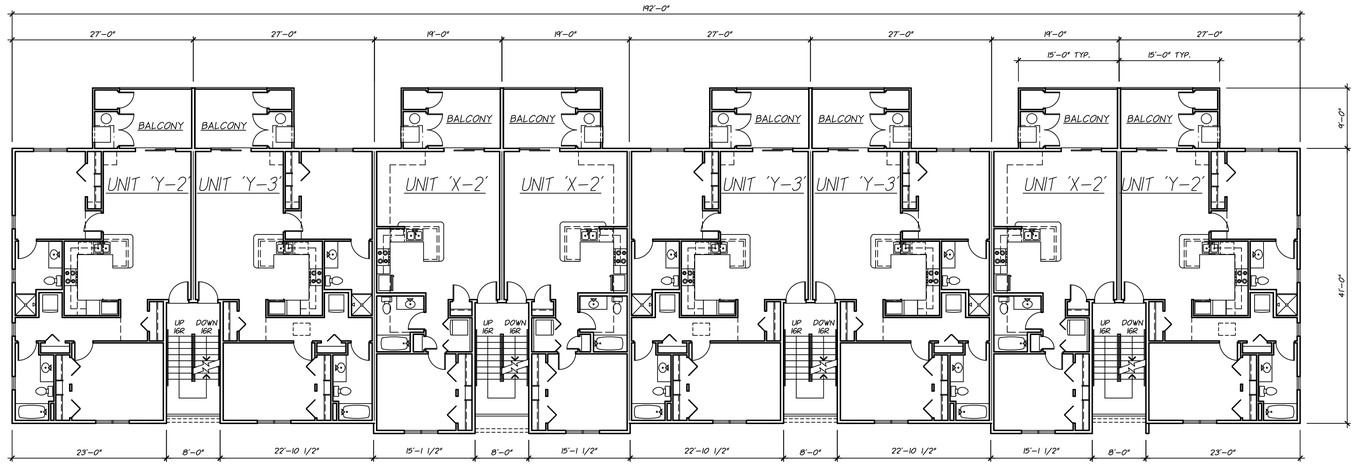
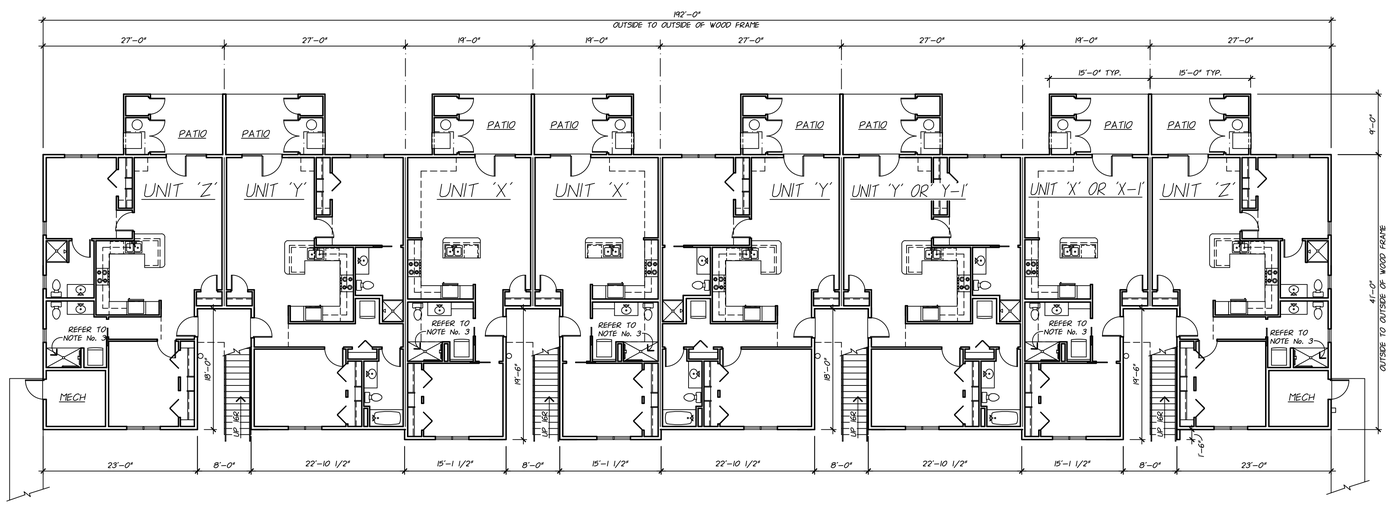


SECOND AND THIRD FLOOR OVERALL PLAN – BUILDINGS A, D & E

SCALE: 3/32"=1'-0" 24 UNIT



FIRST FLOOR OVERALL PLAN – BUILDINGS A, D & E

SCALE: 3/32"=1'-0" 24 UNIT

OVERALL FLOOR PLAN GENERAL NOTES:

1.) BUILDING AREA PER FLOOR:
- TOTAL DWELLING UNIT AREA = 7,189 S.F.
- TOTAL PATIO/BALCONY AREA = 1,080 S.F.
- TOTAL STAIRWELL AREA = 588 S.F.

TOTAL BUILDING AREA 8,857 S.F.

2.) PER 2015 MBC SECTION 1107.6.2.2.1 TWO PERCENT (2%) OR THREE (3) OF THE UNITS ARE REQUIRED TO BE TYPE 'A', ACCESSIBLE UNITS. ALL OF THE GROUND FLOOR UNITS EXCEPT FOR THE THREE (3) TYPE 'A' UNITS ARE TYPE 'B', ACCESSIBLE UNITS. THE TYPE 'A' AND 'B' UNITS ARE DESIGNED TO MEET THE REQUIREMENTS OF ANSI A117.1-2009, CHAPTER 10.

3.) ROLL-IN SHOWER PER ICC A117.1-2009, SECTION 608.3.2

PROJECT UNIT MIX

BLDG. I.D.	UNIT 'W' STU/1 BA 496 S.F.	UNIT 'X' 1 BR/1 BA 730 S.F.	UNIT 'Y' 2 BR/2 BA 1,035 S.F.	UNIT 'Z' 2 BR/2 BA 947 S.F.	TOTAL
A	–	9	13	2	24
B	–	6	22 *	2	30
C	–	6	22 *	2	30
D	–	9	13	2	24
E	–	9	13	2	24
F	12	–	10	2	24
TOTAL	12	39	93	12	156
%	8	25	59	8	100

* NOTE: THIS NUMBER INCLUDES (6) 1,070 S.F. 'Y-4' AND 'Y-5' UNITS IN THE 30 UNIT BUILDING

Lakeshore Gardens Apartments - 24 Unit
(Buildings A, D and E)

17114 Robbins Road
Grand Haven Township, Michigan

PUD Submittal No. 2
5-15-18
PUD Submittal
4-23-18 . . . . . date

3017 . . . . . commission

A1.0 . . . . . sheet

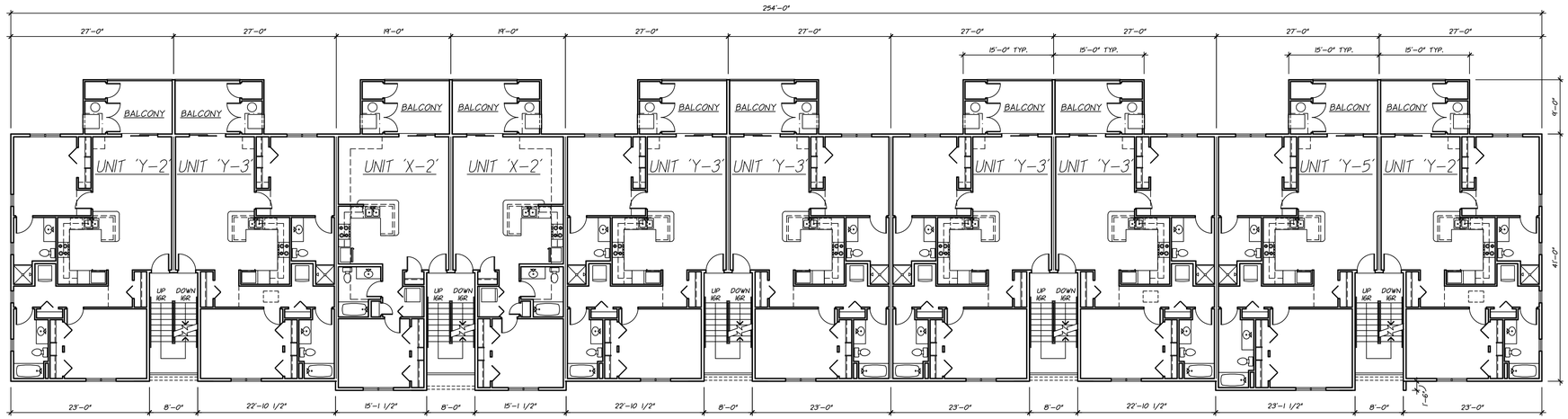
This drawing is the sole property of Oppenhuizen Architects and is not to be used or reproduced without their written consent. ©

333 Jackson St.
Grand Haven
Michigan
49417

ph. 616 846 8990
fax 616 846 8898

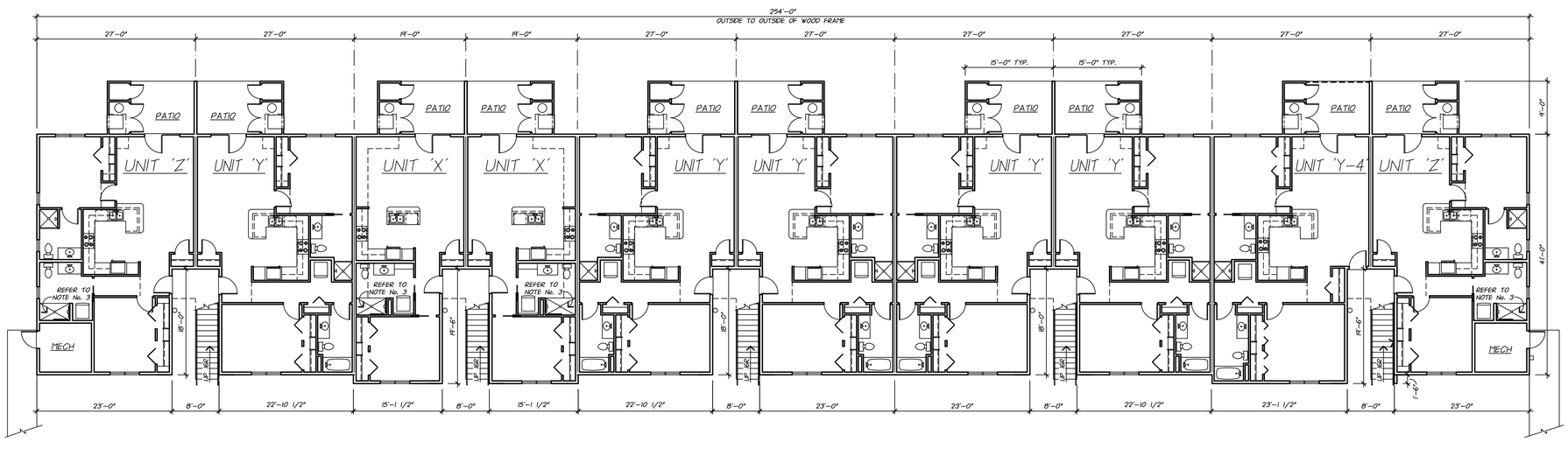
OppenhuizenArchitects

Mark A. Oppenhuizen AIA



SECOND AND THIRD FLOOR OVERALL PLAN – BUILDINGS B & C

SCALE: 3/32"=1'-0" 30 UNIT



FIRST FLOOR OVERALL PLAN – BUILDINGS B & C

SCALE: 3/32"=1'-0" 30 UNIT

OVERALL FLOOR PLAN GENERAL NOTES:

1.) BUILDING AREA PER FLOOR:
- TOTAL DWELLING UNIT AREA = 9,599 S.F.
- TOTAL PATIO/BALCONY AREA = 1,350 S.F.
- TOTAL STAIRWELL AREA = 732 S.F.

TOTAL BUILDING AREA 11,681 S.F.

2.) PER 2015 MBC SECTION 1107.6.2.2.1 TWO PERCENT (2%) OR THREE (3) OF THE UNITS ARE REQUIRED TO BE TYPE 'A', ACCESSIBLE UNITS. ALL OF THE GROUND FLOOR UNITS EXCEPT FOR THE THREE (3) TYPE 'A' UNITS ARE TYPE 'B', ACCESSIBLE UNITS. THE TYPE 'A' AND 'B' UNITS ARE DESIGNED TO MEET THE REQUIREMENTS OF ANSI A117.1–2009, CHAPTER 10.

3.) ROLL–IN SHOWER PER ICC A117.1–2009, SECTION 608.3.2

PROJECT UNIT MIX

BLDG. I.D.	UNIT 'W' STU/1 BA 496 S.F.	UNIT 'X' 1 BR/1 BA 730 S.F.	UNIT 'Y' 2 BR/2 BA 1,035 S.F.	UNIT 'Z' 2 BR/2 BA 947 S.F.	TOTAL
A	–	9	13	2	24
B	–	6	22 *	2	30
C	–	6	22 *	2	30
D	–	9	13	2	24
E	–	9	13	2	24
F	12	–	10	2	24
TOTAL	12	39	93	12	156
%	8	25	59	8	100

* NOTE: THIS NUMBER INCLUDES (6) 1,070 S.F. 'Y-4' AND 'Y-5' UNITS IN THE 30 UNIT BUILDING

Lakeshore Gardens Apartments - 30 Unit
(Buildings B and C)

17114 Robbins Road
Grand Haven Township, Michigan

PUD Submittal No. 2
5-15-18
PUD Submittal
4-23-18 . . . . . date

3017 . . . . . commission

A1.1 . . . . . sheet

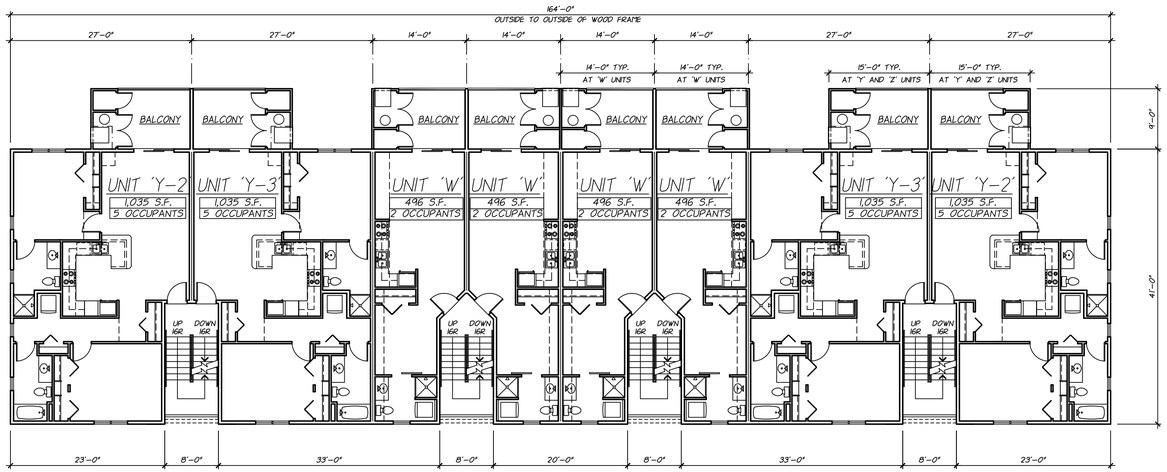
This drawing is the sole property of Oppenhuizen Architects and is not to be used or reproduced without their written consent. ©

333 Jackson St.
Grand Haven
Michigan
49417

ph. 616 846 8990
fax 616 846 8898

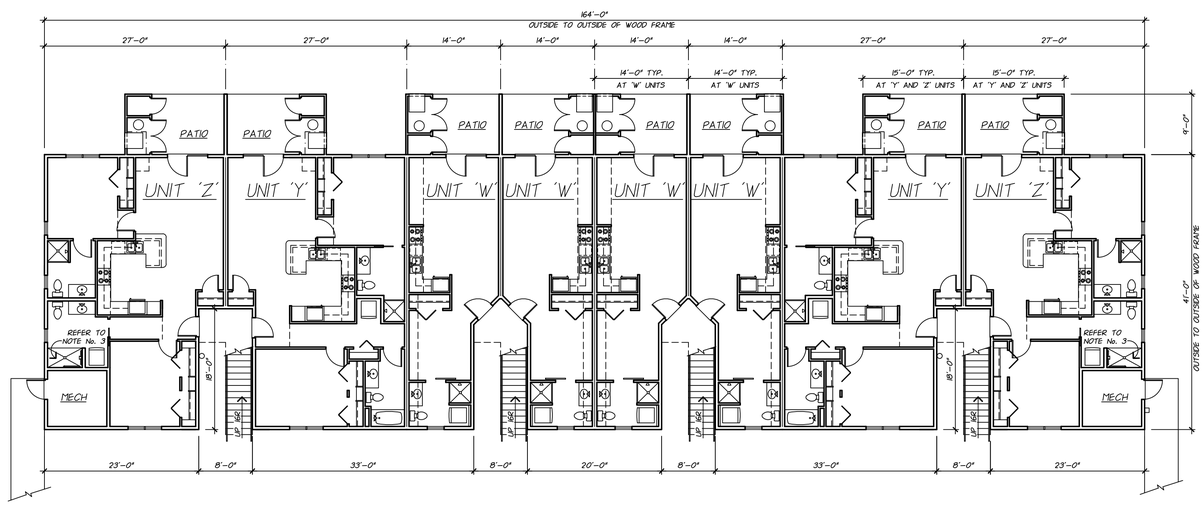
OppenhuizenArchitects

Mark A. Oppenhuizen AIA



SECOND AND THIRD FLOOR OVERALL PLAN – BUILDING 'F'

SCALE: 3/32"=1'-0" 24 UNIT



FIRST FLOOR OVERALL PLAN – BUILDING 'F'

SCALE: 3/32"=1'-0" 24 UNIT

OVERALL FLOOR PLAN GENERAL NOTES:

1.) BUILDING AREA PER FLOOR:
- TOTAL DWELLING UNIT AREA = 6,154 S.F.
- TOTAL PATIO/BALCONY AREA = 1,048 S.F.
- TOTAL STAIRWELL AREA = 570 S.F.
- TOTAL BUILDING AREA 7,772 S.F.

2.) PER 2015 MBC SECTION 1107.6.2.2.1 TWO PERCENT (2%) OR THREE (3) OF THE UNITS ARE REQUIRED TO BE TYPE 'A', ACCESSIBLE UNITS. ALL OF THE GROUND FLOOR UNITS EXCEPT FOR THE THREE (3) TYPE 'A' UNITS ARE TYPE 'B', ACCESSIBLE UNITS. THE TYPE 'A' AND 'B' UNITS ARE DESIGNED TO MEET THE REQUIREMENTS OF ANSI A117.1-2009, CHAPTER 10.

3.) ROLL-IN SHOWER PER ICC A117.1-2009, SECTION 608.3.2

PROJECT UNIT MIX

BLDG. I.D.	UNIT 'W' STU/1 BA 496 S.F.	UNIT 'X' 1 BR/1 BA 730 S.F.	UNIT 'Y' 2 BR/2 BA 1,035 S.F.	UNIT 'Z' 2 BR/2 BA 947 S.F.	TOTAL
A	–	9	13	2	24
B	–	6	22 *	2	30
C	–	6	22 *	2	30
D	–	9	13	2	24
E	–	9	13	2	24
F	12	–	10	2	24
TOTAL	12	39	93	12	156
%	8	25	59	8	100

* NOTE: THIS NUMBER INCLUDES (6) 1,070 S.F. 'Y-4' AND 'Y-5' UNITS IN THE 30 UNIT BUILDING

Lakeshore Gardens Apartments - 24 Unit (Building F)

17114 Robbins Road
Grand Haven Township, Michigan

PUD Submittal No. 2
5-15-18
PUD Submittal
4-23-18 . . . . . date

3017 . . . . . commission

A1.2 . . . . . sheet

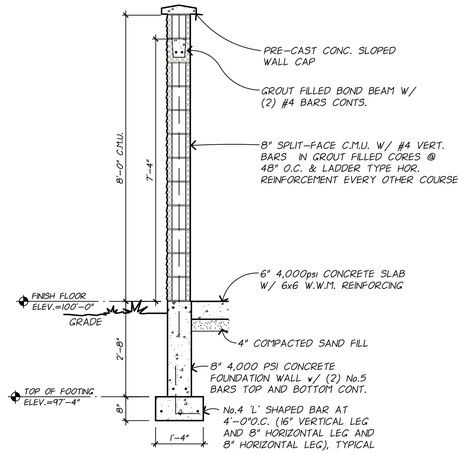
This drawing is the sole property of Oppenhuizen Architects and is not to be used or reproduced without their written consent. ©

333 Jackson St.
Grand Haven
Michigan
49417

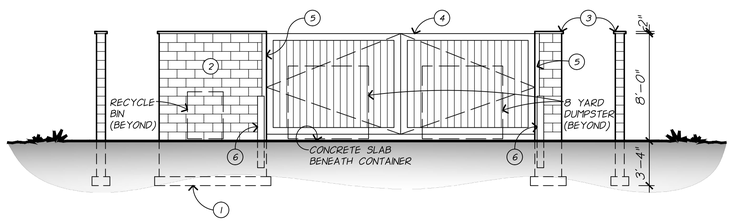
ph. 616 846 8990
fax 616 846 8898

OppenhuizenArchitects

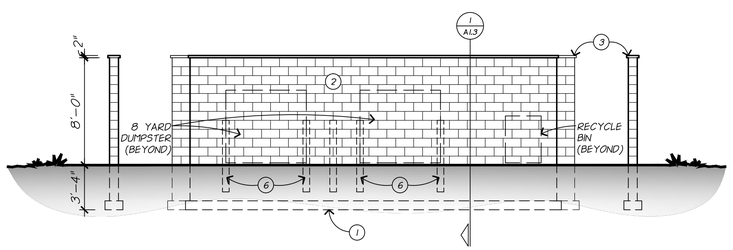
Mark A. Oppenhuizen AIA



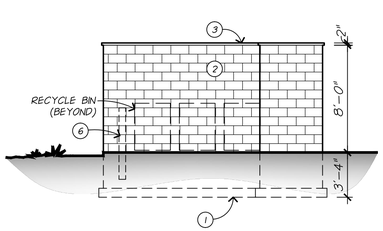
1 / A1.3 WALL SECTION
SCALE: 1/2"=1'-0"



NORTH ELEVATION – REFUSE/RECYCLE STATION
SCALE: 3/16"=1'-0"



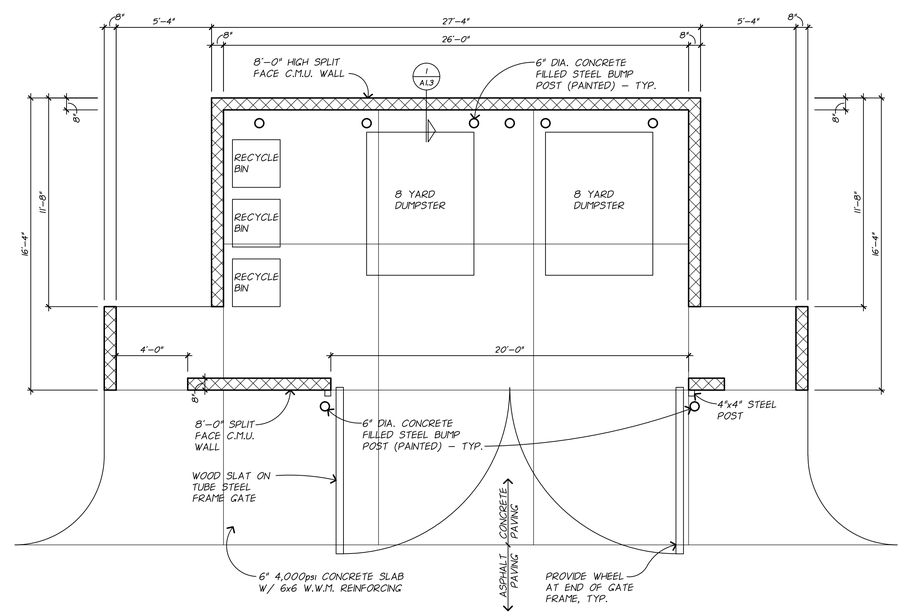
SOUTH ELEVATION – REFUSE/RECYCLE STATION
SCALE: 3/16"=1'-0"



EAST ELEVATION – REFUSE/RECYCLE STATION
SCALE: 3/16"=1'-0"
(WEST ELEVATION SIMILAR – OPPOSITE HAND)

ELEVATION MATERIAL KEY:

1. FOUNDATION, SEE FOUNDATION PLAN
2. 8'-0" HIGH SPLIT-FACE C.M.U. WALL – PROVIDE INTEGRAL COLOR C.M.U. FROM MFGRS. STANDARD COLOR LINE – COLOR SELECTION BY ARCHITECT
3. 2" PRECAST CONCRETE WALL CAP
4. GATE – TRT. WOOD SLAT ON TUBE STEEL FRAME W/ (1) WHEEL PER PANEL
5. 4"x4" STEEL POST, MOUNT (4) TO POST
6. 6" DIA. CONCRETE FILLED STEEL BUMP POST, PAINT – YELLOW OR PROVIDE YELLOW ONE-PIECE PLASTIC COVERS



FLOOR PLAN – REFUSE/RECYCLE STATION
SCALE: 1/4"=1'-0"

N

Dumpster Enclosure Details for:
Lakeshore Gardens Apartments
17114 Robbins Road
Grand Haven Township, Michigan

PUD Submittal No. 2 5-15-13
PUD Submittal 4-23-13 . . . . . date

3017 . . . . . commission

A1.3 . . . . . sheet

This drawing is the sole property of Oppenhuizen Architects and is not to be used or reproduced without their written consent. ©

333 Jackson St.
Grand Haven
Michigan
49417

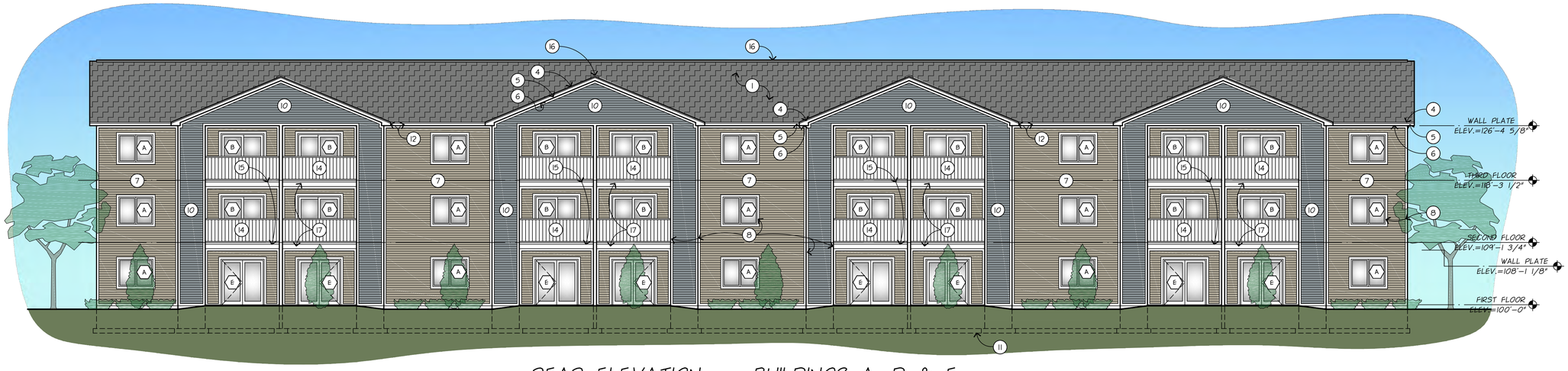
ph. 616 846 8990
fax 616 846 8898

OppenhuizenArchitects

Mark A. Oppenhuizen AIA

FRONT ELEVATION – BUILDINGS A, D & E

SCALE: 1/8"=1'-0" 24 UNIT



REAR ELEVATION – BUILDINGS A, D & E

SCALE: 1/8"=1'-0" 24 UNIT

ELEVATION MATERIAL KEY

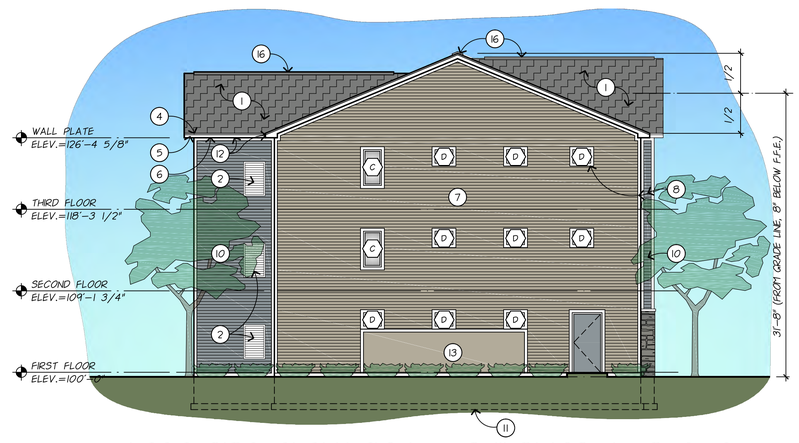
1. ASPHALT SHINGLES, CERTAINTEED LANDMARK OR EQUAL, COLOR SELECTION BY ARCHITECT.
2. HVAC UNIT GRILLE.
3. PVC TRIM ON GLU-LAM BEAM.
4. PRE-FINISHED METAL DRIP EDGE.
5. ALUMINUM FASCIA, COLOR SELECTION BY ARCHITECT.
6. RIBBED, PERFORATED (FOR VENTING) ALUMINUM SOFFIT.
7. 4" EXPOSURE, BEVELED VINYL SIDING, COLOR #1, SELECTION BY ARCHITECT.
8. 4" VINYL TRIM, COLOR SELECTION BY ARCHITECT.
9. VERSETTA STONE TIGHT CUT PATTERN, COLOR SELECTION BY ARCHITECT.
10. 4" EXPOSURE, BEVELED VINYL SIDING, COLOR #2, SELECTION BY ARCHITECT.
11. FOUNDATION, SEE FOUNDATION PLAN.
12. SEAMLESS VINYL GUTTER AND DOWNSPOUT WITH SPLASH BLOCK AT OUTLET. CONTRACTOR TO CALCULATE AND PROVIDE THE CORRECT # OF DOWNSPOUTS.
13. PVC PANEL W/ 4" PVC TRIM OVERALL SURROUND AS FLAT SURFACE AT METER LOCATIONS
14. POWDER COAT STEEL RAILING SYSTEM, PRICE ALUMINUM AND VINYL RAILING SYSTEM AS ALTERNATE.
15. 5/4"x6" PRESSURE TREATED WOOD DECKING.
16. "SHINGLE OVER" RIDGE VENT.
17. PVC TRIM OVER DECK JOIST FRAMING.
18. PVC PANEL + 4" PVC TRIM SIDING
19. LANDING WALL DETAIL, SEE DETAIL NO. 1/A2.0.
20. VERSETTA STONE, WAINSCOAT CAP, COLOR SELECTION BY ARCHITECT.

