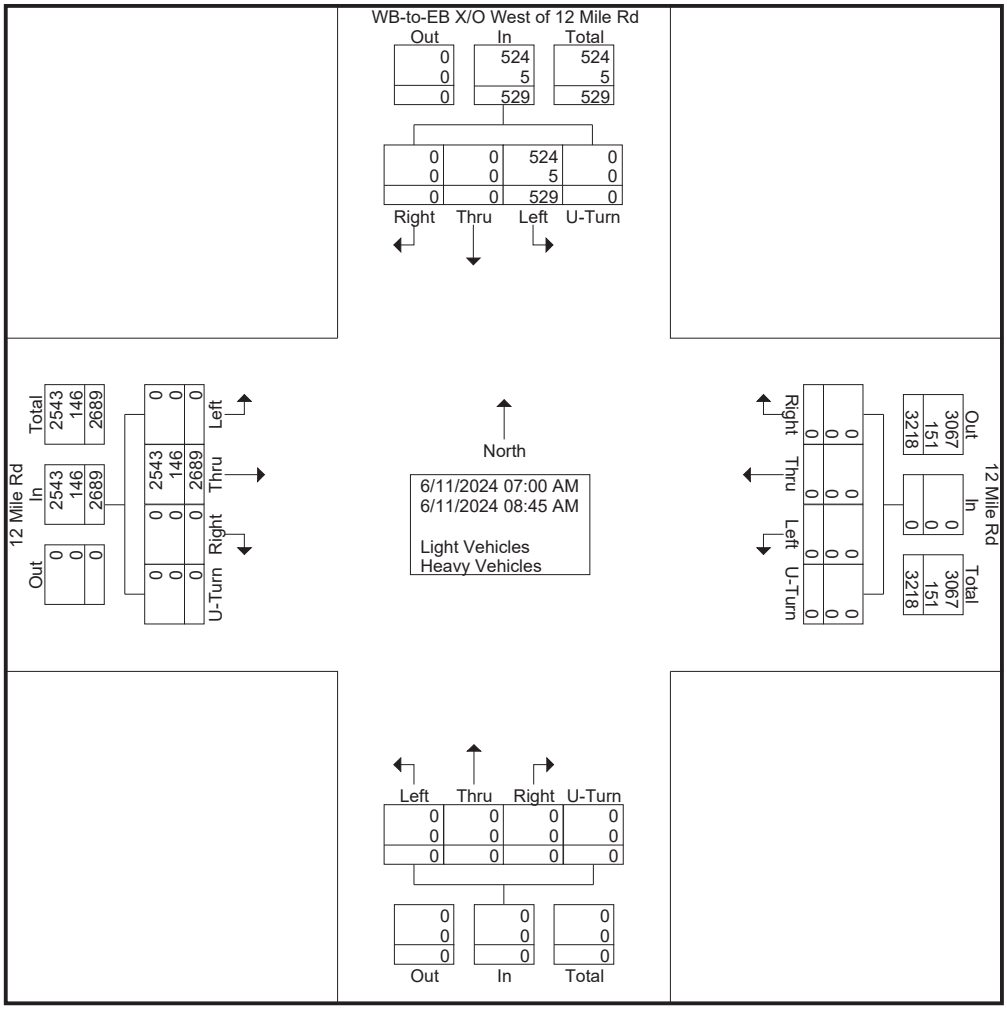


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651609 - WB-to-EB X_O West of 12 Mile Rd -- 12 Mile Rd
Site Code : 16651609
Start Date : 6/11/2024
Page No : 1

Groups Printed- Light Vehicles - Heavy Vehicles

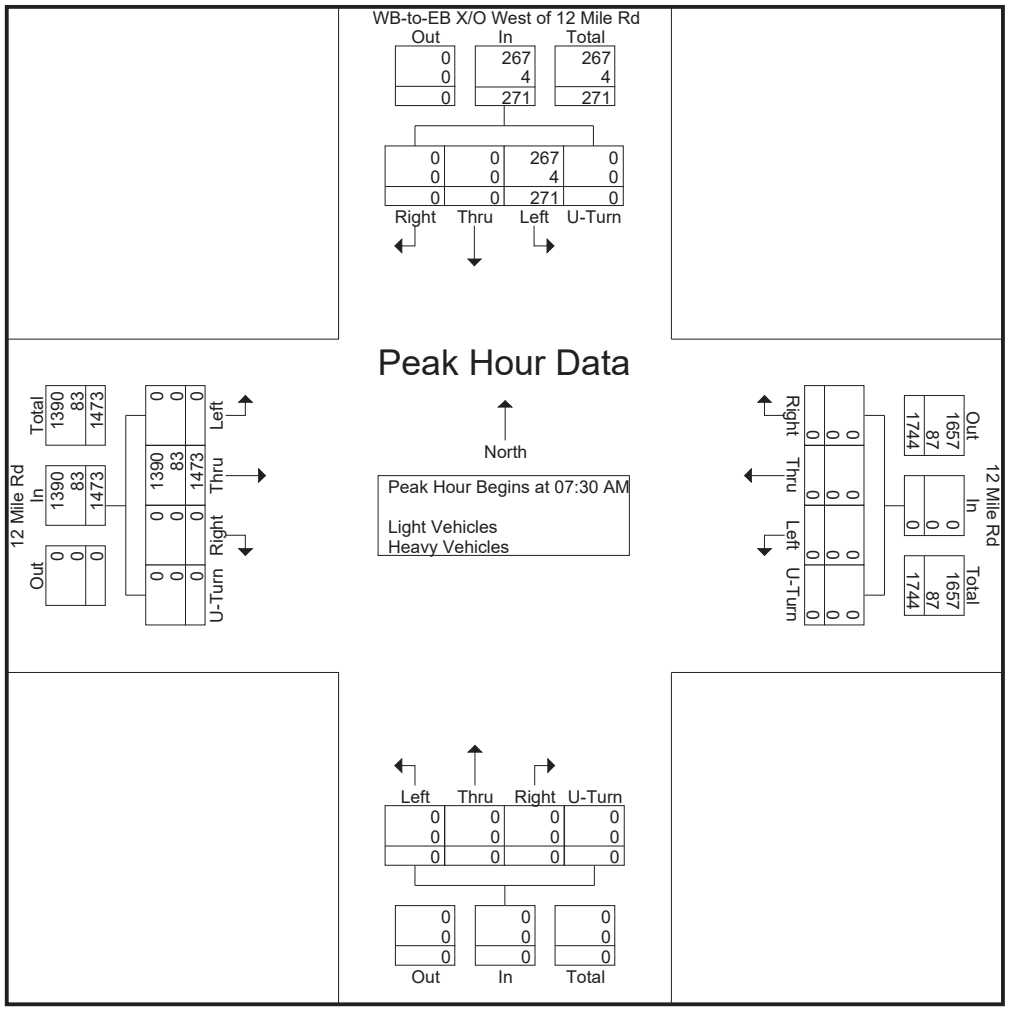
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O West of 12 Mile Rd Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
07:00 AM	0	238	0	0	238	0	0	0	0	0	0	0	0	0	0	44	0	0	0	44	282
07:15 AM	0	279	0	0	279	0	0	0	0	0	0	0	0	0	0	50	0	0	0	50	329
07:30 AM	0	367	0	0	367	0	0	0	0	0	0	0	0	0	0	64	0	0	0	64	431
07:45 AM	0	410	0	0	410	0	0	0	0	0	0	0	0	0	0	67	0	0	0	67	477
Total	0	1294	0	0	1294	0	0	0	0	0	0	0	0	0	0	225	0	0	0	225	1519
08:00 AM	0	357	0	0	357	0	0	0	0	0	0	0	0	0	0	77	0	0	0	77	434
08:15 AM	0	339	0	0	339	0	0	0	0	0	0	0	0	0	0	63	0	0	0	63	402
08:30 AM	0	344	0	0	344	0	0	0	0	0	0	0	0	0	0	73	0	0	0	73	417
08:45 AM	0	355	0	0	355	0	0	0	0	0	0	0	0	0	0	91	0	0	0	91	446
Total	0	1395	0	0	1395	0	0	0	0	0	0	0	0	0	0	304	0	0	0	304	1699
Grand Total	0	2689	0	0	2689	0	0	0	0	0	0	0	0	0	0	529	0	0	0	529	3218
Apprch %	0	100	0	0		0	0	0	0		0	0	0	0		100	0	0	0		
Total %	0	83.6	0	0	83.6	0	0	0	0	0	0	0	0	0	0	16.4	0	0	0	16.4	
Light Vehicles	0	2543	0	0	2543	0	0	0	0	0	0	0	0	0	0	524	0	0	0	524	3067
% Light Vehicles	0	94.6	0	0	94.6	0	0	0	0	0	0	0	0	0	0	99.1	0	0	0	99.1	95.3
Heavy Vehicles	0	146	0	0	146	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	151
% Heavy Vehicles	0	5.4	0	0	5.4	0	0	0	0	0	0	0	0	0	0	0.9	0	0	0	0.9	4.7



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651609 - WB-to-EB X_O West of 12 Mile Rd -- 12 Mile Rd
Site Code : 16651609
Start Date : 6/11/2024
Page No : 2

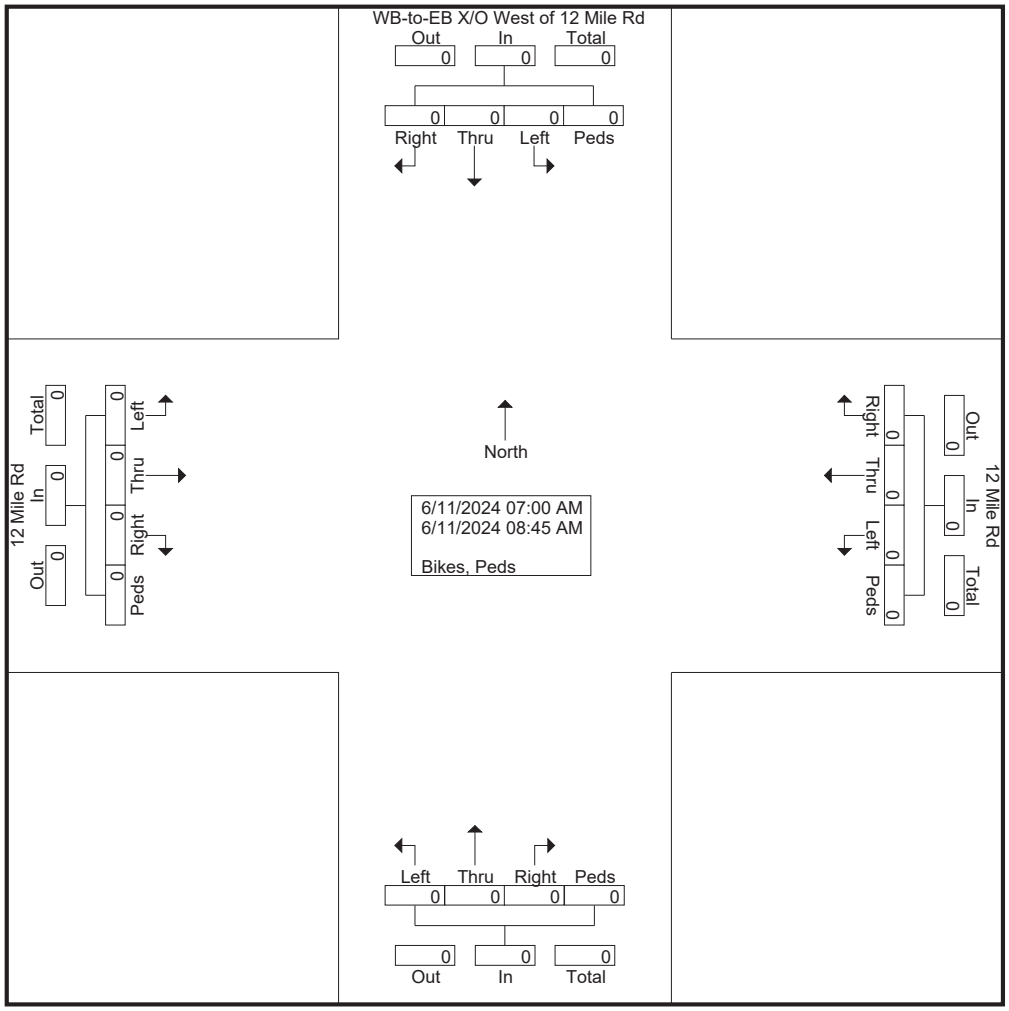
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O West of 12 Mile Rd Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	367	0	0	367	0	0	0	0	0	0	0	0	0	0	64	0	0	0	64	431
07:45 AM	0	**410**	0	0	**410**	0	0	0	0	0	0	0	0	0	0	67	0	0	0	67	**477**
08:00 AM	0	357	0	0	357	0	0	0	0	0	0	0	0	0	0	**77**	0	0	0	**77**	434
08:15 AM	0	339	0	0	339	0	0	0	0	0	0	0	0	0	0	63	0	0	0	63	402
Total Volume	0	1473	0	0	1473	0	0	0	0	0	0	0	0	0	0	271	0	0	0	271	1744
% App. Total	0	100	0	0		0	0	0	0		0	0	0	0		100	0	0	0		
PHF	.000	.898	.000	.000	.898	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.880	.000	.000	.000	.880	.914
Light Vehicles	0	1390	0	0	1390	0	0	0	0	0	0	0	0	0	0	267	0	0	0	267	1657
% Light Vehicles	0	94.4	0	0	94.4	0	0	0	0	0	0	0	0	0	0	98.5	0	0	0	98.5	95.0
Heavy Vehicles	0	83	0	0	83	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	87
% Heavy Vehicles	0	5.6	0	0	5.6	0	0	0	0	0	0	0	0	0	0	1.5	0	0	0	1.5	5.0



File Name : 16651609 - WB-to-EB X_O West of 12 Mile Rd -- 12 Mile Rd
Site Code : 16651609
Start Date : 6/11/2024
Page No : 1

Groups Printed- Bikes, Peds

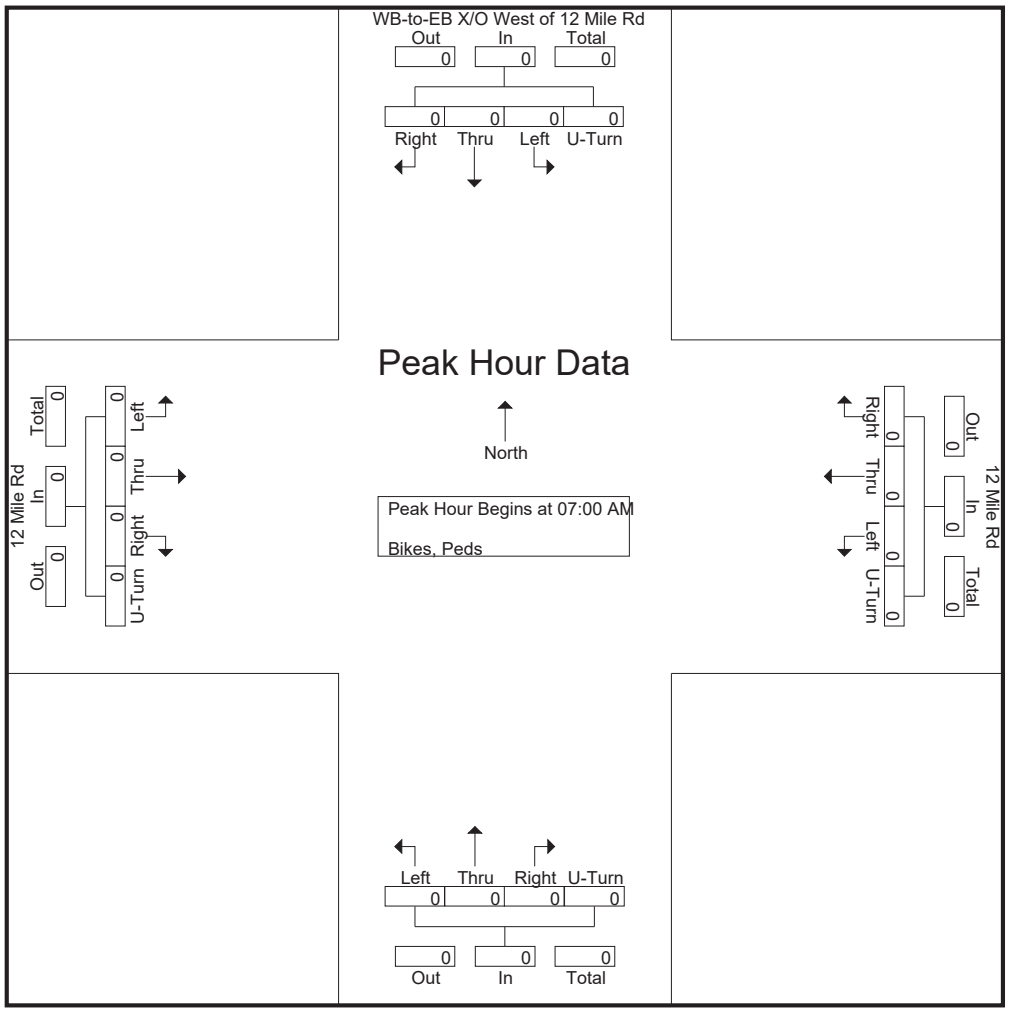
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O West of 12 Mile Rd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651609 - WB-to-EB X_O West of 12 Mile Rd -- 12 Mile Rd
Site Code : 16651609
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O West of 12 Mile Rd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

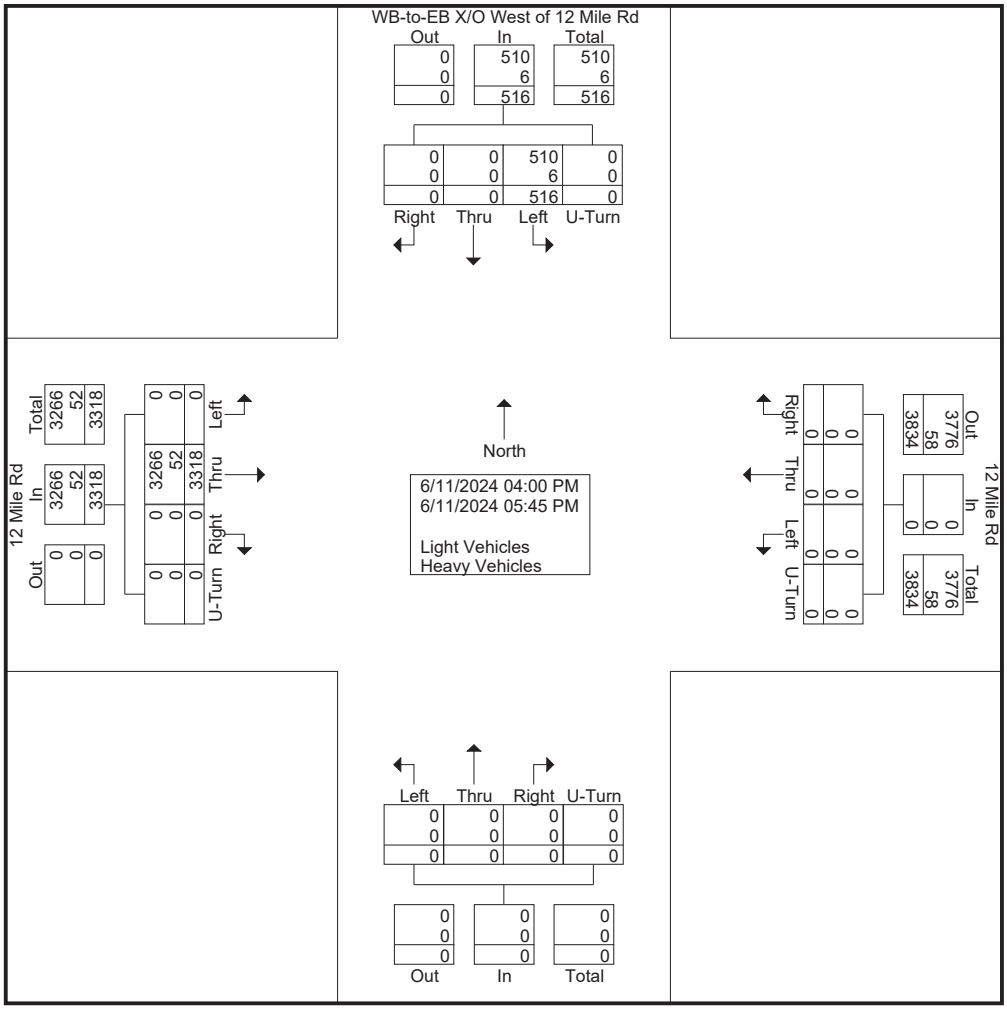


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651610 - WB-to-EB X_O West of 12 Mile Rd -- 12 Mile Rd
Site Code : 16651610
Start Date : 6/11/2024
Page No : 1

Groups Printed- Light Vehicles - Heavy Vehicles

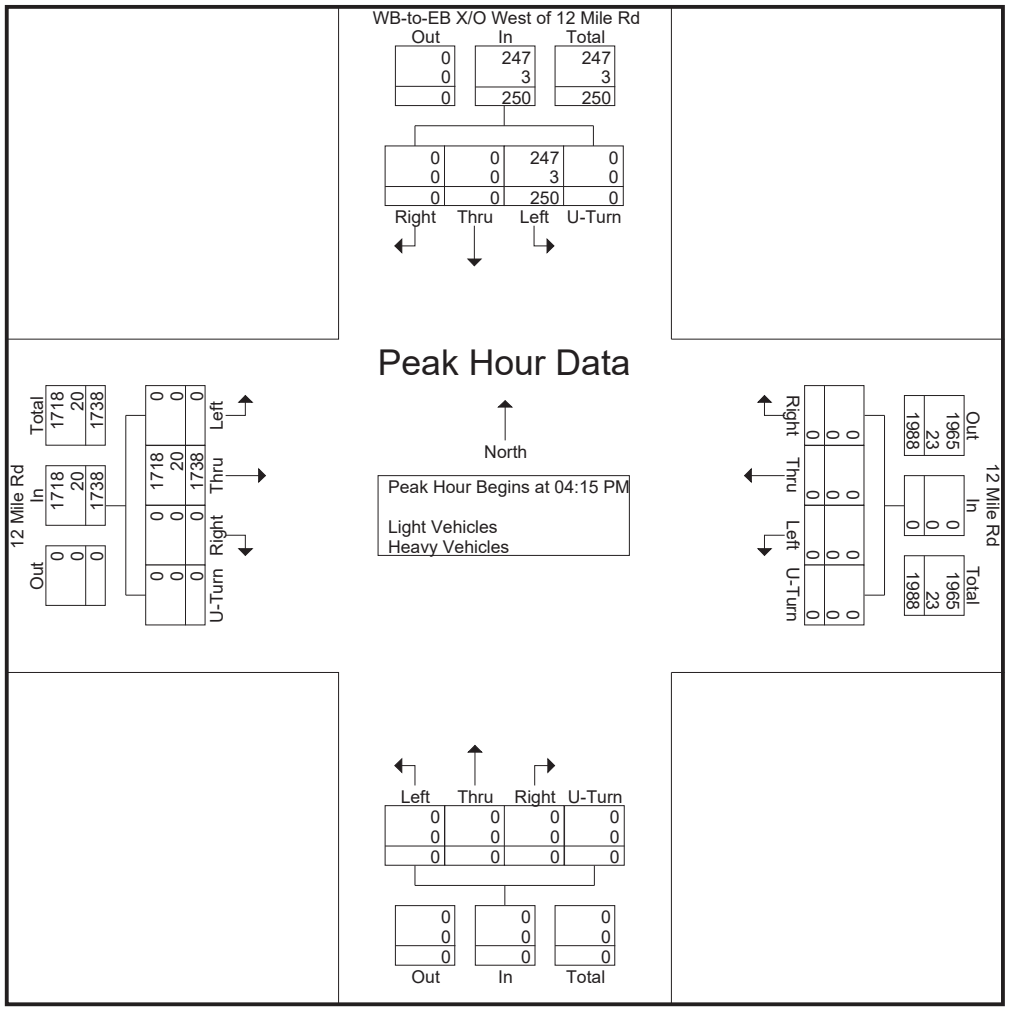
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O West of 12 Mile Rd Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
04:00 PM	0	372	0	0	372	0	0	0	0	0	0	0	0	0	0	62	0	0	0	62	434
04:15 PM	0	438	0	0	438	0	0	0	0	0	0	0	0	0	0	53	0	0	0	53	491
04:30 PM	0	409	0	0	409	0	0	0	0	0	0	0	0	0	0	67	0	0	0	67	476
04:45 PM	0	445	0	0	445	0	0	0	0	0	0	0	0	0	0	67	0	0	0	67	512
Total	0	1664	0	0	1664	0	0	0	0	0	0	0	0	0	0	249	0	0	0	249	1913
05:00 PM	0	446	0	0	446	0	0	0	0	0	0	0	0	0	0	63	0	0	0	63	509
05:15 PM	0	423	0	0	423	0	0	0	0	0	0	0	0	0	0	62	0	0	0	62	485
05:30 PM	0	406	0	0	406	0	0	0	0	0	0	0	0	0	0	60	0	0	0	60	466
05:45 PM	0	379	0	0	379	0	0	0	0	0	0	0	0	0	0	82	0	0	0	82	461
Total	0	1654	0	0	1654	0	0	0	0	0	0	0	0	0	0	267	0	0	0	267	1921
Grand Total	0	3318	0	0	3318	0	0	0	0	0	0	0	0	0	0	516	0	0	0	516	3834
Apprch %	0	100	0	0		0	0	0	0		0	0	0	0		100	0	0	0		
Total %	0	86.5	0	0	86.5	0	0	0	0	0	0	0	0	0	0	13.5	0	0	0	13.5	
Light Vehicles	0	3266	0	0	3266	0	0	0	0	0	0	0	0	0	0	510	0	0	0	510	3776
% Light Vehicles	0	98.4	0	0	98.4	0	0	0	0	0	0	0	0	0	0	98.8	0	0	0	98.8	98.5
Heavy Vehicles	0	52	0	0	52	0	0	0	0	0	0	0	0	0	0	6	0	0	0	6	58
% Heavy Vehicles	0	1.6	0	0	1.6	0	0	0	0	0	0	0	0	0	0	1.2	0	0	0	1.2	1.5



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651610 - WB-to-EB X_O West of 12 Mile Rd -- 12 Mile Rd
Site Code : 16651610
Start Date : 6/11/2024
Page No : 2

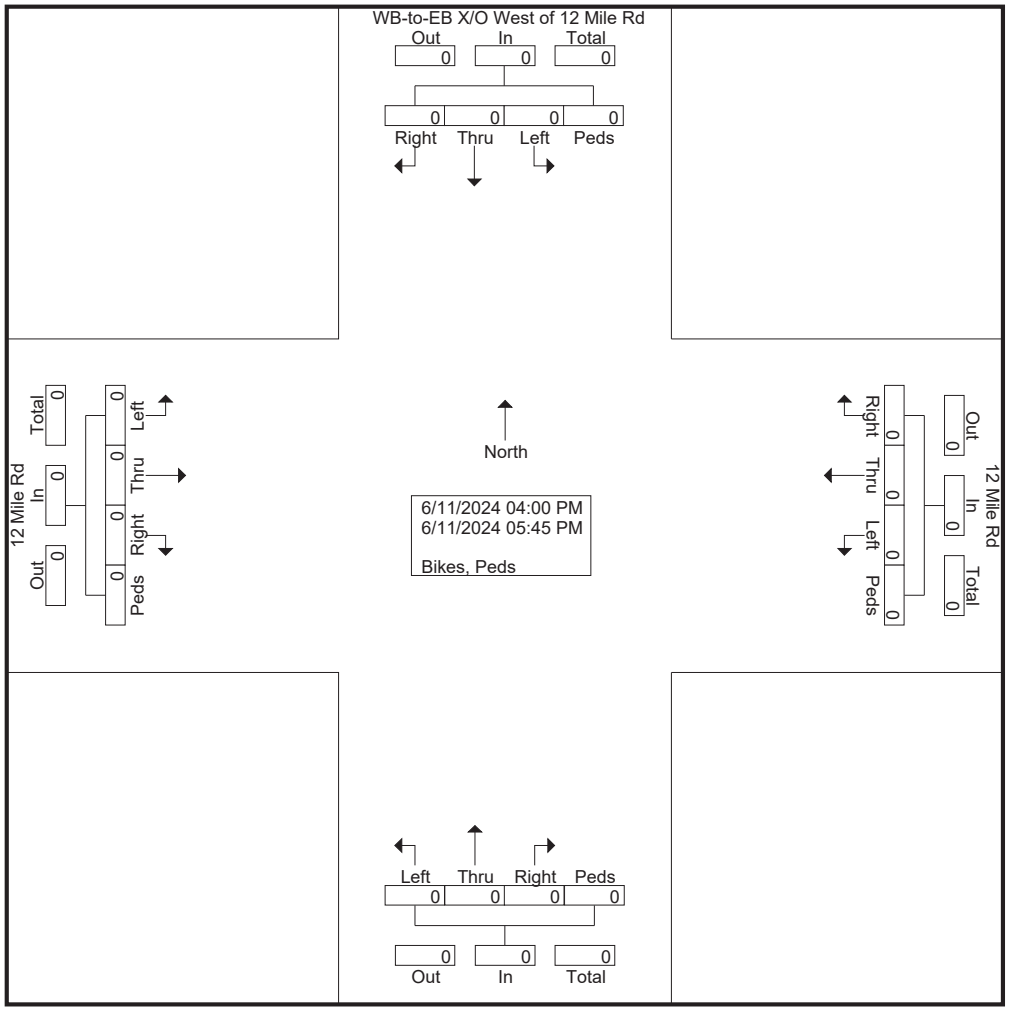
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O West of 12 Mile Rd Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	438	0	0	438	0	0	0	0	0	0	0	0	0	0	53	0	0	0	53	491
04:30 PM	0	409	0	0	409	0	0	0	0	0	0	0	0	0	0	**67**	0	0	0	**67**	476
04:45 PM	0	445	0	0	445	0	0	0	0	0	0	0	0	0	0	67	0	0	0	67	**512**
05:00 PM	0	**446**	0	0	**446**	0	0	0	0	0	0	0	0	0	0	63	0	0	0	63	509
Total Volume	0	1738	0	0	1738	0	0	0	0	0	0	0	0	0	0	250	0	0	0	250	1988
% App. Total	0	100	0	0		0	0	0	0		0	0	0	0		100	0	0	0		
PHF	.000	.974	.000	.000	.974	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.933	.000	.000	.000	.933	.971
Light Vehicles	0	1718	0	0	1718	0	0	0	0	0	0	0	0	0	0	247	0	0	0	247	1965
% Light Vehicles	0	98.8	0	0	98.8	0	0	0	0	0	0	0	0	0	0	98.8	0	0	0	98.8	98.8
Heavy Vehicles	0	20	0	0	20	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	23
% Heavy Vehicles	0	1.2	0	0	1.2	0	0	0	0	0	0	0	0	0	0	1.2	0	0	0	1.2	1.2



File Name : 16651610 - WB-to-EB X_O West of 12 Mile Rd -- 12 Mile Rd
Site Code : 16651610
Start Date : 6/11/2024
Page No : 1

Groups Printed- Bikes, Peds

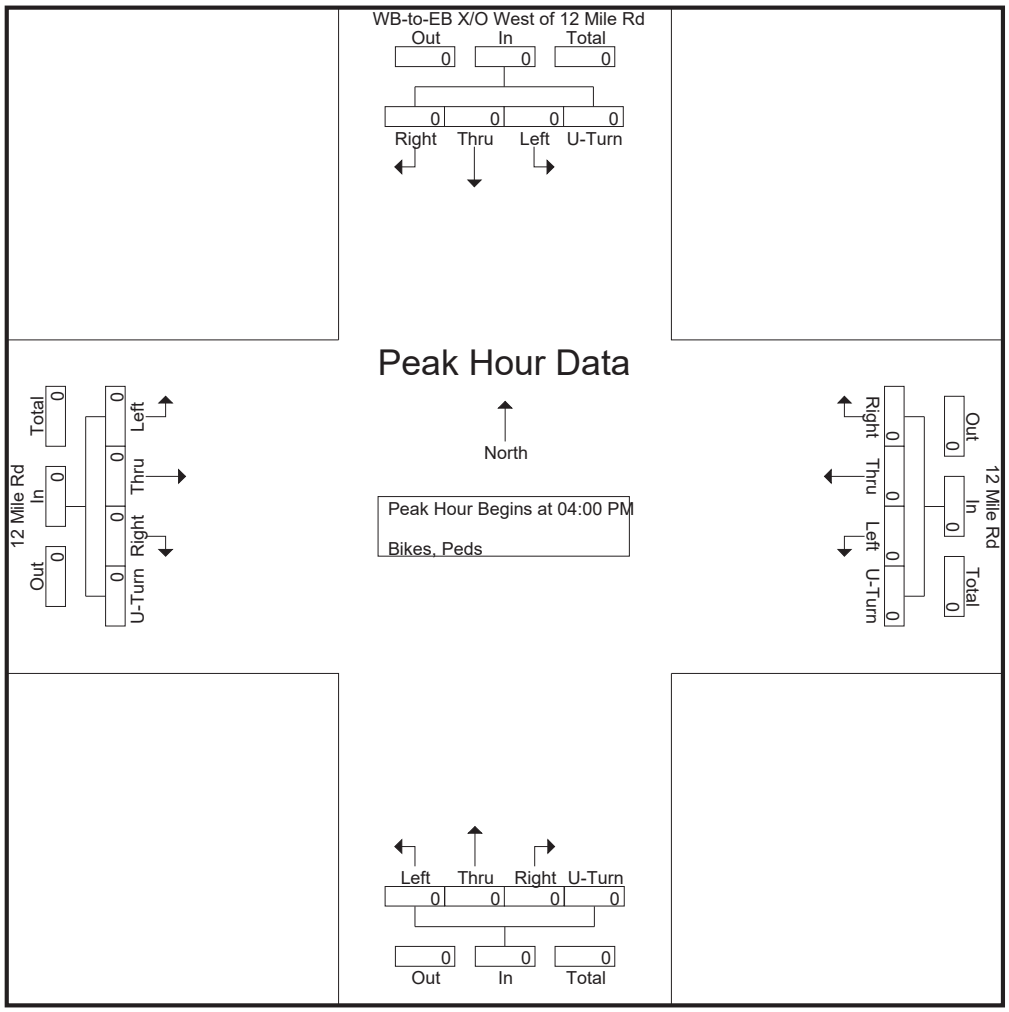
	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O West of 12 Mile Rd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651610 - WB-to-EB X_O West of 12 Mile Rd -- 12 Mile Rd
Site Code : 16651610
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					Northbound					WB-to-EB X/O West of 12 Mile Rd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

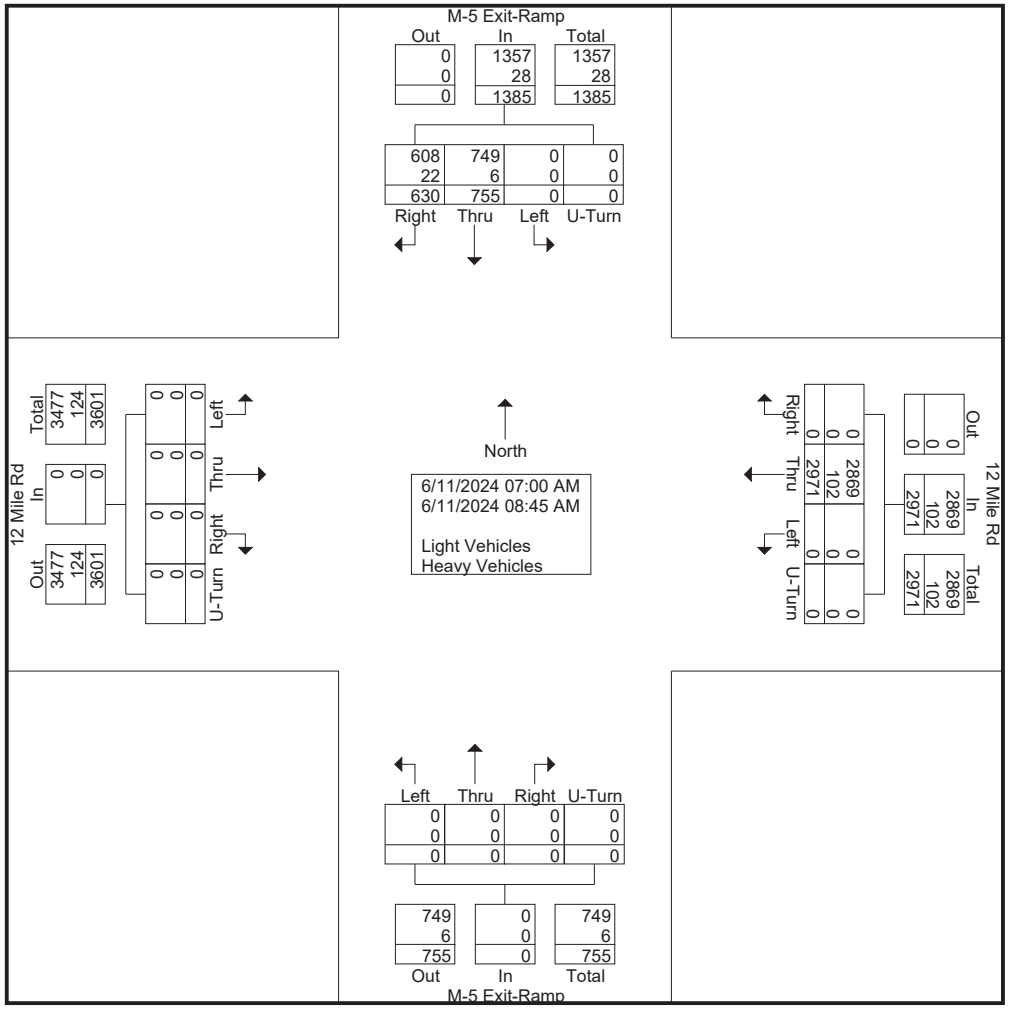


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651611 - M-5 Exit-Ramp -- 12 Mile Rd
Site Code : 16651611
Start Date : 6/11/2024
Page No : 1

Groups Printed- Light Vehicles - Heavy Vehicles

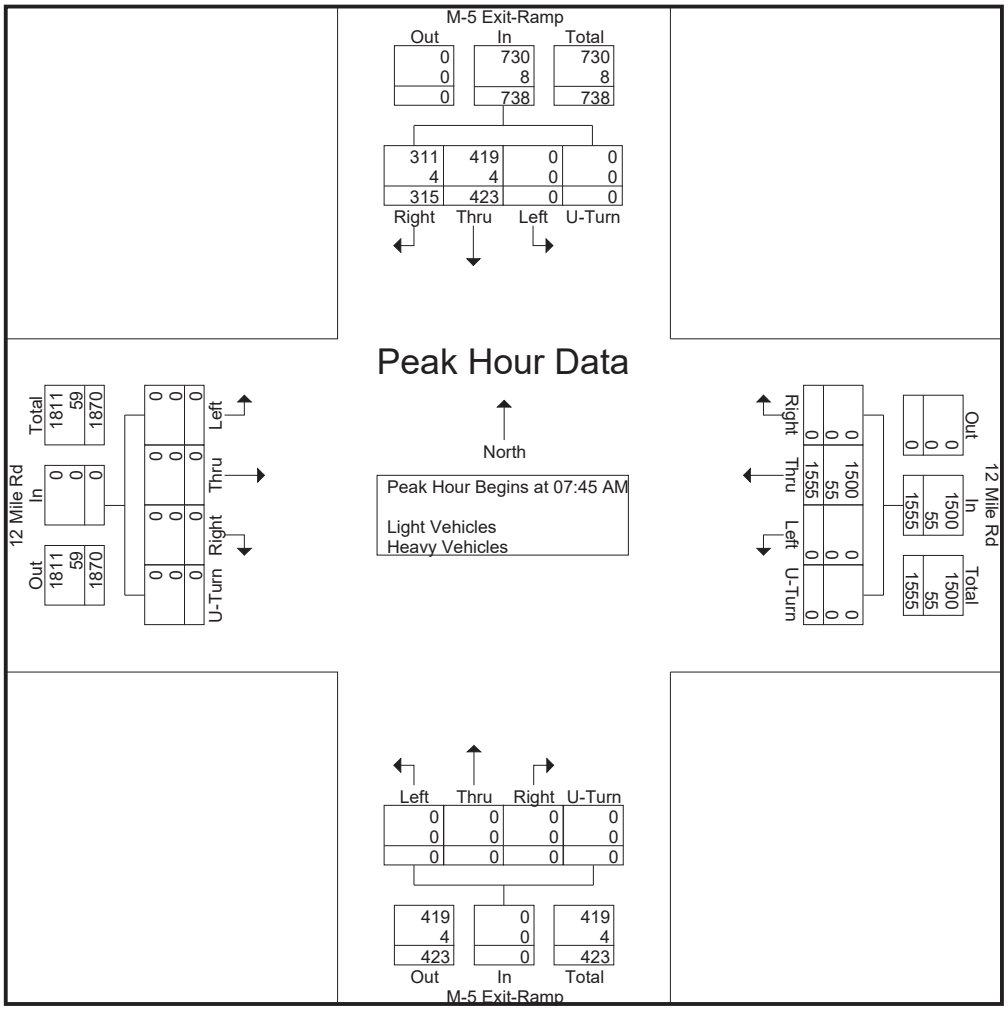
	12 Mile Rd Eastbound					12 Mile Rd Westbound					M-5 Exit-Ramp Northbound					M-5 Exit-Ramp Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	295	0	0	295	0	0	0	0	0	0	54	63	0	117	412
07:15 AM	0	0	0	0	0	0	317	0	0	317	0	0	0	0	0	0	98	85	0	183	500
07:30 AM	0	0	0	0	0	0	386	0	0	386	0	0	0	0	0	0	91	83	0	174	560
07:45 AM	0	0	0	0	0	0	434	0	0	434	0	0	0	0	0	0	108	88	0	196	630
Total	0	0	0	0	0	0	1432	0	0	1432	0	0	0	0	0	0	351	319	0	670	2102
08:00 AM	0	0	0	0	0	0	366	0	0	366	0	0	0	0	0	0	102	80	0	182	548
08:15 AM	0	0	0	0	0	0	366	0	0	366	0	0	0	0	0	0	95	65	0	160	526
08:30 AM	0	0	0	0	0	0	389	0	0	389	0	0	0	0	0	0	118	82	0	200	589
08:45 AM	0	0	0	0	0	0	418	0	0	418	0	0	0	0	0	0	89	84	0	173	591
Total	0	0	0	0	0	0	1539	0	0	1539	0	0	0	0	0	0	404	311	0	715	2254
Grand Total	0	0	0	0	0	0	2971	0	0	2971	0	0	0	0	0	0	755	630	0	1385	4356
Apprch %	0	0	0	0		0	100	0	0		0	0	0	0		0	54.5	45.5	0		
Total %	0	0	0	0	0	0	68.2	0	0	68.2	0	0	0	0	0	0	17.3	14.5	0	31.8	
Light Vehicles	0	0	0	0	0	0	2869	0	0	2869	0	0	0	0	0	0	749	608	0	1357	4226
% Light Vehicles	0	0	0	0	0	0	96.6	0	0	96.6	0	0	0	0	0	0	99.2	96.5	0	98	97
Heavy Vehicles	0	0	0	0	0	0	102	0	0	102	0	0	0	0	0	0	6	22	0	28	130
% Heavy Vehicles	0	0	0	0	0	0	3.4	0	0	3.4	0	0	0	0	0	0	0.8	3.5	0	2	3



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651611 - M-5 Exit-Ramp -- 12 Mile Rd
Site Code : 16651611
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					M-5 Exit-Ramp Northbound					M-5 Exit-Ramp Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	0	0	0	0	0	**434**	0	0	**434**	0	0	0	0	0	0	108	**88**	0	196	**630**
08:00 AM	0	0	0	0	0	0	366	0	0	366	0	0	0	0	0	0	102	80	0	182	548
08:15 AM	0	0	0	0	0	0	366	0	0	366	0	0	0	0	0	0	95	65	0	160	526
08:30 AM	0	0	0	0	0	0	389	0	0	389	0	0	0	0	0	0	**118**	82	0	**200**	589
Total Volume	0	0	0	0	0	0	1555	0	0	1555	0	0	0	0	0	0	423	315	0	738	2293
% App. Total	0	0	0	0		0	100	0	0		0	0	0	0		0	57.3	42.7	0		
PHF	.000	.000	.000	.000	.000	.000	.896	.000	.000	.896	.000	.000	.000	.000	.000	.000	.896	.895	.000	.923	.910
Light Vehicles	0	0	0	0	0	0	1500	0	0	1500	0	0	0	0	0	0	419	311	0	730	2230
% Light Vehicles	0	0	0	0	0	0	96.5	0	0	96.5	0	0	0	0	0	0	99.1	98.7	0	98.9	97.3
Heavy Vehicles	0	0	0	0	0	0	55	0	0	55	0	0	0	0	0	0	4	4	0	8	63
% Heavy Vehicles	0	0	0	0	0	0	3.5	0	0	3.5	0	0	0	0	0	0	0.9	1.3	0	1.1	2.7

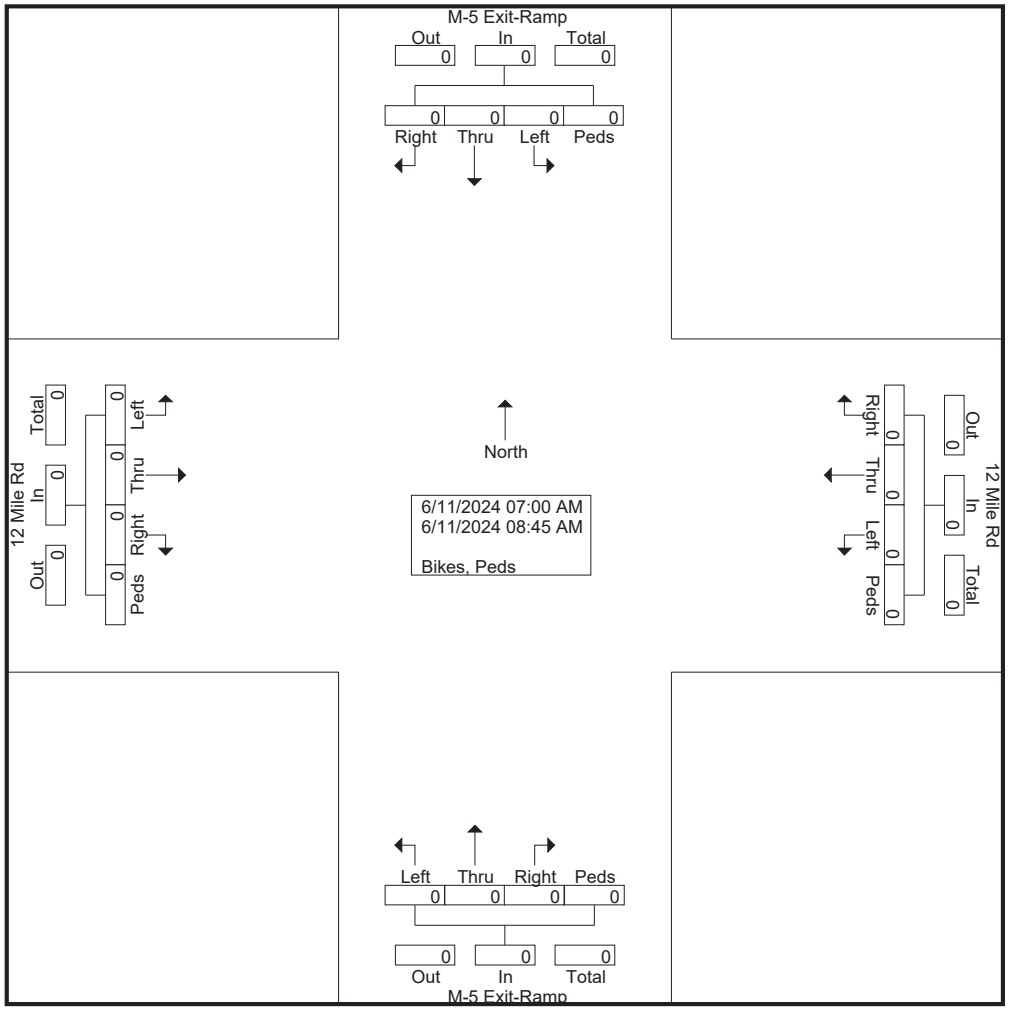


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651611 - M-5 Exit-Ramp -- 12 Mile Rd
Site Code : 16651611
Start Date : 6/11/2024
Page No : 1

Groups Printed- Bikes, Peds

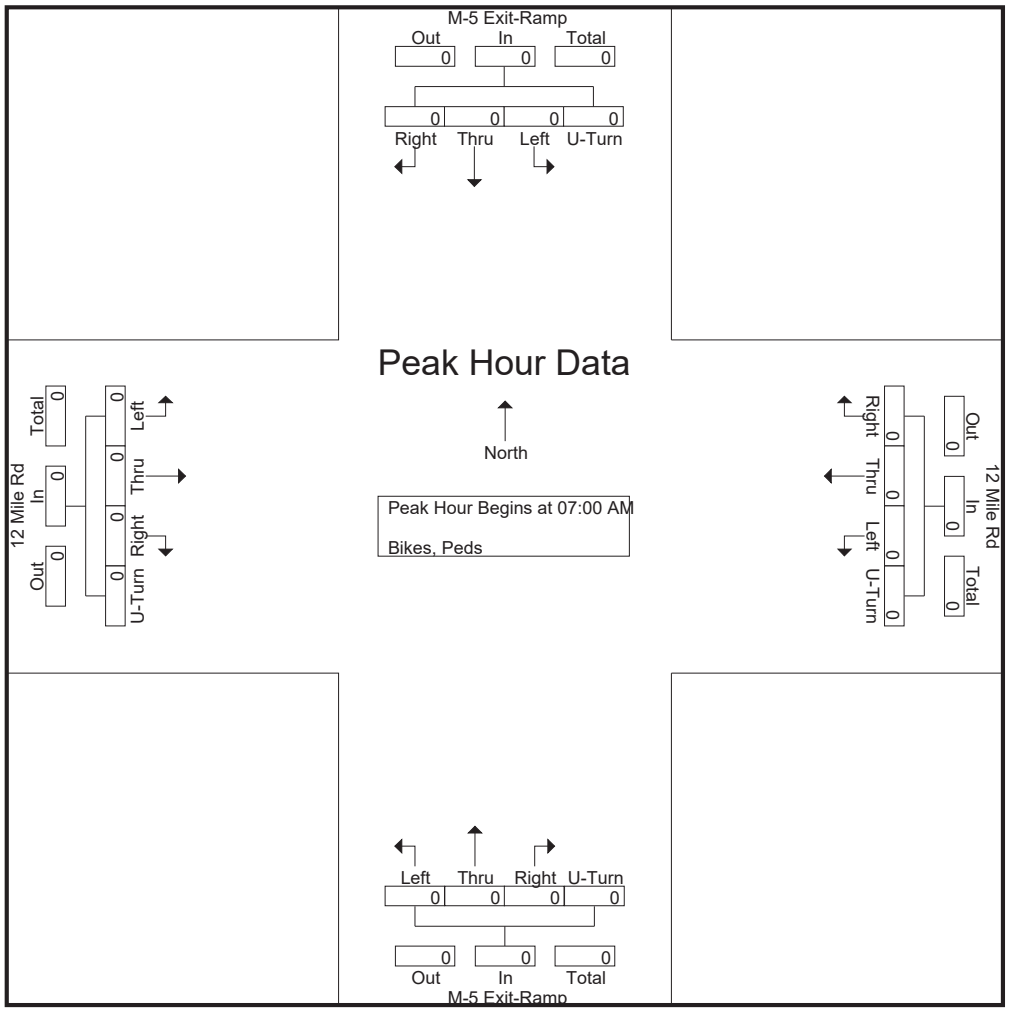
	12 Mile Rd Eastbound					12 Mile Rd Westbound					M-5 Exit-Ramp Northbound					M-5 Exit-Ramp Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651611 - M-5 Exit-Ramp -- 12 Mile Rd
Site Code : 16651611
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					M-5 Exit-Ramp Northbound					M-5 Exit-Ramp Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

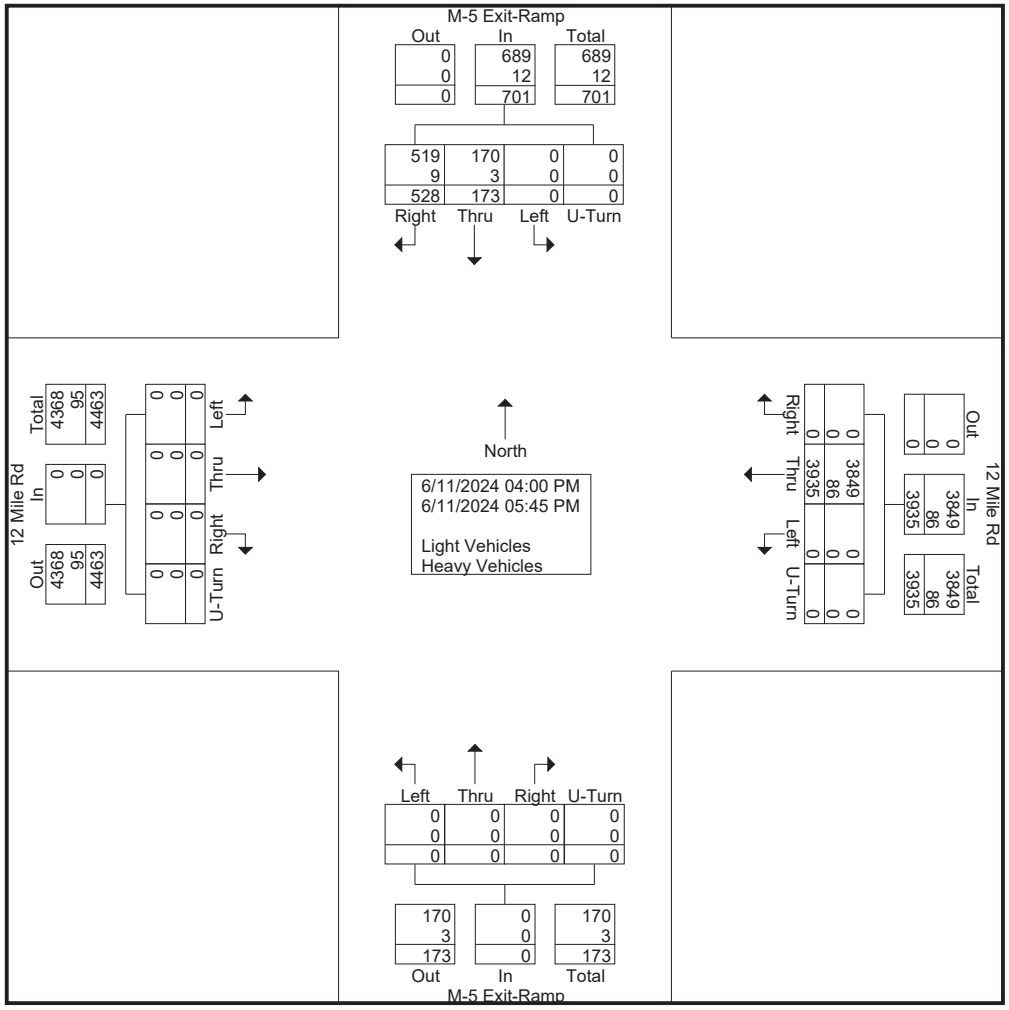


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651612 - M-5 Exit-Ramp -- 12 Mile Rd
Site Code : 16651612
Start Date : 6/11/2024
Page No : 1

Groups Printed- Light Vehicles - Heavy Vehicles

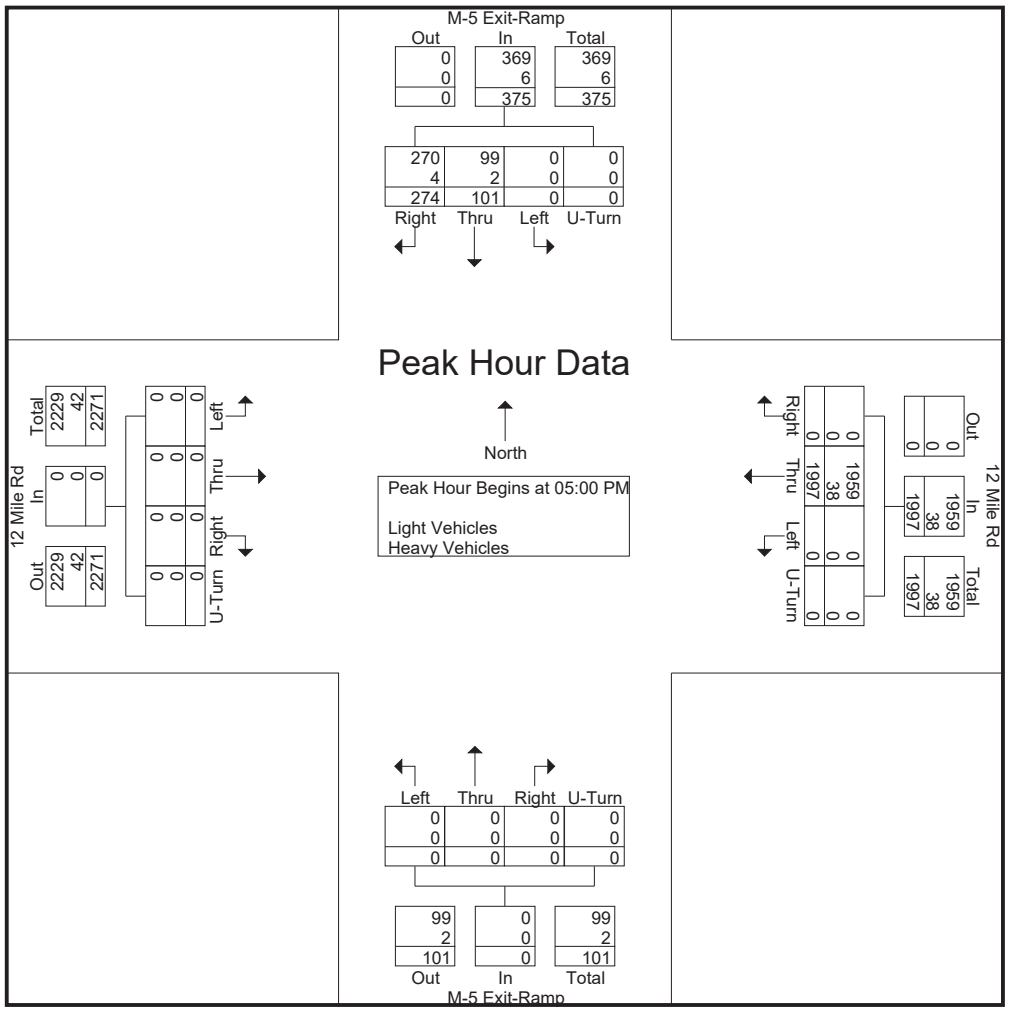
	12 Mile Rd Eastbound					12 Mile Rd Westbound					M-5 Exit-Ramp Northbound					M-5 Exit-Ramp Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	476	0	0	476	0	0	0	0	0	0	19	69	0	88	564
04:15 PM	0	0	0	0	0	0	484	0	0	484	0	0	0	0	0	0	24	65	0	89	573
04:30 PM	0	0	0	0	0	0	487	0	0	487	0	0	0	0	0	0	14	54	0	68	555
04:45 PM	0	0	0	0	0	0	491	0	0	491	0	0	0	0	0	0	15	66	0	81	572
Total	0	0	0	0	0	0	1938	0	0	1938	0	0	0	0	0	0	72	254	0	326	2264
05:00 PM	0	0	0	0	0	0	458	0	0	458	0	0	0	0	0	0	20	67	0	87	545
05:15 PM	0	0	0	0	0	0	446	0	0	446	0	0	0	0	0	0	22	72	0	94	540
05:30 PM	0	0	0	0	0	0	549	0	0	549	0	0	0	0	0	0	30	69	0	99	648
05:45 PM	0	0	0	0	0	0	544	0	0	544	0	0	0	0	0	0	29	66	0	95	639
Total	0	0	0	0	0	0	1997	0	0	1997	0	0	0	0	0	0	101	274	0	375	2372
Grand Total	0	0	0	0	0	0	3935	0	0	3935	0	0	0	0	0	0	173	528	0	701	4636
Apprch %	0	0	0	0		0	100	0	0		0	0	0	0		0	24.7	75.3	0		
Total %	0	0	0	0	0	0	84.9	0	0	84.9	0	0	0	0	0	0	3.7	11.4	0	15.1	
Light Vehicles	0	0	0	0	0	0	3849	0	0	3849	0	0	0	0	0	0	170	519	0	689	4538
% Light Vehicles	0	0	0	0	0	0	97.8	0	0	97.8	0	0	0	0	0	0	98.3	98.3	0	98.3	97.9
Heavy Vehicles	0	0	0	0	0	0	86	0	0	86	0	0	0	0	0	0	3	9	0	12	98
% Heavy Vehicles	0	0	0	0	0	0	2.2	0	0	2.2	0	0	0	0	0	0	1.7	1.7	0	1.7	2.1



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651612 - M-5 Exit-Ramp -- 12 Mile Rd
Site Code : 16651612
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					M-5 Exit-Ramp Northbound					M-5 Exit-Ramp Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	0	0	0	0	0	458	0	0	458	0	0	0	0	0	0	20	67	0	87	545
05:15 PM	0	0	0	0	0	0	446	0	0	446	0	0	0	0	0	0	22	**72**	0	94	540
05:30 PM	0	0	0	0	0	0	**549**	0	0	**549**	0	0	0	0	0	0	**30**	69	0	**99**	**648**
05:45 PM	0	0	0	0	0	0	544	0	0	544	0	0	0	0	0	0	29	66	0	95	639
Total Volume	0	0	0	0	0	0	1997	0	0	1997	0	0	0	0	0	0	101	274	0	375	2372
% App. Total	0	0	0	0		0	100	0	0		0	0	0	0		0	26.9	73.1	0		
PHF	.000	.000	.000	.000	.000	.000	.909	.000	.000	.909	.000	.000	.000	.000	.000	.000	.842	.951	.000	.947	.915
Light Vehicles	0	0	0	0	0	0	1959	0	0	1959	0	0	0	0	0	0	99	270	0	369	2328
% Light Vehicles	0	0	0	0	0	0	98.1	0	0	98.1	0	0	0	0	0	0	98.0	98.5	0	98.4	98.1
Heavy Vehicles	0	0	0	0	0	0	38	0	0	38	0	0	0	0	0	0	2	4	0	6	44
% Heavy Vehicles	0	0	0	0	0	0	1.9	0	0	1.9	0	0	0	0	0	0	2.0	1.5	0	1.6	1.9

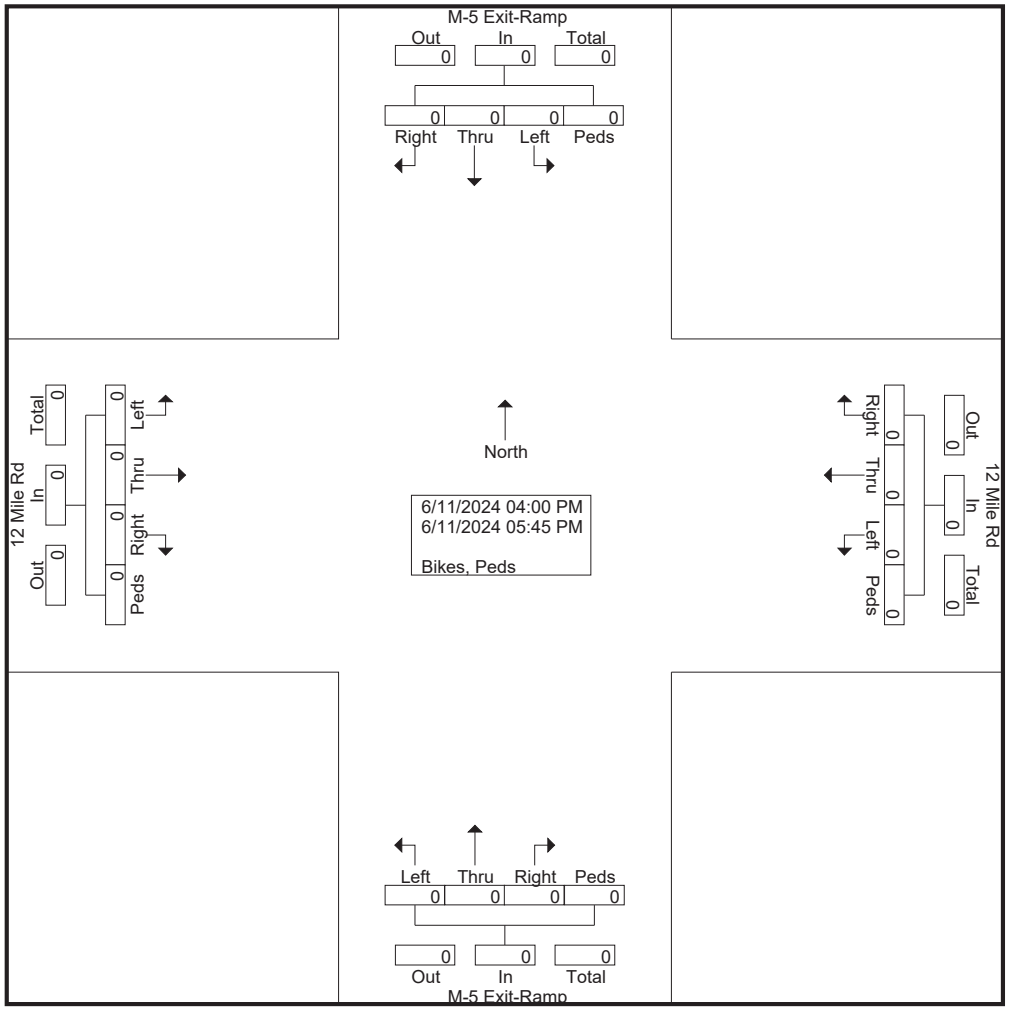


TRUE DATA TO IMPROVE MOBILITY

File Name : 16651612 - M-5 Exit-Ramp -- 12 Mile Rd
Site Code : 16651612
Start Date : 6/11/2024
Page No : 1

Groups Printed- Bikes, Peds

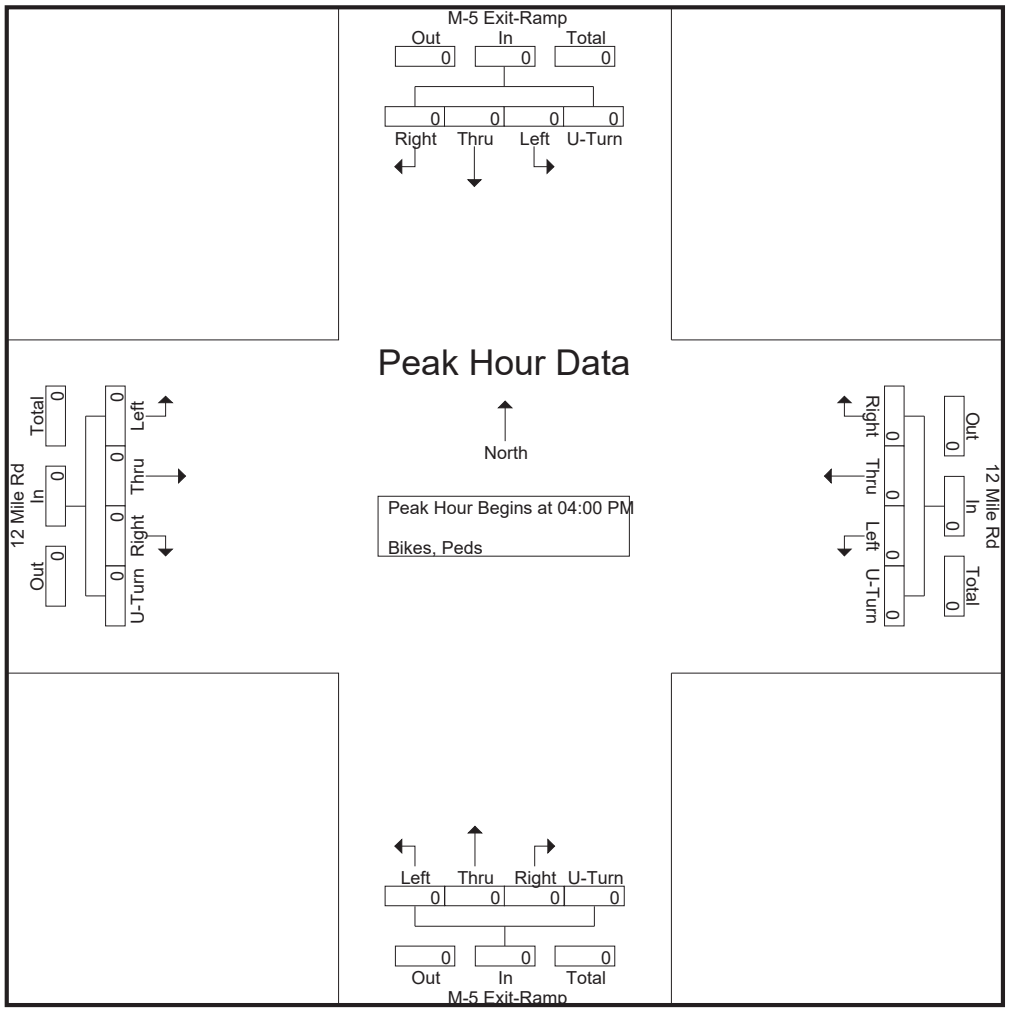
	12 Mile Rd Eastbound					12 Mile Rd Westbound					M-5 Exit-Ramp Northbound					M-5 Exit-Ramp Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