WINDOW KEY:

- (A) 5'-0"x4'-0" SLIDING WINDOW UNIT
- (B) 6'-0"x6'-8" SLIDING GLASS DOOR
- (C) 2'-0"x4'-0" CASEMENT WINDOW UNIT
- (D) 2'-0"x1'-6" FIXED WINDOW UNIT
- (E) 3'-0"x6'-8" FRENCH DOOR W/ TEMPERED GLASS AND 'ADA' LOW-PROFILE SILL w/ 3'-0"x6'-8" TEMPERED GLASS SIDELITE.

NOTES:

1. ALL ROOF OVERHANGS ARE 1'-0" UNLESS NOTED OTHERWISE.
2. GUARD RAIL HEIGHTS AT BALCONIES AND ENTRY BALCONIES ARE 3'-6" OFF FINISHED DECK. GUARDRAL TO RESIST LOADS IDENTIFIED IN 2015 M.B.C., SECTION 1607.8
3. WINDOWS ON THE FRONT ELEVATION TO HAVE GRILLES BETWEEN THE GLASS.
4. WINDOW AND DOOR HEIGHT IS 6'-8" A.F.F., UNLESS NOTED OTHERWISE.
5. PROVIDE A $1,000.00 ALLOWANCE FOR IDENTIFICATION SIGNAGE ON EACH BUILDING.
6. WINDOW TYPES (A) AND (C) ON THE SECOND AND THIRD FLOORS TO HAVE GUARDS COMPLYING WITH 2015 MBC, SECTION 1015.8.



LEFT SIDE ELEVATION – BUILDINGS A, D & E

SCALE: 1/8"=1'-0" 24 UNIT

NOTE: RIGHT SIDE SIMILAR – OPPOSITE HAND

Lakeshore Gardens Apartments - 24 Unit

(Buildings A, D and E)

17114 Robbins Road
Grand Haven Township, Michigan

PUD Submittal No. 2
5-15-13
PUD Submittal
4-23-13 . . . . . date

3017 . . . . . commission

A2.0 . . . . sheet

This drawing is the sole property of Oppenhuizen Architects and is not to be used or reproduced without their written consent. ©

333 Jackson St.
Grand Haven
Michigan
49417

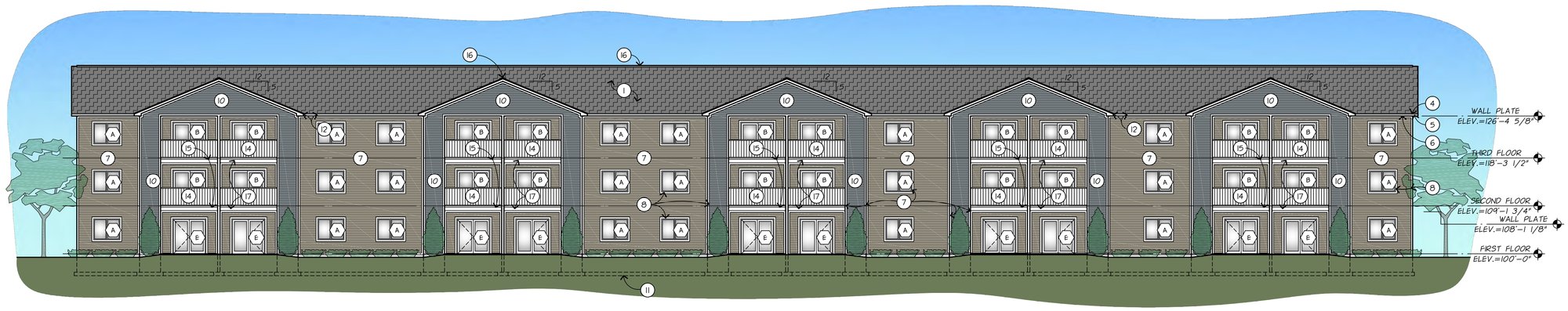
ph. 616 846 8990
fax 616 846 8898

OppenhuizenArchitects

Mark A. Oppenhuizen AIA

FRONT ELEVATION – BUILDINGS B & C

SCALE: 3/32"=1'-0" 30 UNIT



REAR ELEVATION – BUILDINGS B & C

SCALE: 3/32"=1'-0" 30 UNIT

ELEVATION MATERIAL KEY

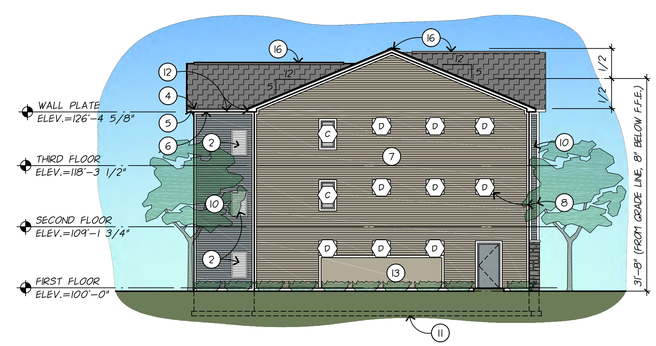
1. ASPHALT SHINGLES, CERTAINTEED LANDMARK OR EQUAL, COLOR SELECTION BY ARCHITECT.
2. HVAC UNIT GRILLE.
3. PVC TRIM ON GLU-LAM BEAM.
4. PRE-FINISHED METAL DRIP EDGE.
5. ALUMINUM FASCIA, COLOR SELECTION BY ARCHITECT.
6. RIBBED, PERFORATED (FOR VENTING) ALUMINUM SOFFIT.
7. 4" EXPOSURE, BEVELED VINYL SIDING, COLOR #1, SELECTION BY ARCHITECT.
8. 4" VINYL TRIM, COLOR SELECTION BY ARCHITECT.
9. VERSETTA STONE TIGHT CUT PATTERN, COLOR SELECTION BY ARCHITECT.
10. 4" EXPOSURE, BEVELED VINYL SIDING, COLOR #2, SELECTION BY ARCHITECT.
11. FOUNDATION, SEE FOUNDATION PLAN.
12. SEAMLESS VINYL GUTTER AND DOWNSPOUT WITH SPLASH BLOCK AT OUTLET. CONTRACTOR TO CALCULATE AND PROVIDE THE CORRECT # OF DOWNSPOUTS.
13. PVC PANEL W/ 4" PVC TRIM OVERALL SURROUND AS FLAT SURFACE AT METER LOCATIONS
14. POWDER COAT STEEL RAILING SYSTEM, PRICE ALUMINUM AND VINYL RAILING SYSTEM AS ALTERNATE.
15. 5/4"x6" PRESSURE TREATED WOOD DECKING.
16. "SHINGLE OVER" RIDGE VENT.
17. PVC TRIM OVER DECK JOIST FRAMING.
18. PVC PANEL + 4" PVC TRIM SIDING
19. LANDING WALL DETAIL, SEE DETAIL NO. 1/A2.0.
20. VERSETTA STONE, WAINSCOAT CAP, COLOR SELECTION BY ARCHITECT.

WINDOW KEY:

- (A) 5'-0"x4'-0" SLIDING WINDOW UNIT
- (B) 6'-0"x6'-8" SLIDING GLASS DOOR
- (C) 2'-0"x4'-0" CASEMENT WINDOW UNIT
- (D) 2'-0"x1'-6" FIXED WINDOW UNT
- (E) 3'-0"x6'-8" FRENCH DOOR W/ TEMPERED GLASS AND 'ADA' LOW-PROFILE SILL w/ 3'-0"x6'-8" TEMPERED GLASS SIDELITE.

NOTES:

1. ALL ROOF OVERHANGS ARE 1'-0" UNLESS NOTED OTHERWISE.
2. GUARD RAIL HEIGHTS AT BALCONIES AND ENTRY BALCONIES ARE 3'-6" OFF FINISHED DECK. GUARDRAIL TO RESIST LOADS IDENTIFIED IN 2015 M.B.C., SECTION 1607.8
3. WINDOWS ON THE FRONT ELEVATION TO HAVE GRILLES BETWEEN THE GLASS.
4. WINDOW AND DOOR HEIGHT IS 6'-8" A.F.F., UNLESS NOTED OTHERWISE.
5. PROVIDE A $1,000.00 ALLOWANCE FOR IDENTIFICATION SIGNAGE ON EACH BUILDING.
6. WINDOW TYPES (A) AND (C) ON THE SECOND AND THIRD FLOORS TO HAVE GUARDS COMPLYING WITH 2015 MBC, SECTION 1015.8.



LEFT SIDE ELEVATION – BUILDINGS B & C

SCALE: 3/32"=1'-0" 30 UNIT

NOTE: RIGHT SIDE SIMILAR – OPPOSITE HAND

Lakeshore Gardens Apartments - 30 Unit

(Buildings B and C)

17114 Robbins Road
Grand Haven Township, Michigan

PUD Submittal No. 2
5-15-18
PUD Submittal
4-23-18 . . . . . date

3017 . . . . . commission

A2.1 . . . . . sheet

This drawing is the sole property of Oppenhuizen **Architects** and is not to be used or reproduced without their written consent. ©

333 Jackson St.
Grand Haven
Michigan
49417

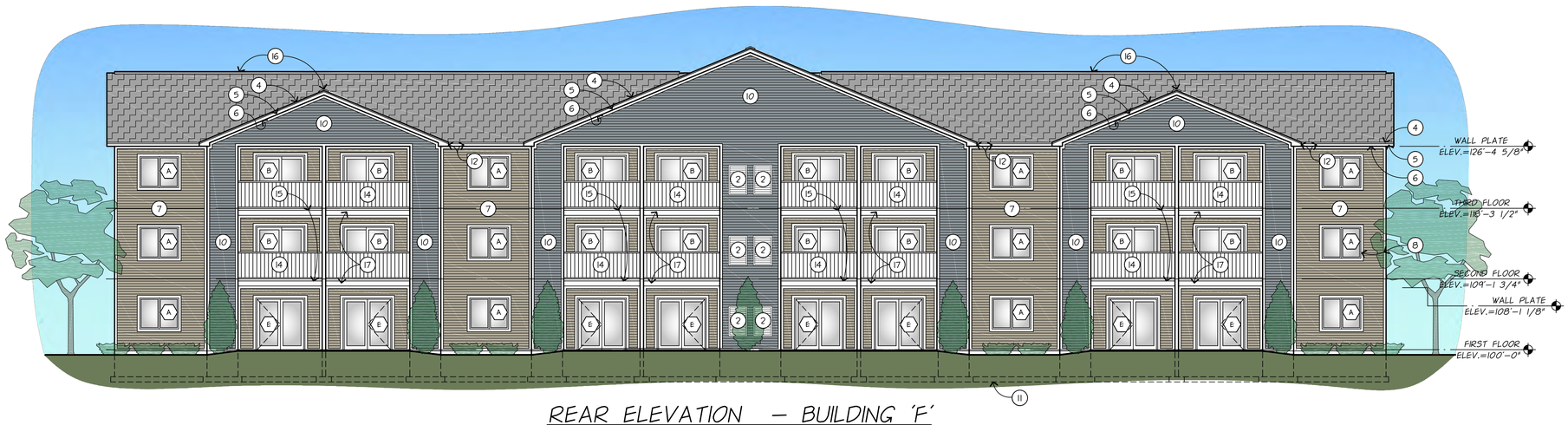
ph. 616 846 8990
fax 616 846 8898

OppenhuizenArchitects

Mark A. Oppenhuizen AIA

FRONT ELEVATION – BUILDING 'F'

SCALE: 1/8"=1'-0" 24 UNIT



REAR ELEVATION – BUILDING 'F'

SCALE: 1/8"=1'-0" 24 UNIT

ELEVATION MATERIAL KEY

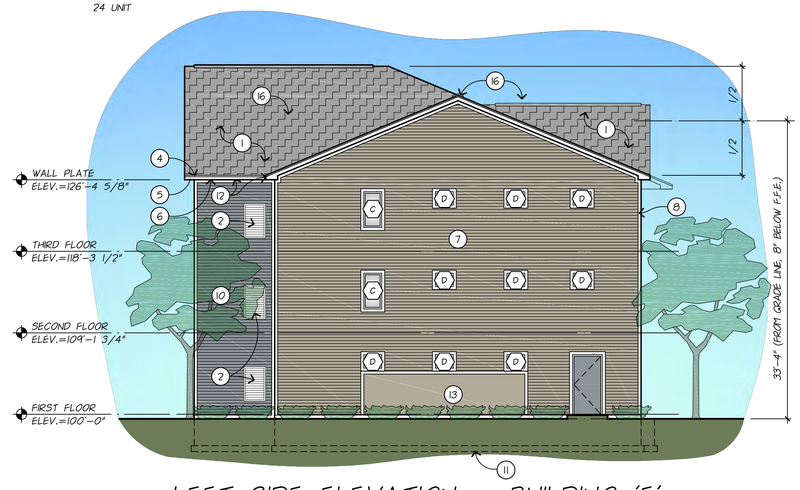
1. ASPHALT SHINGLES, CERTAINTEED LANDMARK OR EQUAL, COLOR SELECTION BY ARCHITECT.
2. HVAC UNIT GRILLE.
3. PVC TRIM ON GLU-LAM BEAM.
4. PRE-FINISHED METAL DRIP EDGE.
5. ALUMINUM FASCIA, COLOR SELECTION BY ARCHITECT.
6. RIBBED, PERFORATED (FOR VENTING) ALUMINUM SOFFIT.
7. 4" EXPOSURE, BEVELED VINYL SIDING, COLOR #1, SELECTION BY ARCHITECT.
8. 4" VINYL TRIM, COLOR SELECTION BY ARCHITECT.
9. VERSETTA STONE TIGHT CUT PATTERN, COLOR SELECTION BY ARCHITECT.
10. 4" EXPOSURE, BEVELED VINYL SIDING, COLOR #2, SELECTION BY ARCHITECT.
11. FOUNDATION, SEE FOUNDATION PLAN.
12. SEAMLESS VINYL GUTTER AND DOWNSPOUT WITH SPLASH BLOCK AT OUTLET. CONTRACTOR TO CALCULATE AND PROVIDE THE CORRECT # OF DOWNSPOUTS.
13. PVC PANEL W/ 4" PVC TRIM OVERALL SURROUND AS FLAT SURFACE AT METER LOCATIONS
14. POWDER COAT STEEL RAILING SYSTEM, PRICE ALUMINUM AND VINYL RAILING SYSTEM AS ALTERNATE.
15. 5/4"x6" PRESSURE TREATED WOOD DECKING.
16. "SHINGLE OVER" RIDGE VENT.
17. PVC TRIM OVER DECK JOIST FRAMING.
18. PVC PANEL + 4" PVC TRIM SIDING
19. LANDING WALL DETAIL, SEE DETAIL NO. 1/A2.0.
20. VERSETTA STONE, WAINSCOAT CAP, COLOR SELECTION BY ARCHITECT.

WINDOW KEY:

- (A) 5'-0"x4'-0" SLIDING WINDOW UNIT
- (B) 6'-0"x6'-8" SLIDING GLASS DOOR
- (C) 2'-0"x4'-0" CASEMENT WINDOW UNIT
- (D) 2'-0"x1'-6" FIXED WINDOW UNIT
- (E) 3'-0"x6'-8" FRENCH DOOR W/ TEMPERED GLASS AND 'ADA' LOW-PROFILE SILL w/ 3'-0"x6'-8" TEMPERED GLASS SIDELITE.

NOTES:

1. ALL ROOF OVERHANGS ARE 1'-0" UNLESS NOTED OTHERWISE.
2. GUARD RAIL HEIGHTS AT BALCONIES AND ENTRY BALCONIES ARE 3'-6" OFF FINISHED DECK. GUARDRAIL TO RESIST LOADS IDENTIFIED IN 2015 M.B.C., SECTION 1607.8
3. WINDOWS ON THE FRONT ELEVATION TO HAVE GRILLES BETWEEN THE GLASS.
4. WINDOW AND DOOR HEIGHT IS 6'-8" A.F.F., UNLESS NOTED OTHERWISE.
5. PROVIDE A $1,000.00 ALLOWANCE FOR IDENTIFICATION SIGNAGE ON EACH BUILDING.
6. WINDOW TYPES (A) AND (C) ON THE SECOND AND THIRD FLOORS TO HAVE GUARDS COMPLYING WITH 2015 MBC, SECTION 1015.8.



LEFT SIDE ELEVATION – BUILDING 'F'

SCALE: 1/8"=1'-0" 24 UNIT

NOTE: RIGHT SIDE SIMILAR – OPPOSITE HAND

Lakeshore Gardens Apartments - 24 Unit (Building F)

17114 Robbins Road
Grand Haven Township, Michigan

PUD Submittal No. 2
5-15-19
PUD Submittal
4-23-19 . . . . . date

3017 . . . . . commission

A2.2 . . . . sheet

This drawing is the sole property of Oppenhuizen **Architects** and is not to be used or reproduced without their written consent. ©

333 Jackson St.
Grand Haven
Michigan
49417

ph. 616 846 8990
fax 616 846 8898

OppenhuizenArchitects

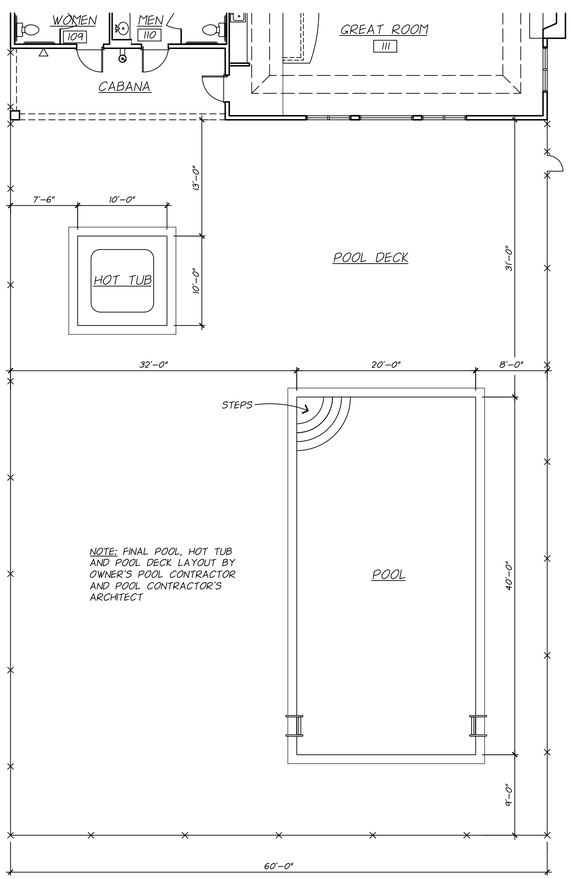
Mark A. Oppenhuizen AIA

GENERAL NOTES:

1. EXTERIOR WALL THICKNESS IS 5 1/2" AND INTERIOR WALL THICKNESS IS 3 1/2" UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE ROUGH FRAMING DIMENSION. FACE TO FACE OF WOOD STUDS, UNLESS NOTED OTHERWISE.
3. REFER TO POOL AND POOL DECK PLAN BY OTHERS FOR POOL, SPA AND POOL DECK DETAILS.
4. OCCUPANT LOAD DETERMINATION PER TABLE 1004.1.2

GREAT ROOM	818 SF / 15 SF	=	55 OCCUPANTS
CABANA	192 SF / 15 SF	=	13 OCCUPANTS
OFFICES	460 SF / 100 SF	=	5 OCCUPANTS
FITNESS CENTER	630 SF / 50 SF	=	13 OCCUPANTS
MAINTENANCE	423 SF / 300 SF	=	2 OCCUPANTS
MECHANICAL	93 SF / 300 SF	=	1 OCCUPANT
POOL EQUIPMENT	125 SF / 300 SF	=	1 OCCUPANT
TOTAL BUILDING OCCUPANCY		=	90 OCCUPANTS
POOL DECK	3900 SF / 30 SF	=	130 OCCUPANTS
TOTAL OCCUPANCY		=	220 OCCUPANTS

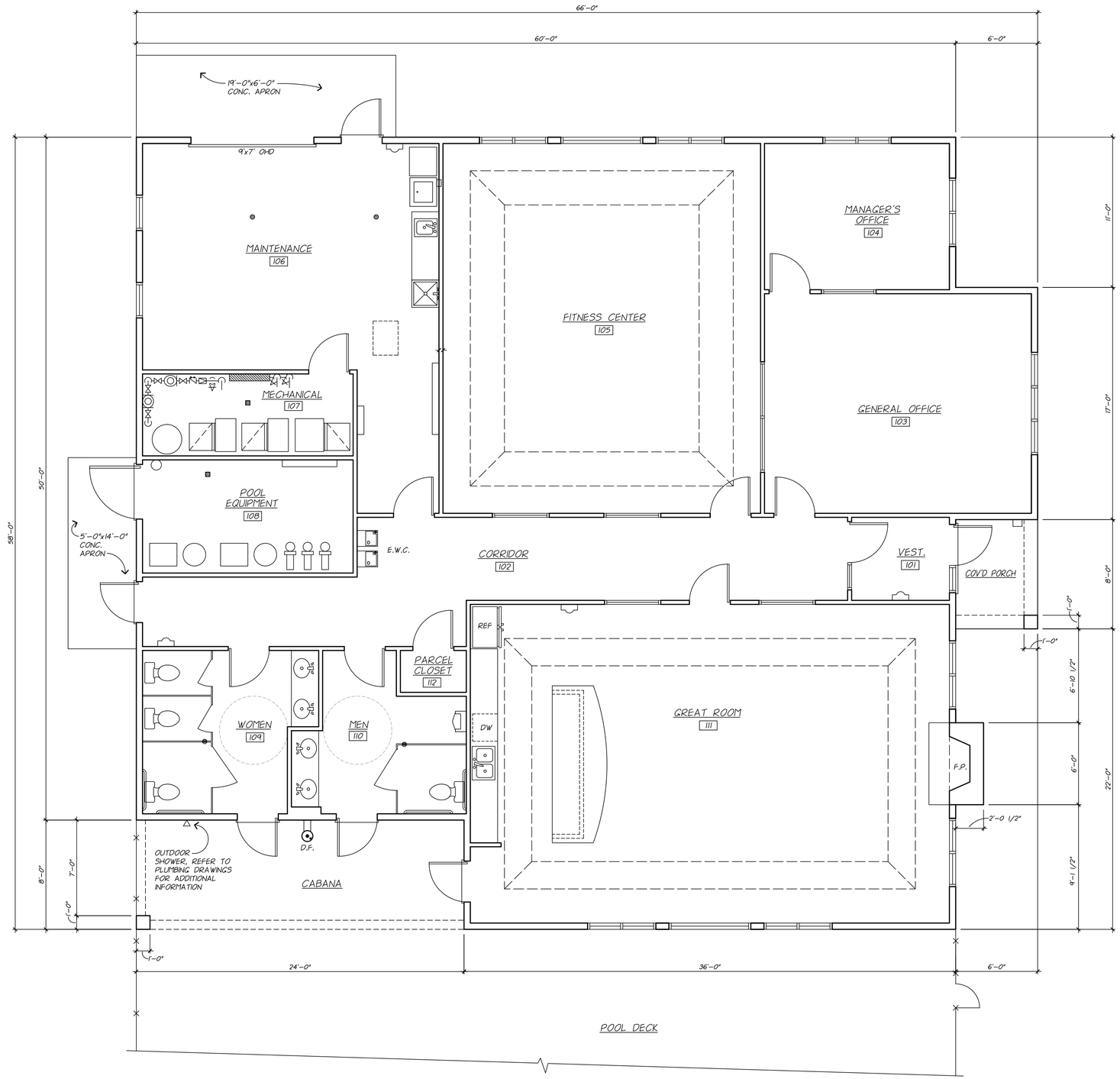
NOTE: TWO EXITS ARE REQUIRED AND PROVIDED FROM THE GREAT ROOM



POOL DECK PLAN

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

N



FLOOR PLAN – COMMUNITY & FITNESS CENTER

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

BUILDING AREA 3,390 SQ. FT.
POOL DECK AREA 4,992 SQ. FT.
(INCL. POOL AND CABANA AREA)

N

Community Center for:
Lakeshore Gardens Apartments
17114 Robbins Road
Grand Haven Township, Michigan

PUD Submittal No. 2
5-15-18
PUD Submittal
3-8-18 . . . . . date

3017 . . . . . commission

A1.0 . . . . . sheet

This drawing is the sole property of Oppenhuizen Architects and is not to be used or reproduced without their written consent. ©

333 Jackson St.
Grand Haven
Michigan
49417

ph. 616 846 8990
fax 616 846 8898

OppenhuizenArchitects

Mark A. Oppenhuizen AIA

ELEVATION MATERIAL KEY:

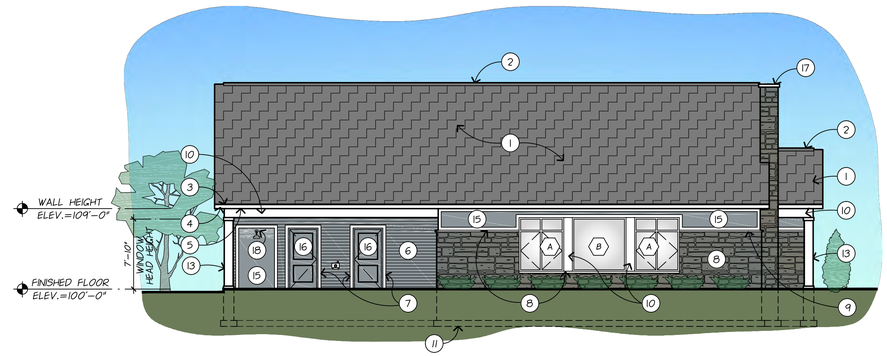
1. ASPHALT SHINGLES
2. SHINGLE OVER RIDGE VENT
3. PRE-FINISHED METAL DRIP EDGE
4. ALUMINUM FASCIA, COLOR SELECTION BY ARCHITECT
5. RIBBED, PERFORATED (FOR VENTING) ALUMINUM SOFFIT
6. 4" EXPOSURE MASTIC CARVED WOOD 44, BEVELED VINYL SIDING, COLOR SELECTION BY ARCHITECT FROM PREMIUM COLOR PALETTE
7. 4" VINYL TRIM
8. VERSETTA STONE, TIGHT CUT PATTERN, COLOR SELECTION BY ARCHITECT
9. VERSETTA STONE, WAINSCOAT CAP, COLOR SELECTION BY ARCHITECT
10. 12" AZEK TRIM
11. FOUNDATION, SEE FOUNDATION PLAN
12. CLAD WD. FRAME WINDOW W/ INSULATED GLASS
13. 12" DIAMETER "TUCSAN STYLE" HB&G FIBERGLASS COLUMN
14. 4" AZEK TRIM
15. AZEK FLUSH FLAT SHEET WITH 4" AZEK TRIM TO CREATE 'PANEL PATTERN' SHOWN
16. EXTERIOR DOOR, REFER TO DOOR SCHEDULE ON DRAWING SHEET A6.0
17. ONE PIECE PRE-FINISHED BLACK METAL CHIMNEY CAP OVER ICE + WATER UNDERLAYMENT, REFER TO ST1.1 ROOF PLAN FOR ADDITIONAL INFORMATION
18. OUTDOOR SHOWER
19. BLACK METAL GAS FIREPLACE EXHAUST HOUSING
20. EMBOSSED PANEL STEEL CLAD INSULTED CORE OVERHEAD DOOR

WINDOW KEY:

- (A) (2) 2'-6"x1'-6" FIXED OVER (2) 2'-6"x4'-6" CASEMENTS
- (B) 6'-0"x6'-0" FIXED
- (C) (3) 2'-6"x1'-6" FIXED OVER (3) 2'-6"x4'-6" CASEMENTS (FIXED CENTER UNIT)
- (D) 2'-6"x1'-6" FIXED

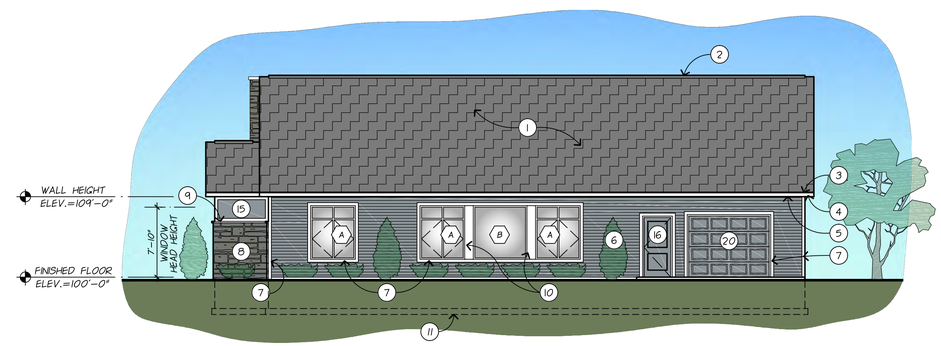
WINDOW KEY NOTES:

1.) * DENOTES TEMPERED GLASS



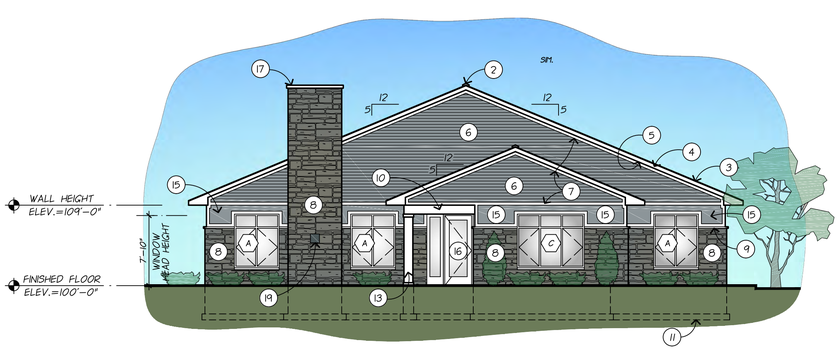
NORTH ELEVATION – COMMUNITY CENTER

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



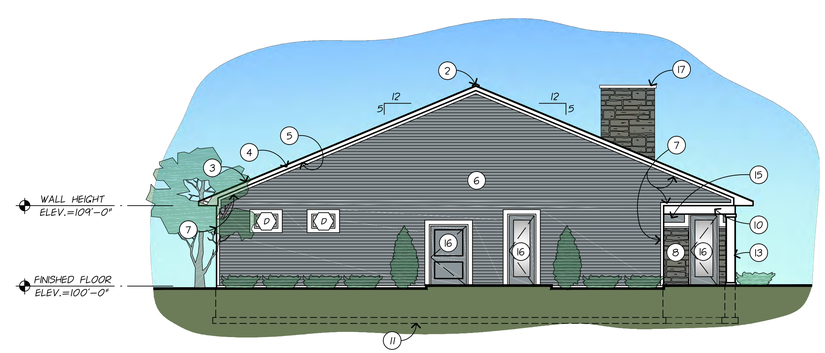
SOUTH ELEVATION – COMMUNITY CENTER

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



WEST ELEVATION – COMMUNITY CENTER

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



EAST ELEVATION – COMMUNITY CENTER

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

Community Center for: Lakeshore Gardens Apartments

17114 Robbins Road
Grand Haven Township, Michigan

PUD Submittal No. 2 5-15-18
PUD Submittal 3-8-18 . . . . . date

3017 . . . . . commission

A2.0 . . . . sheet

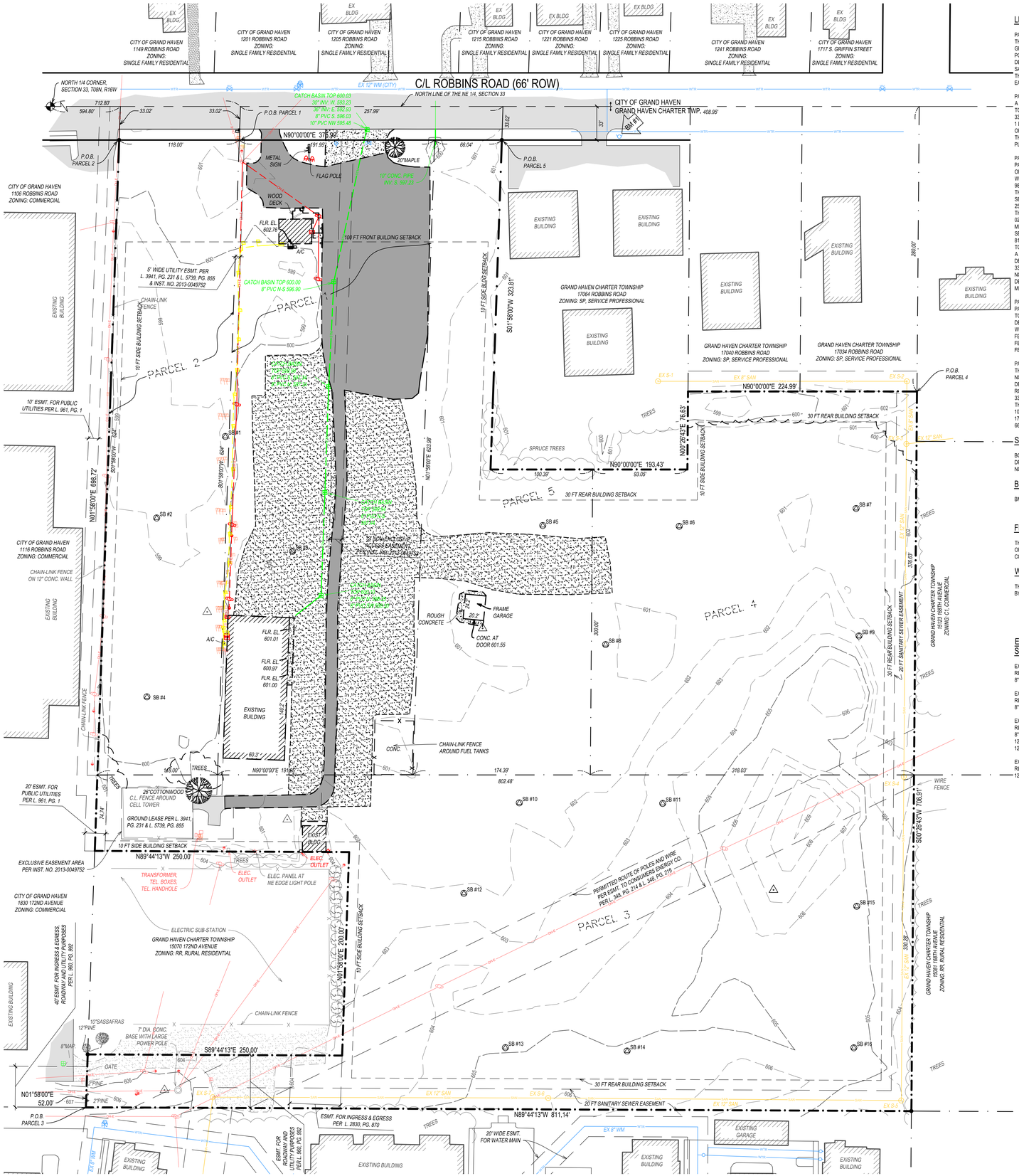
This drawing is the sole property of Oppenhuizen Architects and is not to be used or reproduced without their written consent. ©

333 Jackson St.
Grand Haven
Michigan
49417

ph. 616 846 8990
fax 616 846 8898

OppenhuizenArchitects

Mark A. Oppenhuizen AIA



LEGAL DESCRIPTION:

PARCEL 1:
THAT PART OF THE NORTHEAST 1/4 OF SECTION 33, TOWN 8 NORTH, RANGE 16 WEST, GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN, DESCRIBED AS COMMENCING AT A POINT DUE EAST ALONG THE NORTH LINE OF SAID SECTION 33, 712.8 FEET AND SOUTH 01 DEGREES 58 MINUTES 00 SECONDS WEST 33.00 FEET FROM THE NORTH 1/4 CORNER OF SAID SECTION 33, THENCE SOUTH 01 DEGREES 58 MINUTES 00 SECONDS WEST 624.0 FEET; THENCE DUE EAST 191.95 FEET, THENCE NORTH 01 DEGREES 58 MINUTES 00 SECONDS EAST 624.00 FEET, THENCE DUE WEST 191.95 FEET TO THE POINT OF BEGINNING.

PARCEL 2:
A PARCEL OF LAND IN SECTION 33, TOWN 8 NORTH, RANGE 16 WEST, GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN, DESCRIBED AS: BEGINNING 594.8 FEET EAST AND 33 FEET SOUTH OF THE NORTH 1/4 CORNER OF SAID SECTION 33; RUNNING THENCE SOUTH 1 DEGREES 58 MINUTES WEST 624 FEET; THENCE EAST AND PARALLEL TO THE NORTH LINE OF SAID SECTION 33, 118 FEET; THENCE NORTH 1 DEGREES 58 MINUTES EAST 624 FEET; THENCE WEST AND PARALLEL TO THE NORTH LINE OF SAID SECTION 33, 118 FEET TO THE PLACE OF BEGINNING.

PARCEL 3:
PART OF THE NORTH THEE-QUARTERS (N 3/4) OF THE NORTHWEST ONE-QUARTER (NW 1/4) OF THE NORTHEAST ONE-QUARTER (NE 1/4) OF SECTION 33, TOWN 8 NORTH, RANGE 16 WEST, GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN; COMMENCING SOUTH 980.61 FEET AND SOUTH 89 DEGREES 28 MINUTES 46 SECONDS EAST 556.54 FEET FROM THE NORTH ONE-QUARTER (N 1/4) CORNER; THENCE NORTH 02 DEGREES 13 MINUTES 27 SECONDS EAST 52.00 FEET; THENCE SOUTH 89 DEGREES 28 MINUTES 46 SECONDS EAST 250.00 FEET; THENCE NORTH 02 DEGREES 13 MINUTES 27 SECONDS EAST 00.00 FEET; THENCE NORTH 89 DEGREES 28 MINUTES 46 SECONDS WEST 250.00 FEET; THENCE NORTH 02 DEGREES 13 MINUTES 27 SECONDS EAST 74.74 FEET; THENCE SOUTH 89 DEGREES 44 MINUTES 33 SECONDS EAST 802.48 FEET; THENCE SOUTH 00 DEGREES 42 MINUTES 10 SECONDS WEST 330.28 FEET; THENCE NORTH 89 DEGREES 28 MINUTES 46 SECONDS WEST 811.14 FEET TO BEGINNING.
TOGETHER WITH AN EASEMENT FOR INGRESS AND EGRESS DESCRIBED AS: BEGINNING AT A POINT ON THE NORTH AND SOUTH 1/4 LINE OF SAID SECTION 33 WHICH IS SOUTH 00 DEGREES 00 MINUTES WEST 980.61 FEET FROM THE NORTH 1/4 CORNER OF SAID SECTION 33; THENCE SOUTH 89 DEGREES 28 MINUTES 46 SECONDS EAST 556.54 FEET; THENCE NORTH 02 DEGREES 13 MINUTES 27 SECONDS EAST 40.00 FEET; THENCE NORTH 89 DEGREES 28 MINUTES 46 SECONDS WEST 558.09 FEET; THENCE SOUTH 00 DEGREES 00 MINUTES 00 SECONDS WEST 40.00 FEET TO POINT OF BEGINNING.

PARCEL 4:
PART OF THE NORTH 3/4 OF THE NORTHWEST 1/4 OF THE NORTHEAST 1/4 OF SECTION 33, TOWN 8 NORTH, RANGE 16 WEST, GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN, DESCRIBED AS: COMMENCING SOUTH 89°44'33" EAST 1379.74 FEET AND SOUTH 00°42'10" WEST 280.00 FEET FROM THE NORTH 1/4 CORNER; THENCE NORTH 89°44'33" WEST 224.99 FEET; THENCE SOUTH 00°42'10" WEST 76.63 FEET; THENCE NORTH 89°44'33" WEST 93.05 FEET; THENCE SOUTH 00°42'10" WEST 300.00 FEET; THENCE SOUTH 89°44'33" EAST 318.04 FEET; THENCE NORTH 00°42'10" EAST 376.63 FEET TO BEGINNING.

PARCEL 5:
THAT PART OF THE NORTHWEST 1/4 OF THE NORTHEAST 1/4 OF SECTION 33, TOWN 8 NORTH, RANGE 16 WEST, GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN, DESCRIBED AS: COMMENCING AT A POINT ON THE SOUTHERLY RIGHT OF WAY LINE OF ROBBINS ROAD WHICH IS SOUTH 89°44'33" EAST ALONG THE NORTH LINE OF SAID SECTION 33, 970.79 FEET AND SOUTH 02°13'27" WEST 33.02 FEET FROM THE NORTHWEST CORNER THEREOF; THENCE SOUTH 02°13'27" WEST 323.81 FEET; THENCE SOUTH 89°44'33" EAST 100.39 FEET; THENCE SOUTH 00°42'10" WEST 300.00 FEET; THENCE NORTH 89°44'33" WEST 174.39 FEET; THENCE NORTH 02°13'27" EAST 623.98 FEET; THENCE SOUTH 89°44'33" EAST 66.04 FEET TO THE POINT OF BEGINNING.

SURVEY PROVIDED BY:

BOUNDARY & TOPOGRAPHIC SURVEY PROVIDED BY EXXEL ENGINEERING, INC ON A DRAWING TITLED WATER / SEWER PRELIMINARY MIXED USE PUD LAYOUT, DATED NOVEMBER 14, 2017.

BENCHMARKS:

BM #1: TOP OF SW FLANGE BOLT ON HYDRANT, LOCATED 8 FEET SOUTH OF EDGE OF BIT FOR ROBBINS ROAD AND 298 FEET WEST OF THE CENTERLINE OF S GRIFFIN STREET - 2.6 FEET ABOVE GROUND LEVEL. ELEVATION: 603.48 (NAVD 88 DATUM).

FLOODPLAIN DATA:

THE ENTIRE SITE IS DESIGNATED ZONE "X", "AREA DETERMINED TO BE OUTSIDE OF 0.2" ANNUAL CHANCE FLOODPLAIN" ACCORDING TO FEMA FLOOD INSURANCE RATE MAP COMMUNITY-PANEL NUMBER 26139C0087E , EFFECTIVE DATE: DECEMBER 16, 2011.

WETLAND DATA:

THERE ARE NO WETLANDS ON THE SUBJECT PROPERTY BASED ON MAPPING PUBLISHED BY THE U.S. FISH & WILDLIFE SERVICE NATIONAL WETLANDS INVENTORY MAPS.

EXISTING SANITARY STRUCTURES:

EX S-1
RIM: 600.5
8" (E) INV: 593.82

EX S-2
RIM: 602.6
8" (W) & (S) INV: 592.84

EX S-3
RIM: 601.0
8" (N) INV: 592.58
12" (E) INV: 592.25
12" (S) INV: 592.15

EX S-4
RIM: 603.8
12" (N) & (S) INV: 591.43

EX S-5
TOP 604.13
12" CHANNEL
(N) INV: 590.73
(W) INV: 590.63

EX S-6
TOP 605.96
12" CHANNEL (E-W) 589.96

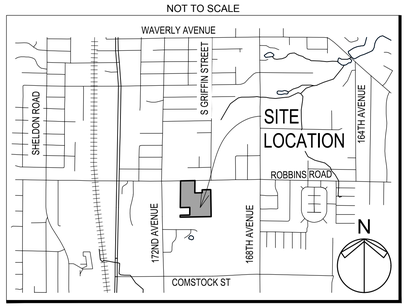
EX S-7
TOP 604.63
12" CHANNEL (E & S) 589.13

CIVIL SHEET INDEX:

C-101 CIVIL EXISTING CONDITIONS
C-102 CIVIL PARALLEL PLAN
C-103 CIVIL LAYOUT PLAN
C-111 CIVIL OVERALL UTILITY PLAN
C-121 CIVIL OVERALL GRADING & SESC PLAN
L-101 LANDSCAPE PLAN
L-102 LANDSCAPE PLAN

SITE LOCATION MAP

NOT TO SCALE



17114 ROBBINS ROAD
GRAND HAVEN TOWNSHIP
OTTAWA COUNTY, MICHIGAN

SECTION 33, TOWN 08 N, RANGE 16 W
42°02'41" N, 86°12'41" W
PARCEL #: 70-03-33-200-035
70-03-33-200-056
70-03-33-200-077

EXISTING LEGEND

BENCHMARK	CONTROL POINT	DECIDUOUS TREE
PROPERTY IRON	SECTION CORNER	CONIFEROUS TREE
MAILBOX	SOIL BORING	SIGN
WATER	**ELECTRICAL**	**NATURAL GAS**
VALVE	UTILITY POLE	METER
HYDRANT	GUY WIRE	"MISS DIG" FLAG - GAS
CURB STOP	LIGHT POLE	**TELEPHONE**
STORM SEWER	GROUND LIGHT	PEDESTAL
SQUARE CATCH BASIN	METER	PIT
CURB CATCH BASIN	"MISS DIG" FLAG - ELECTRIC	"MISS DIG" FLAG - TELEPHONE
PIPE INVERT	**SANITARY SEWER**	**FIBER OPTIC**
	MANHOLE	"MISS DIG" FLAG - FIBER OPTIC

CONCRETE PAVEMENT
ASPHALT
GRAVEL SURFACE
CURB & GUTTER
LANDSCAPE CURB
PROPERTY LINE
600 CONTOUR LINE
X FENCE
TREE LINE
WTR WATER MAIN
SAN SANITARY SEWER
STM STORM SEWER
G NATURAL GAS
OH-E OVERHEAD ELECTRIC

Know what's below. Call before you dig.

NOT FOR CONSTRUCTION

NOTE: ALL UTILITIES SHOWN ARE APPROXIMATE LOCATIONS FROM FIELD DATA AND AVAILABLE INFORMATION. THEY SHOULD NOT BE INTERPRETED AS EXACT LOCATIONS NOR SHOULD THEY BE ASSUMED TO BE THE ONLY UTILITIES IN THE AREA.

N

0 50' 100'

ARCHITECTS • ENGINEERS
paradigm design
GRAND RAPIDS 550 3 MILE N.W. SUITE B GRAND RAPIDS, MI 49544 (616) 785 - 5656
TRAVERSE CITY 333 E. STATE STREET TRAVERSE CITY, MI 49684 (231) 346 - 3030
WEB PARADIGMAE.COM

NOTE: THIS DOCUMENT IS PRELIMINARY IN NATURE AND IS NOT A FINAL SIGNED AND SEALED DOCUMENT

BRIAN T. SINNOTT
MI REGISTRATION #6201052169
EXP. DATE 10/31/2019

PROJECT

LAKESHORE GARDENS APARTMENTS

A PLANNED UNIT DEVELOPMENT

17114 ROBBINS ROAD
GRAND HAVEN, MI 49417

DEVELOPER

MAIN STREET CAPITAL GROUP

18000 COVE STREET, STE 201
SPRING LAKE, MI 49456

RELEASE DATE

	DATE	DESCRIPTION
	01-16-18	PUD APPLICATION
	02-07-18	PUD APPLICATION
	03-09-18	PUD APPLICATION
	04-27-18	PUD APPLICATION
	05-15-18	PUD APPLICATION

PROJECT

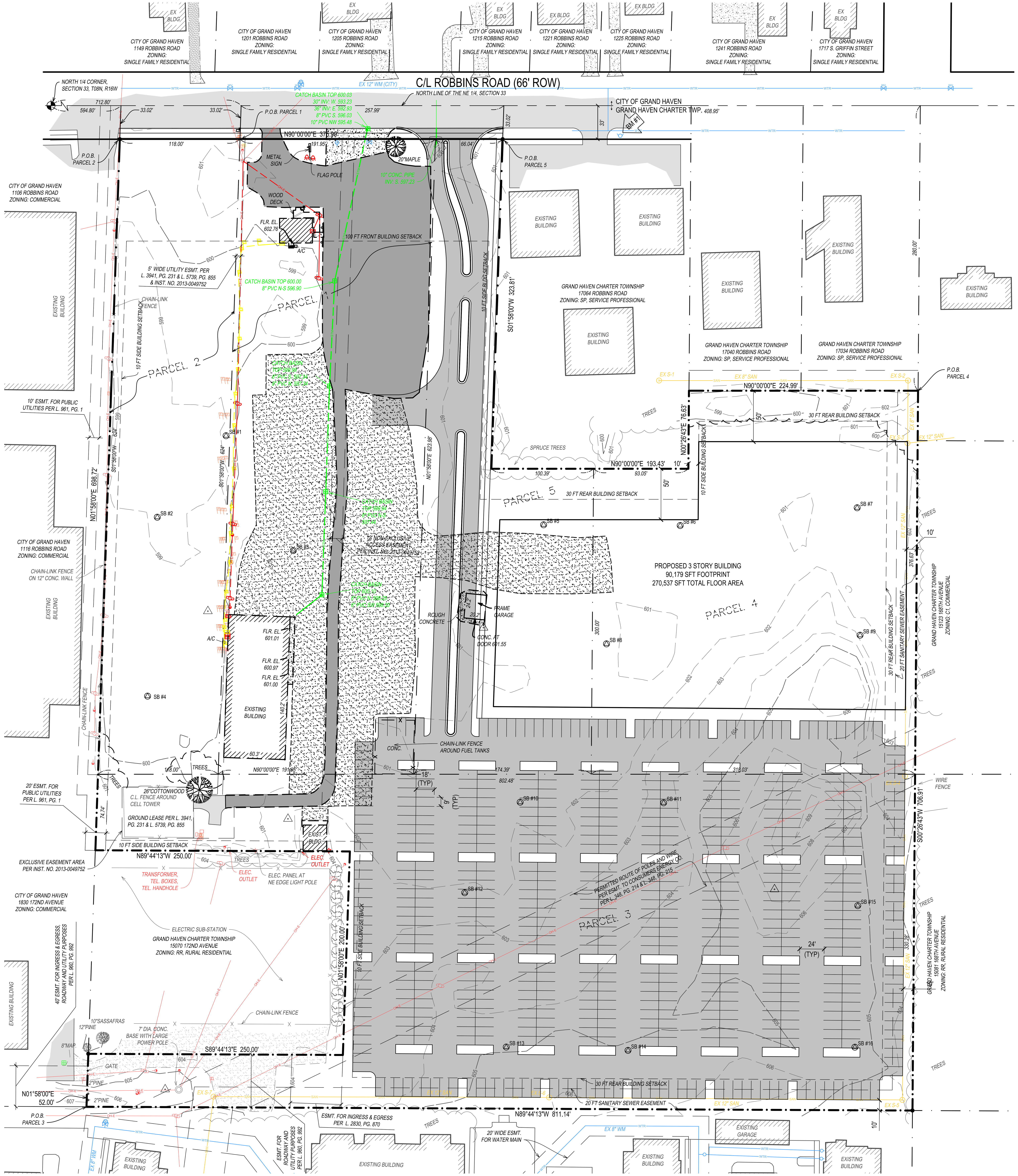
1712151

SHEET

CIVIL EXISTING CONDITIONS

C-101

Tuesday, May-15-2018 at 3:12pm O:\1712151 Robbins Road Mixed-Use\Drawings - 1711151\Civil\151C-101.dwg tkv



Tuesday, May-15-2018 at 3:09pm \\PD-FILE1\Jobs$\1712151 Robbins Road Mixed-Use\Drawings - 1711151\Civil\151C-102.dwg bkv

SITE DATA:
SITE: 11.47 ACRES
ZONED: R-4 MULTI FAMILY RESIDENTIAL

MINIMUM LOT AREA:	3,000 SFT
MINIMUM LOT WIDTH:	100'
MAXIMUM BUILDING HEIGHT:	35' OR 3 STORIES
MINIMUM FLOOR AREA PER UNIT:	884 SFT
FRONT BUILDING SETBACK:	100'
SIDE BUILDING SETBACK:	10'
REAR BUILDING SETBACK:	30'
BUILDING FOOTPRINT:	90,179 SFT
BUILDING HEIGHT:	3 STORIES
TOTAL BUILDING FLOOR AREA:	270,537 SFT
TOTAL NUMBER OF UNITS:	306 @ 884 SFT EACH
TOTAL PARKING AREA:	185,466 SFT
PARKING SPACES REQUIRED:	612 @ 2 PER UNIT
PARKING SPACES PROVIDED:	612

NOT FOR CONSTRUCTION

NOTE: ALL UTILITIES SHOWN ARE APPROXIMATE LOCATIONS FROM FIELD DATA AND AVAILABLE INFORMATION. THEY SHOULD NOT BE INTERPRETED AS EXACT LOCATIONS NOR SHOULD THEY BE ASSUMED TO BE THE ONLY UTILITIES IN THE AREA.

N

0 50' 100'

ARCHITECTS • ENGINEERS
paradigm design
GRAND RAPIDS 550 3 MILE N.W. SUITE B GRAND RAPIDS, MI 49544 (616) 785 - 5656
TRAVERSE CITY 333 E. STATE STREET TRAVERSE CITY, MI 49684 (231) 346 - 3030
WEB ParadigmAE.com

NOTE: THIS DOCUMENT IS PRELIMINARY IN NATURE AND IS NOT A FINAL, SIGNED AND SEALED DOCUMENT.

BRIAN T. SINNOTT
MI REGISTRATION #6201052169
EXP. DATE 10/31/2019

PROJECT

LAKESHORE GARDENS APARTMENTS

A PLANNED UNIT DEVELOPMENT

17114 ROBBINS ROAD
GRAND HAVEN, MI 49417

DEVELOPER

MAIN STREET CAPITAL GROUP

18000 COVE STREET, STE 201
SPRING LAKE, MI 49456

RELEASE DATE

△	DATE	DESCRIPTION
	01-16-18	PUD APPLICATION
	02-07-18	PUD APPLICATION
	03-09-18	PUD APPLICATION
	04-27-18	PUD APPLICATION
	05-15-18	PUD APPLICATION

PROJECT

1712151

SHEET

CIVIL PARALLEL PLAN

C-102

GENERAL NOTES:

REFER TO ARCHITECTURAL PLANS FOR DETAILS OF CONCRETE SIDEWALK AROUND BUILDING, AND CONCRETE DUMPSTER PAD.

REFER TO ARCHITECTURAL FOUNDATION PLAN FOR DETAILING OF BUILDING AND EXACT BUILDING DIMENSIONS.

REFER TO LANDSCAPE PLAN FOR FOR RESTORATION OF ALL NON PAVED SURFACES.

OWNER HAS SUBMITTED FOR AND OBTAINED THE FOLLOWING SITE RELATED PERMITS:

AGENCY	PERMIT #

OWNER HAS SUBMITTED FOR AND IS IN THE PROCESS OF OBTAINING THE FOLLOWING SITE RELATED PERMITS:

AGENCY	PERMIT
GRAND HAVEN TOWNSHIP	PLANNED UNIT DEVELOPMENT / SPA
OTTAWA COUNTY WATER RESOURCES COMMISSIONER	STORMWATER / DRAIN USE APPROVAL
CITY OF GRAND HAVEN	ROBBINS ROAD DRIVEWAYS

UPON AWARD OF CONTRACT, CONTRACTOR WILL BE RESPONSIBLE TO CHECK WITH ENGINEER AND JURISDICTION ON STATUS OF THE PERMIT(S) LISTED ABOVE.

CONTRACTOR IS RESPONSIBLE TO OBTAIN ALL SITE RELATED PERMITS NOT BEING OBTAINED BY THE OWNER. CONTRACTOR IS REQUIRED TO COMPLETE THE APPLICATION, AND SUBMIT NECESSARY DRAWINGS, FEES, ETC. TO THE APPROPRIATE JURISDICTION. CONTRACTOR SHALL PAY ALL FEES RELATED TO PERMIT(S) AND SECURE PERMIT(S) IN HIS NAME.

CONTRACTOR IS RESPONSIBLE TO COORDINATE ALL SITE UTILITY CONNECTIONS AND INSPECTIONS WITH THE PROPER JURISDICTION AND PAY ALL ASSOCIATED FEES.

THE CONTRACTOR SHALL FIELD VERIFY LOCATION AND ELEVATION OF EXISTING WATER, SANITARY SEWER, AND STORM SEWER CROSSINGS AND CONNECTION POINTS PRIOR TO CONSTRUCTION. CONTACT ENGINEER WITH ANY DISCREPANCIES.

ALL DIMENSIONS SHOWN TO CONCRETE CURB AND GUTTER ARE TO BACK OF CURB UNLESS OTHERWISE NOTED.

CONCRETE GUTTER PAN TO TIP IN THE DIRECTION OF THE ADJACENT PAVEMENT.

ALL PAVEMENT MARKINGS SHALL BE 4" WIDE. STANDARD PARKING SPACES SHALL BE MARKED IN YELLOW AND BARRIER FREE SPACES IN BLUE. EACH BARRIER FREE SPACE SHALL BE PROVIDED WITH A PAINTED PAVEMENT SYMBOL, A PRECAST CONCRETE BUMPER BLOCK, AND A SIGN PER THE MANUAL OF UNIFORM TRAFFIC CONTROLS.

REFERENCE SOILS REPORT FOR BORING LOGS AND PREPARATION AND CONSTRUCTION PROCEDURES FOR SUBBASE AND DESIGN SECTION OF ALL PAVED AREAS.

ALL MDOT REFERENCES ARE TO THE 2012 EDITION.

GENERAL NOTES:

DESCRIPTION OF PUD PARCEL (PARCELS B & C):
PART OF THE NE 1/4 OF SECTION 33, T8N, R16W, GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN, DESCRIBED AS: COMMENCING AT THE NORTH 1/4 CORNER OF SAID SECTION 33; THENCE N90°00'E 594.80 FEET ALONG THE NORTH LINE OF SAID NE 1/4; THENCE S01°58'00"W 283.17 FEET TO THE PLACE OF BEGINNING OF THIS DESCRIPTION; THENCE N90°00'E 375.99 FEET; THENCE S01°58'00"W 73.66 FEET; THENCE N90°00'E 193.44 FEET; THENCE N00°26'43"E 76.63 FEET; THENCE N90°00'E 224.99 FEET; THENCE S00°26'43"W 706.91 FEET; THENCE N89°44'13"W 811.14 FEET; THENCE N01°58'00"E 52.00 FEET; THENCE S89°44'13"E 250.00 FEET; THENCE N01°58'00"E 200.00 FEET; THENCE N89°44'13"W 250.00 FEET; THENCE N01°58'00"E 448.57 FEET TO THE PLACE OF BEGINNING.
THIS PARCEL CONTAINS 11.47 ACRES.

DESCRIPTION OF OVERALL PARCEL (A-1, A-2, B & C):
PART OF THE NE 1/4 OF SECTION 33, T8N, R16W, GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN, DESCRIBED AS: COMMENCING AT THE NORTH 1/4 CORNER OF SAID SECTION 33; THENCE N90°00'E 594.80 FEET ALONG THE NORTH LINE OF SAID NE 1/4; THENCE S01°58'00"W 33.02 FEET TO THE SOUTHERLY LINE OF ROBBINS ROAD AND THE PLACE OF BEGINNING OF THIS DESCRIPTION; THENCE N90°00'E 375.99 FEET ALONG SAID SOUTHERLY LINE; THENCE S01°58'00"W 323.81 FEET; THENCE N90°00'E 193.44 FEET; THENCE N00°26'43"E 76.63 FEET; THENCE N90°00'E 224.99 FEET; THENCE S00°26'43"W 706.91 FEET; THENCE N89°44'13"W 811.14 FEET; THENCE N01°58'00"E 52.00 FEET; THENCE S89°44'13"E 250.00 FEET; THENCE N01°58'00"E 200.00 FEET; THENCE N89°44'13"W 250.00 FEET; THENCE N01°58'00"E 668.72 FEET TO THE PLACE OF BEGINNING.
THIS PARCEL CONTAINS 13.62 ACRES.

PROPOSED LAND USE SUMMARY:

PARCEL B	= 2.97 ACRES
CURRENT ZONING	= C-1 AND I-1
PROPOSED USE	= MULTIFAMILY (APARTMENTS)
PARCEL C	= 8.49 ACRES
CURRENT ZONING	= C-1 AND I-1
PROPOSED USE	= MULTIFAMILY (APARTMENTS)
TOTAL SITE AREA	= 11.47 ACRES

LANDSCAPING AND OPEN SPACE:

PARCEL B & C - PARKING LOT INTERIOR LANDSCAPING:
PARKING LOT AREA = 129,853 SFT (2.98 AC)
REQUIRED = 8,657 SFT (1 SFT PER 15 SFT)
PROVIDED = 18,849 SFT

PARCEL B & C - OPEN SPACE:
PARCEL B & C AREA = 499,423 SFT (11.47 AC)
REQUIRED OPEN SPACE = 99,885 SFT (20%)
PROVIDED OPEN SPACE = 10+,275 SFT (22%)

RESIDENTIAL PUD DENSITY:

UNITS PROPOSED IN PARALLEL PLAN = 306 UNITS

BASE R-4 DENSITY ALLOWED PER ORDINANCE
1 DWELLING UNIT PER 3,000 SFT
499,423 SFT / 3000 SFT = 166 DWELLING UNITS

PUD DENSITY BONUS
20% OPEN SPACE = 8% DENSITY BONUS
COMMUNITY CLUBHOUSE = 5% DENSITY BONUS
TOTAL DENSITY BONUS = 13%
166 UNITS X 1.13 = 187 DWELLING UNITS

ALL UNITS ARE EITHER 1 OR 2 BEDROOM RANGING FROM 496 SFT TO 1,070 SFT

PARKING DATA:

APARTMENTS REQUIRE 2 SPACES PER DWELLING UNIT
156 DWELLING UNITS X 2 = 312 SPACES

CLUBHOUSE POOL IS ACCESSORY TO APARTMENTS HOWEVER 6 SPACES ARE ALLOCATED TO THE CLUBHOUSE AREA BEYOND THE REQUIRED AMOUNT

PROPOSED PARKING:
224 SURFACE PARKING SPACES
94 GARAGE SPACES
TOTAL 318 TOTAL SPACES

THE PROPOSED PARKING ABOVE INCLUDES BARRIER FREE SPACES AS FOLLOWS:

14 BARRIER FREE SURFACE SPACES
8 BARRIER FREE GARAGE SPACES

PARKING SPACE: 9' x 18'
DRIVE AISLE: 24' MINIMUM

PROPOSED LEGEND

SIGN
HYDRANT
WALL LIGHT (SEE ELECTRICAL DRAWINGS)
BUMP POST
BOLLARD LIGHT (SEE ELECTRICAL DRAWINGS)
LANDING AREA
LIGHT POLE (SEE ELECTRICAL DRAWINGS)
CONCRETE SIDEWALK
SIDEWALK RAMP
CONCRETE PAVEMENT
STANDARD DUTY BITUMINOUS
GRAVEL DRIVE
PUD OPEN SPACE
INTERIOR LANDSCAPING
STANDARD CURB & GUTTER
INVERTED CURB & GUTTER
LANDSCAPE CURB
FENCE

NOT FOR CONSTRUCTION

NOTE: ALL UTILITIES SHOWN ARE APPROXIMATE LOCATIONS FROM FIELD DATA AND AVAILABLE INFORMATION. THEY SHOULD NOT BE INTERPRETED AS EXACT LOCATIONS NOR SHOULD THEY BE ASSUMED TO BE THE ONLY UTILITIES IN THE AREA.