TRUE DATA TO IMPROVE MOBILITY

File Name : 16651612 - M-5 Exit-Ramp -- 12 Mile Rd
Site Code : 16651612
Start Date : 6/11/2024
Page No : 2

	12 Mile Rd Eastbound					12 Mile Rd Westbound					M-5 Exit-Ramp Northbound					M-5 Exit-Ramp Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000



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List View | All DIRs | Report Center

Record 1 of 1 Goto Record go

Location ID	63-3804	MPO ID	
Type	SPOT	HPMS ID	
On NHS	Yes	On HPMS	No
LRS ID	4462980	LRS Loc Pt.	3.140335
SF Group	Urban Non State	Route Type	
AF Group	NoFactor	Route	
GF Group	Urban Non State	Active	Yes
Class Dist Grp	NTL_3	Category	Primary
Seas Clss Grp			
WIM Group			
QC Group	Default		
Fnct'l Class	(3) Other Principal Arterial	Milepost	
Located On	12 MILE RD		
Loc On Alias			
EAST OF	Meadowbrook Rd		

More Detail

STATION DATA

Directions: 2-WAY | EB | WB

AADT

	Year	AADT	DHV-30	K %	D %	PA	BC	Src
	2023	25,911[3]		11	53	25,030 (97%)	881 (3%)	Grown from 2022
	2022	25,353[3]		11	53	24,567 (97%)	786 (3%)	Grown from 2021
	2021	25,328	2,808	11	53	24,935 (98%)	393 (2%)	
	2020	28,377[3]		14	79	27,355 (96%)	1,022 (4%)	Grown from 2019
	2019	33,228[2]		14	79	31,966 (96%)	1,262 (4%)	

VOLUME COUNT

	Date	Int	Total
	Wed 8/25/2021	15	25,054
	Tue 8/24/2021	15	25,602

VOLUME TREND

Year	Annual Growth
2023	2%
2022	0%
2021	-11%
2020	-15%

CLASSIFICATION

	Date	Int	Total
	Wed 8/25/2021	15	25,054
	Tue 8/24/2021	15	25,602

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List View | All DIRs | Report Center

Record 1 of 1 Goto Record go

Location ID	63-3911	**MPO ID**	39812
Type	SPOT	**HPMS ID**	
On NHS	Yes	**On HPMS**	No
LRS ID	4402005	**LRS Loc Pt.**	3.304827
SF Group	Urban	**Route Type**	M Rte
AF Group	South	**Route**	005
GF Group	Urban	**Active**	Yes
Class Dist Grp	2_005_001	**Category**	Primary
Seas Clss Grp			
WIM Group			
QC Group	Default		
Fnct'l Class	(3) Other Principal Arterial	**Milepost**	
Located On	M-5		
Loc On Alias	Haggerty Connector		
	.25 MI S OF 13 MI RD		

More Detail

STATION DATA

Directions: 2-WAY | NB | SB

AADT

	Year	AADT	DHV-30	K %	D %	PA	BC	Src
	2023	79,422[8]		9	62	76,802 (97%)	2,620 (3%)	
	2022	78,805[8]		9	62	76,205 (97%)	2,600 (3%)	
	2021	78,793[8]		9	62	76,193 (97%)	2,600 (3%)	
	2020	65,705[8]	5,728	9	62	63,574 (97%)	2,131 (3%)	
	2019	58,990[8]				58,459 (99%)	531 (1%)	

|<< < > >>| 1-5 of 16

VOLUME COUNT

	Date	Int	Total
	Mon 8/24/2020	15	71,200
	Tue 2/14/2017	60	82,365
-	Tue 7/29/2014	-	
-	Mon 7/28/2014	-	
-	Wed 7/23/2014	-	
-	Tue 7/22/2014	-	
	Tue 2/14/2012	60	76,272
	Wed 8/24/2011	60	78,425
	Tue 8/23/2011	60	79,256
	Tue 8/11/2009	60	77,844

|<< < > >>| 1-10 of 20

VOLUME TREND

Year	Annual Growth
2023	1%
2022	0%
2021	20%
2020	11%
2019	-25%
2018	0%
2017	4%
2016	3%
2015	3%
2014	-1%

|<< < > >>| 1-10 of 15

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List View | All DIRs | Report Center

Record 1 of 1 Goto Record go

Location ID	63-6119	**MPO ID**	41026
Type	SPOT	**HPMS ID**	1_4_125_065
On NHS	No	**On HPMS**	Yes
LRS ID	0656706	**LRS Loc Pt.**	4.502
SF Group	Urban Non State	**Route Type**	
AF Group	NoFactor	**Route**	
GF Group	Urban Non State	**Active**	Yes
Class Dist Grp	NTL_4	**Category**	Primary
Seas Clss Grp			
WIM Group			
QC Group	Default		
Fnct'l Class	(4) Minor Arterial	**Milepost**	
Located On	MEADOWBROOK RD		
Loc On Alias			
	0.5 MILE N OF 12 MILE (IN NOVI)		

More Detail

STATION DATA

Directions: 2-WAY | NB | SB

AADT

	Year	AADT	DHV-30	K %	D %	PA	BC	Src
	2023	5,053[3]		12	66	4,918 (97%)	135 (3%)	Grown from 2022
	2022	4,944	579	12	66	4,916 (99%)	28 (1%)	
	2021	4,774[3]		12	63	4,549 (95%)	225 (5%)	Grown from 2020
	2020	4,190[3]		12	63	3,988 (95%)	202 (5%)	Grown from 2019
	2019	4,906	594	12	63	4,885 (100%)	21 (0%)	

|<< < > >>| 1-5 of 8

VOLUME COUNT

	Date	Int	Total
	Wed 6/22/2022	15	4,960
	Tue 6/21/2022	15	4,928
	Tue 3/19/2019	15	5,026
	Mon 3/18/2019	15	4,786

VOLUME TREND

Year	Annual Growth
2023	2%
2022	4%
2021	14%
2020	-15%
2019	149%
2018	0%
2017	4%

CLASSIFICATION

	Date	Int	Total

Volume Count Report

LOCATION INFO	
Location ID	63-3899
Type	SPOT
Fnct'l Class	2
Located On	M-5 CD ON LOOP
Direction	RAMP
County	Oakland
Community	Novi
MPO ID	50709
HPMS ID	
Agency	MDOT

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 11/14/2017
End Date	Wed 11/15/2017
Start Time	9:00:00 AM
End Time	9:00:00 AM
Direction	RAMP
Notes	
Station	3771
Study	
Speed Limit	
Description	
Sensor Type	Axle/Tube
Source	
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	4	5	12	3	24
1:00-2:00	2	2	2	0	6
2:00-3:00	1	5	1	0	7
3:00-4:00	1	0	0	1	2
4:00-5:00	1	0	0	4	5
5:00-6:00	3	1	2	5	11
6:00-7:00	5	13	13	19	50
7:00-8:00	26	32	30	32	120
8:00-9:00	46	31	38	29	144
9:00-10:00	18	24	27	26	95
10:00-11:00	26	25	32	31	114
11:00-12:00	48	38	30	44	160
12:00-13:00	44	45	53	62	204
13:00-14:00	64	57	41	63	225
14:00-15:00	63	70	61	60	254
15:00-16:00	60	62	68	56	246
16:00-17:00	77	75	83	80	315
17:00-18:00	86	106	52	54	298
18:00-19:00	71	65	49	55	240
19:00-20:00	69	39	56	54	218
20:00-21:00	42	62	52	36	192
21:00-22:00	55	51	38	30	174
22:00-23:00	34	11	16	11	72
23:00-24:00	12	7	5	6	30
Total					3,206
AADT					2,473
AM Peak					11:45-12:45 186
PM Peak					16:30-17:30 355

MDOT Michigan Department of Transportation — Traffic Count (TCDS) — MS2

Volume Count Report

LOCATION INFO	
Location ID	63-3898
Type	SPOT
Fnct'l Class	2
Located On	M-5 CD ON RAMP
Direction	RAMP
County	Oakland
Community	Novi
MPO ID	58341
HPMS ID	
Agency	MDOT

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 11/14/2017
End Date	Wed 11/15/2017
Start Time	5:00:00 PM
End Time	5:00:00 PM
Direction	RAMP
Notes	
Station	3734
Study	
Speed Limit	
Description	
Sensor Type	Axle/Tube
Source	
Latitude,Longitude	

INTERVAL:15-MIN

Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	14	6	7	6	33
1:00-2:00	1	1	1	4	7
2:00-3:00	1	4	0	0	5
3:00-4:00	2	0	0	1	3
4:00-5:00	1	3	2	4	10
5:00-6:00	3	6	8	6	23
6:00-7:00	15	15	26	48	104
7:00-8:00	40	29	56	63	188
8:00-9:00	46	44	41	58	189
9:00-10:00	36	37	34	31	138
10:00-11:00	34	40	39	49	162
11:00-12:00	29	49	51	65	194
12:00-13:00	75	83	60	49	267
13:00-14:00	75	63	56	73	267
14:00-15:00	70	70	71	69	280
15:00-16:00	96	81	98	80	355
16:00-17:00	129	95	141	123	488
17:00-18:00	164	147	101	78	490
18:00-19:00	95	92	69	53	309
19:00-20:00	69	57	45	34	205
20:00-21:00	66	52	55	43	216
21:00-22:00	68	59	46	42	215
22:00-23:00	36	18	21	21	96
23:00-24:00	23	15	1	3	42
Total					4,286
AADT					3,307
AM Peak					11:45-12:45 283
PM Peak					16:30-17:30 575

189-vph (2017) + 7-years growth @ 0.5% per year **= 196-vph (2024)**

490-vph (2017) + 7-years growth @ 0.5% per year **= 507-vph (2024)**

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Volume Count Report

LOCATION INFO	
Location ID	63-0822
Type	SPOT
Fnct'l Class	2
Located On	M-5 CD OFF RAMP
Direction	RAMP
County	Oakland
Community	Novi
MPO ID	66344
HPMS ID	
Agency	MDOT

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 11/14/2017
End Date	Wed 11/15/2017
Start Time	6:00:00 PM
End Time	6:00:00 PM
Direction	RAMP
Notes	
Station	4221
Study	
Speed Limit	
Description	
Sensor Type	Axle/Tube
Source	
Latitude,Longitude	

INTERVAL:15-MIN

Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	0	0	0	0	0
1:00-2:00	0	3	0	0	3
2:00-3:00	0	0	1	0	1
3:00-4:00	0	4	0	0	4
4:00-5:00	2	2	5	6	15
5:00-6:00	3	10	15	24	52
6:00-7:00	28	46	46	38	158
7:00-8:00	45	59	59	56	219
8:00-9:00	63	88	86	66	303
9:00-10:00	68	41	33	36	178
10:00-11:00	28	17	22	25	92
11:00-12:00	19	25	26	24	94
12:00-13:00	29	33	38	36	136
13:00-14:00	41	23	26	38	128
14:00-15:00	24	15	11	8	58
15:00-16:00	17	24	18	16	75
16:00-17:00	23	28	15	27	93
17:00-18:00	33	21	16	28	98
18:00-19:00	18	15	8	13	54
19:00-20:00	14	12	8	5	39
20:00-21:00	6	12	8	6	32
21:00-22:00	12	6	2	4	24
22:00-23:00	4	5	0	2	11
23:00-24:00	2	2	5	2	11
Total					1,878
AADT					1,449
AM Peak					08:15-09:15 308
PM Peak					12:15-13:15 148

Volume Count Report

LOCATION INFO	
Location ID	63-3800
Type	SPOT
Fnct'l Class	2
Located On	NBD M-5 OFF RAMP
Direction	RAMP
County	Oakland
Community	Novi
MPO ID	66417
HPMS ID	
Agency	MDOT

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 11/14/2017
End Date	Wed 11/15/2017
Start Time	6:00:00 PM
End Time	6:00:00 PM
Direction	RAMP
Notes	
Station	3797
Study	
Speed Limit	
Description	
Sensor Type	Axle/Tube
Source	
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	9	6	8	6	29
1:00-2:00	2	1	2	4	9
2:00-3:00	2	5	4	1	12
3:00-4:00	0	1	2	3	6
4:00-5:00	8	3	10	15	36
5:00-6:00	24	28	47	76	175
6:00-7:00	83	150	209	255	697
7:00-8:00	242	293	296	342	1,173
8:00-9:00	354	361	335	370	1,420
9:00-10:00	263	209	201	170	843
10:00-11:00	150	149	156	130	585
11:00-12:00	114	117	110	114	455
12:00-13:00	102	104	138	167	511
13:00-14:00	139	127	121	127	514
14:00-15:00	119	114	106	141	480
15:00-16:00	152	231	217	276	876
16:00-17:00	300	348	346	314	1,308
17:00-18:00	354	337	344	287	1,322
18:00-19:00	277	229	157	106	769
19:00-20:00	86	59	69	55	269
20:00-21:00	56	45	50	48	199
21:00-22:00	42	32	45	39	158
22:00-23:00	28	22	22	17	89
23:00-24:00	10	19	7	1	37
Total					11,972
AADT					9,240
AM Peak					08:00-09:00 1,420
PM Peak					16:15-17:15 1,362

Volume Count Report

LOCATION INFO	
Location ID	63-3896
Type	SPOT
Fnct'l Class	2
Located On	M-5 CD ON RAMP
Direction	RAMP
County	Oakland
Community	Novi
MPO ID	39806
HPMS ID	
Agency	MDOT

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 11/14/2017
End Date	Wed 11/15/2017
Start Time	5:00:00 PM
End Time	5:00:00 PM
Direction	RAMP
Notes	
Station	3714
Study	
Speed Limit	
Description	
Sensor Type	Axle/Tube
Source	
Latitude,Longitude	

INTERVAL:15-MIN

Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	1	2	1	0	4
1:00-2:00	1	0	4	1	6
2:00-3:00	0	0	2	0	2
3:00-4:00	0	0	0	0	0
4:00-5:00	1	0	0	0	1
5:00-6:00	1	1	3	2	7
6:00-7:00	1	1	3	6	11
7:00-8:00	9	16	4	10	39
8:00-9:00	11	15	11	19	56
9:00-10:00	12	18	14	16	60
10:00-11:00	14	16	34	21	85
11:00-12:00	28	23	45	25	121
12:00-13:00	53	27	27	24	131
13:00-14:00	28	28	35	22	113
14:00-15:00	26	30	30	36	122
15:00-16:00	31	55	63	53	202
16:00-17:00	62	79	57	80	278
17:00-18:00	73	71	62	57	263
18:00-19:00	54	37	46	25	162
19:00-20:00	39	23	24	17	103
20:00-21:00	21	9	16	14	60
21:00-22:00	9	18	13	8	48
22:00-23:00	6	7	13	3	29
23:00-24:00	5	2	0	2	9
Total					1,912
AADT					1,475
AM Peak					11:30-12:30 150
PM Peak					16:15-17:15 289

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Volume Count Report

LOCATION INFO	
Location ID	63-3897
Type	SPOT
Fnct'l Class	2
Located On	M-5 CD ON LOOP
Direction	RAMP
County	Oakland
Community	Novi
MPO ID	58339
HPMS ID	
Agency	MDOT

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 11/14/2017
End Date	Wed 11/15/2017
Start Time	5:00:00 PM
End Time	5:00:00 PM
Direction	RAMP
Notes	
Station	4490
Study	
Speed Limit	
Description	
Sensor Type	Axle/Tube
Source	
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	7	2	5	4	18
1:00-2:00	0	3	10	3	16
2:00-3:00	1	0	7	3	11
3:00-4:00	1	6	2	3	12
4:00-5:00	6	2	8	7	23
5:00-6:00	6	21	21	18	66
6:00-7:00	30	49	58	57	194
7:00-8:00	89	82	101	100	372
8:00-9:00	127	103	109	93	432
9:00-10:00	98	98	78	95	369
10:00-11:00	63	80	98	86	327
11:00-12:00	119	103	114	117	453
12:00-13:00	135	133	110	77	455
13:00-14:00	109	94	92	103	398
14:00-15:00	107	137	136	109	489
15:00-16:00	197	190	273	289	949
16:00-17:00	375	383	378	376	1,512
17:00-18:00	382	416	357	284	1,439
18:00-19:00	295	211	160	121	787
19:00-20:00	111	105	67	66	349
20:00-21:00	66	59	64	38	227
21:00-22:00	30	41	31	25	127
22:00-23:00	39	25	15	17	96
23:00-24:00	13	7	6	6	32
Total					9,153
AADT					7,063
AM Peak					11:30-12:30 499
PM Peak					16:30-17:30 1,552

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Volume Count Report

LOCATION INFO	
Location ID	557_EB
Type	SPOT
Fnct'l Class	-
Located On	TWELVE MILE ROAD
WEST OF	MEADOWBROOK
Direction	EB
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 1/11/2022
End Date	Wed 1/12/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	EB
Notes	
Station	557
Study	
Speed Limit	
Description	
Sensor Type	NA
Source	CombineVolumeCountsIncremental
Latitude,Longitude	

INTERVAL:15-MIN

Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	8	6	8	13	35
1:00-2:00	9	4	2	2	17
2:00-3:00	2	1	2	0	5
3:00-4:00	1	2	1	1	5
4:00-5:00	1	4	8	16	29
5:00-6:00	22	16	23	28	89
6:00-7:00	33	36	56	84	209
7:00-8:00	108	127	155	198	588
8:00-9:00	164	179	151	189	683
9:00-10:00	135	194	214	271	814
10:00-11:00	191	106	141	160	598
11:00-12:00	133	128	195	179	635
12:00-13:00	195	202	186	275	858
13:00-14:00	315	337	319	323	1,294
14:00-15:00	347	345	339	371	1,402
15:00-16:00	415	406	367	325	1,513
16:00-17:00	320	256	251	252	1,079
17:00-18:00	282	258	246	222	1,008
18:00-19:00	243	196	207	218	864
19:00-20:00	207	180	177	170	734
20:00-21:00	171	155	126	89	541
21:00-22:00	97	85	78	31	291
22:00-23:00	62	41	30	36	169
23:00-24:00	21	15	14	17	67
Total					13,527
AM Peak					09:15-10:15 870
PM Peak					14:45-15:45 1,559

Volume Count Report

LOCATION INFO	
Location ID	557_4_EB
Type	SPOT
Fnct'l Class	-
Located On	TWELVE MILE ROAD
WEST OF	MEADOWBROOK
Direction	4
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 1/11/2022
End Date	Wed 1/12/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	
Notes	
Station	557
Study	
Speed Limit	
Description	
Sensor Type	NA
Source	
Latitude,Longitude	

INTERVAL:15-MIN

Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	2	1	0	2	5
1:00-2:00	0	1	0	0	1
2:00-3:00	0	0	1	0	1
3:00-4:00	0	0	0	1	1
4:00-5:00	1	2	5	8	16
5:00-6:00	8	10	9	14	41
6:00-7:00	17	14	21	43	95
7:00-8:00	44	47	59	83	233
8:00-9:00	65	72	61	80	278
9:00-10:00	56	67	60	82	265
10:00-11:00	48	32	43	35	158
11:00-12:00	32	41	61	59	193
12:00-13:00	39	45	46	55	185
13:00-14:00	51	66	52	43	212
14:00-15:00	53	53	46	72	224
15:00-16:00	65	46	39	38	188
16:00-17:00	48	44	54	48	194
17:00-18:00	57	53	63	52	225
18:00-19:00	59	37	32	44	172
19:00-20:00	32	41	25	34	132
20:00-21:00	21	25	22	24	92
21:00-22:00	17	8	14	10	49
22:00-23:00	18	5	5	3	31
23:00-24:00	1	0	2	2	5
Total					2,996
AM Peak					07:45-08:45 281
PM Peak					14:15-15:15 236

Volume Count Report

LOCATION INFO	
Location ID	557_2_NB
Type	SPOT
Fnct'l Class	-
Located On	MEADOWBROOK
SOUTH OF	TWELVE MILE ROAD
Direction	2
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 1/11/2022
End Date	Wed 1/12/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	
Notes	
Station	557
Study	
Speed Limit	
Description	
Sensor Type	NA
Source	
Latitude,Longitude	

INTERVAL:15-MIN	15-min Interval				Hourly Count
Time	1st	2nd	3rd	4th	
0:00-1:00	4	7	1	2	14
1:00-2:00	1	0	0	0	1
2:00-3:00	1	0	0	1	2
3:00-4:00	0	1	1	1	3
4:00-5:00	0	0	1	2	3
5:00-6:00	1	0	9	5	15
6:00-7:00	9	8	17	8	42
7:00-8:00	22	15	25	37	99
8:00-9:00	36	27	31	38	132
9:00-10:00	38	30	36	33	137
10:00-11:00	56	40	39	36	171
11:00-12:00	40	42	42	47	171
12:00-13:00	47	56	44	49	196
13:00-14:00	51	44	40	52	187
14:00-15:00	47	43	59	45	194
15:00-16:00	56	52	50	66	224
16:00-17:00	91	76	88	79	334
17:00-18:00	84	73	65	40	262
18:00-19:00	42	61	41	32	176
19:00-20:00	41	36	44	32	153
20:00-21:00	34	21	26	21	102
21:00-22:00	25	21	22	23	91
22:00-23:00	11	14	9	6	40
23:00-24:00	5	11	18	10	44
Total					2,793
AM Peak					11:45-12:45 194
PM Peak					16:00-17:00 334

Volume Count Report

LOCATION INFO	
Location ID	557_1_NB
Type	SPOT
Fnct'l Class	-
Located On	MEADOWBROOK
SOUTH OF	TWELVE MILE ROAD
Direction	1
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 1/11/2022
End Date	Wed 1/12/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	
Notes	
Station	557
Study	
Speed Limit	
Description	
Sensor Type	NA
Source	
Latitude,Longitude	

INTERVAL:15-MIN	15-min Interval				Hourly Count
Time	1st	2nd	3rd	4th	
0:00-1:00	1	1	3	1	6
1:00-2:00	1	0	1	0	2
2:00-3:00	1	1	1	0	3
3:00-4:00	0	1	2	1	4
4:00-5:00	1	2	0	0	3
5:00-6:00	0	1	0	4	5
6:00-7:00	0	4	4	4	12
7:00-8:00	7	11	12	11	41
8:00-9:00	13	13	15	10	51
9:00-10:00	15	17	28	42	102
10:00-11:00	42	9	20	17	88
11:00-12:00	21	19	15	23	78
12:00-13:00	23	17	26	17	83
13:00-14:00	15	19	19	29	82
14:00-15:00	16	22	22	23	83
15:00-16:00	26	26	37	45	134
16:00-17:00	43	25	42	46	156
17:00-18:00	41	36	44	24	145
18:00-19:00	21	27	33	17	98
19:00-20:00	12	22	11	11	56
20:00-21:00	11	10	11	11	43
21:00-22:00	8	8	7	5	28
22:00-23:00	2	7	6	1	16
23:00-24:00	1	3	5	2	11
Total					1,330
AM Peak					09:15-10:15 129
PM Peak					16:45-17:45 167

Volume Count Report

LOCATION INFO	
Location ID	557_2_SB
Type	SPOT
Fnct'l Class	-
Located On	MEADOWBROOK
NORTH OF	TWELVE MILE ROAD
Direction	2
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 1/11/2022
End Date	Wed 1/12/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	
Notes	
Station	557
Study	
Speed Limit	
Description	
Sensor Type	NA
Source	
Latitude,Longitude	

INTERVAL:15-MIN

Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	2	0	1	1	4
1:00-2:00	0	1	0	0	1
2:00-3:00	0	0	0	0	0
3:00-4:00	0	1	0	1	2
4:00-5:00	0	4	1	0	5
5:00-6:00	6	3	6	8	23
6:00-7:00	12	15	19	30	76
7:00-8:00	26	39	29	20	114
8:00-9:00	19	20	27	26	92
9:00-10:00	31	41	23	33	128
10:00-11:00	24	18	7	10	59
11:00-12:00	12	7	6	9	34
12:00-13:00	9	7	6	12	34
13:00-14:00	7	10	9	0	26
14:00-15:00	11	12	10	21	54
15:00-16:00	16	9	15	22	62
16:00-17:00	30	16	5	4	55
17:00-18:00	6	6	13	46	71
18:00-19:00	28	35	19	17	99
19:00-20:00	31	16	15	17	79
20:00-21:00	11	17	10	11	49
21:00-22:00	16	6	13	8	43
22:00-23:00	3	5	3	2	13
23:00-24:00	5	4	0	1	10
Total					1,133
AM Peak					09:00-10:00 128
PM Peak					17:45-18:45 128

Volume Count Report

LOCATION INFO	
Location ID	557_1_SB
Type	SPOT
Fnct'l Class	-
Located On	MEADOWBROOK
NORTH OF	TWELVE MILE ROAD
Direction	1
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 1/11/2022
End Date	Wed 1/12/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	
Notes	
Station	557
Study	
Speed Limit	
Description	
Sensor Type	NA
Source	
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	2	0	0	1	3
1:00-2:00	0	1	0	0	1
2:00-3:00	0	0	0	0	0
3:00-4:00	0	0	0	2	2
4:00-5:00	0	3	0	0	3
5:00-6:00	2	2	3	3	10
6:00-7:00	6	8	18	15	47
7:00-8:00	12	18	16	35	81
8:00-9:00	40	21	21	33	115
9:00-10:00	22	30	20	22	94
10:00-11:00	20	23	18	17	78
11:00-12:00	14	18	23	30	85
12:00-13:00	17	20	17	30	84
13:00-14:00	18	28	15	29	90
14:00-15:00	25	23	28	25	101
15:00-16:00	20	36	26	33	115
16:00-17:00	41	33	35	40	149
17:00-18:00	37	32	28	28	125
18:00-19:00	22	20	16	9	67
19:00-20:00	15	11	8	14	48
20:00-21:00	9	8	8	10	35
21:00-22:00	10	3	7	7	27
22:00-23:00	1	2	2	1	6
23:00-24:00	3	2	0	0	5
Total					1,371
AM Peak					07:45-08:45 117
PM Peak					16:00-17:00 149

Volume Count Report

LOCATION INFO	
Location ID	557_WB
Type	SPOT
Fnct'l Class	-
Located On	TWELVE MILE ROAD
EAST OF	MEADOWBROOK
Direction	WB
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 1/11/2022
End Date	Wed 1/12/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	WB
Notes	
Station	557
Study	
Speed Limit	
Description	
Sensor Type	NA
Source	CombineVolumeCountsIncremental
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	9	9	4	12	34
1:00-2:00	7	3	7	2	19
2:00-3:00	4	1	2	4	11
3:00-4:00	0	0	2	0	2
4:00-5:00	4	10	19	19	52
5:00-6:00	17	21	30	56	124
6:00-7:00	63	47	67	102	279
7:00-8:00	97	110	121	183	511
8:00-9:00	176	166	178	269	789
9:00-10:00	175	210	234	344	963
10:00-11:00	254	182	180	172	788
11:00-12:00	153	180	219	201	753
12:00-13:00	182	179	214	350	925
13:00-14:00	323	369	363	302	1,357
14:00-15:00	270	339	315	393	1,317
15:00-16:00	431	346	428	536	1,741
16:00-17:00	509	564	701	313	2,087
17:00-18:00	302	274	233	299	1,108
18:00-19:00	215	210	180	153	758
19:00-20:00	142	130	104	88	464
20:00-21:00	98	116	105	65	384
21:00-22:00	68	53	49	36	206
22:00-23:00	31	21	33	32	117
23:00-24:00	25	16	20	14	75
Total					14,864
AM Peak					09:15-10:15 1,042
PM Peak					15:45-16:45 2,310

Volume Count Report

LOCATION INFO	
Location ID	557_4_WB
Type	SPOT
Fnct'l Class	-
Located On	TWELVE MILE ROAD
EAST OF	MEADOWBROOK
Direction	4
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 1/11/2022
End Date	Wed 1/12/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	
Notes	
Station	557
Study	
Speed Limit	
Description	
Sensor Type	NA
Source	
Latitude,Longitude	

INTERVAL:15-MIN

Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	2	1	2	1	6
1:00-2:00	2	0	1	0	3
2:00-3:00	0	1	0	1	2
3:00-4:00	0	0	0	0	0
4:00-5:00	0	0	0	0	0
5:00-6:00	2	0	0	3	5
6:00-7:00	1	1	0	3	5
7:00-8:00	0	2	5	13	20
8:00-9:00	12	20	15	19	66
9:00-10:00	8	10	9	16	43
10:00-11:00	18	7	12	7	44
11:00-12:00	7	12	7	7	33
12:00-13:00	8	10	10	16	44
13:00-14:00	13	21	15	26	75
14:00-15:00	19	21	22	29	91
15:00-16:00	33	33	41	59	166
16:00-17:00	55	83	151	47	336
17:00-18:00	29	25	20	18	92
18:00-19:00	16	15	11	19	61
19:00-20:00	14	6	12	5	37
20:00-21:00	10	15	8	6	39
21:00-22:00	8	6	4	4	22
22:00-23:00	2	3	4	9	18
23:00-24:00	3	2	6	3	14
Total					1,222
AM Peak					08:00-09:00 66
PM Peak					15:45-16:45 348

Volume Count Report

LOCATION INFO	
Location ID	19201_EB
Type	SPOT
Fnct'l Class	-
Located On	TWELVE MILE ROAD
WEST OF	M-5 SB OFF RAMP
Direction	EB
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 1/11/2022
End Date	Wed 1/12/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	EB
Notes	
Station	19201
Study	
Speed Limit	
Description	
Sensor Type	NA
Source	CombineVolumeCountsIncremental
Latitude,Longitude	

INTERVAL:15-MIN

Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	7	6	7	9	29
1:00-2:00	4	4	3	2	13
2:00-3:00	4	0	0	0	4
3:00-4:00	0	3	3	2	8
4:00-5:00	0	2	1	6	9
5:00-6:00	10	3	14	23	50
6:00-7:00	13	16	37	44	110
7:00-8:00	65	70	98	123	356
8:00-9:00	86	103	92	118	399
9:00-10:00	86	83	82	61	312
10:00-11:00	88	70	80	68	306
11:00-12:00	51	55	63	61	230
12:00-13:00	71	67	58	97	293
13:00-14:00	96	93	88	86	363
14:00-15:00	75	95	104	86	360
15:00-16:00	99	109	120	125	453
16:00-17:00	129	151	156	112	548
17:00-18:00	71	100	130	98	399
18:00-19:00	136	166	146	128	576
19:00-20:00	159	138	130	120	547
20:00-21:00	115	92	85	57	349
21:00-22:00	72	70	47	35	224
22:00-23:00	28	26	27	33	114
23:00-24:00	10	8	32	15	65
Total					6,117
AM Peak					07:30-08:30 410
PM Peak					18:15-19:15 599

Volume Count Report

LOCATION INFO	
Location ID	19201_SB
Type	SPOT
Fnct'l Class	-
Located On	M-5 SB OFF RAMP
NORTH OF	TWELVE MILE ROAD
Direction	SB
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 1/11/2022
End Date	Wed 1/12/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	SB
Notes	
Station	19201
Study	
Speed Limit	
Description	
Sensor Type	NA
Source	CombineVolumeCountsIncremental
Latitude,Longitude	

INTERVAL:15-MIN

Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	17	10	2	6	35
1:00-2:00	0	0	0	4	4
2:00-3:00	0	0	0	4	4
3:00-4:00	0	0	11	0	11
4:00-5:00	0	22	32	9	63
5:00-6:00	36	31	43	62	172
6:00-7:00	42	50	89	101	282
7:00-8:00	99	106	64	104	373
8:00-9:00	80	100	76	90	346
9:00-10:00	58	67	56	52	233
10:00-11:00	43	46	48	57	194
11:00-12:00	51	54	57	47	209
12:00-13:00	48	56	40	72	216
13:00-14:00	61	48	59	45	213
14:00-15:00	42	38	53	67	200
15:00-16:00	61	49	39	39	188
16:00-17:00	45	43	59	85	232
17:00-18:00	48	44	60	95	247
18:00-19:00	78	72	112	71	333
19:00-20:00	94	80	46	46	266
20:00-21:00	75	65	14	36	190
21:00-22:00	13	20	14	22	69
22:00-23:00	25	11	11	20	67
23:00-24:00	19	52	2	0	73
Total					4,220
AM Peak					06:30-07:30 395
PM Peak					17:45-18:45 357

Volume Count Report

LOCATION INFO	
Location ID	19201_1_SB
Type	SPOT
Fnct'l Class	-
Located On	M-5 SB OFF RAMP
NORTH OF	TWELVE MILE ROAD
Direction	1
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 1/11/2022
End Date	Wed 1/12/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	
Notes	
Station	19201
Study	
Speed Limit	
Description	
Sensor Type	NA
Source	
Latitude,Longitude	

INTERVAL:15-MIN

Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	1	2	1	1	5
1:00-2:00	0	0	0	0	0
2:00-3:00	0	0	0	0	0
3:00-4:00	0	0	0	0	0
4:00-5:00	0	2	2	0	4
5:00-6:00	9	6	10	10	35
6:00-7:00	8	13	13	26	60
7:00-8:00	20	21	14	21	76
8:00-9:00	13	20	18	19	70
9:00-10:00	10	9	7	6	32
10:00-11:00	7	11	7	7	32
11:00-12:00	9	5	4	6	24
12:00-13:00	7	10	8	23	48
13:00-14:00	17	6	19	7	49
14:00-15:00	10	5	13	6	34
15:00-16:00	10	13	6	7	36
16:00-17:00	4	10	8	4	26
17:00-18:00	1	5	7	40	53
18:00-19:00	16	7	16	12	51
19:00-20:00	13	12	4	3	32
20:00-21:00	6	14	2	3	25
21:00-22:00	3	4	1	3	11
22:00-23:00	5	4	1	8	18
23:00-24:00	4	43	0	0	47
Total					768
AM Peak					06:45-07:45 81
PM Peak					17:45-18:45 79

Volume Count Report

LOCATION INFO	
Location ID	19201_2_SB
Type	SPOT
Fnct'l Class	-
Located On	M-5 SB OFF RAMP
NORTH OF	TWELVE MILE ROAD
Direction	2
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 1/11/2022
End Date	Wed 1/12/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	
Notes	
Station	19201
Study	
Speed Limit	
Description	
Sensor Type	NA
Source	
Latitude,Longitude	

INTERVAL:15-MIN

Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	4	2	1	2	9
1:00-2:00	0	0	0	0	0
2:00-3:00	0	0	0	1	1
3:00-4:00	0	0	2	0	2
4:00-5:00	0	7	6	2	15
5:00-6:00	5	4	9	17	35
6:00-7:00	8	11	20	21	60
7:00-8:00	20	21	18	33	92
8:00-9:00	25	30	19	16	90
9:00-10:00	11	12	15	11	49
10:00-11:00	10	7	6	13	36
11:00-12:00	10	9	8	8	35
12:00-13:00	10	10	11	12	43
13:00-14:00	9	10	6	6	31
14:00-15:00	7	5	8	15	35
15:00-16:00	14	13	15	10	52
16:00-17:00	11	11	7	14	43
17:00-18:00	8	13	10	8	39
18:00-19:00	17	13	19	14	63
19:00-20:00	20	18	11	13	62
20:00-21:00	13	9	3	8	33
21:00-22:00	2	4	2	5	13
22:00-23:00	6	2	2	5	15
23:00-24:00	3	2	0	0	5
Total					858
AM Peak					07:45-08:45 107
PM Peak					18:30-19:30 71

Volume Count Report

LOCATION INFO	
Location ID	19201_WB
Type	SPOT
Fnct'l Class	-
Located On	TWELVE MILE ROAD
EAST OF	M-5 SB OFF RAMP
Direction	WB
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Holiday	No
Start Date	Tue 1/11/2022
End Date	Wed 1/12/2022
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	WB
Notes	
Station	19201
Study	
Speed Limit	
Description	
Sensor Type	NA
Source	CombineVolumeCountsIncremental
Latitude,Longitude	

INTERVAL:15-MIN

Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	8	7	4	9	28
1:00-2:00	8	3	7	4	22
2:00-3:00	1	3	2	4	10
3:00-4:00	0	0	1	1	2
4:00-5:00	5	11	17	12	45
5:00-6:00	19	17	24	52	112
6:00-7:00	59	38	56	79	232
7:00-8:00	72	90	104	128	394
8:00-9:00	134	148	160	143	585
9:00-10:00	114	83	98	119	414
10:00-11:00	83	94	116	96	389
11:00-12:00	109	97	102	118	426
12:00-13:00	115	101	125	136	477
13:00-14:00	112	146	134	128	520
14:00-15:00	113	144	111	136	504
15:00-16:00	164	135	192	176	667
16:00-17:00	167	141	183	208	699
17:00-18:00	187	180	160	146	673
18:00-19:00	155	167	142	132	596
19:00-20:00	101	91	98	69	359
20:00-21:00	74	83	65	48	270
21:00-22:00	34	46	41	34	155
22:00-23:00	39	25	26	21	111
23:00-24:00	17	10	18	15	60
Total					7,750
AM Peak					08:00-09:00 585
PM Peak					16:30-17:30 758

OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: 12 Mile & Meadowbrook DATE: 12-18-14

CITY/TOWNSHIP: Novi BY: T. Creech

COUNTY#: 557 STATE#: - CHARGES: 78005570

PLEASE PERFORM THE FOLLOWING:

_____ ELECTRICAL DEVICE: ____ INSTALL _____ MODERNIZE _____ MAINTENANCE

_____ UNDERGROUND: _____

_____ EDISON OK: _____ YES _____ NO JOB#: _____

_____ COORDINATE W/DISTRICT 7: _____

DIAL..	1	1	1	1		2	2	2	2		3	3	3	3		4	4	4	4
SPLIT.	1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4
_____ CHANGE TIMING.....																			
_____ CHANGE OFFSET.....																			
_____ CHANGE CYCLE LENGTH.....																			
_____ ADD DIAL/SPLIT.....																			

X CHANGE BREAKOUT OR EPROM: Change Pass → Rev Z
(changed Ped 2 to W.F.G)

_____ CHANGE HOURS OF OPERATION:

OLD: _____

NEW: _____

_____ REPROGRAM TBC

_____ INSTALL INTERCONNECT: _____ TBC _____ MINITROL _____ TONE

_____ MBT OK: _____ YES _____ NO

_____ NO CHANGE - RECORD CORRECTION

_____ OTHER: _____

_____

_____

_____

APPROVED BY: _____ DATE: 1/8/15

DATE INSTALLED: _____

INSTALLED BY: _____

INTERSECTION :- 557 12 MILE & MEADOWBROOK
DESCRIPTION PROMS :- X00557 / F2403
CONTROLLER TYPE :- STANDARD PERSONALITY CONTROLLER
SOFTWARE TYPE :- MOD 52 SCATS
INPUTS :-

1. WB 12 MILE L (LK)
2. WB 12 MILE C (LK)
3. WB 12 MILE R (LK)
4. WB 12 MILE RT (LK)
5. SB MEADOWBROOK L (LK)
6. SB MEADOWBROOK R (LK)
7. EB 12 MILE L (LK)
8. EB 12 MILE C (LK)
9. EB 12 MILE R (LK)
10. EB 12 MILE RT (LK)
11. NB MEADOWBROOK L (LK)
12. NB MEADOWBROOK R (LK)

NOTE :- ALL DETECTORS ARE AUTOSCOPE (2004 CAMERAS).

PED 2: 12 MILE PED NORTH & SOUTH W.F.G.
PED 4: MEADOWBROOK PED EAST & WEST P.B.

APPROACHES :-
A APP 1 : WB 12 MILE L,C,R,RT
B APP 1 : NB MEADOWBROOK L,R
A APP 2 : EB 12 MILE L,C,R,RT
B APP 2 : SB MEADOWBROOK L,R

FLEXIDATA :-

SEQUENCE	A,B	A,B
AUTO REL		
R- REL	A	A
R+ REL	B	B
Q- REL		
Q+ REL		

PEDESTRIANS :-
1. NO PED 1
2. 12 MILE PED NORTH & SOUTH
3. NO PED 3
4. MEADOWBROOK PED EAST & WEST (P-)

SPECIAL FEATURES :-
Personality revision is 2 (=B).
A STAGE HAS PERMANENT DEMAND.
DEMAND FOR STAGE B IN FLEXI & ISOL, SET ZNEG TO DISABLE.
Pedestrians have automatic introduction using SCATS Y-.
MEADOWBROOK NEAR has early cut-off operation in B stage.

BACKPANEL :- SIZE P-12 CABINET

LOAD SWITCH 2 - 12 MILE	A	FLR
LOAD SWITCH 4 - MEADOWBROOK NEAR	B	FLR
LOAD SWITCH 5 - MEADOWBROOK FAR (OLA)	C	FLR
LOAD SWITCH 9 - 12 MILE PED NORTH & SOUTH	W-1	
LOAD SWITCH 10 - MEADOWBROOK PED EAST & WEST	W-2	

JUMPERS :-
195-196,197-198,199-200,201-202,207-208,217-218,219-220,221-222,
223-224,229-230,233-234,235-236,237-238,298-302,321-PB1,325-326,
327-328,329-PB1,334-335,343-PB1,345-346,347-348,349-350,351-PB1,
356-357,365-366,367-368,369-PB1,373-PB1,387-PB1,391-PB1,395-PB1.

MMU:(MENU : SET/VIEW CONFIG)

Dual Indication Enable:	R+G: Channel 2, 4, 5 R+Y: Channel 2, 4, 5 G+Y: Channel 2, 4, 5
Red Fail Enable:	Enable: Channel 2, 4, 5
Unit Options:	All OFF except: Recurrent pulse Program Memory Card
Y & R Clearance Disable:	Channel 2, 4, 5 Enabled
Program Card:	Compatible Channels: 4-5 Min Flash Time : 4+2+1 Min Yellow Change Disable: None Voltage Monitor Latch: NONE

```
*******************************
* CONTROLLER INFORMATION SHEET *
*     FOR SITE NO. 557         *
*       TERRY CREECH           *
*       18-DEC-2014            *
*******************************
```

CHECKSUMS
TIMES: 6A / 152
PERS: CB / 313
TOTAL: A1 / 241

FLEXILINK PLAN DATA

Intersection # 557 State # _____ Date: 12/18/14 Prepared By: Terry Creech

Intersection: 12 Mile & Meadowbrook City: Novi

Hours of Operation: 7 Days: 24 Hours Approved By: Rachel Jones

Hours of Flashing: None

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL		80	120	120					
1	A		0	0	0					
2	B		33	63	64					
3	C									
4	D									
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	Of (Y-)		67	37	37					
11	Y+	C								
12	Z-									
13	Z+									
14	Q-									
15	Q+									
16	XH									
17	XL									

NOTE: Stages with 1 second of phase time are skipped. Blank entries are default values equal to 0.
Except for an AWA controller, entries #8 to #15 (=254) and 'C' entry means continuous (=255).

							Timers		
Phase	Direction	Min	Max	ECO	Amber	All Red	Gap	Hdwy	Waste
A	12 Mile	10.0	50.0	17.0	4.3	1.7	3.0	1.2	10.0
B	Meadowbrook	8.0	30.0	4.0	3.9	2.5	3.5	1.4	10.0
C									
D									
E									
F									
G									

	Day	Hours	Plan#
SC1	14	0:00	1
SC2	8	6:00	2
SC3	8	9:00	1
SC4	8	15:00	3
SC5	8	19:00	1
SC6			
SC7			
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2
12 Mile Ped North & South (Ped2)	7.0	17.0	3.0
Meadowbrook Ped East & West (Ped4)	7.0	12.0	3.4

Normal Operating Mode

Isolated	Flexilink	Masterlink	Master Isolated	Flexi Isolated
		X		

DAY OF WEEK CODE NUMBER

0	End of Schedule	4	WED	8	MON-FRI	12	MON,FRI,SAT
1	SUN	5	THUR	9	MON-SAT	13	SAT,SUN
2	MON	6	FRI	10	TUE,WED,THU	14	EVERY DAY
3	TUE	7	SAT	11	MON,FRI	15	NEVER

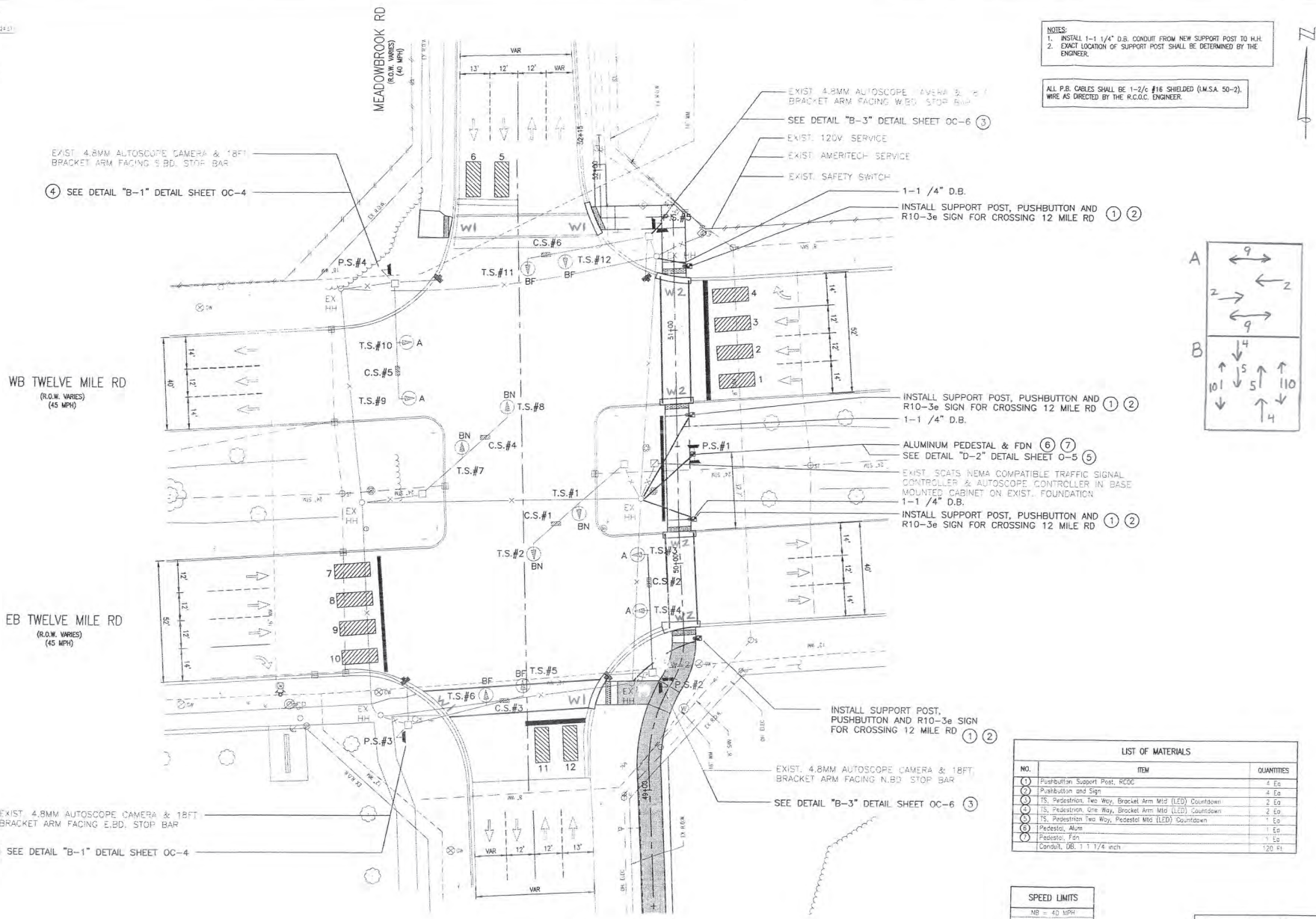
Autoscope 37-Pin Male Output Harness (33457G2) Wiring CO#557 - 12 Mile & Meadowbrook

Autoscope Output Harness Pins #1 & #20 to Logic Common & Pins #18 & # 37 to +24 VDC

Camera Number	EIM Switch Position	EIM LED#	Output Harness Pin#	D-Conn Pin (1,2,..)	Vehicle Detector No. D-Conn format (9,10,...)	Vehicle Detector No. On Print (1,2,..)	Detector Description	Phase No. (1,2,3,...)
1	1	1	29	1	9	1	WB 12 Mile L	2
	1	2	30	2	10	2	WB 12 Mile C	2
	1	3	31	3	11	3	WB 12 Mile R	2
	1	4	32	4	12	4	WB 12 Mile RT	2
	1	5	33					
	1	6	34					
	1	7	35					
	1	8	36					
2	2	1	10	5	13	5	SB Meadowbrook L	4
	2	2	11	6	14	6	SB Meadowbrook R	4
	2	3	12					
	2	4	13					
	2	5	14					
	2	6	15					
	2	7	16					
	2	8	17					
3	3	1	21	7	15	7	EB 12 Mile L	2
	3	2	22	8	16	8	EB 12 Mile C	2
	3	3	23	9	17	9	EB 12 Mile R	2
	3	4	24	10	18	10	EB 12 Mile RT	2
	3	5	25					
	3	6	26					
	3	7	27					
	3	8	28					
4	4	1	2	11	19	11	NB Meadowbrook L	4
	4	2	3	12	20	12	NB Meadowbrook R	4
	4	3	4					
	4	4	5					
	4	5	6					
	4	6	7					
	4	7	8					
	4	8	9					

Autoscope 37-Pin Female Input Harness (33457G3) Wiring

EIM Switch Position	EIM LED#	Input Harness Pin#	Phase Status Input From +24 VDC	Backpanel Terminal Position and Number
5	1	29	Phase 8 Green	
5	1	30	Phase 7 Green	
5	1	31	Phase 6 Green	
5	1	32	Phase 5 Green	
5	1	33	Phase 4 Green	LS 4 Green 221
5	1	34	Phase 3 Green	
5	1	35	Phase 2 Green	LS 2 Green 199
5	1	36	Phase 1 Green	
6	2	10	Phase 8 Red	
6	2	11	Phase 7 Red	
6	2	12	Phase 6 Red	
6	2	13	Phase 5 Red	
6	2	14	Phase 4 Red	LS 4 Red 217
6	2	15	Phase 3 Red	
6	2	16	Phase 2 Red	LS 2 Red 195
6	2	17	Phase 1 Red	



INSTALLATION PLAN
SCALE: 1" = 20'

NOTES:
1. INSTALL 1-1 1/4" D.B. CONDUIT FROM NEW SUPPORT POST TO H.H.
2. EXACT LOCATION OF SUPPORT POST SHALL BE DETERMINED BY THE ENGINEER.

ALL P.B. CABLES SHALL BE 1-2/c #16 SHIELDED (I.M.S.A. 50-2), WIRE AS DIRECTED BY THE R.C.O.C. ENGINEER.

LIST OF MATERIALS

NO.	ITEM	QUANTITIES
(1)	Pushbutton Support Post, RCOC	4 Ea
(2)	Pushbutton and Sign	4 Ea
(3)	TS, Pedestrian, Two Way, Bracket Arm Mtd (LED) Countdown	2 Ea
(4)	TS, Pedestrian, One Way, Bracket Arm Mtd (LED) Countdown	2 Ea
(5)	TS, Pedestrian Two Way, Pedestal Mtd (LED) Countdown	1 Ea
(6)	Pedestal, Alum	1 Ea
(7)	Pedestal, Fdn	1 Ea
	Conduit, OB, 1 1 1/4 inch	120 Ft

SPEED LIMITS
NB = 40 MPH
SB = 40 MPH
EB = 45 MPH
WB = 45 MPH

3 FULL WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
Normal 3 days are required for locate. Prior notices at no charge to the caller.

OHM
WWW.OHM-ADVISORS.COM
34000 Plymouth Road | Livonia, MI 48150 | P (734) 522-6711 | F (734) 522-6427

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DESIGN	DGDR
DRAWN	DGDR
CHECKED	JLH
QA/QC	JLH
PROJECT MGR	JAR
SECTION	13
TOWN	T1N
RANGE	R8E
CITY	CITY OF NOVI
COUNTY	OAKLAND COUNTY
CITY/VILLAGE/TOWNSHIP	CITY OF NOVI
SCALE	1" = 20'
V. DATUM	NAVD 88
HORIZ DATUM	NAD 83 (2011)
JOB NO.	0163-12-0130
SEQUENCING	
REVISIONS	
NO	
DATE	4/24/13

METRO CONNECTOR TRAIL - PHASE I
MEADOWBROOK ROAD
SIGNAL INSTALLATION PLAN

SHEET
26
OF 30

DRAWING PATH: P:\0126_31650\163120130_Metro_Connector_Trail_Private_Proj\Signal\130130510.dwg Nov 26, 2013 - 8:13pm

OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: M-5 SB Off Ramp & 12 Mile DATE: 1-22-14

CITY/TOWNSHIP: NOVI BY: T. Creech

COUNTY#: 19201 STATE#: 6319Z-01-101 CHARGES: 49421.0981

ROAD COMMISSION FOR
OAKLAND COUNTY

PLEASE PERFORM THE FOLLOWING:

JUL 14 2015

_____ ELECTRICAL DEVICE: ____ INSTALL _____ MODERNIZE _____ MAINTENANCE

_____ UNDERGROUND: _____

TRAFFIC OPERATIONS

_____ EDISON OK: _____ YES _____ NO JOB#: _____

_____ COORDINATE W/DISTRICT 7: _____

DIAL..	1	1	1	1		2	2	2	2		3	3	3	3		4	4	4	4
SPLIT.	1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4
_____ CHANGE TIMING.....																			
_____ CHANGE OFFSET.....																			
_____ CHANGE CYCLE LENGTH.....																			
_____ ADD DIAL/SPLIT.....																			

X CHANGE BREAKOUT OR EPROM: Change Pers → Rev 1

_____ CHANGE HOURS OF OPERATION:

OLD: _____

NEW: _____

_____ REPROGRAM TBC

_____ INSTALL INTERCONNECT: _____ TBC _____ MINITROL _____ TONE

_____ MBT OK: _____ YES _____ NO

_____ NO CHANGE - RECORD CORRECTION

X OTHER: Swap out existing AWA controller w/ MOD 52 SCATS controller. Hook up field wiring per paperwork (LS4+LS5 switched). Install modem & phone jack. Hook up comms. Swap out D-connector & hook up Autoscope per paperwork. Requires a checksum change.

APPROVED BY: _____ DATE: 1/31/14

DATE INSTALLED: 7-11-15

INSTALLED BY: Richardson, Casey

INTERSECTION :- 19201 M-5 SB OFF RAMP & 12 MILE
DESCRIPTION PROMS :- X19200 / F2003
CONTROLLER TYPE :- STANDARD PERSONALITY CONTROLLER
SOFTWARE :- MOD 52 SCATS

INPUTS :-
 1. EB 12 MILE L (LK)
 2. EB 12 MILE C (LK)
 3. EB 12 MILE R (LK)
 4. WB 12 MILE L (LK)
 5. WB 12 MILE C (LK)
 6. WB 12 MILE R (LK)
 7. SB M-5 OFF RAMP LT L (LK)
 8. SB M-5 OFF RAMP LT R (LK)
 9. SB M-5 OFF RAMP RT L (NL)
10. SB M-5 OFF RAMP RT R (NL)

NOTE: ALL DETECTORS ARE
AUTOSCOPE (2004 CAMERAS).

APPROACHES :-
A APP 1 : EB 12 MILE L,C,R
B APP 1 : SB M-5 OFF RAMP LT L,R
A APP 2 : WB 12 MILE L,C,R
B APP 2 : SB M-5 OFF RAMP RT L,R

FLEXIDATA :-

SEQUENCE	A,B	A,B
AUTO REL		
R- REL	A	A
R+ REL	B	B
Q- REL		
Q+ REL		

PEDESTRIANS :-

SPECIAL FEATURES :-
Personality revision is 1 (=A).
M-5 OFF RAMP (NEAR) has early cut-off operation in B stage.
A stage has a permanent demand.
Demand for B stage in flexi and isol, set ZNEG to disable.

BACKPANEL - 4 PHASE EAGLE

LOAD SWITCH 2: 12 MILE ROAD	A & C	FLA
LOAD SWITCH 4: M-5 OFF RAMP (NEAR)	B	FLR
LOAD SWITCH 5: M-5 OFF RAMP (FAR)	D	FLR

JUMPERS :-
121-213, 151-152, 153-154, 155-156, 158-159, 161-162, 164-165, 173-174, 175-176, 177-178, 233-PB1, 237-PB1, 241-242, 243-244, 245-246, 255-256, 257-258, 259-260, 261-262, 263-PB1.

SIGNAL MONITOR: 4-5
All switches OFF EXCEPT: Dual Select A&B; G&Y Enable; SSM 2,4,5.
Minimum flash = 4 + 2 + 1.

```
********************************
* CONTROLLER INFORMATION SHEET *
*     FOR SITE NO. 19201       *
*         T. CREECH            *
*         22-Jan-2014          *
********************************
```

Checksums: Times 93 / 223
Pers C2 / 302
Total 51 / 121

FLEXILINK PLAN DATA

Intersection # 19201 **State #** 63192-01-101 **Date:** 01/22/14 **Prepared By:** T. Creech

Intersection: M-5 SB Off Ramp & 12 Mile **City:** Novi

Hours of Operation: 7 Days: 5am - 12:30am **Approved By:** R. Jones

Hours of Flashing: 7 Days 12:30am - 5am

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL		80	120	120					
1	A		0	0	0					
2	B		58	82	82					
3	C									
4	D									
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	Of (Y-)		24	97	100					
11	Y+	C								
12	Z-									
13	Z+									
14	Q-									
15	Q+									
16	XH									
17	XL									

NOTE: Stages with 1 second of phase time are skipped. Blank entries are default values equal to 0. Except for an AWA controller, entries #8 to #15 (=254) and 'C' entry means continuous (=255).

							Timers		
Phase	Direction	Min	Max	ECO	Amber	All Red	Gap	Hdwy	Waste
A	12 Mile	12.0	48.0		4.3	1.6	3.0	1.2	10.0
B	M-5 Ramp	8.0	28.0	3.0	3.5	2.5	3.2	1.2	10.0
C									
D									
E									
F									
G									

	Day	Hours	Plan#
SC1	8	6:00	2
SC2	8	9:00	1
SC3	8	15:00	3
SC4	8	19:00	1
SC5	14	0:00	1
SC6	14	0:30	0
SC7	14	5:00	1
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2

Normal Operating Mode

Isolated	Flexilink	Masterlink	Master Isolated	Flexi Isolated
		X		

DAY OF WEEK CODE NUMBER

0	End of Schedule	4	WED	8	MON-FRI	12	MON,FRI,SAT
1	SUN	5	THUR	9	MON-SAT	13	SAT,SUN
2	MON	6	FRI	10	TUE,WED,THU	14	EVERY DAY
3	TUE	7	SAT	11	MON,FRI	15	NEVER

Autoscope 37-Pin Male Output Harness (33457G2) Wiring

Autoscope Output Harness Pins #1 & 20 to Logic Common
Autoscope Output Harness Pins #18 & 37 to +24VDC

Camera Number	EIM Switch Position	Autoscope EIM LED #	Autoscope Output Harness Pin #	SCATS D-Connector Terminal #	SCATS Detector Description
1	1	LED 1	29	1	EB 12 MILE T1 PRES
1	1	LED 2	30	2	EB 12 MILE T2 PRES
1	1	LED 3	31	3	EB 12 MILE T3 PRES
	1	LED 4	32		
	1	LED 5	33		
	1	LED 6	34		
	1	LED 7	35		
	1	LED 8	36		
2	2	LED 1	10	4	WB 12 MILE T1 PRES
2	2	LED 2	11	5	WB 12 MILE T2 PRES
2	2	LED 3	12	6	WB 12 MILE T3 PRES
	2	LED 4	13		
	2	LED 5	14		
	2	LED 6	15		
	2	LED 7	16		
	2	LED 8	17		
3	3	LED 1	21	7	M-5 OFF RAMP L1 PRES
3	3	LED 2	22	8	M-5 OFF RAMP L2 PRES
3	3	LED 3	23	9	M-5 OFF RAMP R1 PRES
3	3	LED 4	24	10	M-5 OFF RAMP RT PRES
	3	LED 5	25		
	3	LED 6	26		
	3	LED 7	27		
	3	LED 8	28		
	4	LED 1	2		
	4	LED 2	3		
	4	LED 3	4		
	4	LED 4	5		
	4	LED 5	6		
	4	LED 6	7		
	4	LED 7	8		
	4	LED 8	9		

Autoscope 37-Pin Female Input Harnes (33467G3) Wiring

Autoscope Output Harness Pins #1 & 20 to Logic Common
Autoscope Output Harness Pins #18 & 37 to +24VDC

EIM Switch Position	Autoscope EIM LED #	Autoscope Input Harness Pin #	Phase Status Input From +24VDC	Back Panel Terminal Position
5	1	29	Ø8 Green	
5	2	30	Ø7 Green	
5	3	31	Ø6 Green	
5	4	32	Ø5 Green	
5	5	33	Ø4 Green	
5	6	34	Ø3 Green	LOAD SW 5
5	7	35	Ø2 Green	LOAD SW 4
5	8	36	Ø1 Green	LOAD SW 2
6	1	10	Ø8 Red	
6	2	11	Ø7 Red	
6	3	12	Ø6 Red	
6	4	13	Ø5 Red	
6	5	14	Ø4 Red	
6	6	15	Ø3 Red	LOAD SW 5
6	7	16	Ø2 Red	LOAD SW 4
6	8	17	Ø1 Red	LOAD SW 2

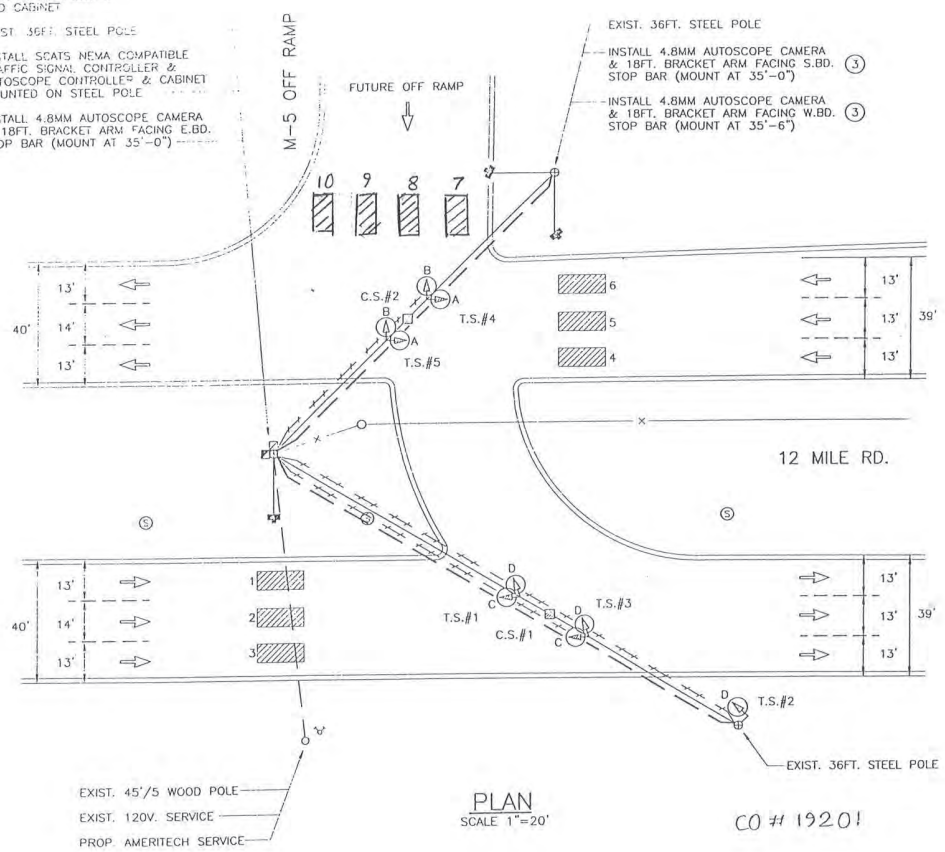
The preceeding table represents the correct wiring for phase inputs from the SCATS controller. The Autoscope™ input harness wires should be terminated at the +24VDC location on the back panel. The far right column is intetionally left blank so that the back panel terminal positions can be added as the cabinet is completed. This information is used for Autoscope™ extension and delay calculations. It is imperative that this harness is wired correctly Failure to do so will result in erratic detector performance

(1) REMOVE CONTROLLER AND CABINET

EXIST. 36FT. STEEL POLE

(2) INSTALL SCATS NEMA COMPATIBLE TRAFFIC SIGNAL CONTROLLER & (4) AUTOSCOPE CONTROLLER & CABINET MOUNTED ON STEEL POLE

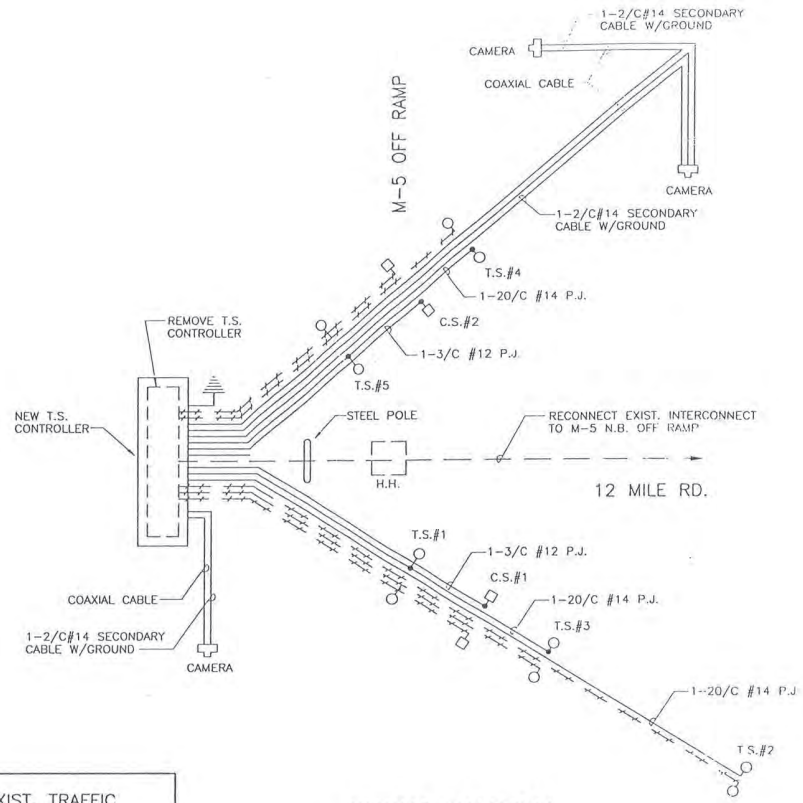
(3) INSTALL 4.8MM AUTOSCOPE CAMERA & 18FT. BRACKET ARM FACING E.BD. STOP BAR (MOUNT AT 35'-0")



PLAN
SCALE 1"=20'

CO # 19201

N

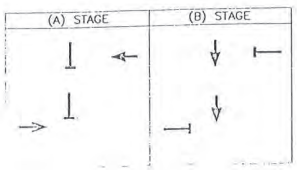


WIRING DIAGRAM

REWIRING OF EXIST. TRAFFIC SIGNALS SHALL BE INCLUDED IN THE INSTALLATION OF TRAFFIC SIGNALS ON THIS CONTRACT.