N

0 50' 100'

ARCHITECTS • ENGINEERS
paradigm design
GRAND RAPIDS 550 3 MILE N.W. SUITE B GRAND RAPIDS, MI 49544 (616) 785 - 5656
TRAVERSE CITY 333 E. STATE STREET TRAVERSE CITY, MI 49684 (231) 346 - 3030
WEB ParadigmAE.com

NOTE: THIS DOCUMENT IS PRELIMINARY IN NATURE AND IS NOT A FINAL SIGNED AND SEALED DOCUMENT

BRIAN T. SINNOTT
MI REGISTRATION #6201052169
EXP. DATE 10/31/2019

PROJECT

LAKESHORE GARDENS APARTMENTS

A PLANNED UNIT DEVELOPMENT
17114 ROBBINS ROAD
GRAND HAVEN, MI 49417

DEVELOPER

MAIN STREET CAPITAL GROUP

18000 COVE STREET, STE 201
SPRING LAKE, MI 49456

RELEASE DATE

DATE	DESCRIPTION
01-16-18	PUD APPLICATION
02-07-18	PUD APPLICATION
03-09-18	PUD APPLICATION
04-27-18	PUD APPLICATION
05-15-18	PUD APPLICATION

PROJECT

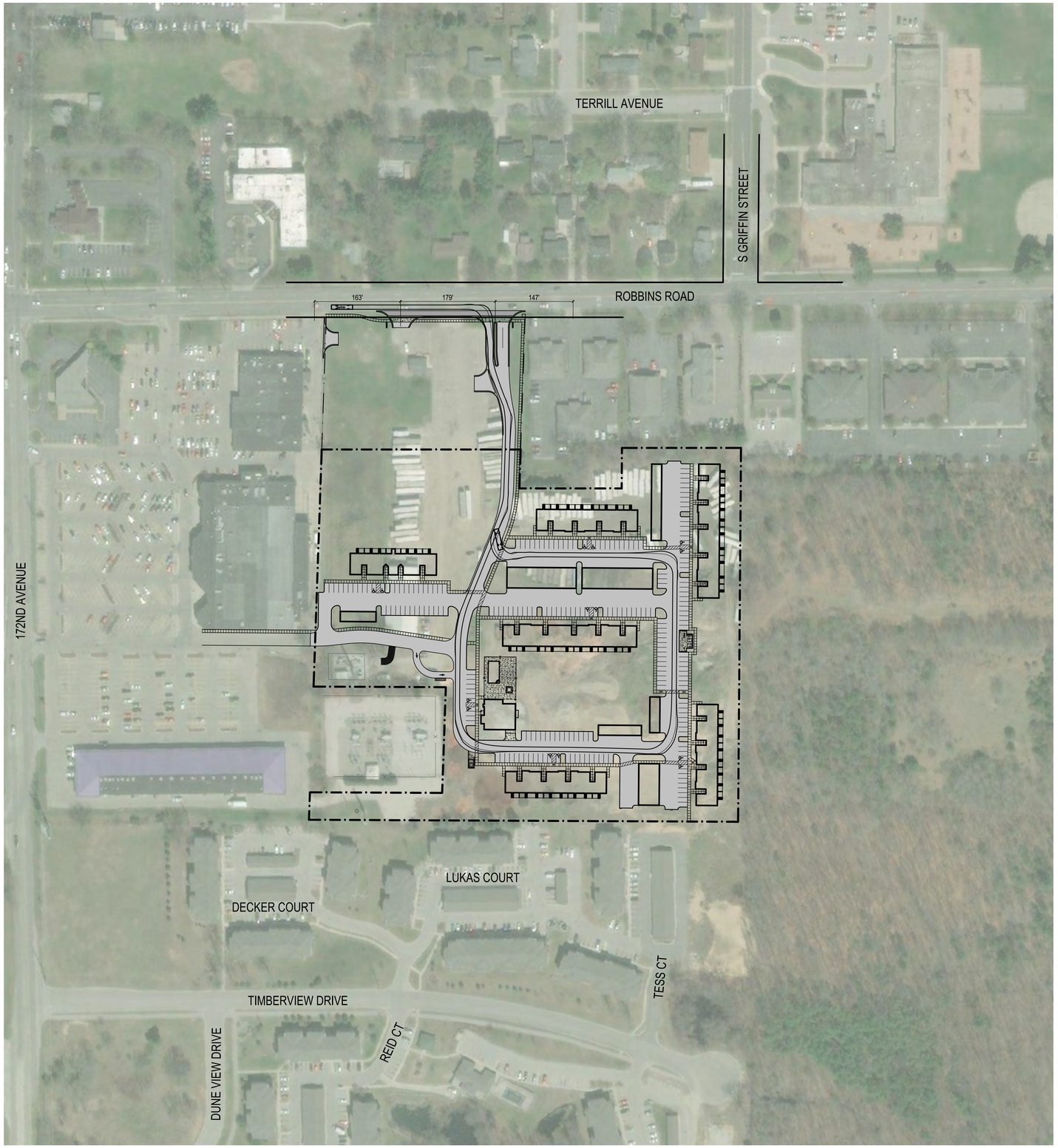
1712151

SHEET

CIVIL LAYOUT PLAN

C-103

Tuesday, May-15-2018 at 3:09pm \\PD-FILE\Jobs\1712151 Robbins Road Mixed-Use\Drawings - 1711151\Civil\151C-103.dwg bkv



NOT FOR CONSTRUCTION

NOTE: ALL UTILITIES SHOWN ARE APPROXIMATE LOCATIONS FROM FIELD DATA AND AVAILABLE INFORMATION. THEY SHOULD NOT BE INTERPRETED AS EXACT LOCATIONS NOR SHOULD THEY BE ASSUMED TO BE THE ONLY UTILITIES IN THE AREA.

N

0 100' 200'

ARCHITECTS • ENGINEERS

paradigm design

GRAND RAPIDS
550 3 MILE N.W. SUITE B
GRAND RAPIDS, MI 49544
(616) 785 - 5656

TRAVERSE CITY
333 E. STATE STREET
TRAVERSE CITY, MI 49684
(231) 346 - 3030

WEB
ParadigmAE.com

NOTE: THIS DOCUMENT IS PRELIMINARY IN NATURE AND IS NOT A FINAL, SIGNED AND SEALED DOCUMENT

BRIAN T. SINNOTT
MI REGISTRATION #6201052169
EXP. DATE 10/31/2019

PROJECT

LAKESHORE GARDENS APARTMENTS

A PLANNED UNIT DEVELOPMENT

17114 ROBBINS ROAD
GRAND HAVEN, MI 49417

DEVELOPER

MAIN STREET CAPITAL GROUP

18000 COVE STREET, STE 201
SPRING LAKE, MI 49456

RELEASE DATE

	DATE	DESCRIPTION
	01-16-18	PUD APPLICATION
	02-07-18	PUD APPLICATION
	03-09-18	PUD APPLICATION
	04-27-18	PUD APPLICATION
	05-15-18	PUD APPLICATION

PROJECT

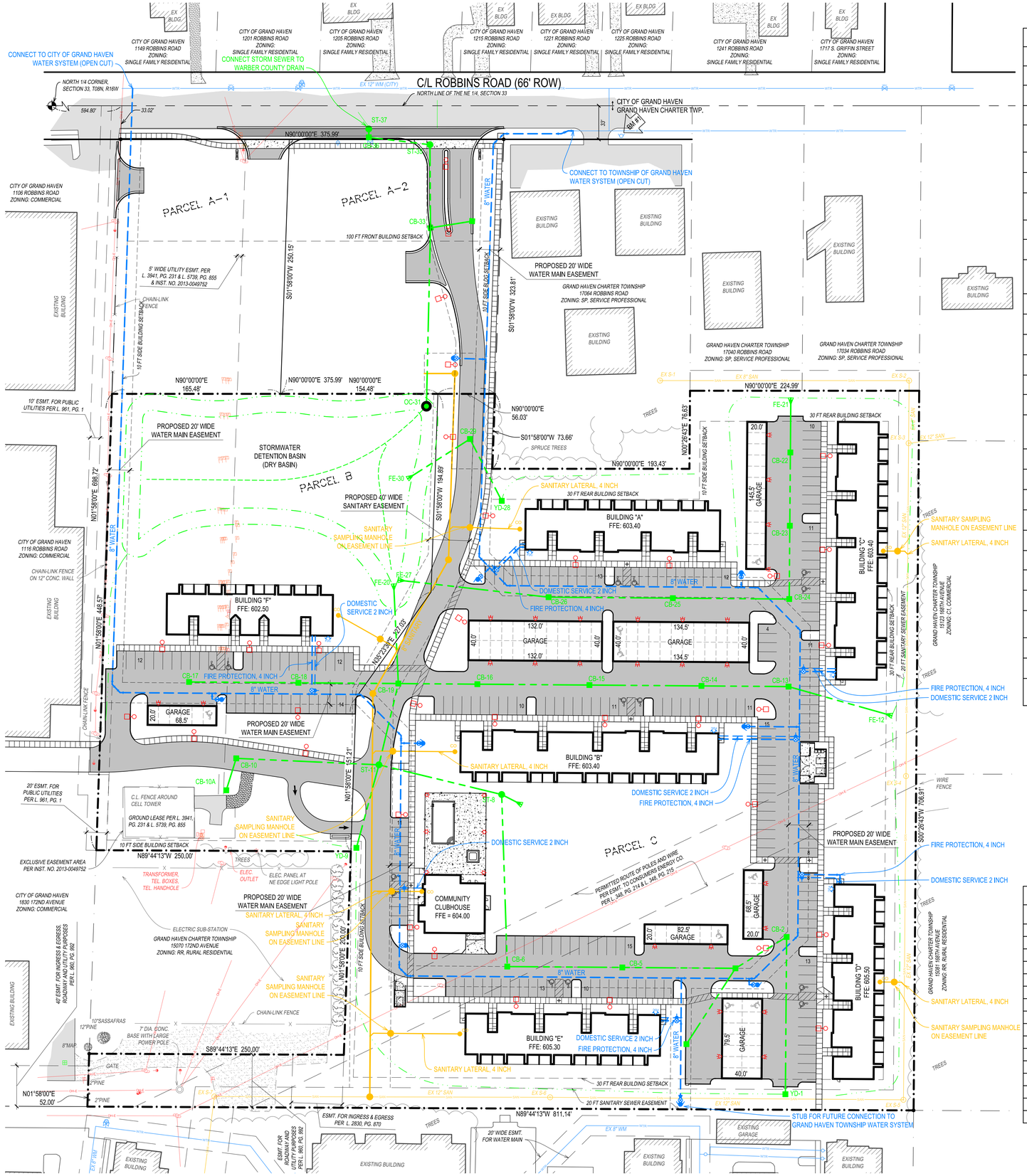
1712151

SHEET

CIVIL CIRCULATION PLAN

C-103A

Tuesday, May-15-2018 at 3:00pm O:\1712151 Robbins Road Mixed-Use\Drawings - 1711151\Civil\151C-103.dwg bkv



PROPOSED STORM SEWER STRUCTURE TABLE

STRUCTURE NUMBER	STRUCTURE TYPE & SIZE	RIM ELEV. CASTING TYPE	INVERT
1	YD 2' Ø STANDARD	RIM = 602.32 EJ 1040-N	12" (N) = 599.32
2	CB 5' Ø STANDARD	RIM = 603.47 EJ 1040-N	12" (S) = 598.55 12" (SW) = 598.55
3	CB 2' Ø STANDARD	RIM = 603.66 EJ 7045-M1-T1	12" (NE) = 600.66
4	CB 5' Ø STANDARD	RIM = 603.16 EJ 1040-M1	12" (NE) = 598.36 12" (SW) = 599.50 15" (W) = 598.36
5	CB 4' Ø STANDARD	RIM = 602.99 EJ 1040-M1	15" (E) = 598.04 15" (W) = 598.04
6	CB 4' Ø STANDARD	RIM = 603.08 EJ 1040-M1	18" (E) = 597.83 18" (N) = 597.83
8	ST 4' Ø STANDARD	RIM = 602.89 EJ 1040-B	18" (S) = 597.46 12" (SE) = 599.78 18" (W) = 597.46
9	YD 4' Ø STANDARD	RIM = 601.00 EJ 1040-N	12" (N) = 598.00
10	CB 4' Ø STANDARD	RIM = 600.97 EJ 1040-B	12" (S) = 597.47 12" (E) = 597.47
11	ST 5' Ø STANDARD	RIM = 601.45 EJ #1040-B	18" (E) = 596.94 12" (S) = 597.15 12" (W) = 596.77 24" (N) = 596.77
13	CB 4' Ø STANDARD	RIM = 601.54 EJ 1040-M1	12" (E) = 598.30 15" (W) = 598.05
14	CB 4' Ø STANDARD	RIM = 601.39 EJ 1040-M1	15" (E) = 597.67 15" (W) = 597.67
15	CB 4' Ø STANDARD	RIM = 601.39 EJ 1040-M1	15" (E) = 596.96 18" (W) = 596.96
16	CB 4' Ø STANDARD	RIM = 601.39 EJ 1040-M1	18" (E) = 596.58 18" (W) = 596.58
17	CB 2' Ø STANDARD	RIM = 600.53 EJ 1040-M1	12" (E) = 597.29
18	CB 4' Ø STANDARD	RIM = 600.53 EJ 1040-M1	12" (W) = 596.75 12" (E) = 596.74
19	CB 5' Ø STANDARD	RIM = 600.86 EJ 1040-M1	18" (E) = 596.42 12" (W) = 596.43 24" (S) = 598.66 30" (N) = 596.21
22	CB 4' Ø STANDARD	RIM = 601.63 EJ 1040-M1	12" (N) = 598.44 12" (S) = 598.44
23	CB 4' Ø STANDARD	RIM = 601.63 EJ 1040-M1	12" (N) = 598.21 12" (S) = 598.21
24	CB 4' Ø STANDARD	RIM = 601.53 EJ 1040-M1	12" (N) = 597.98 12" (W) = 597.98
25	CB 4' Ø STANDARD	RIM = 601.34 EJ 1040-M1	12" (E) = 597.61 12" (W) = 597.61
26	CB 4' Ø STANDARD	RIM = 601.39 EJ 1040-M1	12" (E) = 596.68 18" (W) = 596.68
28	YD 4' Ø STANDARD	RIM = 599.39 EJ 1040-N	12" (NW) = 596.49
29	CB 4' Ø STANDARD	RIM = 600.35 EJ 1040-M1	12" (SE) = 596.27 12" (SW) = 596.27
31	OC 7' Ø STANDARD	RIM = 599.45 STANDARD	4" (SW) = 595.00 36" (N) = 595.00
33	CB 5' Ø STANDARD	RIM = 600.13 EJ 7045-M1-T1	36" (S) = 594.06 12" (E) = 596.09 36" (N) = 594.06
35	ST 6' Ø STANDARD	RIM = 600.64 EJ 1040-B	36" (S) = 593.62 36" (W) = 593.62
36	CB 6' Ø STANDARD	RIM = 599.95 EJ 7030-M1-T1	36" (E) = 593.29 36" (N) = 593.29
37	ST 6' Ø STANDARD	RIM = 600.03 EJ 1040-M1	36" (S) = 593.25 36" (E) = 592.93 30" (W) = 593.23

GENERAL PRIVATE UTILITY NOTES:

PROPOSED PRIVATE UTILITY SERVICE AS SHOWN ARE SCHEMATIC ONLY. ACTUAL LOCATION TO BE COORDINATED WITH INDIVIDUAL UTILITY COMPANY AND APPROVED BY OWNER.

ALL PROPOSED UTILITIES WILL BE INSTALLED UNDERGROUND.

CONTRACTOR SHALL COORDINATE LOCATION OF ALL PRIVATE UTILITIES (GAS, ELECTRIC, PHONE, CABLE, ETC.) WITH THE LOCAL UTILITY COMPANIES AND THE MECHANICAL DRAWINGS. COORDINATE ALL PRIVATE UTILITY LOCATIONS WITH ALL SUB-SURFACE SITE UTILITIES SHOWN ON THIS PLAN.

GENERAL SANITARY SERVICE NOTES:

SITE CONTRACTOR TO END SANITARY LATERAL WITH A CLEAN-OUT AND TEMPORARY CAP AT 5' FROM BUILDING. COORDINATE CONNECTION WITH BUILDING PLUMBING CONTRACTOR.

SANITARY SEWER SERVICE LATERAL AND FITTINGS SHALL BE PVC PER ASTM D3034, SDR 26. JOINTS TO BE ELASTOMERIC SEALS IN ACCORDANCE WITH ASTM F477.

MATERIALS, INSTALLATION, AND TESTING OF SANITARY SEWER SERVICES SHALL CONFORM TO GRAND HAVEN CHARTER TOWNSHIP PUBLIC SERVICES DEPARTMENT WASTEWATER CONNECTION SPECIFICATIONS.

GENERAL STORM SEWER NOTES:

SITE CONTRACTOR TO END STORM CONNECTION 5' FROM BUILDING WITH A TEMPORARY CAP. COORDINATE CONNECTION WITH BUILDING PLUMBING CONTRACTOR.

STORM SEWER UNDERDRAIN (SPU) (12" - 60") SHALL BE SMOOTH INTERIOR CORRUGATED POLYETHYLENE PIPE PER AASHTO M294 TYPE SP, AND SHALL BE PERFORATED AND PRE-WRAPPED WITH A 3.5 OZ/SY GEOTEXTILE FILTER SOCK. JOINTS SHALL BE SOIL TIGHT. PAVEMENT SUBGRADE TO BE GRADED TO SLOPE TOWARDS THE PROPOSED SPU TRENCHES THROUGHOUT SITE.

UNDERDRAIN (4" - 10") SHALL BE SMOOTH INTERIOR CORRUGATED POLYETHYLENE PIPE TYPE S, PER AASHTO M252 AND PRE-WRAPPED WITH A GEOTEXTILE FILTER SOCK. PAVEMENT SUBGRADE TO BE GRADED TO SLOPE TOWARDS THE PROPOSED SPU TRENCHES THROUGHOUT SITE.

STORM SEWER PIPE FOR ROOF DRAIN CONNECTIONS OR WHERE INDICATED TO BE PVC SHALL MEET THE REQUIREMENTS OF ASTM D3034, SDR 26. JOINTS TO BE ELASTOMERIC SEALS IN ACCORDANCE WITH ASTM F477.

MATERIALS, INSTALLATION, AND TESTING OF THE STORM SEWER SYSTEM SHALL CONFORM TO GRAND HAVEN CHARTER TOWNSHIP PUBLIC SERVICES DEPARTMENT WASTEWATER CONNECTION SPECIFICATIONS STANDARDS.

GENERAL WATER SERVICE NOTES:

SITE CONTRACTOR TO END WATER SERVICE(S) AT 5' FROM BUILDING WITH TEMPORARY CAP(S), COORDINATE CONNECTION WITH BUILDING PLUMBING CONTRACTOR.

IRRIGATION WATER SERVICE TO BE TAPPED OFF WATER SERVICE INSIDE BUILDING UTILITY ROOM. COORDINATE WITH LANDSCAPER AND BUILDING PLUMBER.

FIRE PROTECTION LINE AND COMBINED SERVICE LINE SHALL BE DUCTILE IRON PER ANSI/AWWA C151/A21.51, THICKNESS CLASS PER ANSI/AWWA C110/A21.50. FITTINGS SHALL BE DUCTILE IRON PER ANSI/AWWA C110/A21.10, PRESSURE CLASS 350.

DOMESTIC SERVICE SHALL BE COPPER, TYPE K, ANNEALED AND SOFT TEMPER PER ASTM B-88. FITTINGS SHALL CONFORM TO ASTM B-88.

MINIMUM DEPTH OF BURY SHALL BE 60".

FIRE HYDRANT SHALL CONFORM TO ANSI / AWWA C-502 STANDARDS.

MATERIALS, INSTALLATION, AND TESTING OF WATER SERVICE LINES SHALL CONFORM TO GRAND HAVEN CHARTER TOWNSHIP PUBLIC SERVICES DEPARTMENT WASTEWATER CONNECTION SPECIFICATIONS AND THE STATE PLUMBING CODE.

PROPOSED LEGEND

- SIGN
- BUMP POST
- LANDING AREA
- WALL LIGHT (SEE ELECTRICAL DRAWINGS)
- BOLLARD LIGHT (SEE ELECTRICAL DRAWINGS)
- LIGHT POLE (SEE ELECTRICAL DRAWINGS)
- MANHOLE
- CATCH BASIN
- CLEAN OUT
- HYDRANT
- WATER VALVE
- CURB STOP
- FLARED END SECTION
- FIRE DEPARTMENT CONNECTION
- PIPE PLUG
- 90° BEND
- 45° BEND
- TEE
- CONCRETE SIDEWALK
- SIDEWALK RAMP
- CONCRETE PAVEMENT
- STANDARD DUTY BITUMINOUS
- GRAVEL DRIVE
- STANDARD CURB & GUTTER
- INVERTED CURB & GUTTER
- LANDSCAPE CURB
- FENCE
- WATER MAIN
- SANITARY SEWER
- STORM SEWER
- UNDERDRAIN

PROPOSED STORM SEWER PIPE TABLE

UP STREAM STRUCTURE	DOWN STREAM STRUCTURE	SIZE	LENGTH	SLOPE
1	2	12"	154 FT	0.50%
2	4	12"	59 FT	0.32%
3	4	12"	89 FT	1.31%
4	5	15"	111 FT	0.29%
5	6	18"	113 FT	0.18%
6	8	18"	169 FT	0.22%
7	8	12"	22 FT	1.00%
8	11	18"	124 FT	0.42%
10	11	12"	140 FT	0.50%
12	13	12"	105 FT	1.52%
13	14	15"	85 FT	0.45%
14	15	15"	110 FT	0.65%
15	16	18"	110 FT	0.34%
16	19	18"	78 FT	0.20%
17	18	12"	107 FT	0.50%
18	19	12"	98 FT	0.32%

PROPOSED STORM SEWER PIPE TABLE

UP STREAM STRUCTURE	DOWN STREAM STRUCTURE	SIZE	LENGTH	SLOPE
19	20	30"	98 FT	0.21%
21	22	12"	54 FT	0.86%
22	23	12"	72 FT	0.32%
23	24	12"	72 FT	0.32%
24	25	12"	114 FT	0.32%
25	26	12"	122 FT	0.76%
26	27	18"	149 FT	0.20%
28	29	12"	68 FT	0.32%
29	30	12"	73 FT	0.32%
31	33	36"	175 FT	0.54%
33	35	36"	82 FT	0.54%
35	36	36"	60 FT	0.54%
36	37	36"	8 FT	0.54%

NOTE: ALL UTILITIES SHOWN ARE APPROXIMATE LOCATIONS FROM FIELD DATA AND AVAILABLE INFORMATION. THEY SHOULD NOT BE INTERPRETED AS EXACT LOCATIONS NOR SHOULD THEY BE ASSUMED TO BE THE ONLY UTILITIES IN THE AREA.

NOT FOR CONSTRUCTION

N

0 50' 100'

ARCHITECTS • ENGINEERS

paradigm design

GRAND RAPIDS: 550 3 MILE N.W. SUITE B, GRAND RAPIDS, MI 49544, (616) 785 - 5656

TRAVERSE CITY: 333 E. STATE STREET, TRAVERSE CITY, MI 49684, (231) 346 - 3030

WEB: ParadigmAE.com

NOTE: THIS DOCUMENT IS PRELIMINARY IN NATURE AND IS NOT A FINAL SIGNED AND SEALED DOCUMENT.

BRIAN T. SINNOTT
MI REGISTRATION #6201052169
EXP. DATE 10/31/2019

PROJECT

LAKESHORE GARDENS APARTMENTS

A PLANNED UNIT DEVELOPMENT

17114 ROBBINS ROAD
GRAND HAVEN, MI 49417

DEVELOPER

MAIN STREET CAPITAL GROUP

18000 COVE STREET, STE 201
SPRING LAKE, MI 49456

RELEASE DATE

DATE	DESCRIPTION
01-16-18	PUD APPLICATION
02-07-18	PUD APPLICATION
03-09-18	PUD APPLICATION
04-27-18	PUD APPLICATION
05-15-18	PUD APPLICATION

PROJECT

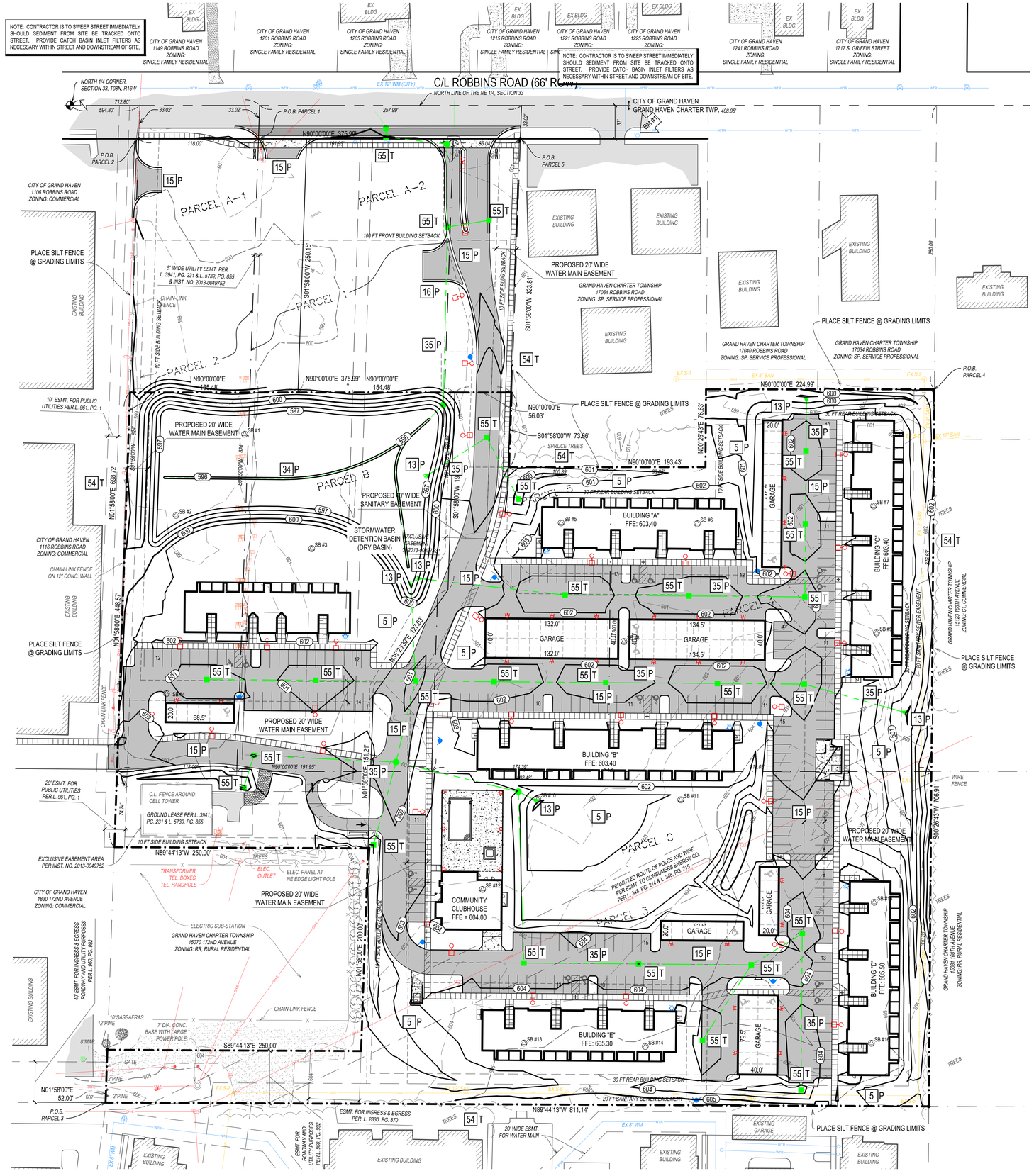
1712151

SHEET

CIVIL OVERALL UTILITY PLAN

C-111

Tuesday, May-15-2018 at 3:10pm \pd-fs1\Jobs$\1712151 Robbins Road Mixed-Use\Drawings - 1711511\Civil\1511C-111.dwg bkv



GENERAL SOIL EROSION AND SEDIMENTATION CONTROL NOTES:

IT IS THE OWNER'S RESPONSIBILITY TO OBTAIN THE SOIL EROSION PERMIT FROM THE PROPER GOVERNING AUTHORITY.

A CONTRACTOR / INSPECTOR SHALL INSPECT THE SOIL EROSION/SEDIMENT CONTROL DEVICES ONCE EACH WEEK AND/OR WITHIN 24 HOURS OF A PRECIPITATION EVENT WHICH RESULTS IN A STORM DISCHARGE FROM THE SITE.

ALL DISTURBED NON-PAVEMENT AREAS MUST BE RESTORED WITH TOPSOIL, SEED, FERTILIZER, AND MULCH UNLESS SODDED. (SEE LANDSCAPING PLAN)

ALL SLOPES STEEPER THAN 1V:3H SHALL USE AN EROSION CONTROL BLANKET ([NORTH AMERICAN GREEN S150BN] OR EQUAL). ALL SLOPES BETWEEN 1V:4H AND 1V:3H SHALL USE AN EROSION CONTROL BLANKET ([NORTH AMERICAN GREEN DS75] OR EQUAL), UNLESS INDICATED OTHERWISE ON PLANS.

SEEDING SHOULD BE PREPARED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS. THE CONTRACTOR / INSPECTOR SHALL INSPECT THE AREA AFTER SEEDING IS COMPLETED. AREAS THAT ARE BARE OR NOT MULCHED PROPERLY WILL NEED TO BE SPOT SEEDED AND/OR RE-MULCHED.

SILT FENCE SHOULD BE TRENCHED IN, BACKFILLED, AND STAPLED OR STAKED ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS. MAINTENANCE INCLUDES THE REMOVING OF BUILT-UP SEDIMENT WHEN THE SEDIMENT ACCUMULATES TO 1/3 TO 1/2 THE HEIGHT OF THE FENCE. CONTRACTOR WILL HAVE TO REMOVE, REPLACE, RETRENCH, OR REBACKFILL THE FENCE IF IT FAILS. IT WOULD ALSO BE NECESSARY TO REINSTALL IF ANY PORTION OF THE FENCING WAS DAMAGED BY CONSTRUCTION MACHINERY.

INLET FILTERS SHALL BE SILT SACKS, DANDY BAGS, OR APPROVED EQUAL. INLET FILTERS SHOULD BE INSPECTED FOR BUILDUP OF SILT AND OTHER DEBRIS. THIS IS EVIDENT IF STRUCTURE IS CAUSING FLOODING. MAINTENANCE WOULD CONSIST OF REMOVING OF SEDIMENTS OR REPLACING FILTER AS NECESSARY.