COAXIAL CABLE SHALL BE BELDEN 8281-75 OHM COAX WITH 20 GA. SOLID BARE COPPER CONDUCTOR OR APPROVED EQUAL, EXCEPT AS OTHERWISE NOTED.

MOVEMENT DIAGRAM



LIST OF MATERIALS

NO.	ITEM	QUANTITIES	CODE NO.
(1)	REMOVE CONTROLLER AND CABINET	1 EACH	6910162
(2)	SOLID STATE ACTUATED CONTROLLER AND CABINET	1 EACH	6910337
(3)	AUTOSCOPE CAMERA	3 EACH	6910340
(4)	AUTOSCOPE CONTROLLER	1 EACH	6910341
	CLAMP-ON BRACKET ARM, 18FT.	3 EACH	6917050

LOAD	AMPS	WATTS
SIGNALS	0	0

M-5 S.B. OFF RAMP & 12 MILE

CO. 19201

MANNELL ASSOCIATES INC.
ENGINEERING CONSULTANTS
33608 Grand River
Farmington, MI. 48335
(810) 473-7070

PROTECH ENGINEERING ASSOCIATES INC

SEMCOG | Southeast Michigan Council of Governments

Community Profiles

YOU ARE VIEWING DATA FOR:

City of Novi

45175 W 10 Mile Rd
Novi, MI 48375-3024
http://www.cityofnovi.org

SEMCOG MEMBER

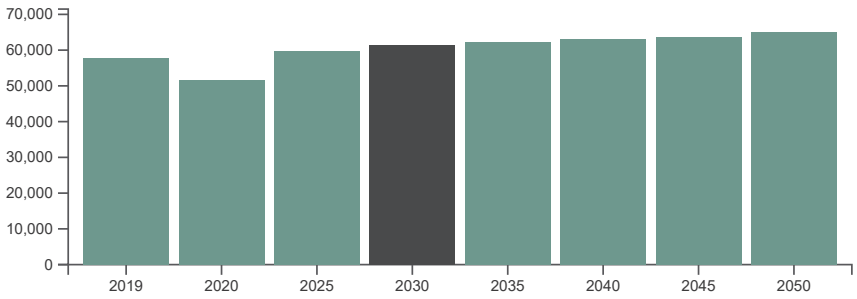
Census 2020 Population: 66,243
Area: 31.2 square miles

VIEW COMMUNITY EXPLORER MAP | VIEW 2020 CENSUS MAP

Economy & Jobs

Link to American Community Survey (ACS) Profiles: **Select a Year** 2018-2022 | **Economic**

Forecasted Jobs



Note: The base year for the employment forecast is 2019, as 2020 employment was artificially low due to the COVID recession.

Source: **SEMCOG 2050 Regional Development Forecast**

Forecasted Jobs by Industry Sector

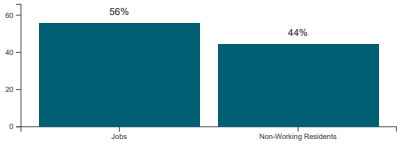
Forecasted Jobs By Industry Sector	2019	2020	2025	2030	2035	2040	2045	2050	Change 2019-2050	Pct Change 2019-2050
Natural Resources, Mining, & Construction	2,219	2,200	3,029	3,015	2,991	2,906	2,831	2,840	621	28%
Manufacturing	4,670	4,239	4,627	4,575	4,344	4,101	3,935	3,913	-757	-16.2%
Wholesale Trade	3,118	2,929	3,139	3,197	3,288	3,266	3,202	3,138	20	0.6%
Retail Trade	7,892	6,944	7,207	6,823	6,338	6,029	5,777	5,623	-2,269	-28.8%
Transportation, Warehousing, & Utilities	1,418	1,410	1,667	1,701	1,747	1,751	1,774	1,783	365	25.7%
Information & Financial Activities	6,576	6,145	7,173	7,806	8,290	8,615	8,922	9,254	2,678	40.7%
Professional and Technical Services & Corporate HQ	8,452	7,940	9,299	9,800	10,237	10,599	11,019	11,441	2,989	35.4%
Administrative, Support, & Waste Services	3,477	3,026	3,421	3,565	3,729	3,854	3,960	4,107	630	18.1%
Education Services	2,212	2,060	2,213	2,286	2,347	2,362	2,379	2,398	186	8.4%
Healthcare Services	7,679	7,095	7,941	8,216	8,579	8,969	9,388	9,839	2,160	28.1%
Leisure & Hospitality	7,103	5,217	7,105	7,275	7,317	7,335	7,346	7,405	302	4.3%
Other Services	2,137	1,851	2,247	2,373	2,429	2,452	2,499	2,513	376	17.6%
Public Administration	719	682	718	732	736	732	732	731	12	1.7%
Total Employment Numbers	57,672	51,738	59,786	61,364	62,372	62,971	63,764	64,985	7,313	12.7%

Note: The base year for the employment forecast is 2019, as 2020 employment was artificially low due to the COVID recession.

Source: **SEMCOG 2050 Regional Development Forecast**

Daytime Population

Daytime Population	ACS 2016
Jobs	36,078
Non-Working Residents	28,531
Age 15 and under	12,980
Not in labor force	14,353
Unemployed	1,198
Daytime Population	64,609



Source: **2012-2016 American Community Survey 5-Year Estimates** and **2012-2016 Census Transportation Planning Products Program (CTPP)**. For additional information, visit SEMCOG's **Interactive Commuting Patterns Map**

Note: The number of residents attending school outside Southeast Michigan is not available. Likewise, the number of students commuting into Southeast Michigan to attend school is also not known.

SEMCOG | Southeast Michigan Council of Governments

Community Profiles

YOU ARE VIEWING DATA FOR:

City of Novi

45175 W 10 Mile Rd
Novi, MI 48375-3024
http://www.cityofnovi.org

SEMCOG MEMBER

Census 2020 Population: 66,243
Area: 31.2 square miles

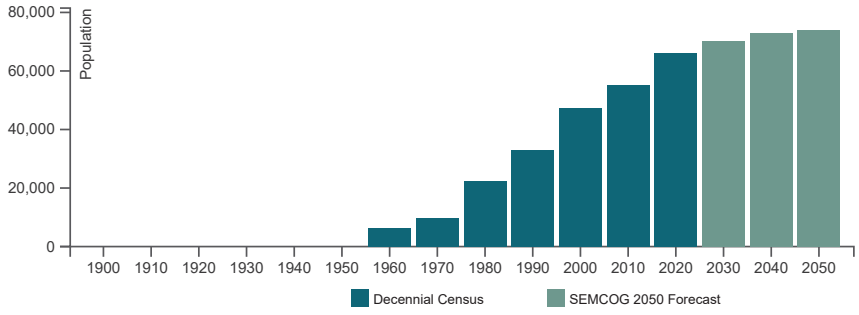
VIEW COMMUNITY EXPLORER MAP | VIEW 2020 CENSUS MAP

Population and Households

Link to American Community Survey (ACS) Profiles: **Select a Year** 2018-2022 | **Social** | **Demographic**

Population and Household Estimates for Southeast Michigan, 2023

Population Forecast



Note for City of Novi : Incorporated as of the 1970 Census from Village of Novi. Population numbers prior to 1970 are of the village. The Village of Novi was incorporated in 1958 from the majority of Novi Township. Population numbers not available before 1960 as area was part of Novi Township.

Population and Households

Population and Households	Census 2020	Census 2010	Change 2010-2020	Pct Change 2010-2020	SEMCOG Jul 2023	SEMCOG 2050
Total Population	66,243	55,224	11,019	20.0%	68,080	74,081
Group Quarters Population	332	360	-28	-7.8%	604	763
Household Population	65,911	54,864	11,047	20.1%	67,476	73,318
Housing Units	27,863	24,226	3,637	15.0%	28,613	-
Households (Occupied Units)	26,458	22,258	4,200	18.9%	27,710	29,484
Residential Vacancy Rate	5.0%	8.1%	-3.1%	-	3.2%	-
Average Household Size	2.49	2.46	0.03	-	2.44	2.49

Source: **U.S. Census Bureau** and **SEMCOG 2050 Regional Development Forecast**

Components of Population Change

Components of Population Change	2000-2005 Avg.	2006-2010 Avg.	2011-2018 Avg.
Natural Increase (Births - Deaths)	390	252	213
Births	701	583	637
Deaths	311	331	424
Net Migration (Movement In - Movement Out)	534	353	826
Population Change (Natural Increase + Net Migration)	924	605	1,039

Source: **Michigan Department of Community Health Vital Statistics**, **U.S. Census Bureau**, and SEMCOG

Household Types

Household Types	Census 2010	ACS 2021	Change 2010-2021	Pct Change 2010-2021	SEMCOG 2050
With Seniors 65+	4,598	6,650	2,052	44.6%	-
Without Seniors	17,660	19,634	1,974	11.2%	-
Live Alone, 65+	2,210	2,984	774	35%	-
Live Alone, <65	4,348	4,765	417	9.6%	-
2+ Persons, With children	7,838	9,262	1,424	18.2%	-
2+ Persons, Without children	7,862	9,273	1,411	17.9%	-
Total Households	22,258	26,284	4,026	18.1%	-

Source: **U.S. Census Bureau**, **Decennial Census**, **2017-2021 American Community Survey 5-Year Estimates**, and **SEMCOG 2050 Regional Development Forecast**

Table 1
Elm Creek Trip Generation

Land Use	ITE Code	Amount	Units	Average Daily Traffic	AM Peak Hour			PM Peak Hour		
					In	Out	Total	In	Out	Total
Single-Family Attached Housing	215	121	DU	872	14	43	57	41	28	69

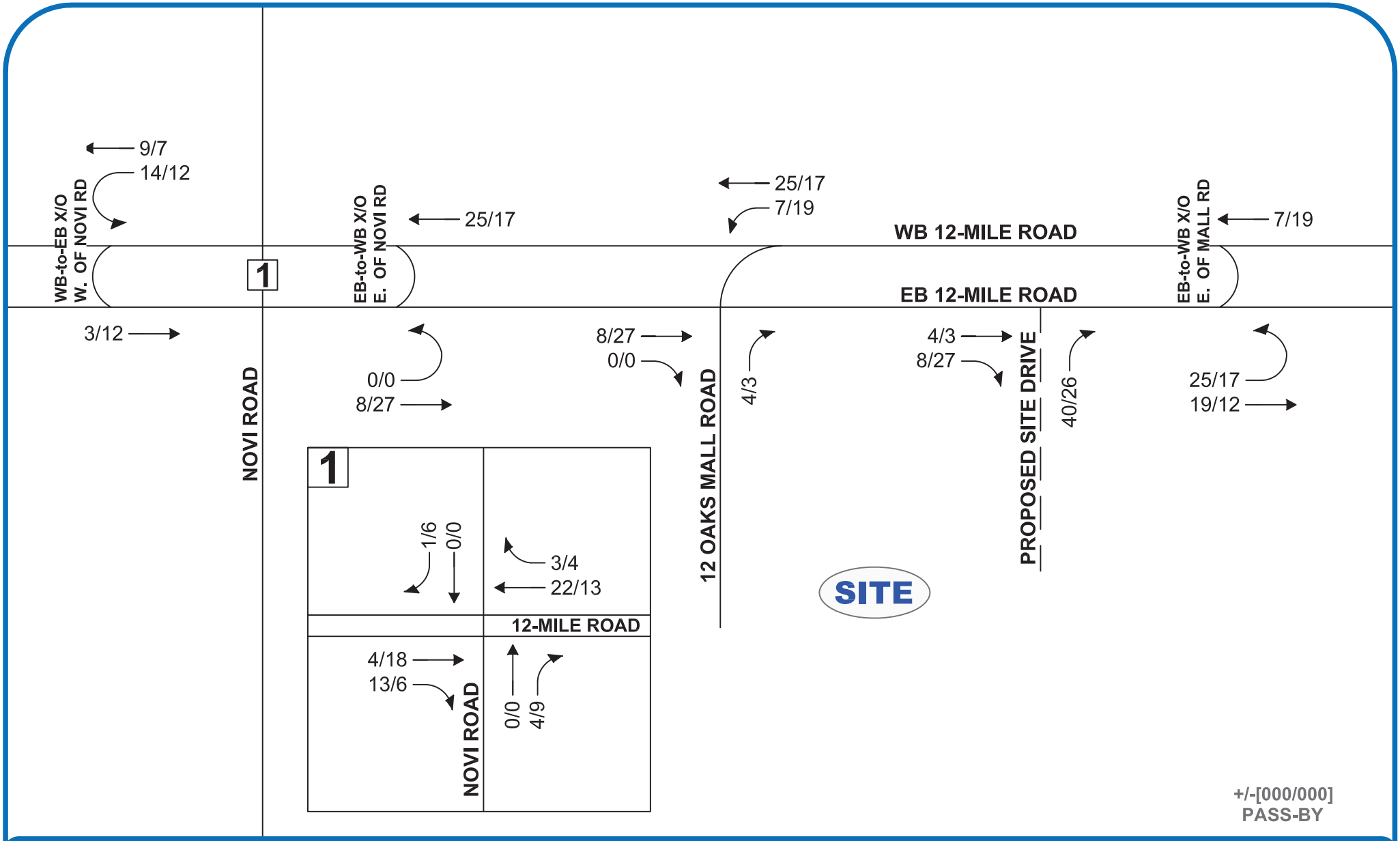


FIGURE 5

SITE-GENERATED TRAFFIC VOLUMES

GRIFFIN TWELVE OAKS APARTMENTS - NOVI, MI

LEGEND

ROADS

PROPOSED ROADS

TRAFFIC VOLUMES (AM/PM)

NORTH

SCALE: NOT TO SCALE

Table 1
Griffin Novi II Trip Generation

Land Use	ITE Code	Amoun	Units	Average Daily Traffic	AM Peak Hour (vph)			PM Peak Hour (vph)		
					In	Out	Total	In	Out	Total
Multi-Family Housing (Mid-Rise)	221	102	DU	440	8	25	33	24	16	40

Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	478	0	0	271	0
Future Vol, veh/h	0	478	0	0	271	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	1082	894	336	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	92	92	88	88
Heavy Vehicles, %	4	4	2	2	2	2
Mvmt Flow	0	531	0	0	308	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	212	-
Stage 1	-	-	0	-
Stage 2	-	-	212	-
Critical Hdwy	-	-	5.74	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.04	-
Follow-up Hdwy	-	-	3.82	-
Pot Cap-1 Maneuver	0	-	751	0
Stage 1	0	-	-	0
Stage 2	0	-	737	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	751	-
Mov Cap-2 Maneuver	-	-	751	-
Stage 1	-	-	-	-
Stage 2	-	-	737	-

Approach	EB	SB
HCM Control Delay, s	0	13.1
HCM LOS		B

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	751
HCM Lane V/C Ratio	-	0.41
HCM Control Delay (s)	-	13.1
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	734	66	0	52	0	0	115	92
Future Volume (vph)	0	0	0	0	734	66	0	52	0	0	115	92
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.0	6.0		6.4			10.4	10.4
Lane Util. Factor					0.91	1.00		1.00			1.00	1.00
Frpb, ped/bikes					1.00	0.98		1.00			1.00	1.00
Flpb, ped/bikes					1.00	1.00		1.00			1.00	1.00
Frt					1.00	0.85		1.00			1.00	0.85
Flt Protected					1.00	1.00		1.00			1.00	1.00
Satd. Flow (prot)					5301	1616		1905			1923	1635
Flt Permitted					1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)					5301	1616		1905			1923	1635
Peak-hour factor, PHF	0.90	0.90	0.90	0.73	0.73	0.73	0.93	0.93	0.93	0.88	0.88	0.88
Adj. Flow (vph)	0	0	0	0	1005	90	0	56	0	0	131	105
RTOR Reduction (vph)	0	0	0	0	0	44	0	0	0	0	0	53
Lane Group Flow (vph)	0	0	0	0	1005	47	0	56	0	0	131	52
Confl. Peds. (#/hr)	1					1			1	1		
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	5%	5%	5%	4%	4%	4%
Turn Type					NA	Perm		NA			NA	Perm
Protected Phases					6			8			4	
Permitted Phases						6						4
Actuated Green, G (s)					62.0	62.0		45.6			41.6	41.6
Effective Green, g (s)					62.0	62.0		45.6			41.6	41.6
Actuated g/C Ratio					0.52	0.52		0.38			0.35	0.35
Clearance Time (s)					6.0	6.0		6.4			10.4	10.4
Vehicle Extension (s)					3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)					2738	834		723			666	566
v/s Ratio Prot					c0.19			0.03			c0.07	
v/s Ratio Perm						0.03						0.03
v/c Ratio					0.37	0.06		0.08			0.20	0.09
Uniform Delay, d1					17.3	14.4		23.8			27.5	26.5
Progression Factor					1.17	2.49		0.00			1.00	1.00
Incremental Delay, d2					0.4	0.1		0.0			0.1	0.1
Delay (s)					20.6	36.1		0.1			27.6	26.5
Level of Service					C	D		A			C	C
Approach Delay (s)		0.0			21.9			0.1			27.1	
Approach LOS		A			C			A			C	

Intersection Summary			
HCM 2000 Control Delay	21.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	33.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	468	281	0	0	0	0	52	152	0	115	0
Future Volume (vph)	0	468	281	0	0	0	0	52	152	0	115	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					10.4	10.4		6.4	
Lane Util. Factor		0.91	1.00					1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00					1.00	0.99		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		5250	1635					1905	1598		1923	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		5250	1635					1905	1598		1923	
Peak-hour factor, PHF	0.90	0.90	0.90	0.73	0.73	0.73	0.93	0.93	0.93	0.88	0.88	0.88
Adj. Flow (vph)	0	520	312	0	0	0	0	56	163	0	131	0
RTOR Reduction (vph)	0	0	151	0	0	0	0	0	106	0	0	0
Lane Group Flow (vph)	0	520	161	0	0	0	0	56	57	0	131	0
Confl. Peds. (#/hr)	1					1			1	1		
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	5%	5%	5%	4%	4%	4%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		62.0	62.0					41.6	41.6		45.6	
Effective Green, g (s)		62.0	62.0					41.6	41.6		45.6	
Actuated g/C Ratio		0.52	0.52					0.35	0.35		0.38	
Clearance Time (s)		6.0	6.0					10.4	10.4		6.4	
Vehicle Extension (s)		3.0	3.0					3.0	3.0		3.0	
Lane Grp Cap (vph)		2712	844					660	553		730	
v/s Ratio Prot		c0.10						0.03			c0.07	
v/s Ratio Perm			0.10						0.04			
v/c Ratio		0.19	0.19					0.08	0.10		0.18	
Uniform Delay, d1		15.6	15.6					26.4	26.6		24.8	
Progression Factor		0.82	0.51					1.00	1.00		0.00	
Incremental Delay, d2		0.2	0.5					0.1	0.1		0.1	
Delay (s)		12.9	8.5					26.4	26.6		0.1	
Level of Service		B	A					C	C		A	
Approach Delay (s)		11.2			0.0			26.6			0.1	
Approach LOS		B			A			C			A	

Intersection Summary			
HCM 2000 Control Delay	12.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	33.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	620	0	0	0	0
Future Vol, veh/h	0	620	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	1080	541	184	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	92	92	92	92
Heavy Vehicles, %	6	6	2	2	2	2
Mvmt Flow	0	729	0	0	0	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	292	-
Stage 1	-	-	0	-
Stage 2	-	-	292	-
Critical Hdwy	-	-	5.74	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.04	-
Follow-up Hdwy	-	-	3.82	-
Pot Cap-1 Maneuver	0	-	688	0
Stage 1	0	-	-	0
Stage 2	0	-	671	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	688	-
Mov Cap-2 Maneuver	-	-	688	-
Stage 1	-	-	-	-
Stage 2	-	-	671	-

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

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

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	765	35	0
Future Vol, veh/h	0	0	0	765	35	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	3	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	90	73	80	80
Heavy Vehicles, %	2	2	3	3	3	3
Mvmt Flow	0	0	0	1048	44	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	419	-
Stage 1	-	-	0	-
Stage 2	-	-	419	-
Critical Hdwy	-	-	5.76	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.06	-
Follow-up Hdwy	-	-	3.83	-
Pot Cap-1 Maneuver	0	-	596	0
Stage 1	0	-	-	0
Stage 2	0	-	575	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	596	-
Mov Cap-2 Maneuver	-	-	596	-
Stage 1	-	-	-	-
Stage 2	-	-	575	-

Approach	WB	NB
HCM Control Delay, s	0	11.5
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	596	-
HCM Lane V/C Ratio	0.073	-
HCM Control Delay (s)	11.5	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.2	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	585	0	0	14	0
Future Vol, veh/h	0	585	0	0	14	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	92	92	60	60
Heavy Vehicles, %	6	6	2	2	0	0
Mvmt Flow	0	688	0	0	23	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	275	-
Stage 1	-	-	0	-
Stage 2	-	-	275	-
Critical Hdwy	-	-	5.7	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6	-
Follow-up Hdwy	-	-	3.8	-
Pot Cap-1 Maneuver	0	-	706	0
Stage 1	0	-	-	0
Stage 2	0	-	690	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	706	-
Mov Cap-2 Maneuver	-	-	706	-
Stage 1	-	-	-	-
Stage 2	-	-	690	-

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

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	706
HCM Lane V/C Ratio	-	0.033
HCM Control Delay (s)	-	10.3
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	591	0	0	0	0	0	162	188
Future Volume (vph)	0	0	0	0	591	0	0	0	0	0	162	188
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					5.9						9.0	9.0
Lane Util. Factor					0.91						0.95	0.88
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					5250						3762	2962
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					5250						3762	2962
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.92	0.92	0.92	0.87	0.87	0.87
Adj. Flow (vph)	0	0	0	0	649	0	0	0	0	0	186	216
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	137
Lane Group Flow (vph)	0	0	0	0	649	0	0	0	0	0	186	79
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	2%	2%	2%	1%	1%	1%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					61.1						44.0	44.0
Effective Green, g (s)					61.1						44.0	44.0
Actuated g/C Ratio					0.51						0.37	0.37
Clearance Time (s)					5.9						9.0	9.0
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					2673						1379	1086
v/s Ratio Prot					c0.12						c0.05	
v/s Ratio Perm												0.03
v/c Ratio					0.24						0.13	0.07
Uniform Delay, d1					16.5						25.3	24.7
Progression Factor					1.00						1.00	1.00
Incremental Delay, d2					0.2						0.0	0.0
Delay (s)					16.7						25.4	24.8
Level of Service					B						C	C
Approach Delay (s)		0.0			16.7			0.0			25.0	
Approach LOS		A			B			A			C	

Intersection Summary			
HCM 2000 Control Delay	19.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.20		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.9
Intersection Capacity Utilization	29.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	403	0	0	162	0
Future Volume (vph)	0	403	0	0	162	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.9			6.0	
Lane Util. Factor		0.91			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		5151			3650	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		5151			3650	
Peak-hour factor, PHF	0.85	0.85	0.92	0.92	0.87	0.87
Adj. Flow (vph)	0	474	0	0	186	0
RTOR Reduction (vph)	0	0	0	0	113	0
Lane Group Flow (vph)	0	474	0	0	73	0
Heavy Vehicles (%)	6%	6%	2%	2%	1%	1%
Turn Type		NA			Prot	
Protected Phases		2			8	
Permitted Phases						
Actuated Green, G (s)		61.1			47.0	
Effective Green, g (s)		61.1			47.0	
Actuated g/C Ratio		0.51			0.39	
Clearance Time (s)		5.9			6.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		2622			1429	
v/s Ratio Prot		c0.09			c0.02	
v/s Ratio Perm						
v/c Ratio		0.18			0.05	
Uniform Delay, d1		15.9			22.7	
Progression Factor		1.12			1.00	
Incremental Delay, d2		0.2			0.0	
Delay (s)		18.0			22.7	
Level of Service		B			C	
Approach Delay (s)		18.0	0.0		22.7	
Approach LOS		B	A		C	

Intersection Summary			
HCM 2000 Control Delay	19.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.13		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.9
Intersection Capacity Utilization	29.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	599	0	0	0	0	0
Future Vol, veh/h	599	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	92	92	92	92
Heavy Vehicles, %	6	6	2	2	2	2
Mvmt Flow	705	0	0	0	0	0

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	353
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	7.14
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.92
Pot Cap-1 Maneuver	-	-		0	549
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	549
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	0
HCM LOS		A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	0	0	0	204	0	0	396	0
Future Vol, veh/h	0	0	0	0	0	0	0	204	0	0	396	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	500	-	-	475	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	93	93	93	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	5	5	5	2	2	2
Mvmt Flow	0	0	0	0	0	0	0	219	0	0	430	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	649	649	430	649	649	219	430	0	0	219	0	0
Stage 1	430	430	-	219	219	-	-	-	-	-	-	-
Stage 2	219	219	-	430	430	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.15	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.245	-	-	2.218	-	-
Pot Cap-1 Maneuver	383	389	625	383	389	821	1114	-	-	1350	-	-
Stage 1	603	583	-	783	722	-	-	-	-	-	-	-
Stage 2	783	722	-	603	583	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	383	389	625	383	389	821	1114	-	-	1350	-	-
Mov Cap-2 Maneuver	383	389	-	383	389	-	-	-	-	-	-	-
Stage 1	603	583	-	783	722	-	-	-	-	-	-	-
Stage 2	783	722	-	603	583	-	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1114	-	-	-	-	1350	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-	0	-	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	204	0	0	396
Future Vol, veh/h	0	0	204	0	0	396
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	-	-	-	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	93	93	92	92
Heavy Vehicles, %	2	2	5	5	2	2
Mvmt Flow	0	0	219	0	0	430

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	649	219	0	0	219	0
Stage 1	219	-	-	-	-	-
Stage 2	430	-	-	-	-	-
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	434	821	-	-	1350	-
Stage 1	817	-	-	-	-	-
Stage 2	656	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	434	821	-	-	1350	-
Mov Cap-2 Maneuver	524	-	-	-	-	-
Stage 1	817	-	-	-	-	-
Stage 2	656	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	1350	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	840	0	0	250	0
Future Vol, veh/h	0	840	0	0	250	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	1082	894	336	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	92	92	93	93
Heavy Vehicles, %	2	2	2	2	1	1
Mvmt Flow	0	1000	0	0	269	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	400	-
Stage 1	-	-	0	-
Stage 2	-	-	400	-
Critical Hdwy	-	-	5.72	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.02	-
Follow-up Hdwy	-	-	3.81	-
Pot Cap-1 Maneuver	0	-	*762	0
Stage 1	0	-	-	0
Stage 2	0	-	*762	0
Platoon blocked, %		-	1	
Mov Cap-1 Maneuver	-	-	*762	-
Mov Cap-2 Maneuver	-	-	*762	-
Stage 1	-	-	-	-
Stage 2	-	-	*762	-

Approach	EB	SB
HCM Control Delay, s	0	12.3
HCM LOS		B

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	762
HCM Lane V/C Ratio	-	0.353
HCM Control Delay (s)	-	12.3
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	1.6

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1769	339	0	158	0	0	150	56
Future Volume (vph)	0	0	0	0	1769	339	0	158	0	0	150	56
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.0	6.0		6.4			10.4	10.4
Lane Util. Factor					0.91	1.00		1.00			1.00	1.00
Frpb, ped/bikes					1.00	1.00		1.00			1.00	0.99
Flpb, ped/bikes					1.00	1.00		1.00			1.00	1.00
Frt					1.00	0.85		1.00			1.00	0.85
Flt Protected					1.00	1.00		1.00			1.00	1.00
Satd. Flow (prot)					5353	1667		1980			1869	1567
Flt Permitted					1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)					5353	1667		1980			1869	1567
Peak-hour factor, PHF	0.93	0.93	0.93	0.74	0.74	0.74	0.91	0.91	0.91	0.72	0.72	0.72
Adj. Flow (vph)	0	0	0	0	2391	458	0	174	0	0	208	78
RTOR Reduction (vph)	0	0	0	0	0	172	0	0	0	0	0	19
Lane Group Flow (vph)	0	0	0	0	2391	286	0	174	0	0	208	59
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)									1			2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	7%	7%	7%
Turn Type					NA	Perm		NA			NA	Perm
Protected Phases					6			8			4	
Permitted Phases						6						4
Actuated Green, G (s)					68.0	68.0		39.6			35.6	35.6
Effective Green, g (s)					68.0	68.0		39.6			35.6	35.6
Actuated g/C Ratio					0.57	0.57		0.33			0.30	0.30
Clearance Time (s)					6.0	6.0		6.4			10.4	10.4
Vehicle Extension (s)					3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)					3033	944		653			554	464
v/s Ratio Prot					c0.45			0.09			c0.11	
v/s Ratio Perm						0.17						0.04
v/c Ratio					0.79	0.30		0.27			0.38	0.13
Uniform Delay, d1					20.4	13.6		29.5			33.4	30.8
Progression Factor					0.98	2.18		0.00			1.00	1.00
Incremental Delay, d2					1.7	0.6		0.2			0.4	0.1
Delay (s)					21.7	30.3		0.2			33.8	31.0
Level of Service					C	C		A			C	C
Approach Delay (s)		0.0			23.1			0.2			33.0	
Approach LOS		A			C			A			C	

Intersection Summary			
HCM 2000 Control Delay	22.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	53.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	894	196	0	0	0	0	158	337	0	150	0
Future Volume (vph)	0	894	196	0	0	0	0	158	337	0	150	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					10.4	10.4		6.4	
Lane Util. Factor		0.91	1.00					1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00					1.00	0.99		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		5353	1667					1980	1660		1869	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		5353	1667					1980	1660		1869	
Peak-hour factor, PHF	0.84	0.84	0.84	0.92	0.92	0.92	0.91	0.91	0.91	0.72	0.72	0.72
Adj. Flow (vph)	0	1064	233	0	0	0	0	174	370	0	208	0
RTOR Reduction (vph)	0	0	101	0	0	0	0	0	63	0	0	0
Lane Group Flow (vph)	0	1064	132	0	0	0	0	174	307	0	208	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)									1			2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	7%	7%	7%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		68.0	68.0					35.6	35.6		39.6	
Effective Green, g (s)		68.0	68.0					35.6	35.6		39.6	
Actuated g/C Ratio		0.57	0.57					0.30	0.30		0.33	
Clearance Time (s)		6.0	6.0					10.4	10.4		6.4	
Vehicle Extension (s)		3.0	3.0					3.0	3.0		3.0	
Lane Grp Cap (vph)		3033	944					587	492		616	
v/s Ratio Prot		c0.20						0.09			0.11	
v/s Ratio Perm			0.08						c0.18			
v/c Ratio		0.35	0.14					0.30	0.62		0.34	
Uniform Delay, d1		14.1	12.2					32.5	36.4		30.3	
Progression Factor		0.76	0.45					1.00	1.00		0.00	
Incremental Delay, d2		0.3	0.3					0.3	2.5		0.3	
Delay (s)		11.0	5.8					32.8	38.9		0.3	
Level of Service		B	A					C	D		A	
Approach Delay (s)		10.0			0.0			36.9			0.3	
Approach LOS		B			A			D			A	

Intersection Summary			
HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	53.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	1231	0	0	3	0
Future Vol, veh/h	0	1231	0	0	3	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	1080	541	184	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	88	92	92	60	60
Heavy Vehicles, %	2	1	2	2	0	0
Mvmt Flow	0	1399	0	0	5	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	560	-
Stage 1	-	-	0	-
Stage 2	-	-	560	-
Critical Hdwy	-	-	5.7	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6	-
Follow-up Hdwy	-	-	3.8	-
Pot Cap-1 Maneuver	0	-	*706	0
Stage 1	0	-	-	0
Stage 2	0	-	*706	0
Platoon blocked, %		-	1	
Mov Cap-1 Maneuver	-	-	*706	-
Mov Cap-2 Maneuver	-	-	*706	-
Stage 1	-	-	-	-
Stage 2	-	-	*706	-

Approach	EB	SB
HCM Control Delay, s	0	10.1
HCM LOS		B

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	706
HCM Lane V/C Ratio	-	0.007
HCM Control Delay (s)	-	10.1
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0

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

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	2040	71	0
Future Vol, veh/h	0	0	0	2040	71	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	3	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	93	74	63	63
Heavy Vehicles, %	2	2	2	2	1	1
Mvmt Flow	0	0	0	2757	113	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	1103	-
Stage 1	-	-	0	-
Stage 2	-	-	1103	-
Critical Hdwy	-	-	5.72	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.02	-
Follow-up Hdwy	-	-	3.81	-
Pot Cap-1 Maneuver	0	-	278	0
Stage 1	0	-	-	0
Stage 2	0	-	253	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	278	-
Mov Cap-2 Maneuver	-	-	278	-
Stage 1	-	-	-	-
Stage 2	-	-	253	-

Approach	WB	NB
HCM Control Delay, s	0	26.5
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	278	-
HCM Lane V/C Ratio	0.405	-
HCM Control Delay (s)	26.5	-
HCM Lane LOS	D	-
HCM 95th %tile Q(veh)	1.9	-

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	1163	0	0	22	0
Future Vol, veh/h	0	1163	0	0	22	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	92	92	92	92
Heavy Vehicles, %	1	1	2	2	14	14
Mvmt Flow	0	1322	0	0	24	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	529	-
Stage 1	-	-	0	-
Stage 2	-	-	529	-
Critical Hdwy	-	-	5.98	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.28	-
Follow-up Hdwy	-	-	3.94	-
Pot Cap-1 Maneuver	0	-	500	0
Stage 1	0	-	-	0
Stage 2	0	-	478	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	500	-
Mov Cap-2 Maneuver	-	-	500	-
Stage 1	-	-	-	-
Stage 2	-	-	478	-