SOIL EROSION CONTROL METHODS SHOWN ARE A GUIDELINE AND DO NOT RELIEVE THE CONTRACTOR FROM ADDITIONAL METHODS THAT MAY BE REQUIRED BY THE SOIL EROSION CONTROL PERMIT.

DETENTION BASIN(S) SHALL BE ONE OF THE FIRST ITEMS CONSTRUCTED AND SHALL BE USED AS A TEMPORARY SEDIMENTATION BASIN UNTIL THE SITE IS STABILIZED. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING ALL ACCUMULATED SEDIMENT AND RESTORATION OF THE BASIN PRIOR TO ACCEPTANCE BY THE [OWNER] [REGULATORY AGENCY].

THE CONTRACTOR WILL ENGAGE A CERTIFIED STORM WATER OPERATOR IN ACCORDANCE WITH EPA PHASE II RULES TO MEET REQUIREMENTS OF THE PERMIT. THIS OPERATOR WILL INSPECT THE JOB SITE AS REQUIRED BY RULE. NOTIFY JOB SITE SUPERINTENDENT OF ANY DEFICIENCIES, AND ENTER FINDINGS IN THE JOB SITE INSPECTION JOB BOOK.

TOTAL DISTURBED AREA = 13.12 ACRES. APPROXIMATELY 19,000 CUBIC YARDS OF FILL WILL BE REQUIRED TO ACHIEVE PROPOSED GRADERS, NOT INCLUDING PAVEMENT SECTION MATERIALS.

UNIFIED KEYING SYSTEM
SOIL EROSION AND SEDIMENTATION CONTROL MEASURES

5	SEEDING	34	SEDIMENT BASIN
13	RIP-RAP, RUBBLE, GABIONS	35	STORM SEWER CB CB
15	PAVING	54	GEOTEXTILE SILT FENCE
16	CURB & GUTTER	55	GEOTEXTILE INLET FILTER

CONSTRUCTION SEQUENCE	YEAR: 2018											
	JAN.	FEB.	MARC.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
STRIPPING & STOCKPILING TOPSOIL												
ROUGH GRADING SEDIMENT CONTROL												
TEMPORARY CONTROL MEASURES												
STORM UTILITIES												
TEMPORARY CONSTRUCTION ROADS												
PERMANENT CONTROL MEASURES												
FOUNDATION / BUILDING CONSTRUCTION												
SITE CONSTRUCTION												
FINISH GRADING												
LANDSCAPING												

GENERAL CONTRACTOR SHALL COMPLETE CONSTRUCTION SEQUENCE SCHEDULE WHEN MAKING APPLICATION FOR SOIL EROSION CONTROL PERMIT.

PROPOSED LEGEND

SIGN
WALL LIGHT (SEE ELECTRICAL DRAWINGS)
MANHOLE
HYDRANT
FLARED END SECTION
BUMP POST
BOLLARD LIGHT (SEE ELECTRICAL DRAWINGS)
CATCH BASIN
WATER VALVE
FIRE DEPARTMENT CONNECTION
LANDING AREA
LIGHT POLE (SEE ELECTRICAL DRAWINGS)
CLEAN OUT
CURB STOP

CONCRETE SIDEWALK
SIDEWALK RAMP
CONCRETE PAVEMENT
STANDARD DUTY BITUMINOUS
GRAVEL DRIVE
STANDARD CURB & GUTTER
INVERTED CURB & GUTTER
LANDSCAPE CURB
CONTOUR LINE
FENCE
WATER MAIN
SANITARY SEWER
STORM SEWER
UNDERDRAIN
SILT FENCE

X T TEMPORARY SOIL EROSION & SEDIMENTATION CONTROL MEASURE
X P PERMANENT SOIL EROSION & SEDIMENTATION CONTROL MEASURE

NOT FOR CONSTRUCTION

NOTE: ALL UTILITIES SHOWN ARE APPROXIMATE LOCATIONS FROM FIELD DATA AND AVAILABLE INFORMATION. THEY SHOULD NOT BE INTERPRETED AS EXACT LOCATIONS NOR SHOULD THEY BE ASSUMED TO BE THE ONLY UTILITIES IN THE AREA.

N

0 50' 100'

ARCHITECTS • ENGINEERS

paradigm design

GRAND RAPIDS: 550 3 MILE N.W. SUITE B, GRAND RAPIDS, MI 49544, (616) 785 - 5656

TRAVERSE CITY: 333 E. STATE STREET, TRAVERSE CITY, MI 49684, (231) 346 - 3030

WEB: ParadigmAE.com

NOTE: THIS DOCUMENT IS PRELIMINARY IN NATURE AND IS NOT A FINAL SIGNED AND SEALED DOCUMENT

BRIAN T. SINNOTT
MI REGISTRATION #6201052169
EXP. DATE 10/31/2019

PROJECT

LAKESHORE GARDENS APARTMENTS

A PLANNED UNIT DEVELOPMENT

17114 ROBBINS ROAD
GRAND HAVEN, MI 49417

DEVELOPER

MAIN STREET CAPITAL GROUP

18000 COVE STREET, STE 201
SPRING LAKE, MI 49456

RELEASE DATE

	DATE	DESCRIPTION
	01-16-18	PUD APPLICATION
	02-07-18	PUD APPLICATION
	03-09-18	PUD APPLICATION
	04-27-18	PUD APPLICATION
	05-15-18	PUD APPLICATION

PROJECT

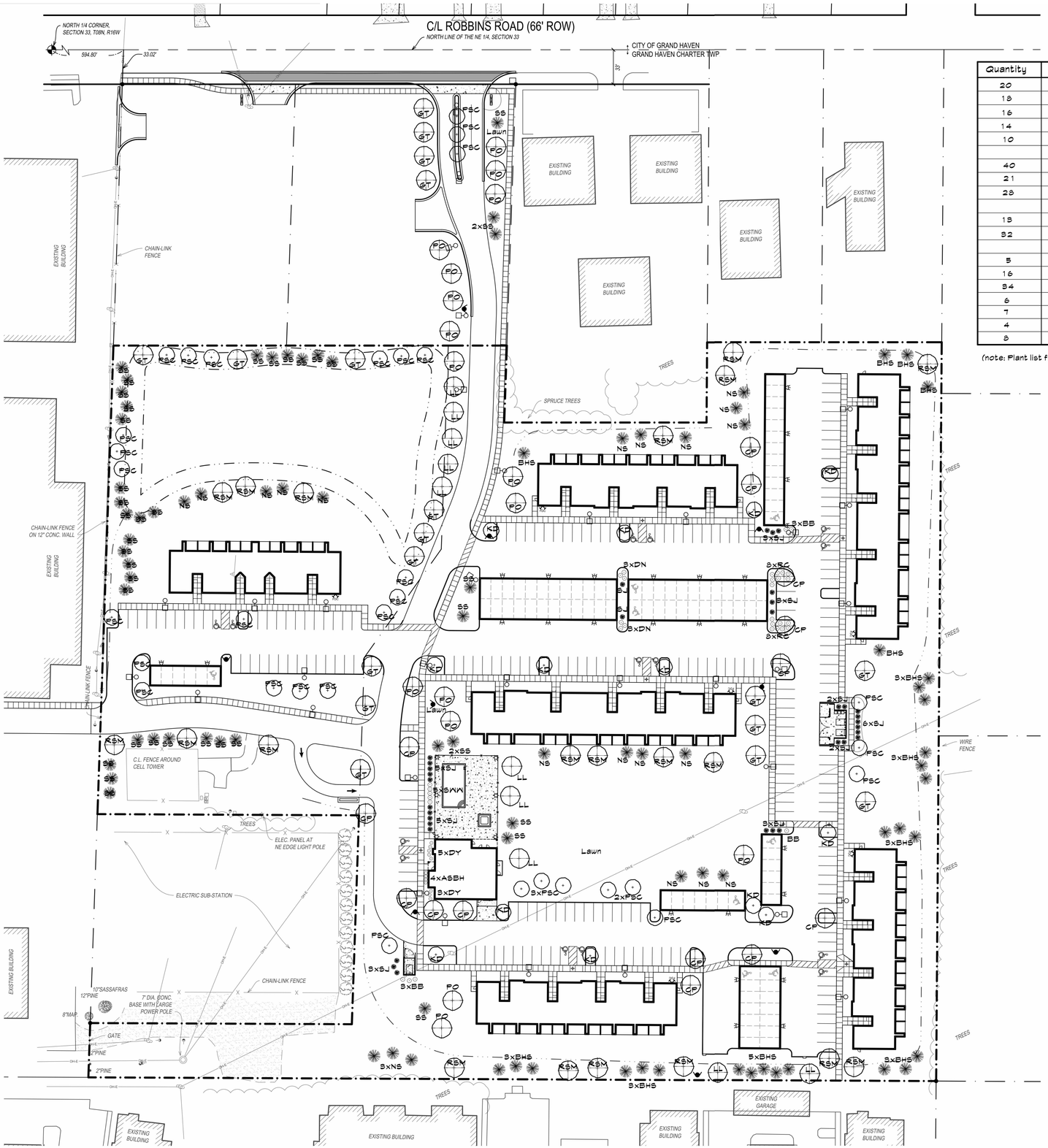
1712151

SHEET

CIVIL OVERALL GRADING & SESC PLAN

C-121

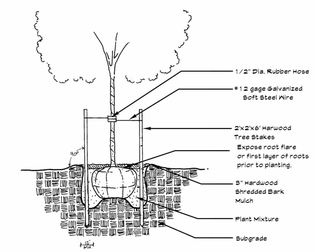
Tuesday, May-15-2018 at 3:10pm top-file\Uods51712151 Robbins Road Mixed-Use\Drawings - 1711151\Civil\151C-121.dwg biv



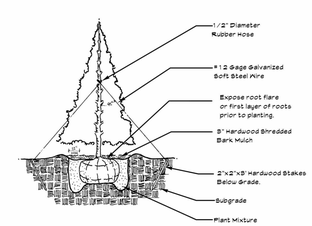
Plant List

Quantity	Common Name	Latin Name	Planted Size	Key
20	Red Sunset Maple	Acer rubrum 'Franksred'	3 1/2" cal.	RSM
18	Ginkgo Tree	Ginkgo biloba	3 1/2" cal.	GT
16	Pin Oak	Quercus palustris	3 1/2" cal.	PO
14	Capital Pear	Pyrus calleryana 'Capital'	3 1/2" cal.	CP
10	Little Leaf Linden	Tilia cordata	3 1/2" cal.	LL
40	Serbian Spruce	Picea omorika	6' Ht.	SS
21	Norway Spruce	Picea abies	6' ht.	NS
28	Black Hills Spruce	Picea glauca var. densata	6' ht.	BHS
13	Kousa Dogwood	Cornus Kousa	3 " cal.	KD
32	Pink Spires Flowering Crab	Malus 'Pink Spires'	3 " cal.	PSC
5	Spilled Wine Weigela	Weigela florida 'Bokraspiwi'	3 gal.	SWW
16	Russian Cypress	Microbiota decussata	18-24" spd.	RC
34	Spartan Juniper	Juniperus chinensis 'Spartan'	6' Ht.	SJ
6	Diablo Ninebark	Physocarpus opulifolious "Diablo"	24-30" ht.	DN
7	Dwarf Burning Bush	Euonymus alatus 'Compactus'	24-30" ht.	BB
4	All Summer Beauty Hydrangea	Hydrangea macrophylla 'All Summer Beauty'	3 gal.	ASBH
8	Dense Yew	Taxus densiformis	18-24" ht.	DY

(note: Plant list for ordinance purposes only, the landscape contractor is responsible for plant quantities shown on the landscape plan)



Deciduous Trees 3" Caliper and Smaller



Evergreen Planting Detail-5' and Taller

Notes:

1. All landscaping shall be installed by a qualified Landscape Contractor to the size specified on the landscape plan. Smaller sizes will be rejected.
2. All plantings shall be mulched with 3" shredded premium hardwood bark mulch. Trees in lawn areas shall receive a 6' diameter bark ring 3" deep..
3. The landscape contractor shall remove any twine that is wrapped around the trunk of a tree or shrub as well as the top third of any burlap. Remove excess soil on the top of the root ball to expose the root flare or first layer of roots prior to planting. Use a wire cutter to make 3–5 cuts in the wire basket to allow roots to grow through.
4. Planting areas shall be edged with a mechanical bed edger at a depth of 4" to define border for shredded bark mulch.
5. Parking Islands shall be back filled with at least 24" of topsoil. Amend the topsoil with composted manure and mix into the topsoil at a depth of 6–12". Any aggregate or stone from the construction of the parking lot shall be removed prior to backfill.
6. Lawn areas shall recieve at least 4" of topsoil and hydroseeded. Check with specifications for topsoil availability or contact project manager. Topsoil for lawns shall be appropriate for growing and sustaining a healthy lawn. All lawns, except the detention pond and cell tower, shall be hydroseeded with a seed blend consisting of 30% Kentucky Bluegrass, 20% Perennial Ryegrass, 10% Hard Fescue, 20% Creeping Red Fescue and 20% Chewings Fescue.
7. The detention pond shall be seeded with Stormwater Seed Mix & Economy Prairie Seed Mix by Cardno JFN. The cell tower lawn shall be seeded with Economy Prairie Seed Mix by Cardno JFN.
8. All lawn and shrub bed areas shall be watered by an automatic irrigation system. The irrigation system shall be designed and installed by the Landscape Contractor.
9. Maintenance of the landscape shall be provided for by the owner and include fertilizing of lawn and plant material, yearly pruning, top dressing of mulch areas every other year and provide 1" of water per week during the growing season.
10. Plant materials shall be chosen and installed in accordance with standards recommended by the County Cooperative Extension Service or American Nursery Association.

N

0 50' 100'

NOTE: ALL UTILITIES SHOWN ARE APPROXIMATE LOCATIONS FROM FIELD DATA AND AVAILABLE INFORMATION. THEY SHOULD NOT BE INTERPRETED AS EXACT LOCATIONS NOR SHOULD THEY BE ASSUMED TO BE THE ONLY UTILITIES IN THE AREA.

ARCHITECTS • ENGINEERS

paradigm design

GRAND RAPIDS: 550 3 MILE N.W. SUITE B, GRAND RAPIDS, MI 49544, (616) 785 - 5656

TRAVERSE CITY: 333 E. STATE STREET, TRAVERSE CITY, MI 49684, (231) 346 - 3030

WEB: PARADIGMAE.COM

STATE OF MICHIGAN — JOYCE E. WEISE — LANDSCAPE ARCHITECT — No. 1202 — LICENSED LANDSCAPE ARCHITECT

Landscape Plan Drawn By: Joyce E. Weise PLA, ASLA

PROJECT

LAKESHORE GARDENS APARTMENTS

A PLANNED UNIT DEVELOPMENT

17114 ROBBINS ROAD
GRAND HAVEN, MI 49417

DEVELOPER

MAIN STREET CAPITAL GROUP

18000 COVE STREET, STE 201
SPRING LAKE, MI 49456

RELEASE DATE

DATE	DESCRIPTION
01-16-18	PUD APPLICATION
02-07-18	PUD APPLICATION
03-09-18	PUD APPLICATION
04-27-18	PUD APPLICATION
05-15-18	PUD APPLICATION

PROJECT

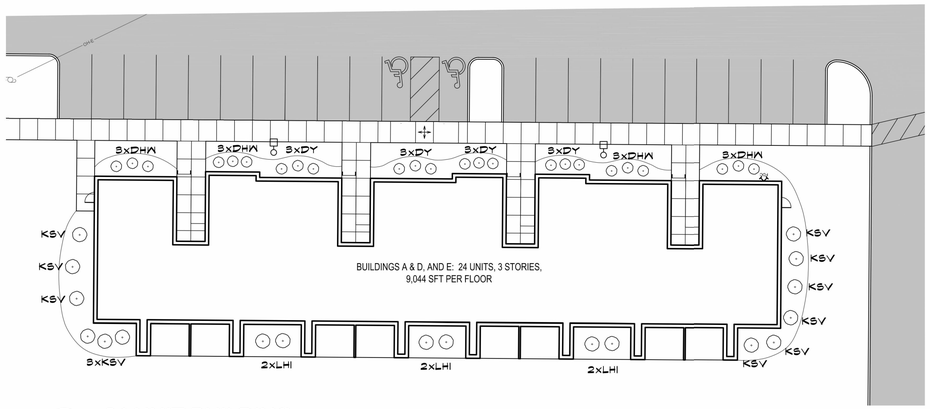
1712151

SHEET

LANDSCAPE PLAN

L-101

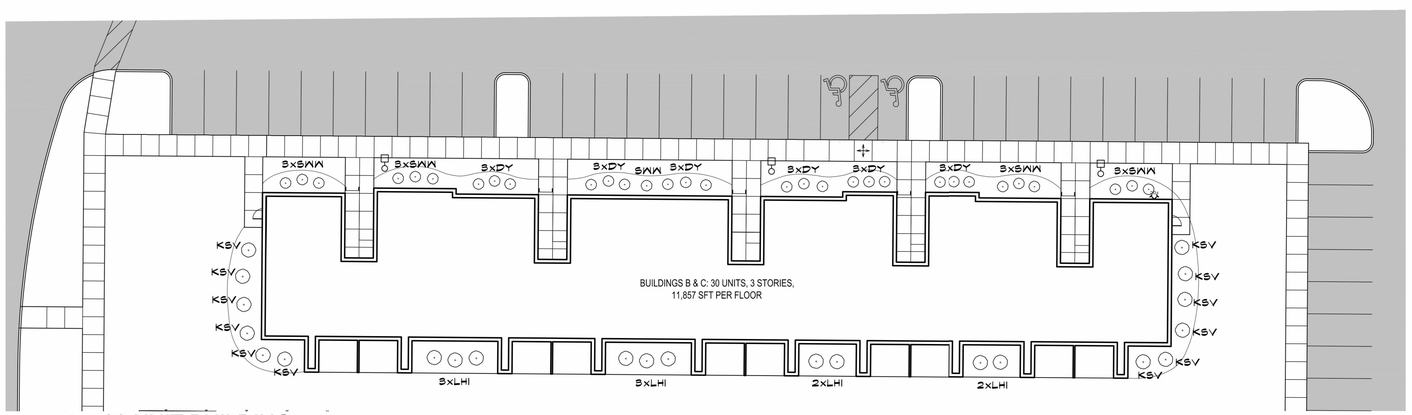
Tuesday, May-15-2018 at 3:10pm \\pd-file1\Jobs\1712151 Robbins Road Mixed-Use\Drawings - 1711151\Civil\151L-101.dwg SIv



1 24 UNIT BUILDING

SCALE: 1" = 20'

0 10' 20' 40'



2 30 UNIT BUILDING

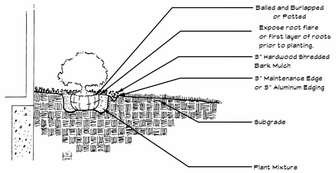
SCALE: 1" = 20'

0 10' 20' 40'

Plant List

Quantity	Common Name	Latin Name	Planted Size	Key
60	Korean Spice Viburnum	Viburnum carlesii	24-30" ht.	KSV
38	Little Henry Itea	Itea virginica 'Sprich'	18-24" ht.	LHI
26	Spilled Wine Weigela	Weigela florida 'Bokraspiwi'	3 gal.	SWW
72	Dense Yew	Taxus densiformis	18-24" ht.	DY
36	Dark Horse Weigela	Weigela florida 'Dark Horse'	3 gal.	DHW

(note: Plant list for ordinance purposes only, the landscape contractor is responsible for plant quantities shown on the landscape plan)



Shrub Planting Detail

Notes:

1. All landscaping shall be installed by a qualified Landscape Contractor to the size specified on the landscape plan. Smaller sizes will be rejected.
2. All plantings shall be mulched with 3" shredded premium hardwood bark mulch. Trees in lawn areas shall receive a 6' diameter bark ring 3" deep..
3. The landscape contractor shall remove any twine that is wrapped around the trunk of a tree or shrub as well as the top third of any burlap. Remove excess soil on the top of the root ball to expose the root flare or first layer of roots prior to planting. Use a wire cutter to make 3–5 cuts in the wire basket to allow roots to grow through.
4. Planting areas shall be edged with a mechanical bed edger at a depth of 4" to define border for shredded bark mulch.
5. Parking Islands shall be back filled with at least 24" of topsoil. Amend the topsoil with composted manure and mix into the topsoil at a depth of 6–12". Any aggregate or stone from the construction of the parking lot shall be removed prior to backfill.
6. Lawn areas shall recieve at least 4" of topsoil and hydroseeded. Check with specifications for topsoil availability or contact project manager. Topsoil for lawns shall be appropriate for growing and sustaining a healthy lawn. All lawns including the detention ponds shall be hydroseeded with a seed blend consisting of 30% Kentucky Bluegrass, 20% Perennial Ryegrass, 10% Hard Fescue, 20% Creeping Red Fescue and 20% Chewings Fescue.
7. All lawn and shrub bed areas shall be watered by an automatic irrigation system. The irrigation system shall be designed and installed by the Landscape Contractor.
8. Maintenance of the landscape shall be provided for by the owner and include fertilizing of lawn and plant material, yearly pruning, top dressing of mulch areas every other year and provide 1" of water per week during the growing season.
9. Plant materials shall be chosen and installed in accordance with standards recommended by the County Cooperative Extension Service or American Nursery Association.

ARCHITECTS • ENGINEERS

paradigm design

GRAND RAPIDS
550 3 MILE N.W. SUITE B
GRAND RAPIDS, MI 49544
(616) 785 - 5656

TRAVERSE CITY
333 E. STATE STREET
TRAVERSE CITY, MI 49684
(231) 346 - 3030

WEB
ParadigmAE.com

STATE OF MICHIGAN
JOYCE E. WEISE
LANDSCAPE ARCHITECT
No. 1202
LICENSED LANDSCAPE ARCHITECT

Joyce E. Weise

Landscape Plan Drawn By:
Joyce E. Weise PLA, ASLA

PROJECT

LAKESHORE GARDENS APARTMENTS

A PLANNED UNIT DEVELOPMENT

17114 ROBBINS ROAD
GRAND HAVEN, MI 49417

DEVELOPER

MAIN STREET CAPITAL GROUP

18000 COVE STREET, STE 201
SPRING LAKE, MI 49456

RELEASE DATE

DATE	DESCRIPTION
01-16-18	PUD APPLICATION
02-07-18	PUD APPLICATION
03-09-18	PUD APPLICATION
04-27-18	PUD APPLICATION
05-15-18	PUD APPLICATION

PROJECT

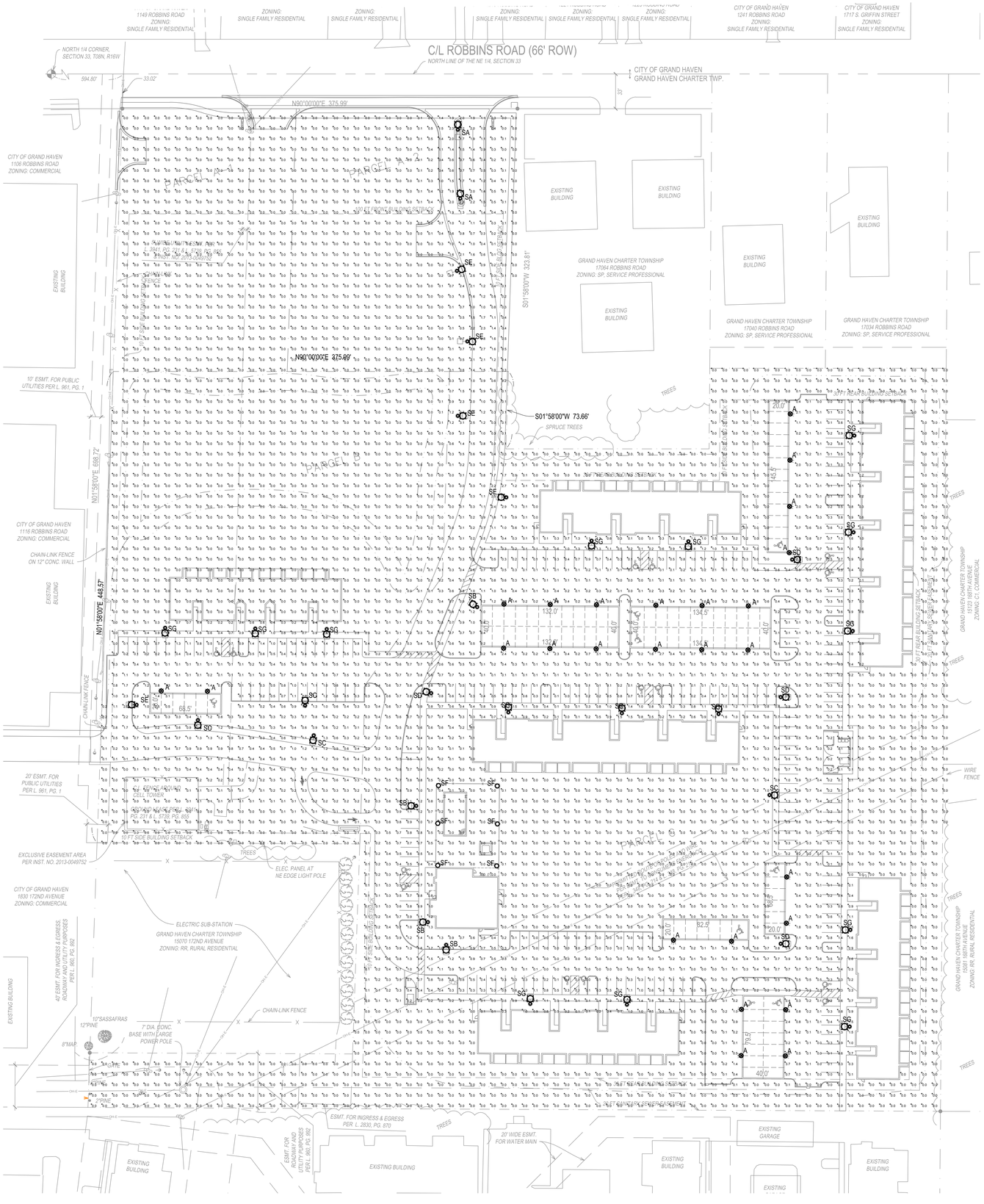
1712151

SHEET

LANDSCAPE PLAN

L-102

Tuesday, May-15-2018 at 3:10pm HPD-FILE1:Lobs$1712151 Robbins Road Mixed-Use\Drawings - 1711151Civil\151L-101.dwg bkv



Tuesday, May-15-2018 at 11:29am O:\1712151 Robbins Road Mixed-Use\Drawings - 1711151\Elec\15\ES.1.dwg ALN

LUMIÈRE®

DESCRIPTION

Tahoe mini-bollards are petite, yet rugged low voltage beacons in three distinct styles. They utilize a 20-watt MR16 lamp source and are ideal for a variety of commercial and residential applications. Each model is available in three sizes and includes a cast zinc ground spike for fast, easy installation. Luminière's exclusive Siphon Protection System (S.P.S.) prevents water from siphoning into the fixture through its own lead wires.

Catalog #	Type
Project	
Comments	Date
Prepared by	

SPECIFICATION FEATURES

A ... Material
Fixture housing is aluminum-machined from corrosion-resistant 6061-T6 aluminum extrusion.

B ... Finish
Fixture finish is double protected by a chromate conversion undercoating and polyester powdercoat paint finish, surpassing the rigorous demands of the outdoor environment. Fixture housing is available in a variety of standard colors.

C ... Gasket
Wire lead and mounting spike adaptor stem are sealed with a high temperature silicone o-ring gasket to prevent water intrusion.

D ... Lens
Lens is machined from solid U.V. stabilized clear acrylic.

E ... Mounting Spike
6-3/4" corrosion-resistant cast zinc ground spike with 1/2" female threaded opening provided as standard (model G3501). It is sealed around the lead wires for rigidity and a watertight seal.

F ... Hardware
Fixture mounting hardware is standard to provide maximum corrosion-resistance.

G ... Socket
Lamp is socketed with 250° C Teflon® coated lead wires and GU5.3 bi-pin base.

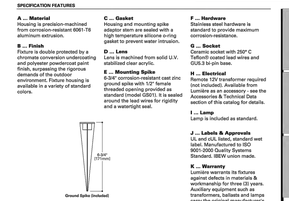
H ... Electrical
Lamp is 12V transformer required (not included). Available from Luminière as an accessory - see the Accessories & Technical Data section of this catalog for details.

I ... Lamp
Lamp is included as standard.

J ... Labels & Approvals
UL and cUL listed, standard wet label. Manufactured to ISO 9001:2008 Quality Systems Standard. IBEW union made.

K ... Warranty
Luminière warrants its fixtures against defects in materials & workmanship for three (3) years. Auxiliary equipment such as transformers, ballasts and lamps carry the original manufacturer's warranty.

TAHOE
501
504
510
20W (max.) MR16
Halogen
Low Voltage
Mini-Bollard



COOPER Lighting
www.cooperlighting.com

Specifications and Dimensions subject to change without notice.
Contact your representative for additional options and finishes.

ADLE52464

STREETWORKS®

DESCRIPTION

The EPIC Collection delivers custom luminaire flexibility with high quality, yet availability expectations of standard specification grade products. EPIC Collection offers a wide range of optical distributions. Recognizing evolving environmental and legislative trends, EPIC Collection delivers world class LED optical and performance solutions to the decorative luminaire marketplace.

Catalog #	Type
Project	
Comments	Date
Prepared by	

SPECIFICATION FEATURES

Construction
TOP: Cast aluminum classical top with ribbed decorative detail. Top is sidewall thickness. Top attaches to cast aluminum mounting arm hub with four (4) stainless steel fasteners. One (1) piece silicone gasket between mounting arm and top casting seals out moisture and contaminants. MIDSECTION: Continuous silicone gaskets seal lens to top casting and shade. The mid-section optional feature cast aluminum construction with stainless steel fastener hardware. SHADES: Heavy-gauge precision spun aluminum shades offer superior surface finish and consistency in form. DOORFRAME: Cast aluminum frame for lens and doorframe seal to underside of shade with a thick wall continuous silicone gasket. Mounting hub ships attached to mounting arm.

Optics
DISTRIBUTION: Choice of Holmen (12) patented, high-efficiency AccuLED Optics™, that maximize light collection and directional distribution onto the application region. Each optical lens is manufactured in acrylic by injection-molding, then precisely arranged and sealed on the board mounts. LEDs: High output LEDs, 50,000+ hours life at >70% lumen maintenance, offered standard in 4000°K (nominal) CCT and nominal 70 CRI.

Electrical
ELECTRICAL TRAY: Driver and related electrical components are mounted on one-piece tray. Quick disconnect wiring plugs allow for tray removal during routine maintenance. DRIVER: LED drivers are potted and heat sinked for maximum reliability and prolonged life. Standard drivers feature electronic universal voltage (120-277VAC50-60Hz), greater than 0.9 power factor, less than 20% harmonic distortion and operate in ambient temperature range of +40°C (104°F) down to minimum starting temperature of -30°C (-22°F). Shipped standard with Cooper Lighting proprietary circuit module designed to withstand 10kV of transient line surge. All LED Drivers are UL Class 2 and are mounted to dedicated mounting trays and are easily replaced by use of quick disconnects for ease of wiring.

Finish
Housing is finished in 5 stage Super TGIC polyester powder coat paint, 2.5 mil nominal thickness for superior protection against fade and wear. Standard colors include Black, Bronze, Dark Bronze, platinum and graphite metallic, RAL and custom color matches available. Consult Outdoor Architectural Colors brochure for more information. Decorative cover plates are standard white and may be specified to match finish of luminaire housing.

Warranty
CEM LED features a five-year limited warranty.

CEM
CLASSICAL EPIC
MEDIUM LED

1 - 4 LightBARs
Solid State LED

DECORATIVE AREA

DESIGNLIGHTS CONSORTIUM

DIMENSIONS

NOTE: See configurations for more detailed information.

CERTIFICATION DATA
UL/cUL Listed
ISO 9001
IP66 Ingress Rating
IdPhA Compliant
RoHS Lead Compliant
5.5G Vibration Tested

ENERGY DATA
Electronic LED Drivers
>0.9 Power Factor
<20% Total Harmonic Distortion
120-277VAC 50-60Hz, 347VAC 60Hz
-40°C Minimum Temperature
40°C Ambient Temperature Rating

EPA
Effective Projected Area: (Sq. Ft.)
0.94

SHIPPING DATA
Approximate Net Weight:
28 lbs.

ADW11595
2013-02-21 17:08:14

COOPER Lighting
www.cooperlighting.com

		LED OPTION Fixture types										
	Square footage	A	SA	SB	SC	SD	SE	SF	SG			
	Wattage	12.9	51	51	51	51	51	10	27			
LUMENS		1020	4726	4553	4434	4726	4553	240	1873	TOTAL WATTAGE	W/FT^2	LZ3
DRIVEWAY AND PARKING	128315	26	2	4	4	4	5	6	15	1769.4	0.0138	0.080

Schedule

Label	Manufacturer	Catalog Number	Lamp	Number Lamps	Wattage
A	PROGRESS	P8222-2830K LED DOWNLIGHT	40-Nichia 3000K LED's	1	12.9
SA	COOPER LIGHTING - - STREETWORKS	CEMB02LEDEU5MQ MOUNTED ON STRAIGHT STEEL POLE AT 12' ABOVE FINISHED GRADE.	LED	1	51
SB	COOPER LIGHTING - - STREETWORKS	CEMB02LEDEUT3A MOUNTED ON STRAIGHT STEEL POLE AT 20' ABOVE FINISHED GRADE.	LED	1	51
SC	COOPER LIGHTING - - STREETWORKS	CEMB02LEDEUT4S MOUNTED ON STRAIGHT STEEL POLE AT 20' ABOVE FINISHED GRADE.	LED	1	51
SD	COOPER LIGHTING - - STREETWORKS	CEMB02LEDEU5MQ MOUNTED ON STRAIGHT STEEL POLE AT 20' ABOVE FINISHED GRADE.	LED	1	51
SE	COOPER LIGHTING - - STREETWORKS	CEMB02LEDEUT3A MOUNTED ON STRAIGHT STEEL POLE AT 12' ABOVE FINISHED GRADE.	LED	1	51
SF	EATON - LUMIERE (FORMER COOPER LIGHTING)	510-24-10LED3041-12-CS	10W 3000K, 41 Degree Wide, GU5.3 Base	1	10
SG	COOPER LIGHTING - - STREETWORKS	CEMC01LEDEUT2A MOUNTED ON STRAIGHT STEEL POLE AT 12' ABOVE FINISHED GRADE.		7	27

Statistics

Description	Symbol	Avg	Max	Min	Max/Min	Avg/Min
SITE	+	0.2 fc	3.7 fc	0.0 fc	N/A	N/A

NOTE: ALL UTILITIES SHOWN ARE APPROXIMATE LOCATIONS FROM FIELD DATA AND AVAILABLE INFORMATION. THEY SHOULD NOT BE INTERPRETED AS EXACT LOCATIONS NOR SHOULD THEY BE ASSUMED TO BE THE ONLY UTILITIES IN THE AREA.

NOT FOR CONSTRUCTION

N

0 50' 100'

LITHONIA LIGHTING

FEATURES & SPECIFICATIONS

INTENDED USE — The 6" Wafer Thin LED recessed downlight with remote driver box combines high lumen output with a sleek, contemporary aesthetic. Its compact profile and lightweight design (4.9 lbs) are ideal for use in other-than-flat IC design allowing easy installation for new construction or remodel from below the ceiling without the requirement of a gut light housing. The LED module maintains at least 70% light output for 36,000 hours. These LED Wafer downlights are intended for closets, attics, hallways, bathrooms, kitchens, basements, soffits, entryways, porches, garages, stairwells, corridors, nursing/retirement homes, condos, elevators, apartments, and any other small areas.

CONSTRUCTION — Ideal for shallow ceiling plenums since a pan light housing is NOT required. IC rated driver and fixture - approved for direct contact with insulation. Aluminum die-cast outer frame. Durable, powder coat paint to prevent rust. Round fixture with integral edge-lit LED's. Steel spring clip for easy installation. Plenum rated cable connector to connect from module to remote driver box. Isolated driver housing and module meet remote box with four 7/8" knockouts with electric pre-punch. Suitable for ceiling wires up to 1/2" diameter. Remote driver box accommodates up to 20.74 gauge insulated conductors, or 16.12 gauge insulated conductors, making the Wafer LED Downlight a much easier to wire in Zero Clear (plus ground) daisy-chain applications and contractor friendly.

PATENT PENDING.

INSTALLATION — Ideal for shallow ceiling plenums; no housing required. Steel spring clip for easy installation. 6" cut out template is provided to ensure a correct sized hole is cut into ceiling for proper installation of the trim. Size of hole should not exceed 6 1/4 inches for this product. Suitable for installation in or pitched ceiling ceiling applications. 2" plenum space required for installation of the remote driver box.

OPTICS — Wafer Thin downlight edge-lit LED technology uses light guided plate to distribute light. Polycarbonate lens provides uniform illumination throughout the space. 2,600lmd 2700K, 3000K, 3500K, 4000K, and 5000K color temperature LEDs.

ELECTRICAL — Connect directly to 120V power supply via provided UL recognized driver. High efficient driver with power factor >0.9. Ambient operating temperature: -40°F (-40°C) to +104°F (+40°C). Dimming down to 10% Can pass (Tbe recommended dimmers). Standard input wattage is 13W, 7W plenum per watt. Replaces 75W incandescent for 60 lumens and 100W incandescent for 1600 lumens.

LISTINGS — Wet location listed. Suitable for use in Title 24 compliant, ENERGY STAR® qualified product. Wet location, dry light certified in accordance with ASTM E283/284 ASHRAE Certified.

WARRANTY — 5-year limited warranty. Complete warranty terms located at: www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Note: Actual performance may differ as a result of end-user environment and application.
All values are design or typical values, measured under laboratory conditions at 25 °C.
Specifications subject to change without notice.

Catalog Number	
Notes	
Type	

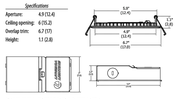
Wafer LED Recessed Downlight

WF6
6" LED Module

IC/Non-IC
New Construction/Remodel

Specifications

Aperture:	4.9 (12.4)
Ceiling opening:	4 (10.2)
Overlap trim:	6.7 (17)
Height:	1.1 (2.8)



All dimensions are inches (centimeters) unless otherwise indicated.

DOWNLIGHTING 1016

ARCHITECTS • ENGINEERS

paradigm design

GRAND RAPIDS
550 3 MILE N.W. SUITE B
GRAND RAPIDS, MI 49544
(616) 785 - 5656

TRAVERSE CITY
333 E. STATE STREET
TRAVERSE CITY, MI 49684
(231) 346 - 3030

WEB
PARADIGMAE.COM

NOTE: THIS DOCUMENT IS PRELIMINARY IN NATURE AND IS NOT A FINAL SIGNED AND SEALED DOCUMENT

PROJECT

LAKESHORE GARDENS APARTMENTS

A PLANNED UNIT DEVELOPMENT
17114 ROBBINS ROAD
GRAND HAVEN, MI 49417

DEVELOPER

MAIN STREET CAPITAL GROUP

18000 COVE STREET, STE 201
SPRING LAKE, MI 49456

RELEASE DATE

	DATE	DESCRIPTION
	01-16-18	PUD APPLICATION
	02-07-18	PUD APPLICATION
	03-09-18	PUD APPLICATION
	04-27-18	SITE PLAN APPROVAL
	05-15-18	PUD APPLICATION

PROJECT

1712151

SHEET

ELECTRICAL SITE LIGHTING CALCULATIONS

ES.1

FLEIS&VANDENBRINK
DESIGN. BUILD. OPERATE.

Memo

VIA EMAIL

To:	**Mr. Ben Robbins** **Main Street Capital Group**
From:	**Michael J. Labadie, PE** **Brandon Hayes, PE, P.Eng.** **Fleis & VandenBrink**
Date:	**October 12, 2017**
Re:	**Proposed Robbins Road PUD** **Grand Haven Township, Michigan** **Traffic Impact Study**

Introduction

This memorandum presents the results of the Traffic Impact Study (TIS) for the proposed PUD located on a 13.62-acre parcel that currently includes a trucking/landscaping/snow removal/storage company (Bill Tysman Companies) in Grand Haven Township, Michigan. The site comprises two distinct parcels included in the PUD: a 129-unit residential apartment development, and a 26,454 square foot (SF) self-storage development. These uses will share access to Robbins Road via a proposed new site access drive.

Robbins Road is under the jurisdiction of the City of Grand Haven. The subject property is located along the northern boundary of Grand Haven Township. This TIS has been completed to identify the impacts (if any) of the proposed development on the following study intersections:

- Robbins Road & 172nd Avenue,
- Robbins Road & S. Griffin Street, and
- The proposed site access points.

The scope of the study was developed based on Fleis & VandenBrink's (F&V) knowledge of the study area, understanding of the development program, accepted traffic engineering practice, and methodologies published by the Institute of Transportation Engineers (ITE). Additionally, F&V solicited input regarding the scope of work from the City of Grand Haven and Grand Haven Township.

Data Collection

The existing weekday turning movement traffic volume data were collected for vehicles, cyclists, and pedestrians by F&V subconsultant Traffic Data Collection, Inc. (TDC) on Tuesday, September 19, 2017. Intersection turning movement counts were collected during the weekday AM (7:00 AM to 9:00 AM) and PM (2:00 PM to 6:00 PM) peak periods at all study intersections. This data was used as a baseline to establish existing traffic conditions without the proposed development. The peak hour volumes for each intersection were utilized for this study and the volumes were balanced upward through the study network. At locations where access is provided between study intersections, "dummy" intersections were used to account for sink and source volumes, and through volumes were carried along the main study roadways. Additionally, F&V collected an inventory of existing lane use and traffic controls and obtained existing traffic signal timing

27725 Stansbury Boulevard, Suite 195
Farmington Hills, MI 48334
P: 248.536.0080
F: 248.536.0079
www.fveng.com

information from the Grand Haven Board of Light & Power. The applicable data referenced in this memorandum are attached.

Existing Conditions

Existing peak hour vehicle delays and Levels of Service (LOS) were calculated at the study intersections using Synchro (Version 10) traffic analysis software. This analysis was based on the existing lane use and traffic control shown on the attached Figure 1, the existing peak hour traffic volumes shown on the attached Figure 2, and the methodologies presented in the *Highway Capacity Manual, 6th Edition* (HCM6). Typically, LOS D is considered acceptable, with LOS A representing minimal delay, and LOS F indicating failing conditions. Additionally, SimTraffic network simulations were reviewed to evaluate network operations and vehicle queues. The existing conditions results are attached and summarized in Table 1.

Table 1: Existing Intersection Operations

			AM Peak		PM Peak	
Intersection	Control	Approach	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1. Robbins Road & 172nd Avenue	Signalized	EB	19.8	B	32.2	C
		WB	17.9	B	0.7	A
		NB	25.6	C	0.7	A
		SB	31.2	C	5.8	A
		Overall	**22.8**	**C**	**9.7**	**A**
2. Robbins Road & S. Griffin Street	STOP (Minor)	EB LT	9.5	A	12.6	B
		WB	Free		Free	
		SB	14.7	B	12.6	B

The results of the existing conditions analysis show that all approaches and movements currently operate at a LOS C or better during both peak periods. A review of network simulations showed good traffic operations at all study area intersection approaches and movements during both the AM and PM peak hours. Long vehicle queues were not observed during either peak hour.

Background Conditions

In order to determine the applicable growth rate for the existing traffic volumes to the project build-out year of 2018, historical traffic volume data was reviewed. The historical growth rates on Robbins Road to the east of the study area indicate that between 2013 and 2016, the average annual growth rate was negative (decreasing traffic volumes) on all sections of Robbins Road where data is available. Therefore, no growth rate was applied to the existing 2017 traffic volumes to forecast the 2019 background traffic volumes ***without the proposed development.***

In addition to background growth, it is important to account for traffic that is expected to be generated by approved developments within the vicinity of the study area that have yet to be constructed or are currently under construction. No background developments were identified near the study area that are expected to be completed prior to the site buildout of the proposed development.

The development is proposed to be completed by 2019. Since there is no anticipated traffic growth for the study area, and no approved developments have been identified through the 2019 build-out year, future background conditions (without the proposed development) are assumed equal to existing conditions.

Site Trip Generation Analysis

The number of AM and PM peak hour vehicle trips that would be generated by the proposed development was forecast based on data published by ITE in the *Trip Generation Manual, 10th Edition.* The site trip generation forecast for the proposed development is summarized in Table 2.

Table 2: Site Trip Generation

Land Use	ITE Code	Amount	Units	Average Daily Traffic	AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total
Multifamily Housing (Mid-Rise)	221	129	D.U.	701	11	33	44	35	22	57
Mini-Warehouse	151	26,454	S.F.	40	2	1	3	2	2	4
New Trips				741	13	34	47	37	24	61

The vehicle trips that would be generated by the proposed development were assigned to the study road network based on existing peak hour traffic patterns, the proposed site plan, and the methodologies published by ITE. This methodology indicates that new trips will return to their direction of origin. The site trip distributions used in the analysis are summarized in Table 3.

Table 3: Site Trip Distribution

To / From	New Trips Via	AM	PM
North	172nd Avenue	10%	18%
	S. Griffin Street	27%	7%
South	172nd Avenue	17%	25%
East	Robbins Road	17%	23%
West	Robbins Road	29%	27%
		100%	100%

The site-generated vehicle trips were assigned to the study road network based on these trip distribution patterns and are shown on the attached Figure 4. The site-generated trips were added to the existing traffic volumes to calculate the future peak hour traffic volumes shown on the attached Figure 6.

Future Conditions

Future peak hour vehicle delays and LOS ***with the proposed development*** were calculated based on the existing lane use and traffic control, the future traffic volumes, the proposed site access plan, and the methodologies presented in the HCM. Additionally, SimTraffic simulations were reviewed to evaluate network operations and vehicle queues. The results of the future conditions analysis are attached and are summarized in Table 4.

Table 4: Future Intersection Operations

Intersection	Control	Approach	AM Peak Delay (s/veh)	AM Peak LOS	PM Peak Delay (s/veh)	PM Peak LOS
1. Robbins Road & 172nd Avenue	Signalized	EB	20.2	C	27.6	C
		WB	18.1	B	21.5	C
		NB	25.5	C	32.6	C
		SB	31.1	C	35.0	C
		Overall	**22.9**	**C**	**28.9**	**C**
2. Robbins Road & S. Griffin Street	STOP (Minor)	EB LT	9.6	A	8.9	A
		WB	Free		Free	
		SB	15.0	C	16.3	C
3. Robbins Road & Site Driveway	STOP (Minor)	EB	Free		Free	
		WB LT	7.9	A	8.7	A
		NB	11.5	B	14.2	B

The results show that all study intersection approaches and movements are expected to continue to operate in a manner similar to existing conditions during both the AM and PM peak hours. Vehicle delays and LOS as shown in Table 4 are expected to be similar to existing conditions and minor increases will generally not be discernable. In addition, all approaches and movements at the unsignalized site driveway intersection operate at a LOS B or better during both peak periods.

A review of network simulations showed good traffic operations at all study area intersection approaches and movements during both the AM and PM peak hours. Long vehicle queues were not observed during either peak hour. Overall, future traffic conditions will be similar to existing traffic conditions and the development is not expected to have a significant impact on the study intersections.

Auxiliary Lane Analysis

In order to determine the configurations of the proposed site access location on Robbins Road, warrants for right turn lanes were evaluated. The City of Grand Haven does not maintain right-turn lane and taper warrants. Therefore, the Ottawa County Road Commission (OCRC) requirements were reviewed. The OCRC requirements state the following:

> *Additional lanes, passing flares, or other improvements on adjacent public roadways may be required to provide access to a proposed development. Improvements may be identified in a traffic impact study or warranted based on traffic volumes and turning movements as follows:*
>
> *a) Left turns of 150 ADT from a public roadway into proposed development.*
>
> *b) Adjacent public roadway volume exceeds 3000 ADT and development has 15 or more lots/living units.*

Since the daily volume on Robbins Road exceeds 3000 ADT and development has 15 or more lots/living units, improvements at the site driveway should be considered. OCRC does not maintain right-turn lane and taper warrant, so MDOT traffic volumes guidelines for right-turn lanes and tapers were reviewed. Based upon the peak hour traffic volumes on Robbins Road at the site driveway, a right turn deceleration taper is required at the Site Drive. This taper should be designed in accordance with City of Grand Haven requirements.

Access Management

The City of Grand Haven standards for access management were reviewed with respect to the proposed site driveway on Robbins Road. The evaluation was based upon the requirements for a 35 mph roadway. The results of the driveway spacing analysis showed that the proposed Site Access driveway should be located 150 feet from adjacent commercial driveways per the City's standards.

The Robbins Road PUD at 17114 Robbins Road has proposed one access for all site users. The site driveway will be designed as a boulevard access, with ingress and egress lanes separated by a median. This will increase ease-of-access for emergency vehicles by providing additional access lanes via the site egress in the event of a driveway blockage at the site ingress.

Conclusions

The conclusions of this Traffic Impact Study are as follows:

1. The results of the existing conditions analysis showed that all approaches and movements currently operate at a LOS C or better during both peak periods.
2. The analysis of future conditions ***with the proposed development*** showed that all study intersection approaches and movements are expected to continue to operate in a manner similar to existing conditions during both the AM and PM peak hours. Vehicle delays and LOS are expected to be similar to existing conditions and minor increases in delay will not be discernable.
3. The proposed site driveway intersection approaches and movements operate at a LOS B or better during both peak periods.
4. The results of the auxiliary lane warrant analysis are summarized below:
    - A right-turn deceleration taper is required at the Site Drive.
5. The driveway spacing analysis showed that the proposed Site Drive should be located 150 feet from adjacent commercial driveways.
6. The proposed site driveways should be designed in accordance with City of Grand Haven requirements.

Attached: Figures 1-4
Traffic Volume Data
Synchro / SimTraffic Results
Auxiliary Lane Warrants

BMH:mjl

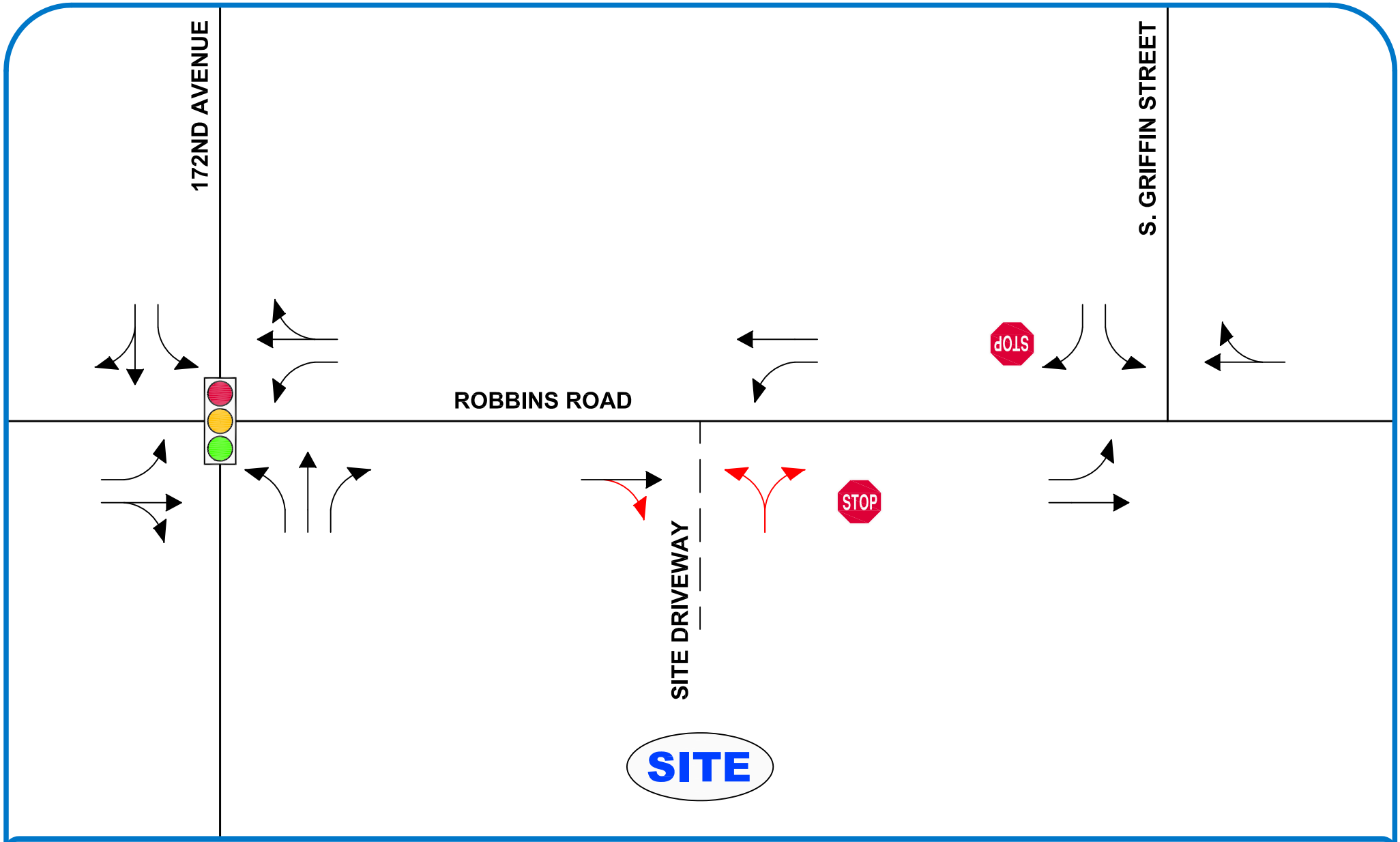


FIGURE 1
LANE USE AND TRAFFIC CONTROL

PROPOSED ROBBINS ROAD PUD - GRAND HAVEN TWP, MI

LEGEND

- SIGNALIZED INTERSECTION
- UNSIGNALIZED INTERSECTION
- ROADS
- EXISTING LANE USE
- PROPOSED LANE USE

NORTH

SCALE: NOT TO SCALE

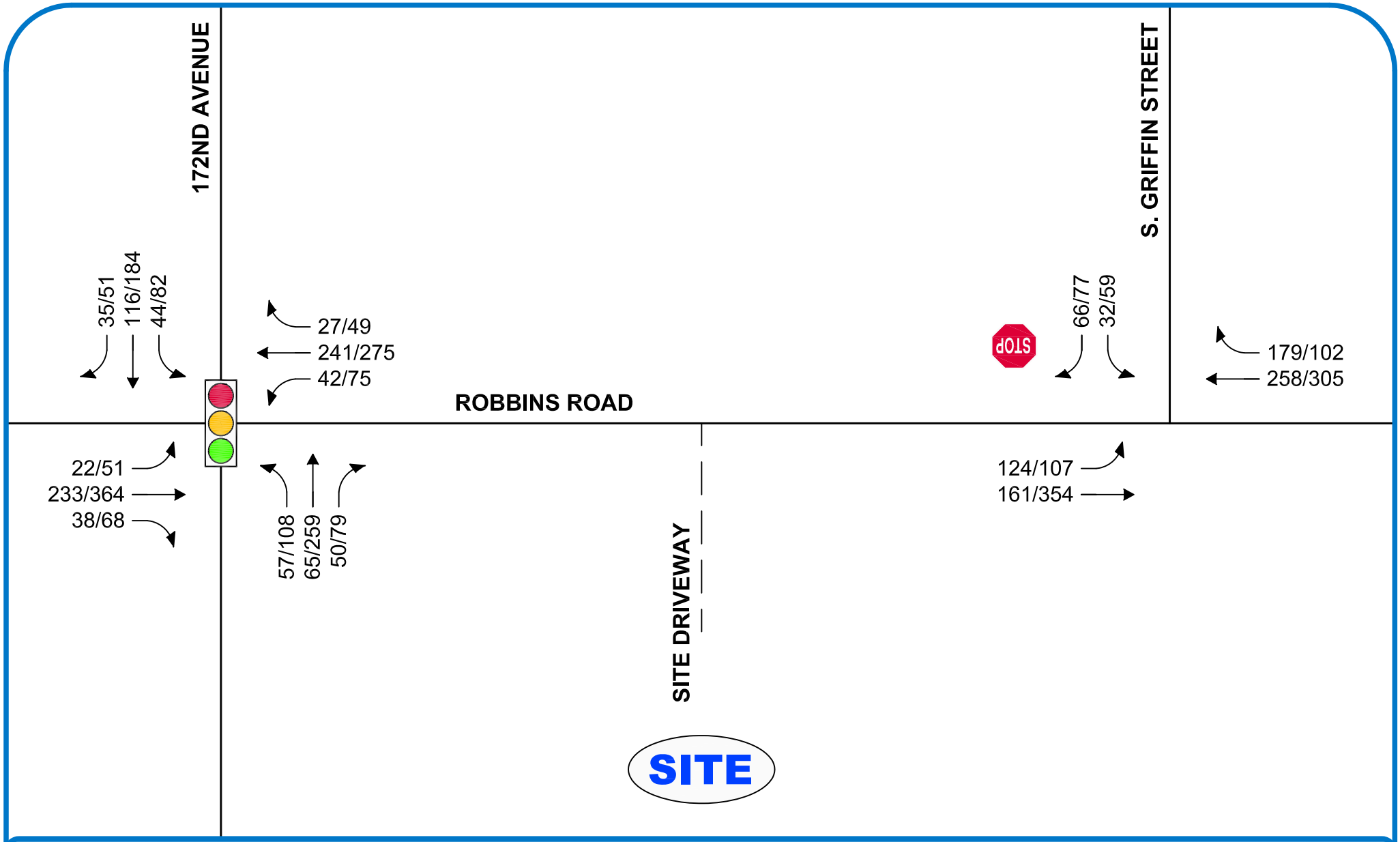


FIGURE 2
EXISTING TRAFFIC VOLUMES

PROPOSED ROBBINS ROAD PUD - GRAND HAVEN TWP, MI

LEGEND

- SIGNALIZED INTERSECTION
- UNSIGNALIZED INTERSECTION
- TRAFFIC VOLUMES (AM/PM)
- ROADS

NORTH

SCALE: NOT TO SCALE

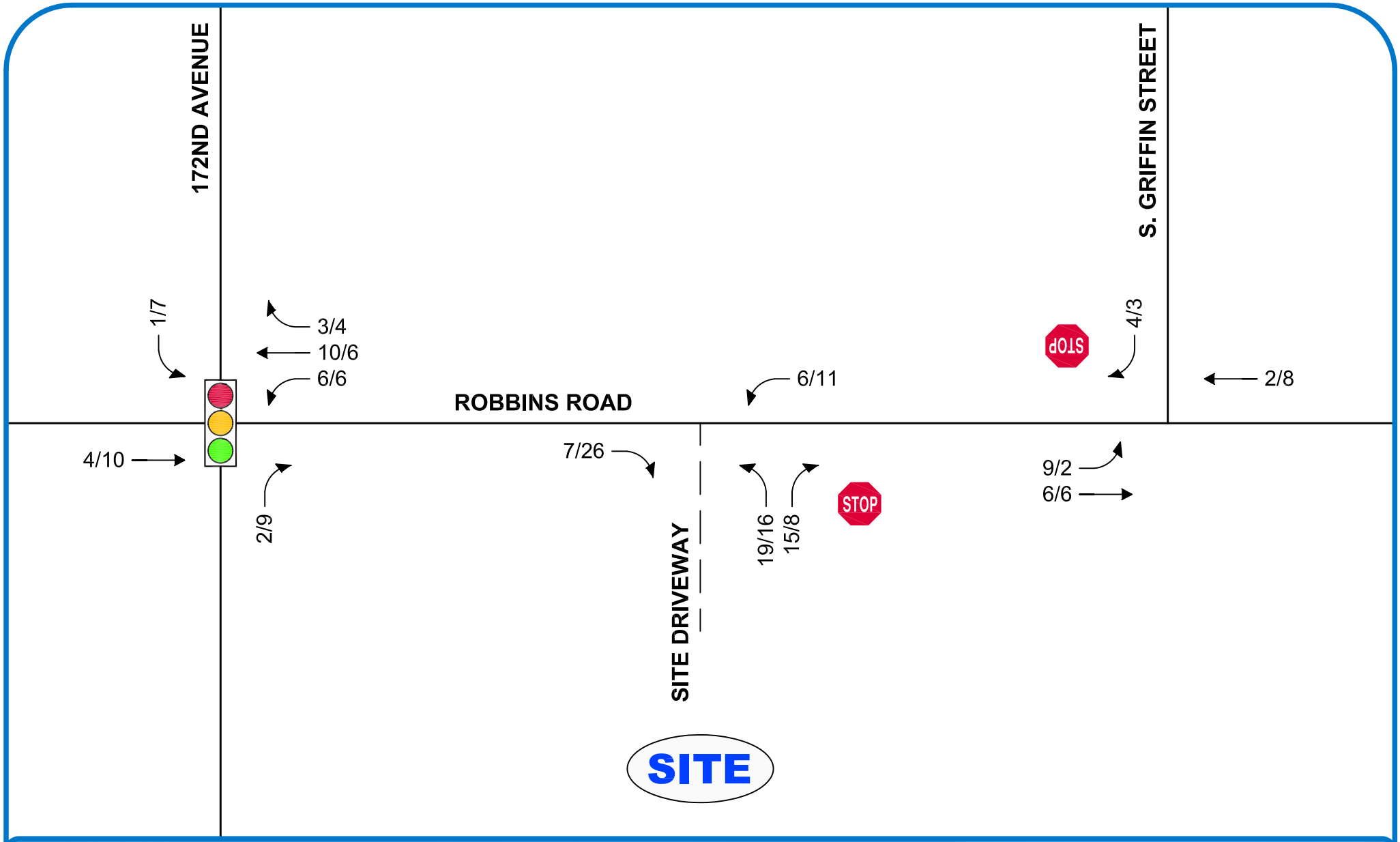


FIGURE 3
SITE-GENERATED TRAFFIC VOLUMES

PROPOSED ROBBINS ROAD PUD - GRAND HAVEN TWP, MI

LEGEND

- SIGNALIZED INTERSECTION
- UNSIGNALIZED INTERSECTION
- TRAFFIC VOLUMES (AM/PM)
- ROADS

NORTH

SCALE: NOT TO SCALE

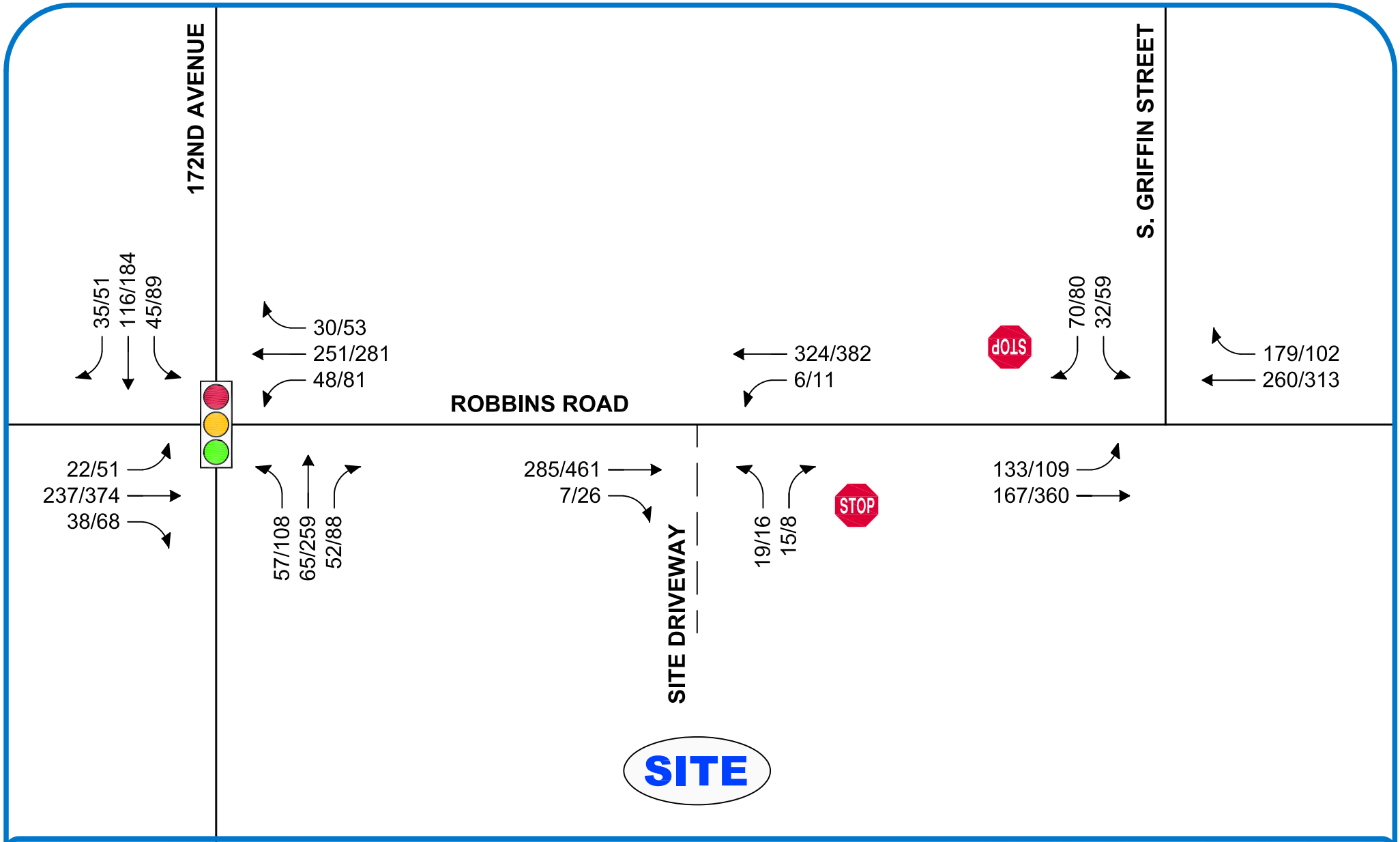


FIGURE 4
FUTURE TRAFFIC VOLUMES

PROPOSED ROBBINS ROAD PUD - GRAND HAVEN TWP, MI

LEGEND

- SIGNALIZED INTERSECTION
- UNSIGNALIZED INTERSECTION
- TRAFFIC VOLUMES (AM/PM)
- ROADS

NORTH

SCALE: NOT TO SCALE

Traffic Data Collection, LLC

tdccounts.com

Phone: (586) 786-5407

Traffic Study Peformed For:

Fleis & VandenBrink

Project:Grand Haven Traffic Impact Study
Type: 4 Hr. Video Turning Movement Count
Weather:Sunny/Cldy, Dry Deg. 70's
Count By: Miovision Video SCU 3DQ SE

File Name : TMC_1 Robbins & 172nd_9-19-17
Site Code : TMC_1
Start Date : 9/19/2017
Page No : 1

Groups Printed- Pass Cars - Buses - Single Units - Heavy Trucks - Peds. - Bikes

	172nd Ave. Southbound					Robbins Road Westbound					172nd Ave. Northbound					Robbins Road Eastbound					
Start Time	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	3	12	7	1	23	5	51	9	0	65	4	9	8	1	22	6	36	3	1	46	156
07:15 AM	8	16	5	0	29	3	61	3	0	67	6	19	21	0	46	3	34	5	1	43	185
07:30 AM	4	25	5	2	36	9	56	5	1	71	9	25	15	0	49	8	43	10	2	63	219
07:45 AM	5	29	6	0	40	9	46	7	0	62	13	15	23	0	51	10	50	6	0	66	219
Total	20	82	23	3	128	26	214	24	1	265	32	68	67	1	168	27	163	24	4	218	779
08:00 AM	6	23	8	3	40	7	55	14	1	77	15	17	10	0	42	5	46	2	0	53	212
08:15 AM	17	34	11	3	65	9	61	9	1	80	21	17	16	1	55	13	68	5	2	88	288
08:30 AM	8	32	16	1	57	7	61	11	0	79	5	22	19	0	46	12	52	9	1	74	256
08:45 AM	4	27	9	1	41	4	64	8	0	76	9	9	12	0	30	8	67	6	2	83	230
Total	35	116	44	8	203	27	241	42	2	312	50	65	57	1	173	38	233	22	5	298	986
**** BREAK ****																					
02:00 PM	4	39	18	0	61	9	75	12	0	96	13	47	26	0	86	12	57	13	0	82	325
02:15 PM	10	50	19	1	80	12	69	15	1	97	13	54	30	0	97	13	49	12	1	75	349
02:30 PM	8	45	10	1	64	16	79	13	0	108	15	86	38	0	139	20	63	11	2	96	407
02:45 PM	13	37	17	0	67	14	55	19	0	88	17	48	29	0	94	7	79	10	1	97	346
Total	35	171	64	2	272	51	278	59	1	389	58	235	123	0	416	52	248	46	4	350	1427
03:00 PM	5	47	13	1	66	10	63	12	0	85	19	67	27	0	113	24	66	21	1	112	376
03:15 PM	7	43	14	2	66	11	66	14	0	91	24	57	23	0	104	12	68	18	0	98	359
03:30 PM	14	58	18	1	91	13	78	17	0	108	18	80	28	0	126	18	93	6	2	119	444
03:45 PM	11	46	26	1	84	17	66	13	2	98	20	65	26	0	111	15	90	16	2	123	416
Total	37	194	71	5	307	51	273	56	2	382	81	269	104	0	454	69	317	61	5	452	1595
04:00 PM	14	44	17	4	79	13	68	23	3	107	23	60	29	0	112	20	101	16	0	137	435
04:15 PM	12	36	21	5	74	6	63	22	3	94	18	54	25	0	97	15	80	13	0	108	373
04:30 PM	11	46	19	1	77	12	88	12	1	113	23	46	33	0	102	29	77	13	1	120	412
04:45 PM	18	40	16	0	74	16	78	15	1	110	22	56	33	0	111	22	63	12	0	97	392
Total	55	166	73	10	304	47	297	72	8	424	86	216	120	0	422	86	321	54	1	462	1612
05:00 PM	15	39	7	1	62	20	75	16	0	111	13	65	26	0	104	25	79	14	0	118	395
05:15 PM	6	46	16	4	72	12	65	9	3	89	15	48	22	1	86	21	64	9	1	95	342
05:30 PM	4	42	9	2	57	9	54	13	1	77	9	45	21	1	76	11	59	9	1	80	290
05:45 PM	6	26	10	0	42	23	71	6	0	100	16	37	23	3	79	16	69	7	5	97	318
Total	31	153	42	7	233	64	265	44	4	377	53	195	92	5	345	73	271	39	7	390	1345
Grand Total	213	882	317	35	1447	266	1568	297	18	2149	360	1048	563	7	1978	345	1553	246	26	2170	7744
Apprch %	14.7	61	21.9	2.4		12.4	73	13.8	0.8		18.2	53	28.5	0.4		15.9	71.6	11.3	1.2		
Total %	2.8	11.4	4.1	0.5	18.7	3.4	20.2	3.8	0.2	27.8	4.6	13.5	7.3	0.1	25.5	4.5	20.1	3.2	0.3	28	
Pass Cars	207	848	306	0	1361	256	1535	282	0	2073	342	1024	544	0	1910	342	1517	239	0	2098	7442
% Pass Cars	97.2	96.1	96.5	0	94.1	96.2	97.9	94.9	0	96.5	95	97.7	96.6	0	96.6	99.1	97.7	97.2	0	96.7	96.1
Buses	5	26	10	0	41	8	20	9	0	37	14	21	6	0	41	0	20	7	0	27	146
% Buses	2.3	2.9	3.2	0	2.8	3	1.3	3	0	1.7	3.9	2	1.1	0	2.1	0	1.3	2.8	0	1.2	1.9
Single Units	1	7	1	0	9	2	11	3	0	16	4	3	11	0	18	3	11	0	0	14	57
% Single Units	0.5	0.8	0.3	0	0.6	0.8	0.7	1	0	0.7	1.1	0.3	2	0	0.9	0.9	0.7	0	0	0.6	0.7
Heavy Trucks	0	1	0	0	1	0	2	3	0	5	0	0	2	0	2	0	5	0	0	5	13
% Heavy Trucks	0	0.1	0	0	0.1	0	0.1	1	0	0.2	0	0	0.4	0	0.1	0	0.3	0	0	0.2	0.2
Peds.	0	0	0	31	31	0	0	0	18	18	0	0	0	7	7	0	0	0	21	21	77
% Peds.	0	0	0	88.6	2.1	0	0	0	100	0.8	0	0	0	100	0.4	0	0	0	80.8	1	1
Bikes	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	9
% Bikes	0	0	0	11.4	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	19.2	0.2	0.1

Comments: 4 hour traffic study conducted during typical weekday (Tuesday) from 7:00-9:00 AM morning & 2:00-6:00 PM afternoon peak hours while school was in session. Signalized intersection, with ped. signals for all quadrants. Push buttons exist for east & west legs. Video SCU camera was located within SE intersection quadrant.

Traffic Data Collection, LLC

tdccounts.com

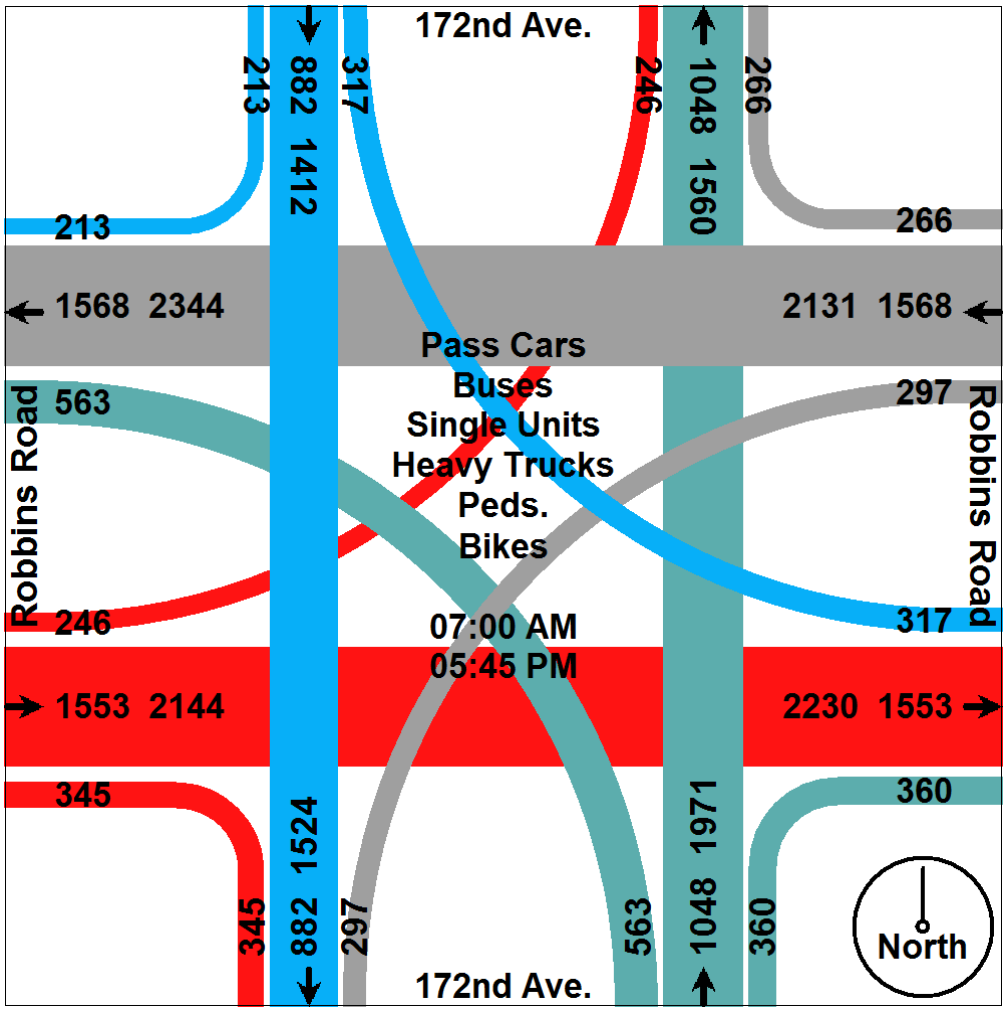
Phone: (586) 786-5407

Traffic Study Peformed For:

Fleis & VandenBrink

Project:Grand Haven Traffic Impact Study
Type: 4 Hr. Video Turning Movement Count
Weather:Sunny/Cldy, Dry Deg. 70's
Count By: Miovision Video SCU 3DQ SE

File Name : TMC_1 Robbins & 172nd_9-19-17
Site Code : TMC_1
Start Date : 9/19/2017
Page No : 2



Traffic Data Collection, LLC

tdccounts.com

Phone: (586) 786-5407

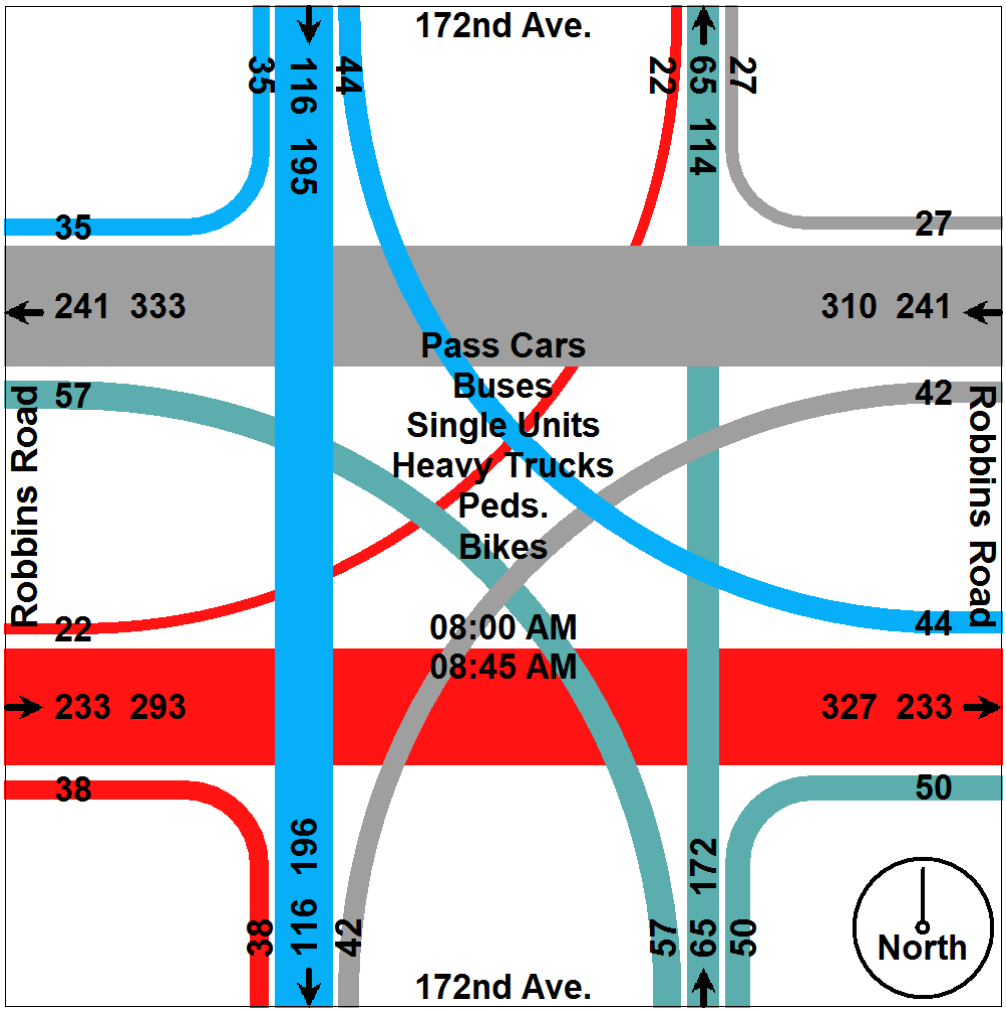
Traffic Study Peformed For:

Fleis & VandenBrink

Project:Grand Haven Traffic Impact Study
Type: 4 Hr. Video Turning Movement Count
Weather:Sunny/Cldy, Dry Deg. 70's
Count By: Miovision Video SCU 3DQ SE

File Name : TMC_1 Robbins & 172nd_9-19-17
Site Code : TMC_1
Start Date : 9/19/2017
Page No : 3

	172nd Ave. Southbound				Robbins Road Westbound				172nd Ave. Northbound				Robbins Road Eastbound				
Start Time	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	6	23	8	37	7	55	**14**	76	15	17	10	42	5	46	2	53	208
08:15 AM	**17**	**34**	11	**62**	**9**	61	9	**79**	**21**	17	16	**54**	**13**	**68**	5	**86**	**281**
08:30 AM	8	32	**16**	56	7	61	11	79	5	**22**	**19**	46	12	52	**9**	73	254
08:45 AM	4	27	9	40	4	**64**	8	76	9	9	12	30	8	67	6	81	227
Total Volume	35	116	44	195	27	241	42	310	50	65	57	172	38	233	22	293	970
% App. Total	17.9	59.5	22.6		8.7	77.7	13.5		29.1	37.8	33.1		13	79.5	7.5		
PHF	.515	.853	.688	.786	.750	.941	.750	.981	.595	.739	.750	.796	.731	.857	.611	.852	.863
Pass Cars	34	112	42	188	25	235	38	298	45	62	54	161	38	227	22	287	934
% Pass Cars	97.1	96.6	95.5	96.4	92.6	97.5	90.5	96.1	90.0	95.4	94.7	93.6	100	97.4	100	98.0	96.3
Buses	1	3	1	5	2	5	3	10	5	2	0	7	0	4	0	4	26
% Buses	2.9	2.6	2.3	2.6	7.4	2.1	7.1	3.2	10.0	3.1	0	4.1	0	1.7	0	1.4	2.7
Single Units	0	1	1	2	0	1	1	2	0	1	3	4	0	2	0	2	10
% Single Units	0	0.9	2.3	1.0	0	0.4	2.4	0.6	0	1.5	5.3	2.3	0	0.9	0	0.7	1.0
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peds.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Peds.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Traffic Data Collection, LLC

tdccounts.com

Phone: (586) 786-5407

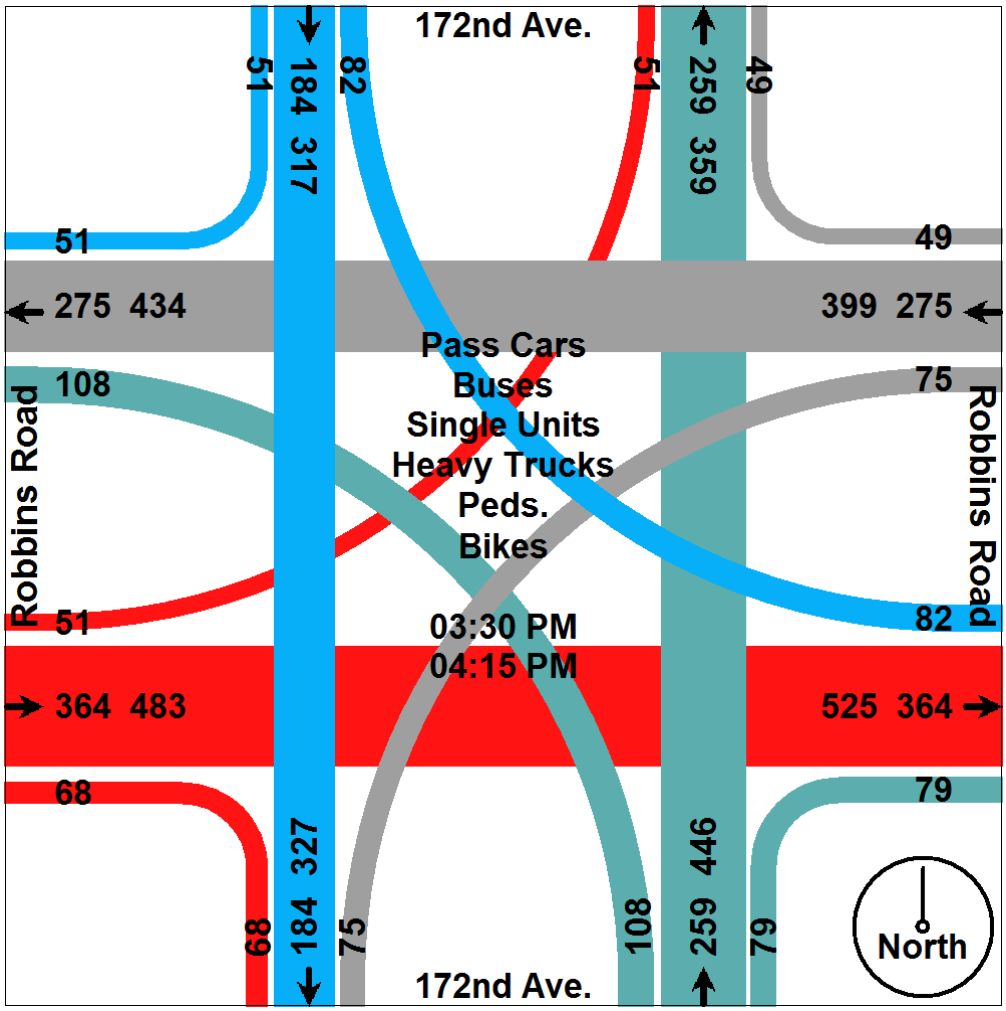
Traffic Study Peformed For:

Fleis & VandenBrink

Project:Grand Haven Traffic Impact Study
Type: 4 Hr. Video Turning Movement Count
Weather:Sunny/Cldy, Dry Deg. 70's
Count By: Miovision Video SCU 3DQ SE

File Name : TMC_1 Robbins & 172nd_9-19-17
Site Code : TMC_1
Start Date : 9/19/2017
Page No : 4

	172nd Ave. Southbound				Robbins Road Westbound				172nd Ave. Northbound				Robbins Road Eastbound				
Start Time	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:30 PM																	
03:30 PM	**14**	**58**	18	**90**	13	**78**	17	**108**	18	**80**	28	**126**	18	93	6	117	**441**
03:45 PM	11	46	**26**	83	**17**	66	13	96	20	65	26	111	15	90	**16**	121	411
04:00 PM	14	44	17	75	13	68	**23**	104	**23**	60	**29**	112	**20**	**101**	16	**137**	428
04:15 PM	12	36	21	69	6	63	22	91	18	54	25	97	15	80	13	108	365
Total Volume	51	184	82	317	49	275	75	399	79	259	108	446	68	364	51	483	1645
% App. Total	16.1	58	25.9		12.3	68.9	18.8		17.7	58.1	24.2		14.1	75.4	10.6		
PHF	.911	.793	.788	.881	.721	.881	.815	.924	.859	.809	.931	.885	.850	.901	.797	.881	.933
Pass Cars	49	178	77	304	49	270	74	393	75	256	107	438	67	355	50	472	1607
% Pass Cars	96.1	96.7	93.9	95.9	100	98.2	98.7	98.5	94.9	98.8	99.1	98.2	98.5	97.5	98.0	97.7	97.7
Buses	2	3	5	10	0	2	0	2	1	3	0	4	0	5	1	6	22
% Buses	3.9	1.6	6.1	3.2	0	0.7	0	0.5	1.3	1.2	0	0.9	0	1.4	2.0	1.2	1.3
Single Units	0	3	0	3	0	3	0	3	3	0	1	4	1	2	0	3	13
% Single Units	0	1.6	0	0.9	0	1.1	0	0.8	3.8	0	0.9	0.9	1.5	0.5	0	0.6	0.8
Heavy Trucks	0	0	0	0	0	0	1	1	0	0	0	0	0	2	0	2	3
% Heavy Trucks	0	0	0	0	0	0	1.3	0.3	0	0	0	0	0	0.5	0	0.4	0.2
Peds.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Peds.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Traffic Data Collection, LLC

tdccounts.com

Phone: (586) 786-5407

Traffic Study Peformed For:

Fleis & VandenBrink

Project:Grand Haven Traffic Impact Study
Type: 4 Hr. Video Turning Movement Count
Weather:Sunny/Cldy, Dry Deg. 70's
Count By: Miovision Video SCU 34N

File Name : TMC_2 Robbins & Griffin_9-19-17
Site Code : TMC_1
Start Date : 9/19/2017
Page No : 1

Groups Printed- Pass Cars - Buses - Single Units - Heavy Trucks - Peds. - Bikes

	S. Griffin Street Southbound					Robbins Road Westbound					Office Bldg. West Dw. Northbound					Robbins Road Eastbound					
Start Time	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	12	0	2	4	18	11	67	0	0	78	0	0	0	0	0	0	35	9	0	44	140
07:15 AM	8	0	4	0	12	20	60	0	0	80	0	0	0	0	0	0	24	21	0	45	137
07:30 AM	10	0	4	1	15	10	64	0	0	74	0	0	0	0	0	0	32	7	1	40	129
07:45 AM	9	0	11	1	21	11	59	0	0	70	0	0	0	0	0	0	47	11	0	58	149
Total	39	0	21	6	66	52	250	0	0	302	0	0	0	0	0	0	138	48	1	187	555
08:00 AM	20	0	4	4	28	36	61	0	1	98	0	0	0	0	0	0	37	30	2	69	195
08:15 AM	16	0	7	3	26	87	65	0	1	153	0	0	0	0	0	0	34	51	0	85	264
08:30 AM	23	0	15	2	40	38	66	0	2	106	0	0	0	2	2	0	34	32	0	66	214
08:45 AM	7	0	6	1	14	18	66	0	0	84	0	0	0	0	0	0	56	11	1	68	166
Total	66	0	32	10	108	179	258	0	4	441	0	0	0	2	2	0	161	124	3	288	839
**** BREAK ****																					
02:00 PM	3	0	6	0	9	11	77	0	0	88	0	0	0	0	0	0	67	3	0	70	167
02:15 PM	3	0	5	2	10	5	84	0	1	90	0	0	0	0	0	0	63	7	0	70	170
02:30 PM	7	0	3	0	10	4	79	0	0	83	0	0	0	0	0	0	67	4	0	71	164
02:45 PM	5	0	6	1	12	16	73	0	0	89	0	0	0	0	0	0	84	11	0	95	196
Total	18	0	20	3	41	36	313	0	1	350	0	0	0	0	0	0	281	25	0	306	697
03:00 PM	8	0	6	3	17	17	60	0	0	77	0	0	0	0	0	0	86	11	0	97	191
03:15 PM	5	0	3	2	10	30	85	0	2	117	0	0	0	0	0	0	70	31	1	102	229
03:30 PM	14	0	14	1	29	34	90	0	0	124	0	0	0	0	0	0	87	28	0	115	268
03:45 PM	36	0	14	1	51	24	55	0	2	81	0	0	0	0	0	0	98	29	0	127	259
Total	63	0	37	7	107	105	290	0	4	399	0	0	0	0	0	0	341	99	1	441	947
04:00 PM	22	0	28	0	50	14	75	0	0	89	0	0	0	0	0	0	99	19	0	118	257
04:15 PM	19	0	5	0	24	8	62	0	1	71	0	0	0	0	0	0	87	16	2	105	200
04:30 PM	15	0	16	0	31	8	92	0	0	100	0	0	0	0	0	0	99	13	1	113	244
04:45 PM	9	0	1	3	13	12	94	0	0	106	0	0	0	0	0	0	83	14	0	97	216
Total	65	0	50	3	118	42	323	0	1	366	0	0	0	0	0	0	368	62	3	433	917
05:00 PM	20	0	17	1	38	18	85	0	0	103	0	0	0	0	0	0	102	13	0	115	256
05:15 PM	10	0	18	1	29	3	65	0	0	68	0	0	0	0	0	0	81	14	0	95	192
05:30 PM	14	0	5	0	19	5	69	0	0	74	0	0	0	0	0	0	82	12	1	95	188
05:45 PM	7	0	2	0	9	4	85	0	0	89	0	0	0	0	0	0	75	18	0	93	191
Total	51	0	42	2	95	30	304	0	0	334	0	0	0	0	0	0	340	57	1	398	827
Grand Total	302	0	202	31	535	444	1738	0	10	2192	0	0	0	2	2	0	1629	415	9	2053	4782
Apprch %	56.4	0	37.8	5.8		20.3	79.3	0	0.5		0	0	0	100		0	79.3	20.2	0.4		
Total %	6.3	0	4.2	0.6	11.2	9.3	36.3	0	0.2	45.8	0	0	0	0	0	0	34.1	8.7	0.2	42.9	
Pass Cars	292	0	190	0	482	392	1696	0	0	2088	0	0	0	0	0	0	1589	394	0	1983	4553
% Pass Cars	96.7	0	94.1	0	90.1	88.3	97.6	0	0	95.3	0	0	0	0	0	0	97.5	94.9	0	96.6	95.2
Buses	9	0	12	0	21	50	29	0	0	79	0	0	0	0	0	0	26	21	0	47	147
% Buses	3	0	5.9	0	3.9	11.3	1.7	0	0	3.6	0	0	0	0	0	0	1.6	5.1	0	2.3	3.1
Single Units	1	0	0	0	1	2	11	0	0	13	0	0	0	0	0	0	10	0	0	10	24
% Single Units	0.3	0	0	0	0.2	0.5	0.6	0	0	0.6	0	0	0	0	0	0	0.6	0	0	0.5	0.5
Heavy Trucks	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	4	0	0	4	6
% Heavy Trucks	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0	0.2	0	0	0.2	0.1
Peds.	0	0	0	31	31	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	34
% Peds.	0	0	0	100	5.8	0	0	0	30	0.1	0	0	0	0	0	0	0	0	0	0	0.7
Bikes	0	0	0	0	0	0	0	0	7	7	0	0	0	2	2	0	0	0	9	9	18
% Bikes	0	0	0	0	0	0	0	0	70	0.3	0	0	0	100	100	0	0	0	100	0.4	0.4

Comments: 4 hour traffic study conducted during typical weekday (Tuesday) from 7:00-9:00 AM morning & 2:00-6:00 PM afternoon peak hours while school was in session. Non-signalized intersection. Griffin Elementary School located within NE intersection quadrant. Video SCU camera was located within NW intersection quadrant.