Approach	EB	SB
HCM Control Delay, s	0	12.6
HCM LOS		B

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	500
HCM Lane V/C Ratio	-	0.048
HCM Control Delay (s)	-	12.6
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1549	0	0	0	0	0	165	513
Future Volume (vph)	0	0	0	0	1549	0	0	0	0	0	165	513
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					5.9						9.0	9.0
Lane Util. Factor					0.91						0.95	0.88
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					5353						3725	2933
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					5353						3725	2933
Peak-hour factor, PHF	0.92	0.92	0.92	0.84	0.84	0.84	0.92	0.92	0.92	0.68	0.68	0.68
Adj. Flow (vph)	0	0	0	0	1844	0	0	0	0	0	243	754
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	16
Lane Group Flow (vph)	0	0	0	0	1844	0	0	0	0	0	243	738
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					59.1						46.0	46.0
Effective Green, g (s)					59.1						46.0	46.0
Actuated g/C Ratio					0.49						0.38	0.38
Clearance Time (s)					5.9						9.0	9.0
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					2636						1427	1124
v/s Ratio Prot					c0.34						0.07	
v/s Ratio Perm												c0.25
v/c Ratio					0.70						0.17	0.66
Uniform Delay, d1					23.6						24.4	30.5
Progression Factor					1.00						1.00	1.00
Incremental Delay, d2					1.6						0.1	1.4
Delay (s)					25.1						24.5	31.9
Level of Service					C						C	C
Approach Delay (s)		0.0			25.1			0.0			30.1	
Approach LOS		A			C			A			C	

Intersection Summary			
HCM 2000 Control Delay	26.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.9
Intersection Capacity Utilization	57.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	678	0	0	165	0
Future Volume (vph)	0	678	0	0	165	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.9			6.0	
Lane Util. Factor		0.91			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		5406			3614	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		5406			3614	
Peak-hour factor, PHF	0.88	0.88	0.92	0.92	0.68	0.68
Adj. Flow (vph)	0	770	0	0	243	0
RTOR Reduction (vph)	0	0	0	0	144	0
Lane Group Flow (vph)	0	770	0	0	99	0
Heavy Vehicles (%)	1%	1%	2%	2%	2%	2%
Turn Type		NA			Prot	
Protected Phases		2			8	
Permitted Phases						
Actuated Green, G (s)		59.1			49.0	
Effective Green, g (s)		59.1			49.0	
Actuated g/C Ratio		0.49			0.41	
Clearance Time (s)		5.9			6.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		2662			1475	
v/s Ratio Prot		c0.14			c0.03	
v/s Ratio Perm						
v/c Ratio		0.29			0.07	
Uniform Delay, d1		18.0			21.6	
Progression Factor		1.03			0.04	
Incremental Delay, d2		0.3			0.0	
Delay (s)		18.8			0.8	
Level of Service		B			A	
Approach Delay (s)		18.8	0.0		0.8	
Approach LOS		B	A		A	

Intersection Summary			
HCM 2000 Control Delay	14.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.9
Intersection Capacity Utilization	57.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1185	0	0	0	0	0
Future Vol, veh/h	1185	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	92	92	92	92
Heavy Vehicles, %	1	1	2	2	2	2
Mvmt Flow	1347	0	0	0	0	0

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	674
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	7.14
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.92
Pot Cap-1 Maneuver	-	-		0	341
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	341
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	0
HCM LOS		A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	0	0	0	495	0	0	346	0
Future Vol, veh/h	0	0	0	0	0	0	0	495	0	0	346	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	500	-	-	475	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	91	91	91	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	1	1	1	2	2	2
Mvmt Flow	0	0	0	0	0	0	0	544	0	0	376	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	920	920	376	920	920	544	376	0	0	544	0	0
Stage 1	376	376	-	544	544	-	-	-	-	-	-	-
Stage 2	544	544	-	376	376	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.11	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.209	-	-	2.218	-	-
Pot Cap-1 Maneuver	251	271	670	251	271	539	1188	-	-	1025	-	-
Stage 1	645	616	-	523	519	-	-	-	-	-	-	-
Stage 2	523	519	-	645	616	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	251	271	670	251	271	539	1188	-	-	1025	-	-
Mov Cap-2 Maneuver	251	271	-	251	271	-	-	-	-	-	-	-
Stage 1	645	616	-	523	519	-	-	-	-	-	-	-
Stage 2	523	519	-	645	616	-	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1188	-	-	-	-	1025	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-	0	-	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	495	0	0	346
Future Vol, veh/h	0	0	495	0	0	346
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	-	-	-	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	91	91	92	92
Heavy Vehicles, %	2	2	1	1	2	2
Mvmt Flow	0	0	544	0	0	376

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	920	544	0	0	544	0
Stage 1	544	-	-	-	-	-
Stage 2	376	-	-	-	-	-
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	301	539	-	-	1025	-
Stage 1	582	-	-	-	-	-
Stage 2	694	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	301	539	-	-	1025	-
Mov Cap-2 Maneuver	424	-	-	-	-	-
Stage 1	582	-	-	-	-	-
Stage 2	694	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	1025	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection: 10: EB 12-Mile Road & WB-to-EB XO, W. of Meadowbrook

Movement	SB
Directions Served	L
Maximum Queue (ft)	87
Average Queue (ft)	58
95th Queue (ft)	82
Link Distance (ft)	23
Upstream Blk Time (%)	27
Queuing Penalty (veh)	75
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 11: WB-to-EB XO, W. of Meadowbrook & WB 12-Mile Road

Movement	WB	WB
Directions Served	L	T
Maximum Queue (ft)	121	8
Average Queue (ft)	25	0
95th Queue (ft)	79	6
Link Distance (ft)		651
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	250	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 20: Meadowbrook Road & WB 12-Mile Road

Movement	WB	WB	WB	WB	NB	SB	SB
Directions Served	T	T	T	R	T	T	R
Maximum Queue (ft)	163	157	128	55	4	170	56
Average Queue (ft)	91	73	44	20	0	69	24
95th Queue (ft)	154	134	103	49	4	137	45
Link Distance (ft)	148	148	148	148	56	837	
Upstream Blk Time (%)	1	0	0				
Queuing Penalty (veh)	3	1	0				
Storage Bay Dist (ft)							275
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 21: Meadowbrook Road & EB 12-Mile Road

Movement	EB	EB	EB	EB	NB	NB	SB
Directions Served	T	T	T	R	T	R	T
Maximum Queue (ft)	76	64	94	122	86	84	5
Average Queue (ft)	35	21	29	41	32	36	0
95th Queue (ft)	67	53	72	85	74	66	4
Link Distance (ft)	634	634	634		878		56
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)				350		250	
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 30: EB 12-Mile Road & WB-to-EB XO, E. of Meadowbrook

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 31: WB-to-EB XO, E. of Meadowbrook & WB 12-Mile Road

Movement	WB	WB
Directions Served	T	T
Maximum Queue (ft)	64	27
Average Queue (ft)	4	2
95th Queue (ft)	31	15
Link Distance (ft)	506	506
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 40: EB-to-WB XO, E. of Meadowbrook & WB 12-Mile Road

Movement	NB
Directions Served	L
Maximum Queue (ft)	52
Average Queue (ft)	20
95th Queue (ft)	46
Link Distance (ft)	18
Upstream Blk Time (%)	4
Queuing Penalty (veh)	2
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 41: EB 12-Mile Road & EB-to-WB XO, E. of Meadowbrook

Movement	EB
Directions Served	L
Maximum Queue (ft)	6
Average Queue (ft)	0
95th Queue (ft)	4
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 50: EB 12-Mile Road & WB-to-EB XO, W. of Summit Dr.

Movement	SB
Directions Served	L
Maximum Queue (ft)	31
Average Queue (ft)	10
95th Queue (ft)	32
Link Distance (ft)	23
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 51: WB-to-EB XO, W. of Summit Dr. & WB 12-Mile Road

Movement							
Directions Served							
Maximum Queue (ft)							
Average Queue (ft)							
95th Queue (ft)							
Link Distance (ft)							
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 60: SB M-5 Exit-Ramp & WB 12-Mile Road

Movement	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	T	T	T	R	R
Maximum Queue (ft)	171	116	56	126	149	78	40
Average Queue (ft)	76	22	11	30	87	43	15
95th Queue (ft)	142	73	40	78	138	69	41
Link Distance (ft)	1226	1226	1226			958	
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)				250	250		250
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 61: EB 12-Mile Road & SB M-5 Exit-Ramp

Movement	EB	EB	EB	SB
Directions Served	T	T	T	L
Maximum Queue (ft)	87	86	94	8
Average Queue (ft)	33	28	29	0
95th Queue (ft)	67	67	73	5
Link Distance (ft)	141	141	141	22
Upstream Blk Time (%)				1
Queuing Penalty (veh)				1
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 70: Site Drive #1 & EB 12-Mile Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 80: Meadowbrook Road & Elm Creek Drive/Site Drive #2

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 90: Meadowbrook Road & Site Drive #3

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 81

Intersection: 10: EB 12-Mile Road & WB-to-EB XO, W. of Meadowbrook

Movement	SB
Directions Served	L
Maximum Queue (ft)	74
Average Queue (ft)	59
95th Queue (ft)	78
Link Distance (ft)	23
Upstream Blk Time (%)	32
Queuing Penalty (veh)	80
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 11: WB-to-EB XO, W. of Meadowbrook & WB 12-Mile Road

Movement	WB
Directions Served	L
Maximum Queue (ft)	121
Average Queue (ft)	28
95th Queue (ft)	83
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: Meadowbrook Road & WB 12-Mile Road

Movement	WB	WB	WB	WB	NB	SB	SB
Directions Served	T	T	T	R	T	T	R
Maximum Queue (ft)	179	186	175	143	8	208	106
Average Queue (ft)	142	146	139	69	0	85	23
95th Queue (ft)	194	201	195	125	4	162	64
Link Distance (ft)	148	148	148	148	56	837	
Upstream Blk Time (%)	7	9	7	0			
Queuing Penalty (veh)	39	47	38	1			
Storage Bay Dist (ft)							275
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 21: Meadowbrook Road & EB 12-Mile Road

Movement	EB	EB	EB	EB	NB	NB	SB
Directions Served	T	T	T	R	T	R	T
Maximum Queue (ft)	133	136	199	84	168	199	5
Average Queue (ft)	60	58	83	36	83	82	0
95th Queue (ft)	113	118	163	71	152	154	3
Link Distance (ft)	634	634	634		878		56
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)				350		250	
Storage Blk Time (%)						0	
Queuing Penalty (veh)						0	

Intersection: 30: EB 12-Mile Road & WB-to-EB XO, E. of Meadowbrook

Movement	SB
Directions Served	L
Maximum Queue (ft)	24
Average Queue (ft)	2
95th Queue (ft)	16
Link Distance (ft)	19
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 31: WB-to-EB XO, E. of Meadowbrook & WB 12-Mile Road

Movement	WB	WB	WB	WB
Directions Served	T	T	T	T
Maximum Queue (ft)	226	219	210	66
Average Queue (ft)	50	57	45	3
95th Queue (ft)	144	159	141	46
Link Distance (ft)	506	506	506	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				150
Storage Blk Time (%)	0		0	
Queuing Penalty (veh)	0		3	

Intersection: 40: EB-to-WB XO, E. of Meadowbrook & WB 12-Mile Road

Movement	NB
Directions Served	L
Maximum Queue (ft)	63
Average Queue (ft)	37
95th Queue (ft)	63
Link Distance (ft)	18
Upstream Blk Time (%)	29
Queuing Penalty (veh)	24
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 41: EB 12-Mile Road & EB-to-WB XO, E. of Meadowbrook

Movement	EB
Directions Served	L
Maximum Queue (ft)	63
Average Queue (ft)	6
95th Queue (ft)	32
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 50: EB 12-Mile Road & WB-to-EB XO, W. of Summit Dr.

Movement	SB
Directions Served	L
Maximum Queue (ft)	59
Average Queue (ft)	16
95th Queue (ft)	45
Link Distance (ft)	23
Upstream Blk Time (%)	3
Queuing Penalty (veh)	1
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 51: WB-to-EB XO, W. of Summit Dr. & WB 12-Mile Road

Movement	WB
Directions Served	L
Maximum Queue (ft)	8
Average Queue (ft)	0
95th Queue (ft)	6
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 60: SB M-5 Exit-Ramp & WB 12-Mile Road

Movement	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	T	T	T	R	R
Maximum Queue (ft)	341	343	289	156	218	308	242
Average Queue (ft)	161	126	93	32	95	133	91
95th Queue (ft)	275	249	198	99	171	238	197
Link Distance (ft)	1226	1226	1226			958	
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)				250	250		250
Storage Blk Time (%)					0	1	0
Queuing Penalty (veh)					0	5	0

Intersection: 61: EB 12-Mile Road & SB M-5 Exit-Ramp

Movement	EB	EB	EB	SB
Directions Served	T	T	T	L
Maximum Queue (ft)	119	128	145	19
Average Queue (ft)	45	45	55	1
95th Queue (ft)	95	103	116	7
Link Distance (ft)	141	141	141	22
Upstream Blk Time (%)	0	0	0	2
Queuing Penalty (veh)	0	0	0	2
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 70: Site Drive #1 & EB 12-Mile Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 80: Meadowbrook Road & Elm Creek Drive/Site Drive #2

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 90: Meadowbrook Road & Site Drive #3

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 241

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	526	0	0	287	0
Future Vol, veh/h	0	526	0	0	287	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	1082	894	336	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	92	92	88	88
Heavy Vehicles, %	4	4	2	2	2	2
Mvmt Flow	0	584	0	0	326	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	234	-
Stage 1	-	-	0	-
Stage 2	-	-	234	-
Critical Hdwy	-	-	5.74	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.04	-
Follow-up Hdwy	-	-	3.82	-
Pot Cap-1 Maneuver	0	-	733	0
Stage 1	0	-	-	0
Stage 2	0	-	719	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	733	-
Mov Cap-2 Maneuver	-	-	733	-
Stage 1	-	-	-	-
Stage 2	-	-	719	-

Approach	EB	SB
HCM Control Delay, s	0	13.8
HCM LOS		B

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	733
HCM Lane V/C Ratio	-	0.445
HCM Control Delay (s)	-	13.8
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	784	68	0	56	0	0	119	95
Future Volume (vph)	0	0	0	0	784	68	0	56	0	0	119	95
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.0	6.0		6.4			10.4	10.4
Lane Util. Factor					0.91	1.00		1.00			1.00	1.00
Frpb, ped/bikes					1.00	0.98		1.00			1.00	1.00
Flpb, ped/bikes					1.00	1.00		1.00			1.00	1.00
Frt					1.00	0.85		1.00			1.00	0.85
Flt Protected					1.00	1.00		1.00			1.00	1.00
Satd. Flow (prot)					5301	1616		1905			1923	1635
Flt Permitted					1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)					5301	1616		1905			1923	1635
Peak-hour factor, PHF	0.90	0.90	0.90	0.73	0.73	0.73	0.93	0.93	0.93	0.88	0.88	0.88
Adj. Flow (vph)	0	0	0	0	1074	93	0	60	0	0	135	108
RTOR Reduction (vph)	0	0	0	0	0	46	0	0	0	0	0	42
Lane Group Flow (vph)	0	0	0	0	1074	47	0	60	0	0	135	66
Confl. Peds. (#/hr)	1					1			1	1		
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	5%	5%	5%	4%	4%	4%
Turn Type					NA	Perm		NA			NA	Perm
Protected Phases					6			8			4	
Permitted Phases						6						4
Actuated Green, G (s)					61.0	61.0		46.6			42.6	42.6
Effective Green, g (s)					61.0	61.0		46.6			42.6	42.6
Actuated g/C Ratio					0.51	0.51		0.39			0.36	0.36
Clearance Time (s)					6.0	6.0		6.4			10.4	10.4
Vehicle Extension (s)					3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)					2694	821		739			682	580
v/s Ratio Prot					c0.20			0.03			c0.07	
v/s Ratio Perm						0.03						0.04
v/c Ratio					0.40	0.06		0.08			0.20	0.11
Uniform Delay, d1					18.2	14.9		23.2			26.8	26.0
Progression Factor					1.15	2.37		0.00			1.00	1.00
Incremental Delay, d2					0.4	0.1		0.0			0.1	0.1
Delay (s)					21.3	35.6		0.1			27.0	26.1
Level of Service					C	D		A			C	C
Approach Delay (s)		0.0			22.4			0.1			26.6	
Approach LOS		A			C			A			C	

Intersection Summary			
HCM 2000 Control Delay	22.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	35.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	504	309	0	0	0	0	56	192	0	119	0
Future Volume (vph)	0	504	309	0	0	0	0	56	192	0	119	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					10.4	10.4		6.4	
Lane Util. Factor		0.91	1.00					1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00					1.00	0.99		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		5250	1635					1905	1598		1923	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		5250	1635					1905	1598		1923	
Peak-hour factor, PHF	0.90	0.90	0.90	0.73	0.73	0.73	0.93	0.93	0.93	0.88	0.88	0.88
Adj. Flow (vph)	0	560	343	0	0	0	0	60	206	0	135	0
RTOR Reduction (vph)	0	0	169	0	0	0	0	0	133	0	0	0
Lane Group Flow (vph)	0	560	174	0	0	0	0	60	73	0	135	0
Confl. Peds. (#/hr)	1					1			1	1		
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	5%	5%	5%	4%	4%	4%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		61.0	61.0					42.6	42.6		46.6	
Effective Green, g (s)		61.0	61.0					42.6	42.6		46.6	
Actuated g/C Ratio		0.51	0.51					0.36	0.36		0.39	
Clearance Time (s)		6.0	6.0					10.4	10.4		6.4	
Vehicle Extension (s)		3.0	3.0					3.0	3.0		3.0	
Lane Grp Cap (vph)		2668	831					676	567		746	
v/s Ratio Prot		c0.11						0.03			c0.07	
v/s Ratio Perm			0.11						0.05			
v/c Ratio		0.21	0.21					0.09	0.13		0.18	
Uniform Delay, d1		16.2	16.2					25.8	26.2		24.1	
Progression Factor		0.82	0.52					1.00	1.00		0.00	
Incremental Delay, d2		0.2	0.6					0.1	0.1		0.1	
Delay (s)		13.5	9.0					25.8	26.3		0.1	
Level of Service		B	A					C	C		A	
Approach Delay (s)		11.8			0.0			26.2			0.1	
Approach LOS		B			A			C			A	

Intersection Summary			
HCM 2000 Control Delay	13.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.20		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	35.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	696	0	0	0	0
Future Vol, veh/h	0	696	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	1080	541	184	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	92	92	92	92
Heavy Vehicles, %	6	6	2	2	2	2
Mvmt Flow	0	819	0	0	0	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	328	-
Stage 1	-	-	0	-
Stage 2	-	-	328	-
Critical Hdwy	-	-	5.74	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.04	-
Follow-up Hdwy	-	-	3.82	-
Pot Cap-1 Maneuver	0	-	661	0
Stage 1	0	-	-	0
Stage 2	0	-	644	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	661	-
Mov Cap-2 Maneuver	-	-	661	-
Stage 1	-	-	-	-
Stage 2	-	-	644	-

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

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

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	805	47	0
Future Vol, veh/h	0	0	0	805	47	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	3	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	90	73	80	80
Heavy Vehicles, %	2	2	3	3	3	3
Mvmt Flow	0	0	0	1103	59	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	441	-
Stage 1	-	-	0	-
Stage 2	-	-	441	-
Critical Hdwy	-	-	5.76	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.06	-
Follow-up Hdwy	-	-	3.83	-
Pot Cap-1 Maneuver	0	-	582	0
Stage 1	0	-	-	0
Stage 2	0	-	561	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	582	-
Mov Cap-2 Maneuver	-	-	582	-
Stage 1	-	-	-	-
Stage 2	-	-	561	-

Approach	WB	NB
HCM Control Delay, s	0	11.9
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	582	-
HCM Lane V/C Ratio	0.101	-
HCM Control Delay (s)	11.9	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.3	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	649	0	0	14	0
Future Vol, veh/h	0	649	0	0	14	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	92	92	60	60
Heavy Vehicles, %	6	6	2	2	0	0
Mvmt Flow	0	764	0	0	23	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	306	-
Stage 1	-	-	0	-
Stage 2	-	-	306	-
Critical Hdwy	-	-	5.7	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6	-
Follow-up Hdwy	-	-	3.8	-
Pot Cap-1 Maneuver	0	-	683	0
Stage 1	0	-	-	0
Stage 2	0	-	666	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	683	-
Mov Cap-2 Maneuver	-	-	683	-
Stage 1	-	-	-	-
Stage 2	-	-	666	-

Approach	EB	SB
HCM Control Delay, s	0	10.5
HCM LOS		B

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	683
HCM Lane V/C Ratio	-	0.034
HCM Control Delay (s)	-	10.5
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	622	0	0	0	0	0	167	197
Future Volume (vph)	0	0	0	0	622	0	0	0	0	0	167	197
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					5.9						9.0	9.0
Lane Util. Factor					0.91						0.95	0.88
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					5250						3762	2962
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					5250						3762	2962
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.92	0.92	0.92	0.87	0.87	0.87
Adj. Flow (vph)	0	0	0	0	684	0	0	0	0	0	192	226
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	143
Lane Group Flow (vph)	0	0	0	0	684	0	0	0	0	0	192	83
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	2%	2%	2%	1%	1%	1%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					61.1						44.0	44.0
Effective Green, g (s)					61.1						44.0	44.0
Actuated g/C Ratio					0.51						0.37	0.37
Clearance Time (s)					5.9						9.0	9.0
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					2673						1379	1086
v/s Ratio Prot					c0.13						c0.05	
v/s Ratio Perm												0.03
v/c Ratio					0.26						0.14	0.08
Uniform Delay, d1					16.6						25.4	24.8
Progression Factor					1.00						1.00	1.00
Incremental Delay, d2					0.2						0.0	0.0
Delay (s)					16.9						25.4	24.8
Level of Service					B						C	C
Approach Delay (s)		0.0			16.9			0.0			25.1	
Approach LOS		A			B			A			C	

Intersection Summary			
HCM 2000 Control Delay	20.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.9
Intersection Capacity Utilization	30.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	447	0	0	167	0
Future Volume (vph)	0	447	0	0	167	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.9			6.0	
Lane Util. Factor		0.91			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		5151			3650	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		5151			3650	
Peak-hour factor, PHF	0.85	0.85	0.92	0.92	0.87	0.87
Adj. Flow (vph)	0	526	0	0	192	0
RTOR Reduction (vph)	0	0	0	0	117	0
Lane Group Flow (vph)	0	526	0	0	75	0
Heavy Vehicles (%)	6%	6%	2%	2%	1%	1%
Turn Type		NA			Prot	
Protected Phases		2			8	
Permitted Phases						
Actuated Green, G (s)		61.1			47.0	
Effective Green, g (s)		61.1			47.0	
Actuated g/C Ratio		0.51			0.39	
Clearance Time (s)		5.9			6.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		2622			1429	
v/s Ratio Prot		c0.10			c0.02	
v/s Ratio Perm						
v/c Ratio		0.20			0.05	
Uniform Delay, d1		16.1			22.7	
Progression Factor		1.12			1.00	
Incremental Delay, d2		0.2			0.0	
Delay (s)		18.3			22.7	
Level of Service		B			C	
Approach Delay (s)		18.3	0.0		22.7	
Approach LOS		B	A		C	

Intersection Summary			
HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.14		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.9
Intersection Capacity Utilization	30.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	663	0	0	0	0	0
Future Vol, veh/h	663	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	92	92	92	92
Heavy Vehicles, %	6	6	2	2	2	2
Mvmt Flow	780	0	0	0	0	0

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	390
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	7.14
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.92
Pot Cap-1 Maneuver	-	-		0	520
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	520
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	0
HCM LOS		A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	36	0	7	0	0	0	2	212	0	0	416	12
Future Vol, veh/h	36	0	7	0	0	0	2	212	0	0	416	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	500	-	-	475	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	93	93	93	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	5	5	5	2	2	2
Mvmt Flow	39	0	8	0	0	0	2	228	0	0	452	13

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	691	691	459	695	697	228	465	0	0	228	0	0
Stage 1	459	459	-	232	232	-	-	-	-	-	-	-
Stage 2	232	232	-	463	465	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.15	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.245	-	-	2.218	-	-
Pot Cap-1 Maneuver	359	368	602	357	365	811	1081	-	-	1340	-	-
Stage 1	582	566	-	771	713	-	-	-	-	-	-	-
Stage 2	771	713	-	579	563	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	359	367	602	352	364	811	1081	-	-	1340	-	-
Mov Cap-2 Maneuver	359	367	-	352	364	-	-	-	-	-	-	-
Stage 1	581	566	-	769	712	-	-	-	-	-	-	-
Stage 2	770	712	-	572	563	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.7	0	0.1	0
HCM LOS	C	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1081	-	-	384	-	1340	-	-
HCM Lane V/C Ratio	0.002	-	-	0.122	-	-	-	-
HCM Control Delay (s)	8.3	-	-	15.7	0	0	-	-
HCM Lane LOS	A	-	-	C	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.4	-	0	-	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	214	0	0	423
Future Vol, veh/h	0	0	214	0	0	423
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	-	-	-	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	93	93	92	92
Heavy Vehicles, %	2	2	5	5	2	2
Mvmt Flow	0	0	230	0	0	460

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	690	230	0	0	230	0
Stage 1	230	-	-	-	-	-
Stage 2	460	-	-	-	-	-
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	411	809	-	-	1338	-
Stage 1	808	-	-	-	-	-
Stage 2	636	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	411	809	-	-	1338	-
Mov Cap-2 Maneuver	506	-	-	-	-	-
Stage 1	808	-	-	-	-	-
Stage 2	636	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	1338	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	890	0	0	287	0
Future Vol, veh/h	0	890	0	0	287	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	1082	894	336	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	92	92	93	93
Heavy Vehicles, %	2	2	2	2	1	1
Mvmt Flow	0	1060	0	0	309	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	424	-
Stage 1	-	-	0	-
Stage 2	-	-	424	-
Critical Hdwy	-	-	5.72	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.02	-
Follow-up Hdwy	-	-	3.81	-
Pot Cap-1 Maneuver	0	-	*739	0
Stage 1	0	-	-	0
Stage 2	0	-	*739	0
Platoon blocked, %		-	1	
Mov Cap-1 Maneuver	-	-	*739	-
Mov Cap-2 Maneuver	-	-	*739	-
Stage 1	-	-	-	-
Stage 2	-	-	*739	-

Approach	EB	SB
HCM Control Delay, s	0	13.3
HCM LOS		B

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	739
HCM Lane V/C Ratio	-	0.418
HCM Control Delay (s)	-	13.3
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	2.1

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1885	349	0	164	0	0	157	58
Future Volume (vph)	0	0	0	0	1885	349	0	164	0	0	157	58
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.0	6.0		6.4			10.4	10.4
Lane Util. Factor					0.91	1.00		1.00			1.00	1.00
Frpb, ped/bikes					1.00	1.00		1.00			1.00	0.99
Flpb, ped/bikes					1.00	1.00		1.00			1.00	1.00
Frt					1.00	0.85		1.00			1.00	0.85
Flt Protected					1.00	1.00		1.00			1.00	1.00
Satd. Flow (prot)					5353	1667		1980			1869	1567
Flt Permitted					1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)					5353	1667		1980			1869	1567
Peak-hour factor, PHF	0.93	0.93	0.93	0.74	0.74	0.74	0.91	0.91	0.91	0.72	0.72	0.72
Adj. Flow (vph)	0	0	0	0	2547	472	0	180	0	0	218	81
RTOR Reduction (vph)	0	0	0	0	0	167	0	0	0	0	0	19
Lane Group Flow (vph)	0	0	0	0	2547	305	0	180	0	0	218	62
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)									1			2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	7%	7%	7%
Turn Type					NA	Perm		NA			NA	Perm
Protected Phases					6			8			4	
Permitted Phases						6						4
Actuated Green, G (s)					68.0	68.0		39.6			35.6	35.6
Effective Green, g (s)					68.0	68.0		39.6			35.6	35.6
Actuated g/C Ratio					0.57	0.57		0.33			0.30	0.30
Clearance Time (s)					6.0	6.0		6.4			10.4	10.4
Vehicle Extension (s)					3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)					3033	944		653			554	464
v/s Ratio Prot					c0.48			0.09			c0.12	
v/s Ratio Perm						0.18						0.04
v/c Ratio					0.84	0.32		0.28			0.39	0.13
Uniform Delay, d1					21.5	13.8		29.6			33.6	30.9
Progression Factor					0.98	1.70		0.00			1.00	1.00
Incremental Delay, d2					2.3	0.7		0.2			0.5	0.1
Delay (s)					23.4	24.1		0.2			34.1	31.0
Level of Service					C	C		A			C	C
Approach Delay (s)		0.0			23.5			0.2			33.2	
Approach LOS		A			C			A			C	

Intersection Summary			
HCM 2000 Control Delay	23.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	56.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	937	240	0	0	0	0	164	375	0	157	0
Future Volume (vph)	0	937	240	0	0	0	0	164	375	0	157	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					10.4	10.4		6.4	
Lane Util. Factor		0.91	1.00					1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00					1.00	0.99		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		5353	1667					1980	1660		1869	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		5353	1667					1980	1660		1869	
Peak-hour factor, PHF	0.84	0.84	0.84	0.92	0.92	0.92	0.91	0.91	0.91	0.72	0.72	0.72
Adj. Flow (vph)	0	1115	286	0	0	0	0	180	412	0	218	0
RTOR Reduction (vph)	0	0	124	0	0	0	0	0	56	0	0	0
Lane Group Flow (vph)	0	1115	162	0	0	0	0	180	356	0	218	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)									1			2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	7%	7%	7%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		68.0	68.0					35.6	35.6		39.6	
Effective Green, g (s)		68.0	68.0					35.6	35.6		39.6	
Actuated g/C Ratio		0.57	0.57					0.30	0.30		0.33	
Clearance Time (s)		6.0	6.0					10.4	10.4		6.4	
Vehicle Extension (s)		3.0	3.0					3.0	3.0		3.0	
Lane Grp Cap (vph)		3033	944					587	492		616	
v/s Ratio Prot		c0.21						0.09			0.12	
v/s Ratio Perm			0.10						c0.21			
v/c Ratio		0.37	0.17					0.31	0.72		0.35	
Uniform Delay, d1		14.2	12.5					32.7	37.8		30.5	
Progression Factor		0.76	0.43					1.00	1.00		0.00	
Incremental Delay, d2		0.3	0.4					0.3	5.2		0.3	
Delay (s)		11.1	5.7					32.9	43.0		0.4	
Level of Service		B	A					C	D		A	
Approach Delay (s)		10.0			0.0			40.0			0.4	
Approach LOS		B			A			D			A	

Intersection Summary			
HCM 2000 Control Delay	17.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	56.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	1312	0	0	3	0
Future Vol, veh/h	0	1312	0	0	3	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	1080	541184	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	88	92	92	60	60
Heavy Vehicles, %	2	1	2	2	0	0
Mvmt Flow	0	1491	0	0	5	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	596	-
Stage 1	-	-	0	-
Stage 2	-	-	596	-
Critical Hdwy	-	-	5.7	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6	-
Follow-up Hdwy	-	-	3.8	-
Pot Cap-1 Maneuver	0	-	*688	0
Stage 1	0	-	-	0
Stage 2	0	-	*688	0
Platoon blocked, %		-	1	
Mov Cap-1 Maneuver	-	-	*688	-
Mov Cap-2 Maneuver	-	-	*688	-
Stage 1	-	-	-	-
Stage 2	-	-	*688	-

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

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	688
HCM Lane V/C Ratio	-	0.007
HCM Control Delay (s)	-	10.3
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0

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

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	2156	81	0
Future Vol, veh/h	0	0	0	2156	81	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	3	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	93	74	63	63
Heavy Vehicles, %	2	2	2	2	1	1
Mvmt Flow	0	0	0	2914	129	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	1166	-
Stage 1	-	-	0	-
Stage 2	-	-	1166	-
Critical Hdwy	-	-	5.72	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.02	-
Follow-up Hdwy	-	-	3.81	-
Pot Cap-1 Maneuver	0	-	258	0
Stage 1	0	-	-	0
Stage 2	0	-	234	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	258	-
Mov Cap-2 Maneuver	-	-	258	-
Stage 1	-	-	-	-
Stage 2	-	-	234	-

Approach	WB	NB
HCM Control Delay, s	0	32.1
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	258	-
HCM Lane V/C Ratio	0.498	-
HCM Control Delay (s)	32.1	-
HCM Lane LOS	D	-
HCM 95th %tile Q(veh)	2.6	-

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	1234	0	0	23	0
Future Vol, veh/h	0	1234	0	0	23	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	92	92	92	92
Heavy Vehicles, %	1	1	2	2	14	14
Mvmt Flow	0	1402	0	0	25	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	561	-
Stage 1	-	-	0	-
Stage 2	-	-	561	-
Critical Hdwy	-	-	5.98	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.28	-
Follow-up Hdwy	-	-	3.94	-
Pot Cap-1 Maneuver	0	-	482	0
Stage 1	0	-	-	0
Stage 2	0	-	460	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	482	-
Mov Cap-2 Maneuver	-	-	482	-
Stage 1	-	-	-	-
Stage 2	-	-	460	-

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

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	482
HCM Lane V/C Ratio	-	0.052
HCM Control Delay (s)	-	12.9
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1630	0	0	0	0	0	170	549
Future Volume (vph)	0	0	0	0	1630	0	0	0	0	0	170	549
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					5.9						9.0	9.0
Lane Util. Factor					0.91						0.95	0.88
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					5353						3725	2933
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					5353						3725	2933
Peak-hour factor, PHF	0.92	0.92	0.92	0.84	0.84	0.84	0.92	0.92	0.92	0.68	0.68	0.68
Adj. Flow (vph)	0	0	0	0	1940	0	0	0	0	0	250	807
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	16
Lane Group Flow (vph)	0	0	0	0	1940	0	0	0	0	0	250	791
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					59.1						46.0	46.0
Effective Green, g (s)					59.1						46.0	46.0
Actuated g/C Ratio					0.49						0.38	0.38
Clearance Time (s)					5.9						9.0	9.0
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					2636						1427	1124
v/s Ratio Prot					c0.36						0.07	
v/s Ratio Perm												c0.27
v/c Ratio					0.74						0.18	0.70
Uniform Delay, d1					24.2						24.5	31.2
Progression Factor					1.00						1.00	1.00
Incremental Delay, d2					1.9						0.1	2.0
Delay (s)					26.1						24.5	33.3
Level of Service					C						C	C
Approach Delay (s)		0.0			26.1			0.0			31.2	
Approach LOS		A			C			A			C	

Intersection Summary			
HCM 2000 Control Delay	27.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.9
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	723	0	0	170	0
Future Volume (vph)	0	723	0	0	170	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.9			6.0	
Lane Util. Factor		0.91			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		5406			3614	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		5406			3614	
Peak-hour factor, PHF	0.88	0.88	0.92	0.92	0.68	0.68
Adj. Flow (vph)	0	822	0	0	250	0
RTOR Reduction (vph)	0	0	0	0	138	0
Lane Group Flow (vph)	0	822	0	0	112	0
Heavy Vehicles (%)	1%	1%	2%	2%	2%	2%
Turn Type		NA			Prot	
Protected Phases		2			8	
Permitted Phases						
Actuated Green, G (s)		59.1			49.0	
Effective Green, g (s)		59.1			49.0	
Actuated g/C Ratio		0.49			0.41	
Clearance Time (s)		5.9			6.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		2662			1475	
v/s Ratio Prot		c0.15			c0.03	
v/s Ratio Perm						
v/c Ratio		0.31			0.08	
Uniform Delay, d1		18.2			21.7	
Progression Factor		1.07			0.02	
Incremental Delay, d2		0.3			0.0	
Delay (s)		19.7			0.5	
Level of Service		B			A	
Approach Delay (s)		19.7	0.0		0.5	
Approach LOS		B	A		A	

Intersection Summary			
HCM 2000 Control Delay	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.9
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1257	0	0	0	0	0
Future Vol, veh/h	1257	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	92	92	92	92
Heavy Vehicles, %	1	1	2	2	2	2
Mvmt Flow	1428	0	0	0	0	0

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	714
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	7.14
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.92
Pot Cap-1 Maneuver	-	-		0	321
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	321
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	0
HCM LOS		A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	0	3	0	0	0	4	514	0	0	360	37
Future Vol, veh/h	25	0	3	0	0	0	4	514	0	0	360	37
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	500	-	-	475	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	91	91	91	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	1	1	1	2	2	2
Mvmt Flow	27	0	3	0	0	0	4	565	0	0	391	40

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	984	984	411	986	1004	565	431	0	0	565	0	0
Stage 1	411	411	-	573	573	-	-	-	-	-	-	-
Stage 2	573	573	-	413	431	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.11	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.209	-	-	2.218	-	-
Pot Cap-1 Maneuver	228	248	641	227	242	524	1134	-	-	1007	-	-
Stage 1	618	595	-	505	504	-	-	-	-	-	-	-
Stage 2	505	504	-	616	583	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	227	247	641	225	241	524	1134	-	-	1007	-	-
Mov Cap-2 Maneuver	227	247	-	225	241	-	-	-	-	-	-	-
Stage 1	616	595	-	503	502	-	-	-	-	-	-	-
Stage 2	503	502	-	613	583	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	21.8	0	0.1	0
HCM LOS	C	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1134	-	-	244	-	1007	-	-
HCM Lane V/C Ratio	0.004	-	-	0.125	-	-	-	-
HCM Control Delay (s)	8.2	-	-	21.8	0	0	-	-
HCM Lane LOS	A	-	-	C	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.4	-	0	-	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	518	0	0	363
Future Vol, veh/h	0	0	518	0	0	363
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	-	-	-	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	91	91	92	92
Heavy Vehicles, %	2	2	1	1	2	2
Mvmt Flow	0	0	569	0	0	395

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	964	569	0	0	569	0
Stage 1	569	-	-	-	-	-
Stage 2	395	-	-	-	-	-
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	283	522	-	-	1003	-
Stage 1	566	-	-	-	-	-
Stage 2	681	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	283	522	-	-	1003	-
Mov Cap-2 Maneuver	409	-	-	-	-	-
Stage 1	566	-	-	-	-	-
Stage 2	681	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	1003	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection: 10: EB 12-Mile Road & WB-to-EB XO, W. of Meadowbrook

Movement	SB
Directions Served	L
Maximum Queue (ft)	91
Average Queue (ft)	62
95th Queue (ft)	82
Link Distance (ft)	23
Upstream Blk Time (%)	33
Queuing Penalty (veh)	94
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 11: WB-to-EB XO, W. of Meadowbrook & WB 12-Mile Road

Movement	WB	WB
Directions Served	L	T
Maximum Queue (ft)	125	8
Average Queue (ft)	37	0
95th Queue (ft)	98	6
Link Distance (ft)		651
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	250	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 20: Meadowbrook Road & WB 12-Mile Road

Movement	WB	WB	WB	WB	SB	SB
Directions Served	T	T	T	R	T	R
Maximum Queue (ft)	161	152	134	53	154	71
Average Queue (ft)	95	80	54	19	68	27
95th Queue (ft)	152	134	111	47	133	56
Link Distance (ft)	148	148	148	148	837	
Upstream Blk Time (%)	1	0	0			
Queuing Penalty (veh)	3	1	1			
Storage Bay Dist (ft)						275
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 21: Meadowbrook Road & EB 12-Mile Road

Movement	EB	EB	EB	EB	NB	NB	SB
Directions Served	T	T	T	R	T	R	T
Maximum Queue (ft)	77	85	101	114	94	80	9
Average Queue (ft)	36	31	39	49	32	39	0
95th Queue (ft)	69	70	78	92	74	69	5
Link Distance (ft)	634	634	634		878		56
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)				350		250	
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 30: EB 12-Mile Road & WB-to-EB XO, E. of Meadowbrook

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 31: WB-to-EB XO, E. of Meadowbrook & WB 12-Mile Road

Movement	WB	WB	WB
Directions Served	T	T	T
Maximum Queue (ft)	63	35	6
Average Queue (ft)	5	2	0
95th Queue (ft)	37	19	4
Link Distance (ft)	506	506	506
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 40: EB-to-WB XO, E. of Meadowbrook & WB 12-Mile Road

Movement	NB
Directions Served	L
Maximum Queue (ft)	56
Average Queue (ft)	25
95th Queue (ft)	47
Link Distance (ft)	18
Upstream Blk Time (%)	6
Queuing Penalty (veh)	3
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 41: EB 12-Mile Road & EB-to-WB XO, E. of Meadowbrook

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 50: EB 12-Mile Road & WB-to-EB XO, W. of Summit Dr.

Movement	SB
Directions Served	L
Maximum Queue (ft)	36
Average Queue (ft)	9
95th Queue (ft)	32
Link Distance (ft)	23
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 51: WB-to-EB XO, W. of Summit Dr. & WB 12-Mile Road

Movement							
Directions Served							
Maximum Queue (ft)							
Average Queue (ft)							
95th Queue (ft)							
Link Distance (ft)							
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 60: SB M-5 Exit-Ramp & WB 12-Mile Road

Movement	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	T	T	T	R	R
Maximum Queue (ft)	181	150	60	147	173	94	49
Average Queue (ft)	87	35	14	37	89	47	16
95th Queue (ft)	153	99	43	103	148	76	43
Link Distance (ft)	1226	1226	1226			958	
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)				250	250		250
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 61: EB 12-Mile Road & SB M-5 Exit-Ramp

Movement	EB	EB	EB	SB
Directions Served	T	T	T	L
Maximum Queue (ft)	105	101	114	5
Average Queue (ft)	38	32	39	0
95th Queue (ft)	80	78	92	4
Link Distance (ft)	141	141	141	22
Upstream Blk Time (%)			0	0
Queuing Penalty (veh)			0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 70: Site Drive #1 & EB 12-Mile Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 80: Meadowbrook Road & Elm Creek Drive/Site Drive #2

Movement	EB	NB
Directions Served	LTR	L
Maximum Queue (ft)	56	11
Average Queue (ft)	26	1
95th Queue (ft)	51	7
Link Distance (ft)	364	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		500
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 90: Meadowbrook Road & Site Drive #3

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 103

Intersection: 10: EB 12-Mile Road & WB-to-EB XO, W. of Meadowbrook

Movement	SB
Directions Served	L
Maximum Queue (ft)	87
Average Queue (ft)	63
95th Queue (ft)	81
Link Distance (ft)	23
Upstream Blk Time (%)	41
Queuing Penalty (veh)	119
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 11: WB-to-EB XO, W. of Meadowbrook & WB 12-Mile Road

Movement	WB
Directions Served	L
Maximum Queue (ft)	168
Average Queue (ft)	45
95th Queue (ft)	119
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: Meadowbrook Road & WB 12-Mile Road

Movement	WB	WB	WB	WB	NB	SB	SB
Directions Served	T	T	T	R	T	T	R
Maximum Queue (ft)	172	181	184	150	14	203	71
Average Queue (ft)	149	154	151	69	1	92	21
95th Queue (ft)	189	191	195	121	8	168	53
Link Distance (ft)	148	148	148	148	56	837	
Upstream Blk Time (%)	10	10	9	0			
Queuing Penalty (veh)	54	58	52	1			
Storage Bay Dist (ft)							275
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 21: Meadowbrook Road & EB 12-Mile Road

Movement	EB	EB	EB	EB	NB	NB
Directions Served	T	T	T	R	T	R
Maximum Queue (ft)	128	149	185	119	175	283
Average Queue (ft)	70	74	97	40	92	110
95th Queue (ft)	117	132	166	79	159	215
Link Distance (ft)	634	634	634		878	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)				350		250
Storage Blk Time (%)						1
Queuing Penalty (veh)						1

Intersection: 30: EB 12-Mile Road & WB-to-EB XO, E. of Meadowbrook

Movement	SB
Directions Served	L
Maximum Queue (ft)	23
Average Queue (ft)	1
95th Queue (ft)	12
Link Distance (ft)	19
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 31: WB-to-EB XO, E. of Meadowbrook & WB 12-Mile Road

Movement	WB	WB	WB	WB
Directions Served	T	T	T	T
Maximum Queue (ft)	211	230	217	86
Average Queue (ft)	63	67	56	3
95th Queue (ft)	153	160	148	45
Link Distance (ft)	506	506	506	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				150
Storage Blk Time (%)			0	
Queuing Penalty (veh)			3	

Intersection: 40: EB-to-WB XO, E. of Meadowbrook & WB 12-Mile Road

Movement	NB
Directions Served	L
Maximum Queue (ft)	66
Average Queue (ft)	42
95th Queue (ft)	70
Link Distance (ft)	18
Upstream Blk Time (%)	36
Queuing Penalty (veh)	34
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 41: EB 12-Mile Road & EB-to-WB XO, E. of Meadowbrook

Movement	EB	EB
Directions Served	L	T
Maximum Queue (ft)	140	38
Average Queue (ft)	18	1
95th Queue (ft)	81	28
Link Distance (ft)		506
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	250	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 50: EB 12-Mile Road & WB-to-EB XO, W. of Summit Dr.

Movement	SB
Directions Served	L
Maximum Queue (ft)	72
Average Queue (ft)	19
95th Queue (ft)	55
Link Distance (ft)	23
Upstream Blk Time (%)	3
Queuing Penalty (veh)	1
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 51: WB-to-EB XO, W. of Summit Dr. & WB 12-Mile Road

Movement	WB
Directions Served	L
Maximum Queue (ft)	14
Average Queue (ft)	0
95th Queue (ft)	10
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 60: SB M-5 Exit-Ramp & WB 12-Mile Road

Movement	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	T	T	T	R	R
Maximum Queue (ft)	355	324	267	188	260	304	282
Average Queue (ft)	176	123	99	43	101	147	108
95th Queue (ft)	294	245	200	128	189	246	219
Link Distance (ft)	1226	1226	1226			958	
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)				250	250		250
Storage Blk Time (%)					0	1	0
Queuing Penalty (veh)					0	4	1

Intersection: 61: EB 12-Mile Road & SB M-5 Exit-Ramp

Movement	EB	EB	EB	SB
Directions Served	T	T	T	L
Maximum Queue (ft)	121	134	161	5
Average Queue (ft)	42	48	59	0
95th Queue (ft)	99	109	122	4
Link Distance (ft)	141	141	141	22
Upstream Blk Time (%)	0	0	1	0
Queuing Penalty (veh)	0	0	2	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 70: Site Drive #1 & EB 12-Mile Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 80: Meadowbrook Road & Elm Creek Drive/Site Drive #2

Movement	EB	NB
Directions Served	LTR	L
Maximum Queue (ft)	56	17
Average Queue (ft)	22	1
95th Queue (ft)	49	7
Link Distance (ft)	364	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		500
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 90: Meadowbrook Road & Site Drive #3

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 331

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	536	0	0	292	0
Future Vol, veh/h	0	536	0	0	292	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	1082894336		-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	92	92	88	88
Heavy Vehicles, %	4	4	2	2	2	2
Mvmt Flow	0	596	0	0	332	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	238	-
Stage 1	-	-	0	-
Stage 2	-	-	238	-
Critical Hdwy	-	-	5.74	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.04	-
Follow-up Hdwy	-	-	3.82	-
Pot Cap-1 Maneuver	0	-	730	0
Stage 1	0	-	-	0
Stage 2	0	-	715	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	730	-
Mov Cap-2 Maneuver	-	-	730	-
Stage 1	-	-	-	-
Stage 2	-	-	715	-

Approach	EB	SB
HCM Control Delay, s	0	14
HCM LOS		B

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	730
HCM Lane V/C Ratio	-	0.455
HCM Control Delay (s)	-	14
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	821	68	0	63	0	0	121	95
Future Volume (vph)	0	0	0	0	821	68	0	63	0	0	121	95
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.0	6.0		6.4			10.4	10.4
Lane Util. Factor					0.91	1.00		1.00			1.00	1.00
Frpb, ped/bikes					1.00	0.98		1.00			1.00	1.00
Flpb, ped/bikes					1.00	1.00		1.00			1.00	1.00
Frt					1.00	0.85		1.00			1.00	0.85
Flt Protected					1.00	1.00		1.00			1.00	1.00
Satd. Flow (prot)					5301	1616		1905			1923	1635
Flt Permitted					1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)					5301	1616		1905			1923	1635
Peak-hour factor, PHF	0.90	0.90	0.90	0.73	0.73	0.73	0.93	0.93	0.93	0.88	0.88	0.88
Adj. Flow (vph)	0	0	0	0	1125	93	0	68	0	0	138	108
RTOR Reduction (vph)	0	0	0	0	0	47	0	0	0	0	0	31
Lane Group Flow (vph)	0	0	0	0	1125	46	0	68	0	0	138	77
Confl. Peds. (#/hr)	1					1			1	1		
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	5%	5%	5%	4%	4%	4%
Turn Type					NA	Perm		NA			NA	Perm
Protected Phases					6			8			4	
Permitted Phases						6						4
Actuated Green, G (s)					59.0	59.0		48.6			44.6	44.6
Effective Green, g (s)					59.0	59.0		48.6			44.6	44.6
Actuated g/C Ratio					0.49	0.49		0.41			0.37	0.37
Clearance Time (s)					6.0	6.0		6.4			10.4	10.4
Vehicle Extension (s)					3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)					2606	794		771			714	607
v/s Ratio Prot					c0.21			0.04			c0.07	
v/s Ratio Perm						0.03						0.05
v/c Ratio					0.43	0.06		0.09			0.19	0.13
Uniform Delay, d1					19.7	16.0		22.0			25.5	24.9
Progression Factor					1.08	2.11		0.00			1.00	1.00
Incremental Delay, d2					0.5	0.1		0.0			0.1	0.1
Delay (s)					21.8	33.8		0.1			25.7	24.9
Level of Service					C	C		A			C	C
Approach Delay (s)		0.0			22.7			0.1			25.3	
Approach LOS		A			C			A			C	

Intersection Summary			
HCM 2000 Control Delay	22.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	36.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	509	319	0	0	0	0	63	225	0	121	0
Future Volume (vph)	0	509	319	0	0	0	0	63	225	0	121	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					10.4	10.4		6.4	
Lane Util. Factor		0.91	1.00					1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00					1.00	0.99		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		5250	1635					1905	1598		1923	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		5250	1635					1905	1598		1923	
Peak-hour factor, PHF	0.90	0.90	0.90	0.73	0.73	0.73	0.93	0.93	0.93	0.88	0.88	0.88
Adj. Flow (vph)	0	566	354	0	0	0	0	68	242	0	138	0
RTOR Reduction (vph)	0	0	180	0	0	0	0	0	152	0	0	0
Lane Group Flow (vph)	0	566	174	0	0	0	0	68	90	0	138	0
Confl. Peds. (#/hr)	1					1			1	1		
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	5%	5%	5%	4%	4%	4%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		59.0	59.0					44.6	44.6		48.6	
Effective Green, g (s)		59.0	59.0					44.6	44.6		48.6	
Actuated g/C Ratio		0.49	0.49					0.37	0.37		0.41	
Clearance Time (s)		6.0	6.0					10.4	10.4		6.4	
Vehicle Extension (s)		3.0	3.0					3.0	3.0		3.0	
Lane Grp Cap (vph)		2581	803					708	593		778	
v/s Ratio Prot		c0.11						0.04			c0.07	
v/s Ratio Perm			0.11						0.06			
v/c Ratio		0.22	0.22					0.10	0.15		0.18	
Uniform Delay, d1		17.4	17.4					24.6	25.1		22.9	
Progression Factor		0.83	0.53					1.00	1.00		0.00	
Incremental Delay, d2		0.2	0.6					0.1	0.1		0.1	
Delay (s)		14.6	9.9					24.6	25.2		0.1	
Level of Service		B	A					C	C		A	
Approach Delay (s)		12.8			0.0			25.1			0.1	
Approach LOS		B			A			C			A	

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	36.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	734	0	0	0	0
Future Vol, veh/h	0	734	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	1080	541	184	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	92	92	92	92
Heavy Vehicles, %	6	6	2	2	2	2
Mvmt Flow	0	864	0	0	0	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	346	-
Stage 1	-	-	0	-
Stage 2	-	-	346	-
Critical Hdwy	-	-	5.74	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.04	-
Follow-up Hdwy	-	-	3.82	-
Pot Cap-1 Maneuver	0	-	649	0
Stage 1	0	-	-	0
Stage 2	0	-	630	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	649	-
Mov Cap-2 Maneuver	-	-	649	-
Stage 1	-	-	-	-
Stage 2	-	-	630	-

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

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

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	826	63	0
Future Vol, veh/h	0	0	0	826	63	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	3	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	90	73	80	80
Heavy Vehicles, %	2	2	3	3	3	3
Mvmt Flow	0	0	0	1132	79	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	453	-
Stage 1	-	-	0	-
Stage 2	-	-	453	-
Critical Hdwy	-	-	5.76	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.06	-
Follow-up Hdwy	-	-	3.83	-
Pot Cap-1 Maneuver	0	-	574	0
Stage 1	0	-	-	0
Stage 2	0	-	553	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	574	-
Mov Cap-2 Maneuver	-	-	574	-
Stage 1	-	-	-	-
Stage 2	-	-	553	-

Approach	WB	NB
HCM Control Delay, s	0	12.3
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	574	-
HCM Lane V/C Ratio	0.137	-
HCM Control Delay (s)	12.3	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.5	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	671	0	0	36	0
Future Vol, veh/h	0	671	0	0	36	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	92	92	60	60
Heavy Vehicles, %	6	6	2	2	0	0
Mvmt Flow	0	789	0	0	60	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	316	-
Stage 1	-	-	0	-
Stage 2	-	-	316	-
Critical Hdwy	-	-	5.7	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6	-
Follow-up Hdwy	-	-	3.8	-
Pot Cap-1 Maneuver	0	-	676	0
Stage 1	0	-	-	0
Stage 2	0	-	658	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	676	-
Mov Cap-2 Maneuver	-	-	676	-
Stage 1	-	-	-	-
Stage 2	-	-	658	-

Approach	EB	SB
HCM Control Delay, s	0	10.8
HCM LOS		B

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	676
HCM Lane V/C Ratio	-	0.089
HCM Control Delay (s)	-	10.8
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	661	0	0	0	0	0	167	201
Future Volume (vph)	0	0	0	0	661	0	0	0	0	0	167	201
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					5.9						9.0	9.0
Lane Util. Factor					0.91						0.95	0.88
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					5250						3762	2962
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					5250						3762	2962
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.92	0.92	0.92	0.87	0.87	0.87
Adj. Flow (vph)	0	0	0	0	726	0	0	0	0	0	192	231
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	150
Lane Group Flow (vph)	0	0	0	0	726	0	0	0	0	0	192	81
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	2%	2%	2%	1%	1%	1%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					63.1						42.0	42.0
Effective Green, g (s)					63.1						42.0	42.0
Actuated g/C Ratio					0.53						0.35	0.35
Clearance Time (s)					5.9						9.0	9.0
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					2760						1316	1036
v/s Ratio Prot					c0.14						c0.05	
v/s Ratio Perm												0.03
v/c Ratio					0.26						0.15	0.08
Uniform Delay, d1					15.7						26.7	26.1
Progression Factor					1.00						1.00	1.00
Incremental Delay, d2					0.2						0.1	0.0
Delay (s)					15.9						26.8	26.1
Level of Service					B						C	C
Approach Delay (s)		0.0			15.9			0.0			26.4	
Approach LOS		A			B			A			C	

Intersection Summary			
HCM 2000 Control Delay	19.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.9
Intersection Capacity Utilization	31.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	508	0	0	167	0
Future Volume (vph)	0	508	0	0	167	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.9			6.0	
Lane Util. Factor		0.91			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		5151			3650	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		5151			3650	
Peak-hour factor, PHF	0.85	0.85	0.92	0.92	0.87	0.87
Adj. Flow (vph)	0	598	0	0	192	0
RTOR Reduction (vph)	0	0	0	0	120	0
Lane Group Flow (vph)	0	598	0	0	72	0
Heavy Vehicles (%)	6%	6%	2%	2%	1%	1%
Turn Type		NA			Prot	
Protected Phases		2			8	
Permitted Phases						
Actuated Green, G (s)		63.1			45.0	
Effective Green, g (s)		63.1			45.0	
Actuated g/C Ratio		0.53			0.38	
Clearance Time (s)		5.9			6.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		2708			1368	
v/s Ratio Prot		c0.12			c0.02	
v/s Ratio Perm						
v/c Ratio		0.22			0.05	
Uniform Delay, d1		15.3			23.9	
Progression Factor		1.17			1.00	
Incremental Delay, d2		0.2			0.0	
Delay (s)		18.0			23.9	
Level of Service		B			C	
Approach Delay (s)		18.0	0.0		23.9	
Approach LOS		B	A		C	

Intersection Summary			
HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.16		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.9
Intersection Capacity Utilization	31.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	680	27	0	0	0	82
Future Vol, veh/h	680	27	0	0	0	82
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	92	92	92	92
Heavy Vehicles, %	6	6	2	2	2	2
Mvmt Flow	800	32	0	0	0	89

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	416
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	7.14
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.92
Pot Cap-1 Maneuver	-	-		0	500
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	500
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	13.8
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	500	-	-
HCM Lane V/C Ratio	0.178	-	-
HCM Control Delay (s)	13.8	-	-
HCM Lane LOS	B	-	-
HCM 95th %tile Q(veh)	0.6	-	-

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	36	0	7	11	0	24	2	228	3	6	422	12
Future Vol, veh/h	36	0	7	11	0	24	2	228	3	6	422	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	500	-	-	475	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	93	93	93	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	5	5	5	2	2	2
Mvmt Flow	39	0	8	12	0	26	2	245	3	7	459	13

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	744	732	466	735	737	247	472	0	0	248	0	0
Stage 1	480	480	-	251	251	-	-	-	-	-	-	-
Stage 2	264	252	-	484	486	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.15	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.245	-	-	2.218	-	-
Pot Cap-1 Maneuver	331	348	597	335	346	792	1074	-	-	1318	-	-
Stage 1	567	554	-	753	699	-	-	-	-	-	-	-
Stage 2	741	698	-	564	551	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	318	346	597	329	344	792	1074	-	-	1318	-	-
Mov Cap-2 Maneuver	318	346	-	329	344	-	-	-	-	-	-	-
Stage 1	566	551	-	751	698	-	-	-	-	-	-	-
Stage 2	715	697	-	554	548	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.1	12	0.1	0.1
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1074	-	-	344	549	1318	-	-
HCM Lane V/C Ratio	0.002	-	-	0.136	0.069	0.005	-	-
HCM Control Delay (s)	8.4	-	-	17.1	12	7.7	-	-
HCM Lane LOS	A	-	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.5	0.2	0	-	-

Intersection	
Int Delay, s/veh	0.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	12	16	217	4	6	434
Future Vol, veh/h	12	16	217	4	6	434
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	-	-	-	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	93	93	92	92
Heavy Vehicles, %	2	2	5	5	2	2
Mvmt Flow	13	17	233	4	7	472

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	721	235	0	0	237	0
Stage 1	235	-	-	-	-	-
Stage 2	486	-	-	-	-	-
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	394	804	-	-	1330	-
Stage 1	804	-	-	-	-	-
Stage 2	618	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	392	804	-	-	1330	-
Mov Cap-2 Maneuver	490	-	-	-	-	-
Stage 1	804	-	-	-	-	-
Stage 2	615	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	631	1330	-
HCM Lane V/C Ratio	-	-	0.048	0.005	-
HCM Control Delay (s)	-	-	11	7.7	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑			↰	
Traffic Vol, veh/h	0	913	0	0	307	0
Future Vol, veh/h	0	913	0	0	307	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	1082894336		-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	92	92	93	93
Heavy Vehicles, %	2	2	2	2	1	1
Mvmt Flow	0	1087	0	0	330	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	435	-
Stage 1	-	-	0	-
Stage 2	-	-	435	-
Critical Hdwy	-	-	5.72	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.02	-
Follow-up Hdwy	-	-	3.81	-
Pot Cap-1 Maneuver	0	-	*739	0
Stage 1	0	-	-	0
Stage 2	0	-	*739	0
Platoon blocked, %		-	1	
Mov Cap-1 Maneuver	-	-	*739	-
Mov Cap-2 Maneuver	-	-	*739	-
Stage 1	-	-	-	-
Stage 2	-	-	*739	-

Approach	EB	SB
HCM Control Delay, s	0	13.7
HCM LOS		B

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	739
HCM Lane V/C Ratio	-	0.447
HCM Control Delay (s)	-	13.7
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	2.3

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1919	349	0	168	0	0	163	58
Future Volume (vph)	0	0	0	0	1919	349	0	168	0	0	163	58
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.0	6.0		6.4			10.4	10.4
Lane Util. Factor					0.91	1.00		1.00			1.00	1.00
Frpb, ped/bikes					1.00	1.00		1.00			1.00	0.99
Flpb, ped/bikes					1.00	1.00		1.00			1.00	1.00
Frt					1.00	0.85		1.00			1.00	0.85
Flt Protected					1.00	1.00		1.00			1.00	1.00
Satd. Flow (prot)					5353	1667		1980			1869	1567
Flt Permitted					1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)					5353	1667		1980			1869	1567
Peak-hour factor, PHF	0.93	0.93	0.93	0.74	0.74	0.74	0.91	0.91	0.91	0.72	0.72	0.72
Adj. Flow (vph)	0	0	0	0	2593	472	0	185	0	0	226	81
RTOR Reduction (vph)	0	0	0	0	0	164	0	0	0	0	0	19
Lane Group Flow (vph)	0	0	0	0	2593	308	0	185	0	0	226	62
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)									1			2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	7%	7%	7%
Turn Type					NA	Perm		NA			NA	Perm
Protected Phases					6			8			4	
Permitted Phases						6						4
Actuated Green, G (s)					67.0	67.0		40.6			36.6	36.6
Effective Green, g (s)					67.0	67.0		40.6			36.6	36.6
Actuated g/C Ratio					0.56	0.56		0.34			0.31	0.31
Clearance Time (s)					6.0	6.0		6.4			10.4	10.4
Vehicle Extension (s)					3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)					2988	930		669			570	477
v/s Ratio Prot					c0.48			0.09			c0.12	
v/s Ratio Perm						0.18						0.04
v/c Ratio					0.87	0.33		0.28			0.40	0.13
Uniform Delay, d1					22.7	14.4		29.0			33.0	30.2
Progression Factor					0.98	1.39		0.00			1.00	1.00
Incremental Delay, d2					2.7	0.7		0.2			0.5	0.1
Delay (s)					24.9	20.7		0.2			33.4	30.3
Level of Service					C	C		A			C	C
Approach Delay (s)		0.0			24.2			0.2			32.6	
Approach LOS		A			C			A			C	

Intersection Summary			
HCM 2000 Control Delay	23.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	57.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	949	271	0	0	0	0	168	395	0	163	0
Future Volume (vph)	0	949	271	0	0	0	0	168	395	0	163	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					10.4	10.4		6.4	
Lane Util. Factor		0.91	1.00					1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00					1.00	0.99		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		5353	1667					1980	1660		1869	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		5353	1667					1980	1660		1869	
Peak-hour factor, PHF	0.84	0.84	0.84	0.92	0.92	0.92	0.91	0.91	0.91	0.72	0.72	0.72
Adj. Flow (vph)	0	1130	323	0	0	0	0	185	434	0	226	0
RTOR Reduction (vph)	0	0	143	0	0	0	0	0	51	0	0	0
Lane Group Flow (vph)	0	1130	180	0	0	0	0	185	383	0	226	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)									1			2
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	7%	7%	7%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		67.0	67.0					36.6	36.6		40.6	
Effective Green, g (s)		67.0	67.0					36.6	36.6		40.6	
Actuated g/C Ratio		0.56	0.56					0.31	0.31		0.34	
Clearance Time (s)		6.0	6.0					10.4	10.4		6.4	
Vehicle Extension (s)		3.0	3.0					3.0	3.0		3.0	
Lane Grp Cap (vph)		2988	930					603	506		632	
v/s Ratio Prot		c0.21						0.09			0.12	
v/s Ratio Perm			0.11						c0.23			
v/c Ratio		0.38	0.19					0.31	0.76		0.36	
Uniform Delay, d1		14.8	13.1					32.0	37.7		29.9	
Progression Factor		0.76	0.43					1.00	1.00		0.00	
Incremental Delay, d2		0.4	0.5					0.3	6.4		0.3	
Delay (s)		11.7	6.1					32.3	44.1		0.3	
Level of Service		B	A					C	D		A	
Approach Delay (s)		10.5			0.0			40.6			0.3	
Approach LOS		B			A			D			A	

Intersection Summary			
HCM 2000 Control Delay	17.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	57.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑			↰	
Traffic Vol, veh/h	0	1344	0	0	3	0
Future Vol, veh/h	0	1344	0	0	3	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	1080	541184	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	88	92	92	60	60
Heavy Vehicles, %	2	1	2	2	0	0
Mvmt Flow	0	1527	0	0	5	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	611	-
Stage 1	-	-	0	-
Stage 2	-	-	611	-
Critical Hdwy	-	-	5.7	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6	-
Follow-up Hdwy	-	-	3.8	-
Pot Cap-1 Maneuver	0	-	*688	0
Stage 1	0	-	-	0
Stage 2	0	-	*688	0
Platoon blocked, %		-	1	
Mov Cap-1 Maneuver	-	-	*688	-
Mov Cap-2 Maneuver	-	-	*688	-
Stage 1	-	-	-	-
Stage 2	-	-	*688	-

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

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	688
HCM Lane V/C Ratio	-	0.007
HCM Control Delay (s)	-	10.3
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0

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

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑↑	↰	
Traffic Vol, veh/h	0	0	0	2183	88	0
Future Vol, veh/h	0	0	0	2183	88	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	3	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	93	74	65	63
Heavy Vehicles, %	2	2	2	2	1	1
Mvmt Flow	0	0	0	2950	135	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	1180	-
Stage 1	-	-	0	-
Stage 2	-	-	1180	-
Critical Hdwy	-	-	5.72	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.02	-
Follow-up Hdwy	-	-	3.81	-
Pot Cap-1 Maneuver	0	-	254	0
Stage 1	0	-	-	0
Stage 2	0	-	230	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	254	-
Mov Cap-2 Maneuver	-	-	254	-
Stage 1	-	-	-	-
Stage 2	-	-	230	-

Approach	WB	NB
HCM Control Delay, s	0	34.3
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	254	-
HCM Lane V/C Ratio	0.533	-
HCM Control Delay (s)	34.3	-
HCM Lane LOS	D	-
HCM 95th %tile Q(veh)	2.9	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑			↰	
Traffic Vol, veh/h	0	1259	0	0	105	0
Future Vol, veh/h	0	1259	0	0	105	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	92	92	92	92
Heavy Vehicles, %	1	1	2	2	14	14
Mvmt Flow	0	1431	0	0	114	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	572	-
Stage 1	-	-	0	-
Stage 2	-	-	572	-
Critical Hdwy	-	-	5.98	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	6.28	-
Follow-up Hdwy	-	-	3.94	-
Pot Cap-1 Maneuver	0	-	475	0
Stage 1	0	-	-	0
Stage 2	0	-	453	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	475	-
Mov Cap-2 Maneuver	-	-	475	-
Stage 1	-	-	-	-
Stage 2	-	-	453	-

Approach	EB	SB
HCM Control Delay, s	0	15
HCM LOS		C

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	475
HCM Lane V/C Ratio	-	0.24
HCM Control Delay (s)	-	15
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1720	0	0	0	0	0	170	568
Future Volume (vph)	0	0	0	0	1720	0	0	0	0	0	170	568
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					5.9						9.0	9.0
Lane Util. Factor					0.91						0.95	0.88
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					5353						3725	2933
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					5353						3725	2933
Peak-hour factor, PHF	0.92	0.92	0.92	0.84	0.84	0.84	0.92	0.92	0.92	0.68	0.68	0.68
Adj. Flow (vph)	0	0	0	0	2048	0	0	0	0	0	250	835
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	16
Lane Group Flow (vph)	0	0	0	0	2048	0	0	0	0	0	250	819
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					60.1						45.0	45.0
Effective Green, g (s)					60.1						45.0	45.0
Actuated g/C Ratio					0.50						0.38	0.38
Clearance Time (s)					5.9						9.0	9.0
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					2680						1396	1099
v/s Ratio Prot					c0.38						0.07	
v/s Ratio Perm												c0.28
v/c Ratio					0.76						0.18	0.74
Uniform Delay, d1					24.2						25.1	32.5
Progression Factor					1.00						1.00	1.00
Incremental Delay, d2					2.1						0.1	2.8
Delay (s)					26.4						25.2	35.3
Level of Service					C						C	D
Approach Delay (s)		0.0			26.4			0.0			33.0	
Approach LOS		A			C			A			C	

Intersection Summary			
HCM 2000 Control Delay	28.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.9
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑			↰↰	
Traffic Volume (vph)	0	769	0	0	170	0
Future Volume (vph)	0	769	0	0	170	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.9			6.0	
Lane Util. Factor		0.91			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		5406			3614	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		5406			3614	
Peak-hour factor, PHF	0.88	0.88	0.92	0.92	0.68	0.68
Adj. Flow (vph)	0	874	0	0	250	0
RTOR Reduction (vph)	0	0	0	0	126	0
Lane Group Flow (vph)	0	874	0	0	124	0
Heavy Vehicles (%)	1%	1%	2%	2%	2%	2%
Turn Type		NA			Prot	
Protected Phases		2			8	
Permitted Phases						
Actuated Green, G (s)		60.1			48.0	
Effective Green, g (s)		60.1			48.0	
Actuated g/C Ratio		0.50			0.40	
Clearance Time (s)		5.9			6.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		2707			1445	
v/s Ratio Prot		c0.16			c0.03	
v/s Ratio Perm						
v/c Ratio		0.32			0.09	
Uniform Delay, d1		17.8			22.4	
Progression Factor		1.08			0.02	
Incremental Delay, d2		0.3			0.0	
Delay (s)		19.5			0.4	
Level of Service		B			A	
Approach Delay (s)		19.5	0.0		0.4	
Approach LOS		B	A		A	

Intersection Summary			
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.9
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1270	94	0	0	0	59
Future Vol, veh/h	1270	94	0	0	0	59
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	92	92	92	92
Heavy Vehicles, %	1	1	2	2	2	2
Mvmt Flow	1443	107	0	0	0	64

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	775
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	7.14
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.92
Pot Cap-1 Maneuver	-	-		0	292
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	292
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	20.8
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	292	-	-
HCM Lane V/C Ratio	0.22	-	-
HCM Control Delay (s)	20.8	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	0.8	-	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	0	3	4	0	13	4	525	7	21	376	37
Future Vol, veh/h	25	0	3	4	0	13	4	525	7	21	376	37
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	500	-	-	475	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	91	91	91	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	1	1	1	2	2	2
Mvmt Flow	27	0	3	4	0	14	4	577	8	23	409	40

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1071	1068	429	1066	1084	581	449	0	0	585	0	0
Stage 1	475	475	-	589	589	-	-	-	-	-	-	-
Stage 2	596	593	-	477	495	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.11	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.209	-	-	2.218	-	-
Pot Cap-1 Maneuver	198	222	626	200	217	514	1117	-	-	990	-	-
Stage 1	570	557	-	494	495	-	-	-	-	-	-	-
Stage 2	490	493	-	569	546	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	189	216	626	195	211	514	1117	-	-	990	-	-
Mov Cap-2 Maneuver	189	216	-	195	211	-	-	-	-	-	-	-
Stage 1	568	544	-	492	493	-	-	-	-	-	-	-
Stage 2	475	491	-	553	533	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	25.7	15.2	0.1	0.4
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1117	-	-	204	371	990	-	-
HCM Lane V/C Ratio	0.004	-	-	0.149	0.05	0.023	-	-
HCM Control Delay (s)	8.2	-	-	25.7	15.2	8.7	-	-
HCM Lane LOS	A	-	-	D	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.5	0.2	0.1	-	-

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	11	525	7	16	367
Future Vol, veh/h	4	11	525	7	16	367
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	-	-	-	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	91	91	92	92
Heavy Vehicles, %	2	2	1	1	2	2
Mvmt Flow	4	12	577	8	17	399

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1014	581	0	0	585	0
Stage 1	581	-	-	-	-	-
Stage 2	433	-	-	-	-	-
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	264	514	-	-	990	-
Stage 1	559	-	-	-	-	-
Stage 2	654	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	260	514	-	-	990	-
Mov Cap-2 Maneuver	391	-	-	-	-	-
Stage 1	559	-	-	-	-	-
Stage 2	643	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.9	0	0.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	474	990	-
HCM Lane V/C Ratio	-	-	0.034	0.018	-
HCM Control Delay (s)	-	-	12.9	8.7	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Intersection: 10: EB 12-Mile Road & WB-to-EB XO, W. of Meadowbrook

Movement	SB
Directions Served	L
Maximum Queue (ft)	91
Average Queue (ft)	63
95th Queue (ft)	84
Link Distance (ft)	23
Upstream Blk Time (%)	35
Queuing Penalty (veh)	104
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 11: WB-to-EB XO, W. of Meadowbrook & WB 12-Mile Road

Movement	WB	WB
Directions Served	L	T
Maximum Queue (ft)	146	15
Average Queue (ft)	46	1
95th Queue (ft)	121	11
Link Distance (ft)		651
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	250	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 20: Meadowbrook Road & WB 12-Mile Road

Movement	WB	WB	WB	WB	SB	SB
Directions Served	T	T	T	R	T	R
Maximum Queue (ft)	159	154	129	57	190	81
Average Queue (ft)	89	76	50	21	76	26
95th Queue (ft)	152	134	111	50	145	57
Link Distance (ft)	148	148	148	148	837	
Upstream Blk Time (%)	1	0	0			
Queuing Penalty (veh)	2	1	0			
Storage Bay Dist (ft)						275
Storage Blk Time (%)					0	
Queuing Penalty (veh)					0	

Intersection: 21: Meadowbrook Road & EB 12-Mile Road

Movement	EB	EB	EB	EB	NB	NB	SB
Directions Served	T	T	T	R	T	R	T
Maximum Queue (ft)	90	83	117	130	96	112	5
Average Queue (ft)	40	30	40	52	38	45	0
95th Queue (ft)	75	69	86	104	86	83	5
Link Distance (ft)	634	634	634		878		56
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)				350		250	
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 30: EB 12-Mile Road & WB-to-EB XO, E. of Meadowbrook

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 31: WB-to-EB XO, E. of Meadowbrook & WB 12-Mile Road

Movement	WB	WB	WB
Directions Served	T	T	T
Maximum Queue (ft)	65	27	11
Average Queue (ft)	5	1	0
95th Queue (ft)	30	13	8
Link Distance (ft)	506	506	506
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 40: EB-to-WB XO, E. of Meadowbrook & WB 12-Mile Road

Movement	NB
Directions Served	L
Maximum Queue (ft)	54
Average Queue (ft)	28
95th Queue (ft)	50
Link Distance (ft)	18
Upstream Blk Time (%)	9
Queuing Penalty (veh)	6
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 41: EB 12-Mile Road & EB-to-WB XO, E. of Meadowbrook

Movement	EB
Directions Served	L
Maximum Queue (ft)	5
Average Queue (ft)	0
95th Queue (ft)	4
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 50: EB 12-Mile Road & WB-to-EB XO, W. of Summit Dr.

Movement	SB
Directions Served	L
Maximum Queue (ft)	36
Average Queue (ft)	21
95th Queue (ft)	44
Link Distance (ft)	23
Upstream Blk Time (%)	4
Queuing Penalty (veh)	2
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 51: WB-to-EB XO, W. of Summit Dr. & WB 12-Mile Road

Movement							
Directions Served							
Maximum Queue (ft)							
Average Queue (ft)							
95th Queue (ft)							
Link Distance (ft)							
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 60: SB M-5 Exit-Ramp & WB 12-Mile Road

Movement	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	T	T	T	R	R
Maximum Queue (ft)	167	123	68	147	169	102	65
Average Queue (ft)	89	39	17	35	92	49	17
95th Queue (ft)	153	91	49	109	149	79	48
Link Distance (ft)	1226	1226	1226			958	
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)				250	250		250
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 61: EB 12-Mile Road & SB M-5 Exit-Ramp

Movement	EB	EB	EB	SB
Directions Served	T	T	T	L
Maximum Queue (ft)	100	107	123	5
Average Queue (ft)	40	40	48	0
95th Queue (ft)	82	85	96	5
Link Distance (ft)	141	141	141	22
Upstream Blk Time (%)			0	1
Queuing Penalty (veh)			0	1
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 70: Site Drive #1 & EB 12-Mile Road

Movement	NB
Directions Served	R
Maximum Queue (ft)	67
Average Queue (ft)	33
95th Queue (ft)	55
Link Distance (ft)	454
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 80: Meadowbrook Road & Elm Creek Drive/Site Drive #2

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	L	L
Maximum Queue (ft)	65	56	11	22
Average Queue (ft)	24	24	0	1
95th Queue (ft)	53	51	6	8
Link Distance (ft)	364	417		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			500	475
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 90: Meadowbrook Road & Site Drive #3

Movement	WB	SB
Directions Served	LR	L
Maximum Queue (ft)	36	16
Average Queue (ft)	19	1
95th Queue (ft)	44	9
Link Distance (ft)	413	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		500
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 116

Intersection: 10: EB 12-Mile Road & WB-to-EB XO, W. of Meadowbrook

Movement	SB
Directions Served	L
Maximum Queue (ft)	86
Average Queue (ft)	64
95th Queue (ft)	78
Link Distance (ft)	23
Upstream Blk Time (%)	47
Queuing Penalty (veh)	144
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 11: WB-to-EB XO, W. of Meadowbrook & WB 12-Mile Road

Movement	WB	WB
Directions Served	L	T
Maximum Queue (ft)	197	63
Average Queue (ft)	57	3
95th Queue (ft)	142	34
Link Distance (ft)		651
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	250	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 20: Meadowbrook Road & WB 12-Mile Road

Movement	WB	WB	WB	WB	NB	SB	SB
Directions Served	T	T	T	R	T	T	R
Maximum Queue (ft)	181	184	183	153	9	237	97
Average Queue (ft)	144	149	146	66	0	93	28
95th Queue (ft)	193	193	192	121	5	175	71
Link Distance (ft)	148	148	148	148	56	837	
Upstream Blk Time (%)	9	10	9	0			
Queuing Penalty (veh)	52	56	52	1			
Storage Bay Dist (ft)							275
Storage Blk Time (%)						0	
Queuing Penalty (veh)						0	

Intersection: 21: Meadowbrook Road & EB 12-Mile Road

Movement	EB	EB	EB	EB	NB	NB	SB
Directions Served	T	T	T	R	T	R	T
Maximum Queue (ft)	150	164	197	111	225	239	12
Average Queue (ft)	70	76	104	49	95	106	1
95th Queue (ft)	119	139	173	90	182	202	12
Link Distance (ft)	634	634	634		878		56
Upstream Blk Time (%)							0
Queuing Penalty (veh)							1
Storage Bay Dist (ft)				350		250	
Storage Blk Time (%)					0	0	
Queuing Penalty (veh)					0	0	

Intersection: 30: EB 12-Mile Road & WB-to-EB XO, E. of Meadowbrook

Movement	SB
Directions Served	L
Maximum Queue (ft)	34
Average Queue (ft)	2
95th Queue (ft)	13
Link Distance (ft)	19
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 31: WB-to-EB XO, E. of Meadowbrook & WB 12-Mile Road

Movement	WB	WB	WB	WB
Directions Served	T	T	T	T
Maximum Queue (ft)	219	208	201	12
Average Queue (ft)	70	67	61	0
95th Queue (ft)	178	174	166	6
Link Distance (ft)	506	506	506	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				150
Storage Blk Time (%)	0		1	
Queuing Penalty (veh)	0		7	

Intersection: 40: EB-to-WB XO, E. of Meadowbrook & WB 12-Mile Road

Movement	NB
Directions Served	L
Maximum Queue (ft)	64
Average Queue (ft)	43
95th Queue (ft)	72
Link Distance (ft)	18
Upstream Blk Time (%)	40
Queuing Penalty (veh)	41
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 41: EB 12-Mile Road & EB-to-WB XO, E. of Meadowbrook

Movement	EB	EB	EB	EB
Directions Served	L	T	T	T
Maximum Queue (ft)	222	104	82	32
Average Queue (ft)	36	12	4	1
95th Queue (ft)	163	115	63	19
Link Distance (ft)		506	506	506
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	250			
Storage Blk Time (%)	3	0		
Queuing Penalty (veh)	14	0		

Intersection: 50: EB 12-Mile Road & WB-to-EB XO, W. of Summit Dr.

Movement	SB
Directions Served	L
Maximum Queue (ft)	85
Average Queue (ft)	47
95th Queue (ft)	77
Link Distance (ft)	23
Upstream Blk Time (%)	23
Queuing Penalty (veh)	24
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 51: WB-to-EB XO, W. of Summit Dr. & WB 12-Mile Road

Movement	WB
Directions Served	L
Maximum Queue (ft)	56
Average Queue (ft)	6
95th Queue (ft)	32
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 60: SB M-5 Exit-Ramp & WB 12-Mile Road

Movement	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	T	T	T	R	R
Maximum Queue (ft)	380	378	304	173	228	343	313
Average Queue (ft)	197	158	116	40	102	166	122
95th Queue (ft)	328	296	238	118	186	280	252
Link Distance (ft)	1226	1226	1226			958	
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)				250	250		250
Storage Blk Time (%)					0	2	0
Queuing Penalty (veh)					0	12	2

Intersection: 61: EB 12-Mile Road & SB M-5 Exit-Ramp

Movement	EB	EB	EB	SB
Directions Served	T	T	T	L
Maximum Queue (ft)	131	135	167	9
Average Queue (ft)	51	54	67	1
95th Queue (ft)	108	114	136	6
Link Distance (ft)	141	141	141	22
Upstream Blk Time (%)	0	0	1	1
Queuing Penalty (veh)	0	1	2	1
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 70: Site Drive #1 & EB 12-Mile Road

Movement	NB
Directions Served	R
Maximum Queue (ft)	60
Average Queue (ft)	31
95th Queue (ft)	55
Link Distance (ft)	454
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 80: Meadowbrook Road & Elm Creek Drive/Site Drive #2

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	L	L
Maximum Queue (ft)	52	40	17	29
Average Queue (ft)	19	16	1	7
95th Queue (ft)	45	42	7	26
Link Distance (ft)	364	417		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			500	475
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 90: Meadowbrook Road & Site Drive #3

Movement	WB	SB
Directions Served	LR	L
Maximum Queue (ft)	36	34
Average Queue (ft)	14	3
95th Queue (ft)	40	19
Link Distance (ft)	413	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		500
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 412

HCS Freeway Weaving Report

Project Information

Analyst	SA	Date	10/8/2024
Agency	Fleis & VandenBrink Engineering	Analysis Year	2024
Jurisdiction	RCOC	Time Analyzed	Future AM Peak Hour
Project Description	Site Drive # 1 to EB-to-WB X/O, W. of M-5	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	3	Segment Type	CD Roadway
Segment Length (L_S), ft	600	Number of Maneuver Lanes (N_{WL}), ln	0
Weaving Configuration	Two-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	2
Interchange Density (ID), int/mi	4.00	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adj. Factor for CAVs (CAF_{CAV})	1.000
Proportion of CAVs in Traffic Stream	0	Final Capacity Adjustment Factor (CAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	680	66	16	0
Peak Hour Factor (PHF)	0.85	0.92	0.92	0.92
Total Trucks, %	6.00	2.00	2.00	0.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.943	0.980	0.980	1.000
Flow Rate (v_i), pc/h	848	73	18	0

Weaving Flow Rate (v_w), pc/h	18	Ideal Conditions Capacity (c_{IFL}), pc/h/ln	2200
Non-Weaving Flow Rate (v_{NW}), pc/h	921	Density-Based Capacity ($c_{IWL} \times N \times f_{HV}$), veh/h	5096
Total Flow Rate (v), pc/h	939	Demand Flow-Based Capacity ($c_{IW} \times f_{HV}$), veh/h	-
Volume Ratio (VR)	0.019	Weaving Area Capacity (c_W), veh/h	5096
Minimum Lane Change Rate (LC_{MIN}), lc/h	36	Adjusted Weaving Area Capacity (c_{WA}), veh/h	5096
Maximum Weaving Length (L_{MAX}), ft	5903	Demand-to-Capacity Ratio (v/c)	0.17

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	221	Average Weaving Speed (S_W), mi/h	41.9
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	0	Average Non-Weaving Speed (S_{NW}), mi/h	43.2
Weaving Lane Change Rate (LC_W), lc/h	256	Average Speed (S), mi/h	43.2
Total Lane Change Rate (LC_{All}), lc/h	256	Density (D), pc/mi/ln	7.2
Weaving Intensity Factor (W)	0.115	Level of Service (LOS)	A

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HCS Freeway Weaving Report

Project Information

Analyst	SA	Date	10/8/2024
Agency	Fleis & VandenBrink Engineering	Analysis Year	2024
Jurisdiction	RCOC	Time Analyzed	Future AM Peak Hour
Project Description	WB-to-EB X/O, W. of Summit Dr to Site Drive # 1	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	3	Segment Type	CD Roadway
Segment Length (L_S), ft	300	Number of Maneuver Lanes (N_{WL}), ln	0
Weaving Configuration	Two-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	2
Interchange Density (ID), int/mi	4.00	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adj. Factor for CAVs (CAF_{CAV})	1.000
Proportion of CAVs in Traffic Stream	0	Final Capacity Adjustment Factor (CAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	680	14	22	5
Peak Hour Factor (PHF)	0.85	0.60	0.60	0.85
Total Trucks, %	6.00	0.00	0.00	0.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.943	1.000	1.000	1.000
Flow Rate (v_i), pc/h	848	23	37	6
Weaving Flow Rate (v_w), pc/h	37	Ideal Conditions Capacity (c_{IFL}), pc/h/ln		2200
Non-Weaving Flow Rate (v_{NW}), pc/h	877	Density-Based Capacity ($c_{IWL} \times N \times f_{HV}$), veh/h		4984
Total Flow Rate (v), pc/h	914	Demand Flow-Based Capacity ($c_{IW} \times f_{HV}$), veh/h		-
Volume Ratio (VR)	0.040	Weaving Area Capacity (c_W), veh/h		4984
Minimum Lane Change Rate (LC_{MIN}), lc/h	74	Adjusted Weaving Area Capacity (c_{WA}), veh/h		4984
Maximum Weaving Length (L_{MAX}), ft	6099	Demand-to-Capacity Ratio (v/c)		0.17

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	105	Average Weaving Speed (S_W), mi/h	42.9
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	0	Average Non-Weaving Speed (S_{NW}), mi/h	43.0
Weaving Lane Change Rate (LC_W), lc/h	74	Average Speed (S), mi/h	43.0
Total Lane Change Rate (LC_{All}), lc/h	74	Density (D), pc/mi/ln	7.1
Weaving Intensity Factor (W)	0.075	Level of Service (LOS)	A

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HCS Freeway Weaving Report

Project Information

Analyst	SA	Date	10/8/2024
Agency	Fleis & VandenBrink Engineering	Analysis Year	2024
Jurisdiction	RCOC	Time Analyzed	Future PM Peak Hour
Project Description	Site Drive # 1 to EB-to-WB X/O, W. of M-5	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	3	Segment Type	CD Roadway
Segment Length (L_S), ft	600	Number of Maneuver Lanes (N_{WL}), ln	0
Weaving Configuration	Two-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	2
Interchange Density (ID), int/mi	4.00	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adj. Factor for CAVs (CAF_{CAV})	1.000
Proportion of CAVs in Traffic Stream	0	Final Capacity Adjustment Factor (CAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	1270	52	7	0
Peak Hour Factor (PHF)	0.88	0.92	0.92	0.92
Total Trucks, %	1.00	2.00	2.00	0.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.990	0.980	0.980	1.000
Flow Rate (v_i), pc/h	1458	58	8	0
Weaving Flow Rate (v_W), pc/h	8	Ideal Conditions Capacity (c_{IFL}), pc/h/ln		2200
Non-Weaving Flow Rate (v_{NW}), pc/h	1516	Density-Based Capacity ($c_{IWL} \times N \times f_{HV}$), veh/h		5355
Total Flow Rate (v), pc/h	1524	Demand Flow-Based Capacity ($c_{IW} \times f_{HV}$), veh/h		-
Volume Ratio (VR)	0.005	Weaving Area Capacity (c_W), veh/h		5355
Minimum Lane Change Rate (LC_{MIN}), lc/h	16	Adjusted Weaving Area Capacity (c_{WA}), veh/h		5355
Maximum Weaving Length (L_{MAX}), ft	5774	Demand-to-Capacity Ratio (v/c)		0.28

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	364	Average Weaving Speed (S_W), mi/h	41.6
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	60	Average Non-Weaving Speed (S_{NW}), mi/h	42.4
Weaving Lane Change Rate (LC_W), lc/h	236	Average Speed (S), mi/h	42.4
Total Lane Change Rate (LC_{All}), lc/h	296	Density (D), pc/mi/ln	12.0
Weaving Intensity Factor (W)	0.129	Level of Service (LOS)	A

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HCS Freeway Weaving Report

Project Information

Analyst	SA	Date	10/8/2024
Agency	Fleis & VandenBrink Engineering	Analysis Year	2024
Jurisdiction	RCOC	Time Analyzed	Future PM Peak Hour
Project Description	WB-to-EB X/O, W. of Summit Dr to Site Drive # 1	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	3	Segment Type	CD Roadway
Segment Length (L_S), ft	300	Number of Maneuver Lanes (N_{WL}), ln	0
Weaving Configuration	Two-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	2
Interchange Density (ID), int/mi	4.00	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adj. Factor for CAVs (CAF_{CAV})	1.000
Proportion of CAVs in Traffic Stream	0	Final Capacity Adjustment Factor (CAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	1270	23	82	12
Peak Hour Factor (PHF)	0.88	0.92	0.92	0.95
Total Trucks, %	1.00	14.00	0.00	0.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.990	0.877	1.000	1.000
Flow Rate (v_i), pc/h	1458	29	89	13

Weaving Flow Rate (v_w), pc/h	89	Ideal Conditions Capacity (c_{IFL}), pc/h/ln	2200
Non-Weaving Flow Rate (v_{NW}), pc/h	1500	Density-Based Capacity ($c_{IWL} \times N \times f_{HV}$), veh/h	5175
Total Flow Rate (v), pc/h	1589	Demand Flow-Based Capacity ($c_{IW} \times f_{HV}$), veh/h	-
Volume Ratio (VR)	0.056	Weaving Area Capacity (c_W), veh/h	5175
Minimum Lane Change Rate (LC_{MIN}), lc/h	178	Adjusted Weaving Area Capacity (c_{WA}), veh/h	5175
Maximum Weaving Length (L_{MAX}), ft	6250	Demand-to-Capacity Ratio (v/c)	0.30

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	180	Average Weaving Speed (S_W), mi/h	41.1
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	0	Average Non-Weaving Speed (S_{NW}), mi/h	41.2
Weaving Lane Change Rate (LC_W), lc/h	178	Average Speed (S), mi/h	41.2
Total Lane Change Rate (LC_{All}), lc/h	178	Density (D), pc/mi/ln	12.9
Weaving Intensity Factor (W)	0.150	Level of Service (LOS)	B

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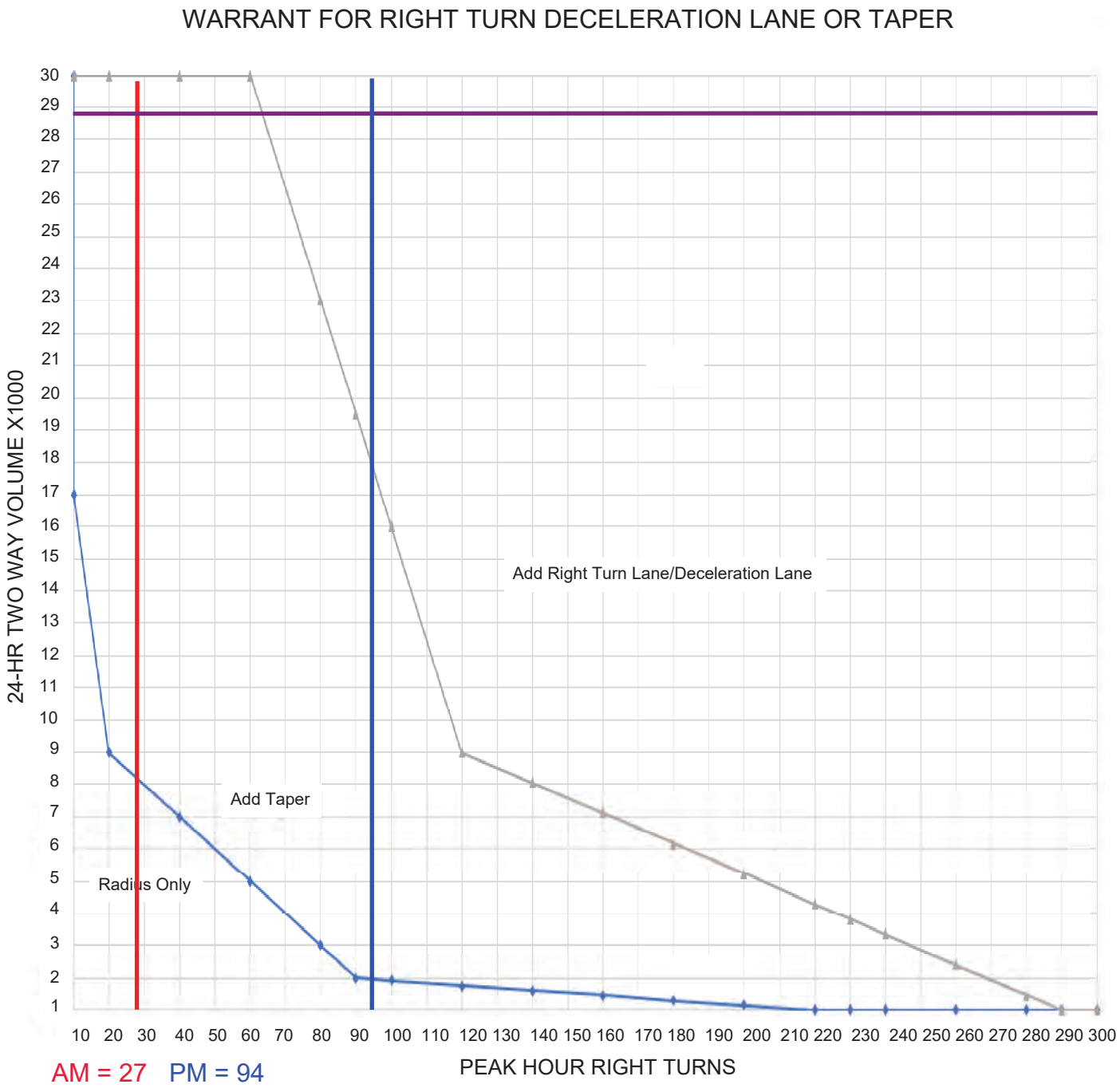
12-Mile Road and Site Drive # 1

FIGURE 6-3



RT Lane
RECOMMENDED

2023 ADT = 26,000 vpd (MDOT)
0.50% @ 7yrs= +924 vpd
The Grove New Trips = +1951 vpd
2030 ADT= 28,875 vpd

Meadowbrook Road and Site Drive # 2

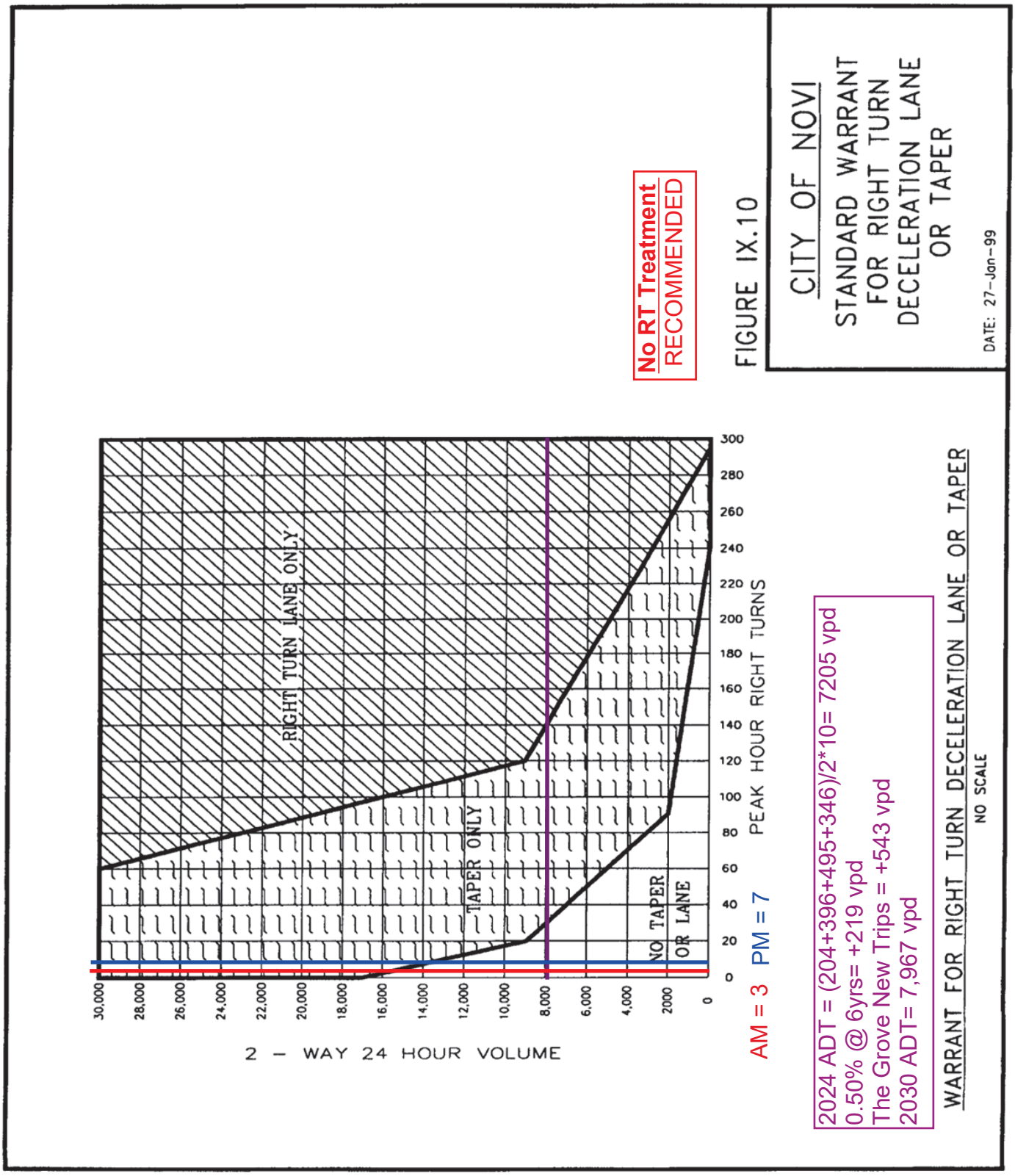


Figure IX.10

(Ord. No. 99-124.11, Pt. XXXIII, 7-26-99)

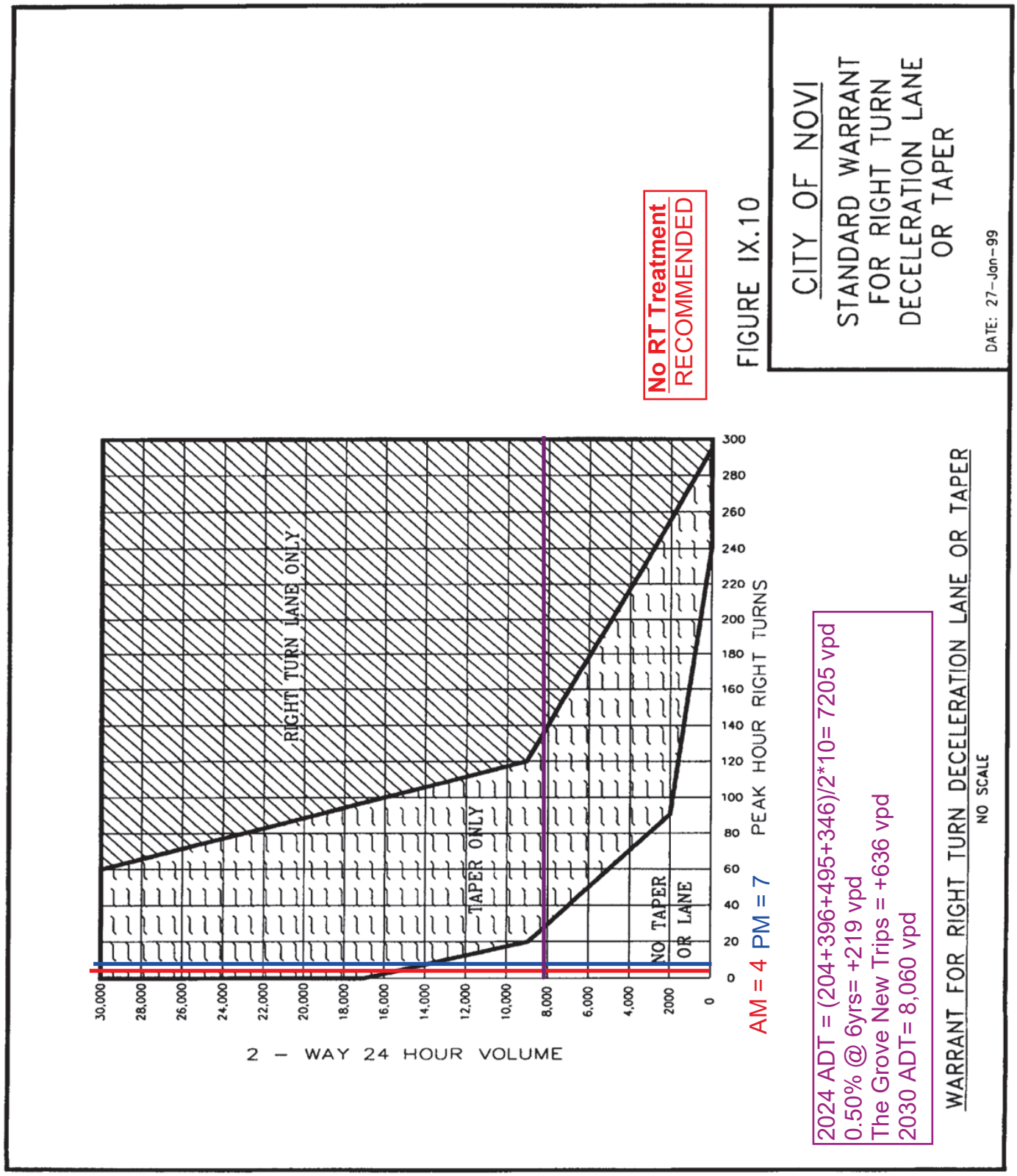


Figure IX.10

(Ord. No. 99-124.11, Pt. XXXIII, 7-26-99)