Traffic Data Collection, LLC

tdccounts.com

Phone: (586) 786-5407

Traffic Study Peformed For:

Fleis & VandenBrink

Project:Grand Haven Traffic Impact Study
Type: 4 Hr. Video Turning Movement Count
Weather:Sunny/Cldy, Dry Deg. 70's
Count By: Miovision Video SCU 34N

File Name : TMC_2 Robbins & Griffin_9-19-17
Site Code : TMC_1
Start Date : 9/19/2017
Page No : 2

Traffic Data Collection, LLC

tdccounts.com

Phone: (586) 786-5407

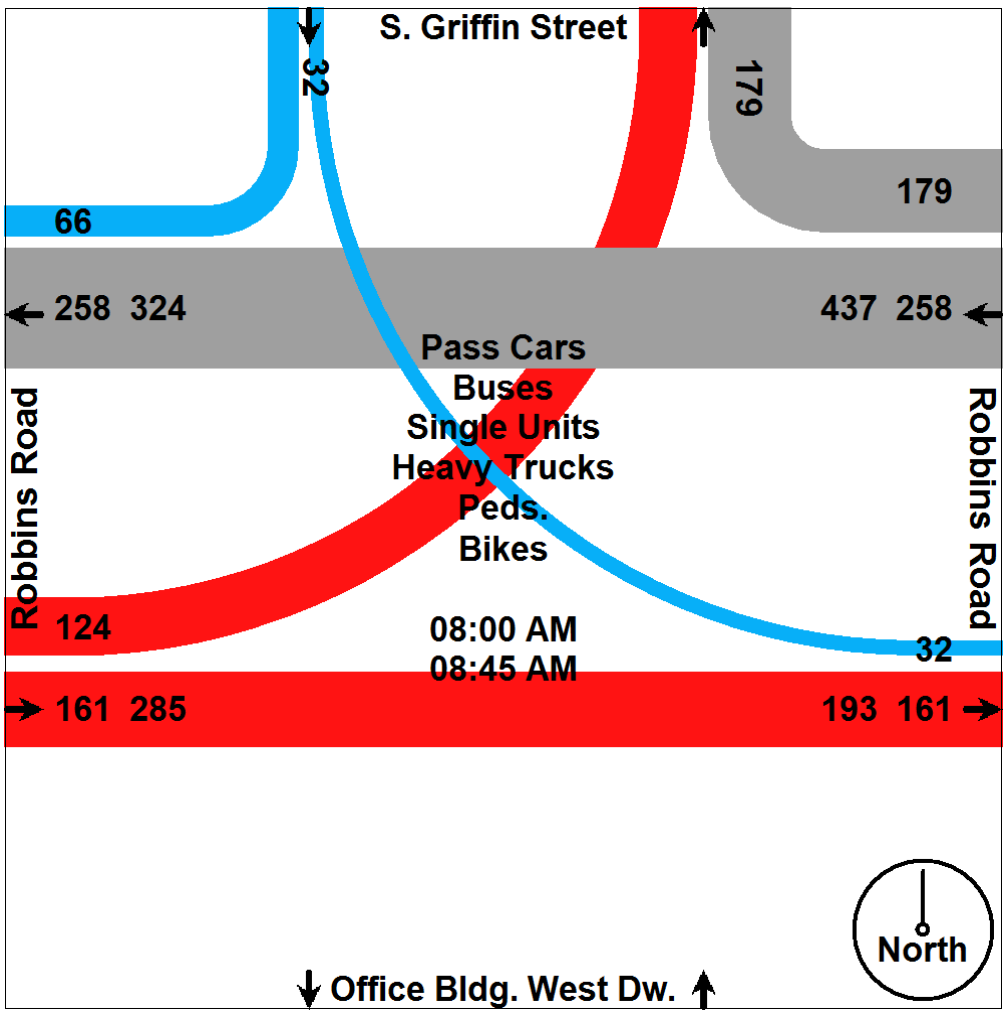
Traffic Study Peformed For:

Fleis & VandenBrink

Project:Grand Haven Traffic Impact Study
Type: 4 Hr. Video Turning Movement Count
Weather:Sunny/Cldy, Dry Deg. 70's
Count By: Miovision Video SCU 34N

File Name : TMC_2 Robbins & Griffin_9-19-17
Site Code : TMC_1
Start Date : 9/19/2017
Page No : 3

	S. Griffin Street Southbound				Robbins Road Westbound				Office Bldg. West Dw. Northbound				Robbins Road Eastbound				
Start Time	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	20	0	4	24	36	61	0	97	0	0	0	0	0	37	30	67	188
08:15 AM	16	0	7	23	**87**	65	0	**152**	0	0	0	0	0	34	**51**	**85**	**260**
08:30 AM	**23**	0	**15**	**38**	38	**66**	0	104	0	0	0	0	0	34	32	66	208
08:45 AM	7	0	6	13	18	66	0	84	0	0	0	0	0	**56**	11	67	164
Total Volume	66	0	32	98	179	258	0	437	0	0	0	0	0	161	124	285	820
% App. Total	67.3	0	32.7		41	59	0		0	0	0		0	56.5	43.5		
PHF	.717	.000	.533	.645	.514	.977	.000	.719	.000	.000	.000	.000	.000	.719	.608	.838	.788
Pass Cars	64	0	30	94	157	248	0	405	0	0	0	0	0	156	115	271	770
% Pass Cars	97.0	0	93.8	95.9	87.7	96.1	0	92.7	0	0	0	0	0	96.9	92.7	95.1	93.9
Buses	2	0	2	4	21	8	0	29	0	0	0	0	0	3	9	12	45
% Buses	3.0	0	6.3	4.1	11.7	3.1	0	6.6	0	0	0	0	0	1.9	7.3	4.2	5.5
Single Units	0	0	0	0	1	2	0	3	0	0	0	0	0	2	0	2	5
% Single Units	0	0	0	0	0.6	0.8	0	0.7	0	0	0	0	0	1.2	0	0.7	0.6
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peds.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Peds.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Traffic Data Collection, LLC

tdccounts.com

Phone: (586) 786-5407

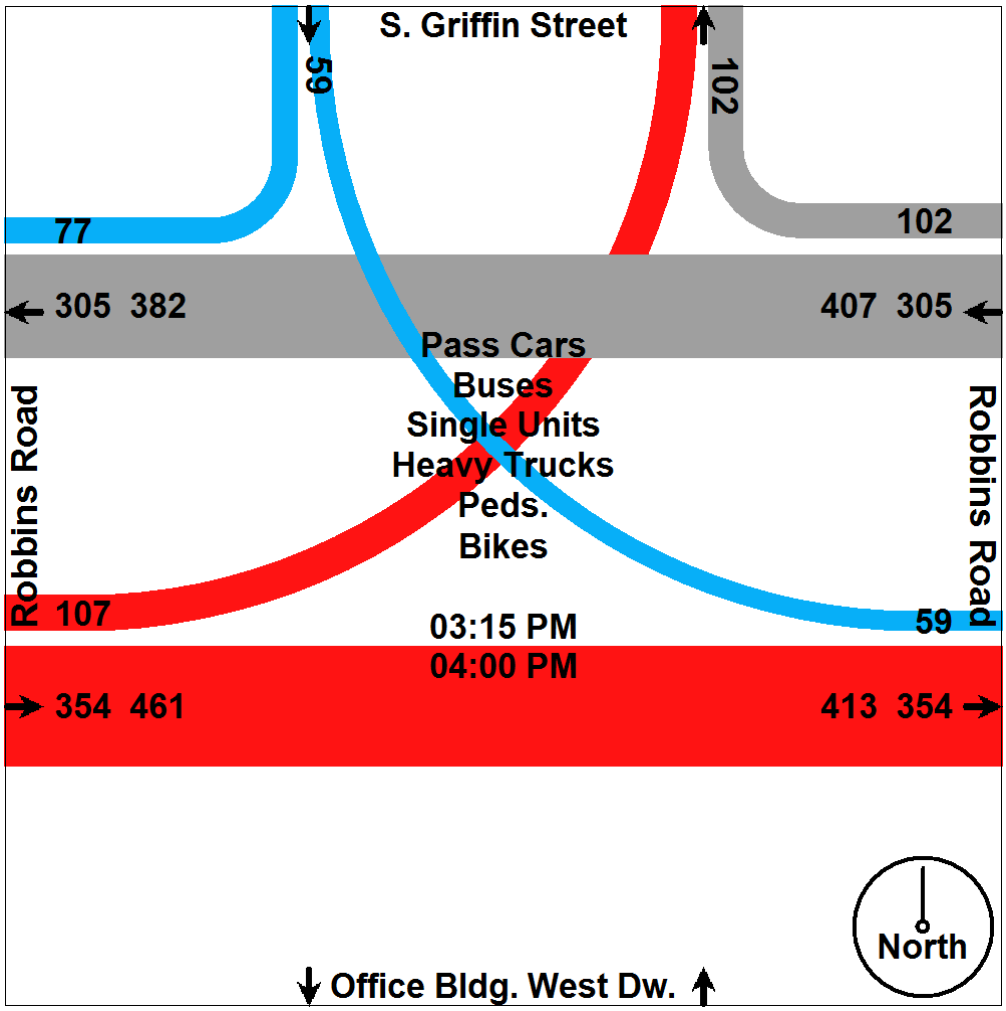
Traffic Study Peformed For:

Fleis & VandenBrink

Project:Grand Haven Traffic Impact Study
Type: 4 Hr. Video Turning Movement Count
Weather:Sunny/Cldy, Dry Deg. 70's
Count By: Miovision Video SCU 34N

File Name : TMC_2 Robbins & Griffin_9-19-17
Site Code : TMC_1
Start Date : 9/19/2017
Page No : 4

	S. Griffin Street Southbound				Robbins Road Westbound				Office Bldg. West Dw. Northbound				Robbins Road Eastbound				
Start Time	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:15 PM																	
03:15 PM	5	0	3	8	30	85	0	115	0	0	0	0	0	70	**31**	101	224
03:30 PM	14	0	14	28	**34**	**90**	0	**124**	0	0	0	0	0	87	28	115	**267**
03:45 PM	**36**	0	14	**50**	24	55	0	79	0	0	0	0	0	98	29	**127**	256
04:00 PM	22	0	**28**	50	14	75	0	89	0	0	0	0	0	**99**	19	118	257
Total Volume	77	0	59	136	102	305	0	407	0	0	0	0	0	354	107	461	1004
% App. Total	56.6	0	43.4		25.1	74.9	0		0	0	0		0	76.8	23.2		
PHF	.535	.000	.527	.680	.750	.847	.000	.821	.000	.000	.000	.000	.000	.894	.863	.907	.940
Pass Cars	77	0	53	130	78	301	0	379	0	0	0	0	0	344	101	445	954
% Pass Cars	100	0	89.8	95.6	76.5	98.7	0	93.1	0	0	0	0	0	97.2	94.4	96.5	95.0
Buses	0	0	6	6	24	2	0	26	0	0	0	0	0	7	6	13	45
% Buses	0	0	10.2	4.4	23.5	0.7	0	6.4	0	0	0	0	0	2.0	5.6	2.8	4.5
Single Units	0	0	0	0	0	2	0	2	0	0	0	0	0	2	0	2	4
% Single Units	0	0	0	0	0	0.7	0	0.5	0	0	0	0	0	0.6	0	0.4	0.4
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
% Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0.2	0.1
Peds.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Peds.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Level of Service Criteria for Stop Sign Controlled Intersections

The level of service criteria are given in Table 17-2. As used here, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue until the vehicle departs from the stop line; this time includes the time required for the vehicle to travel from the last-in-queue position to the first-in-queue position, including deceleration of vehicles from free-flow speed to the speed of vehicles in queue.

The average total delay for any particular minor movement is a function of the service rate or capacity of the approach and the degree of saturation. . . .

Exhibit 17-2. Level of Service Criteria for TWSC Intersections

LEVEL OF SERVICE	AVERAGE CONTROL DELAY (sec/veh)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

Average total delay less than 10 sec/veh is defined as Level of Service (LOS) A. Follow-up times of less than 5 sec have been measured when there is no conflicting traffic for a minor street movement, so control delays of less than 10 sec/veh are appropriate for low flow conditions. To remain consistent with the AWSC intersection analysis procedure described later in this chapter, a total delay of 50 sec/veh is assumed as the break point between LOS E and F.

The proposed level of service criteria for TWSC intersections are somewhat different from the criteria used in Chapter 16 for signalized intersections. The primary reason for this difference is that drivers expect different levels of performance from different kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an unsignalized intersection. Additionally, several driver behavior considerations combine to make delays at signalized intersections less onerous than at unsignalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, where drivers on the minor approaches to unsignalized intersections must remain attentive to the task of identifying acceptable gaps and vehicle conflicts. Also, there is often much more variability in the amount of delay experienced by individual drivers at unsignalized than signalized intersections. For these reasons, it is considered that the total delay threshold for any given level of service is less for an unsignalized intersection than for a signalized intersection. . . .

LOS F exists when there are insufficient gaps of suitable size to allow a side street demand to cross safely through a major street traffic stream. This level of service is generally evident from extremely long total delays experienced by side street traffic and by queueing on the minor approaches. The method, however, is based on a constant critical gap size - that is, the critical gap remains constant, no matter how long the side street motorist waits. LOS F may also appear in the form of side street vehicles' selecting smaller-than-usual gaps. In such cases, safety may be a problem and some disruption to the major traffic stream may result. It is important to note that LOS F may not always result in long queues but may result in adjustments to normal gap acceptance behavior. The latter is more difficult to observe on the field than queueing, which is more obvious.

Source: Highway Capacity Manual, 2010. Transportation Research Board, National Research Council

Level of Service for Signalized Intersections

Level of service for signalized intersections is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and lost travel time. Specifically, level-of-service (LOS) criteria are stated in terms of the average stopped delay per vehicle for a 15-min analysis period. The criteria are given in Exhibit 16-2. Delay may be measured in the field or estimated using procedures presented later in this chapter. Delay is a complex measure and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the *v/c* ratio for the lane group in question.

LOS A describes operations with very low delay, up to 10 sec per vehicle. This level of service occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.

LOS B describes operations with delay greater than 10 and up to 20 sec per vehicle. This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of average delay.

Exhibit 16-2. Level-of-Service Criteria for Signalized Intersections

LEVEL OF SERVICE	STOPPED DELAY PER VEHICLE (SEC)
A	≤10.0
B	> 10.0 and ≤20.0
C	> 20.0 and ≤ 35.0
D	> 35.0 and ≤ 55.0
E	> 55.0 and ≤ 80.0
F	>80.0

LOS C describes operations with delay greater than 20 and up to 35 sec per vehicle. These higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.

LOS D describes operations with delay greater than 35 and up to 55 sec per vehicle. At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high *v/c* ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

LOS E describes operations with delay greater than 55 and up to 80 sec per vehicle. This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high *v/c* ratios. Individual cycle failures are frequent occurrences.

LOS F describes operations with delay in excess of 80 sec per vehicle. This level, considered to be unacceptable to most drivers, often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the intersection. It may also occur at high *v/c* ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

Source: Highway Capacity Manual, 2010. Transportation Research Board, National Research Council

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	233	38	42	241	27	57	65	50	44	116	35
Future Volume (veh/h)	22	233	38	42	241	27	57	65	50	44	116	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.99	0.99		0.99	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1841	1841	1841	1811	1811	1811	1841	1841	1841
Adj Flow Rate, veh/h	26	274	45	44	254	28	71	81	62	56	147	44
Peak Hour Factor	0.85	0.85	0.85	0.95	0.95	0.95	0.80	0.80	0.80	0.79	0.79	0.79
Percent Heavy Veh, %	2	2	2	4	4	4	6	6	6	4	4	4
Cap, veh/h	503	652	107	475	702	77	352	433	443	430	317	95
Arrive On Green	0.04	0.42	0.42	0.05	0.43	0.43	0.06	0.24	0.24	0.06	0.23	0.23
Sat Flow, veh/h	1781	1564	257	1753	1627	179	1725	1811	1519	1753	1356	406
Grp Volume(v), veh/h	26	0	319	44	0	282	71	81	62	56	0	191
Grp Sat Flow(s),veh/h/ln	1781	0	1821	1753	0	1806	1725	1811	1519	1753	0	1762
Q Serve(g_s), s	0.7	0.0	11.1	1.2	0.0	9.5	2.7	3.2	2.7	2.1	0.0	8.4
Cycle Q Clear(g_c), s	0.7	0.0	11.1	1.2	0.0	9.5	2.7	3.2	2.7	2.1	0.0	8.4
Prop In Lane	1.00		0.14	1.00		0.10	1.00		1.00	1.00		0.23
Lane Grp Cap(c), veh/h	503	0	759	475	0	780	352	433	443	430	0	411
V/C Ratio(X)	0.05	0.00	0.42	0.09	0.00	0.36	0.20	0.19	0.14	0.13	0.00	0.46
Avail Cap(c_a), veh/h	575	0	759	521	0	780	375	433	443	464	0	411
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.0	0.0	18.6	13.7	0.0	17.2	23.5	27.3	23.6	23.3	0.0	29.7
Incr Delay (d2), s/veh	0.0	0.0	1.7	0.1	0.0	1.3	0.3	1.0	0.7	0.1	0.0	3.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	4.8	0.5	0.0	4.0	1.0	1.4	1.0	0.9	0.0	4.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.0	0.0	20.3	13.8	0.0	18.5	23.8	28.2	24.2	23.5	0.0	33.4
LnGrp LOS	B	A	C	B	A	B	C	C	C	C	A	C
Approach Vol, veh/h		345			326			214			247	
Approach Delay, s/veh		19.8			17.9			25.6			31.2	
Approach LOS		B			B			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.2	43.5	10.3	27.0	7.8	44.8	9.8	27.5
Change Period (Y+Rc), s	4.5	6.0	4.5	6.0	4.5	6.0	4.5	6.0
Max Green Setting (Gmax), s	7.0	34.0	7.0	21.0	7.0	34.0	7.0	21.0
Max Q Clear Time (g_c+I1), s	3.2	13.1	4.7	10.4	2.7	11.5	4.1	5.2
Green Ext Time (p_c), s	0.0	1.8	0.0	0.8	0.0	1.6	0.0	0.4

Intersection Summary	
HCM 6th Ctrl Delay	22.8
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	124	161	258	179	32	66
Future Vol, veh/h	124	161	258	179	32	66
Conflicting Peds, #/hr	10	0	0	10	10	10
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	72	72	65	65
Heavy Vehicles, %	5	5	7	7	4	4
Mvmt Flow	148	192	358	249	49	102

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	617	0	-	0	991	503
Stage 1	-	-	-	-	493	-
Stage 2	-	-	-	-	498	-
Critical Hdwy	4.15	-	-	-	6.44	6.24
Critical Hdwy Stg 1	-	-	-	-	5.44	-
Critical Hdwy Stg 2	-	-	-	-	5.44	-
Follow-up Hdwy	2.245	-	-	-	3.536	3.336
Pot Cap-1 Maneuver	949	-	-	-	271	565
Stage 1	-	-	-	-	610	-
Stage 2	-	-	-	-	607	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	940	-	-	-	224	554
Mov Cap-2 Maneuver	-	-	-	-	320	-
Stage 1	-	-	-	-	509	-
Stage 2	-	-	-	-	601	-

Approach	EB	WB	SB
HCM Control Delay, s	4.2	0	14.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	940	-	-	-	320	554
HCM Lane V/C Ratio	0.157	-	-	-	0.154	0.183
HCM Control Delay (s)	9.5	-	-	-	18.3	13
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.6	-	-	-	0.5	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	51	364	68	75	275	49	108	259	79	82	184	51
Future Volume (veh/h)	51	364	68	75	275	49	108	259	79	82	184	51
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.99	0.99		0.98	0.99		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1885	1885	1885	1870	1870	1870	1841	1841	1841
Adj Flow Rate, veh/h	58	414	77	82	299	53	121	291	89	93	209	58
Peak Hour Factor	0.88	0.88	0.88	0.92	0.92	0.92	0.89	0.89	0.89	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	1	1	1	2	2	2	4	4	4
Cap, veh/h	449	599	111	353	622	110	319	444	477	298	322	89
Arrive On Green	0.06	0.39	0.39	0.07	0.40	0.40	0.07	0.24	0.24	0.07	0.23	0.23
Sat Flow, veh/h	1781	1530	285	1795	1555	276	1781	1870	1558	1753	1381	383
Grp Volume(v), veh/h	58	0	491	82	0	352	121	291	89	93	0	267
Grp Sat Flow(s),veh/h/ln	1781	0	1814	1795	0	1831	1781	1870	1558	1753	0	1764
Q Serve(g_s), s	1.7	0.0	20.3	2.3	0.0	12.9	4.5	12.6	3.8	3.5	0.0	12.3
Cycle Q Clear(g_c), s	1.7	0.0	20.3	2.3	0.0	12.9	4.5	12.6	3.8	3.5	0.0	12.3
Prop In Lane	1.00		0.16	1.00		0.15	1.00		1.00	1.00		0.22
Lane Grp Cap(c), veh/h	449	0	710	353	0	732	319	444	477	298	0	412
V/C Ratio(X)	0.13	0.00	0.69	0.23	0.00	0.48	0.38	0.66	0.19	0.31	0.00	0.65
Avail Cap(c_a), veh/h	481	0	710	371	0	732	325	444	477	311	0	412
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.9	0.0	22.8	16.3	0.0	20.1	24.1	31.0	23.1	24.0	0.0	31.2
Incr Delay (d2), s/veh	0.1	0.0	5.5	0.3	0.0	2.3	0.7	7.4	0.9	0.6	0.0	7.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	9.2	0.9	0.0	5.7	1.8	6.2	1.4	1.5	0.0	6.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.0	0.0	28.3	16.6	0.0	22.3	24.9	38.4	23.9	24.6	0.0	38.9
LnGrp LOS	B	A	C	B	A	C	C	D	C	C	A	D
Approach Vol, veh/h		549			434			501			360	
Approach Delay, s/veh		26.9			21.3			32.6			35.2	
Approach LOS		C			C			C			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.6	41.2	11.2	27.0	9.9	42.0	10.8	27.3
Change Period (Y+Rc), s	4.5	6.0	4.5	6.0	4.5	6.0	4.5	6.0
Max Green Setting (Gmax), s	7.0	34.0	7.0	21.0	7.0	34.0	7.0	21.0
Max Q Clear Time (g_c+I1), s	4.3	22.3	6.5	14.3	3.7	14.9	5.5	14.6
Green Ext Time (p_c), s	0.0	2.4	0.0	0.8	0.0	2.0	0.0	0.9

Intersection Summary	
HCM 6th Ctrl Delay	28.7
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	107	354	305	102	59	77
Future Vol, veh/h	107	354	305	102	59	77
Conflicting Peds, #/hr	4	0	0	4	4	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	91	91	82	82	68	68
Heavy Vehicles, %	3	3	7	7	4	4
Mvmt Flow	118	389	372	124	87	113

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	500	0	-	0	1067	439
Stage 1	-	-	-	-	438	-
Stage 2	-	-	-	-	629	-
Critical Hdwy	4.13	-	-	-	6.44	6.24
Critical Hdwy Stg 1	-	-	-	-	5.44	-
Critical Hdwy Stg 2	-	-	-	-	5.44	-
Follow-up Hdwy	2.227	-	-	-	3.536	3.336
Pot Cap-1 Maneuver	1059	-	-	-	244	614
Stage 1	-	-	-	-	646	-
Stage 2	-	-	-	-	528	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1055	-	-	-	215	611
Mov Cap-2 Maneuver	-	-	-	-	311	-
Stage 1	-	-	-	-	571	-
Stage 2	-	-	-	-	526	-

Approach	EB	WB	SB
HCM Control Delay, s	2.1	0	16
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1055	-	-	-	311	611
HCM Lane V/C Ratio	0.111	-	-	-	0.279	0.185
HCM Control Delay (s)	8.8	-	-	-	21	12.2
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.4	-	-	-	1.1	0.7

Intersection: 1: 172nd Avenue & Robbins Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	TR
Maximum Queue (ft)	78	187	53	175	109	124	60	119	190
Average Queue (ft)	16	89	19	77	39	43	23	31	81
95th Queue (ft)	53	161	45	146	80	92	49	79	146
Link Distance (ft)		570		360		429			599
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	100		100		165		165	65	
Storage Blk Time (%)		7		4		0		1	15
Queuing Penalty (veh)		2		2		0		2	7

Intersection: 2: Robbins Road & S. Griffin Street

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	111	28	64	63	67
Average Queue (ft)	38	1	7	19	31
95th Queue (ft)	83	13	35	49	61
Link Distance (ft)		886	746		555
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	100			150	
Storage Blk Time (%)	0				
Queuing Penalty (veh)	0				

Zone Summary

Zone wide Queuing Penalty: 13

Intersection: 1: 172nd Avenue & Robbins Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	TR
Maximum Queue (ft)	174	307	107	230	164	279	192	120	260
Average Queue (ft)	33	152	35	105	61	125	38	59	128
95th Queue (ft)	90	260	76	184	120	226	103	116	228
Link Distance (ft)		570		360		429			599
Upstream Blk Time (%)						0			
Queuing Penalty (veh)						0			
Storage Bay Dist (ft)	100		100		165		165	65	
Storage Blk Time (%)		19	0	8		4		5	27
Queuing Penalty (veh)		10	1	6		8		12	22

Intersection: 2: Robbins Road & S. Griffin Street

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	80	21	39	82	70
Average Queue (ft)	32	1	2	33	33
95th Queue (ft)	65	11	19	68	57
Link Distance (ft)		886	746		555
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	100			150	
Storage Blk Time (%)	0				
Queuing Penalty (veh)	0				

Zone Summary

Zone wide Queuing Penalty: 60

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	237	38	48	251	30	57	65	52	45	116	35
Future Volume (veh/h)	22	237	38	48	251	30	57	65	52	45	116	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.99	0.99		0.99	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1841	1841	1841	1811	1811	1811	1841	1841	1841
Adj Flow Rate, veh/h	26	279	45	51	264	32	71	81	65	57	147	44
Peak Hour Factor	0.85	0.85	0.85	0.95	0.95	0.95	0.80	0.80	0.80	0.79	0.79	0.79
Percent Heavy Veh, %	2	2	2	4	4	4	6	6	6	4	4	4
Cap, veh/h	491	647	104	474	694	84	352	433	449	430	317	95
Arrive On Green	0.04	0.41	0.41	0.06	0.43	0.43	0.06	0.24	0.24	0.06	0.23	0.23
Sat Flow, veh/h	1781	1569	253	1753	1609	195	1725	1811	1519	1753	1356	406
Grp Volume(v), veh/h	26	0	324	51	0	296	71	81	65	57	0	191
Grp Sat Flow(s),veh/h/ln	1781	0	1822	1753	0	1803	1725	1811	1519	1753	0	1762
Q Serve(g_s), s	0.7	0.0	11.4	1.4	0.0	10.0	2.7	3.2	2.8	2.1	0.0	8.4
Cycle Q Clear(g_c), s	0.7	0.0	11.4	1.4	0.0	10.0	2.7	3.2	2.8	2.1	0.0	8.4
Prop In Lane	1.00		0.14	1.00		0.11	1.00		1.00	1.00		0.23
Lane Grp Cap(c), veh/h	491	0	752	474	0	778	352	433	449	430	0	411
V/C Ratio(X)	0.05	0.00	0.43	0.11	0.00	0.38	0.20	0.19	0.14	0.13	0.00	0.46
Avail Cap(c_a), veh/h	563	0	752	512	0	778	375	433	449	463	0	411
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.2	0.0	18.9	13.8	0.0	17.4	23.5	27.3	23.4	23.3	0.0	29.7
Incr Delay (d2), s/veh	0.0	0.0	1.8	0.1	0.0	1.4	0.3	1.0	0.7	0.1	0.0	3.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	4.9	0.5	0.0	4.2	1.0	1.4	1.0	0.9	0.0	4.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.3	0.0	20.7	13.9	0.0	18.8	23.8	28.2	24.1	23.5	0.0	33.4
LnGrp LOS	B	A	C	B	A	B	C	C	C	C	A	C
Approach Vol, veh/h		350			347			217			248	
Approach Delay, s/veh		20.2			18.1			25.5			31.1	
Approach LOS		C			B			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.5	43.1	10.3	27.0	7.8	44.8	9.8	27.5
Change Period (Y+Rc), s	4.5	6.0	4.5	6.0	4.5	6.0	4.5	6.0
Max Green Setting (Gmax), s	7.0	34.0	7.0	21.0	7.0	34.0	7.0	21.0
Max Q Clear Time (g_c+I1), s	3.4	13.4	4.7	10.4	2.7	12.0	4.1	5.2
Green Ext Time (p_c), s	0.0	1.8	0.0	0.8	0.0	1.7	0.0	0.4

Intersection Summary	
HCM 6th Ctrl Delay	22.9
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	133	167	260	179	32	70
Future Vol, veh/h	133	167	260	179	32	70
Conflicting Peds, #/hr	10	0	0	10	10	10
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	72	72	65	65
Heavy Vehicles, %	5	5	7	7	4	4
Mvmt Flow	158	199	361	249	49	108

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	620	0	-	0	1021	506
Stage 1	-	-	-	-	496	-
Stage 2	-	-	-	-	525	-
Critical Hdwy	4.15	-	-	-	6.44	6.24
Critical Hdwy Stg 1	-	-	-	-	5.44	-
Critical Hdwy Stg 2	-	-	-	-	5.44	-
Follow-up Hdwy	2.245	-	-	-	3.536	3.336
Pot Cap-1 Maneuver	946	-	-	-	260	562
Stage 1	-	-	-	-	608	-
Stage 2	-	-	-	-	589	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	937	-	-	-	212	551
Mov Cap-2 Maneuver	-	-	-	-	305	-
Stage 1	-	-	-	-	500	-
Stage 2	-	-	-	-	583	-

Approach	EB	WB	SB
HCM Control Delay, s	4.3	0	15
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	937	-	-	-	305	551
HCM Lane V/C Ratio	0.169	-	-	-	0.161	0.195
HCM Control Delay (s)	9.6	-	-	-	19.1	13.1
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.6	-	-	-	0.6	0.7

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	285	7	6	324	19	15
Future Vol, veh/h	285	7	6	324	19	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	310	8	7	352	21	16

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	318	0	680	314
Stage 1	-	-	-	-	314	-
Stage 2	-	-	-	-	366	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1242	-	417	726
Stage 1	-	-	-	-	741	-
Stage 2	-	-	-	-	702	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1242	-	414	726
Mov Cap-2 Maneuver	-	-	-	-	515	-
Stage 1	-	-	-	-	737	-
Stage 2	-	-	-	-	702	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	11.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	591	-	-	1242	-
HCM Lane V/C Ratio	0.063	-	-	0.005	-
HCM Control Delay (s)	11.5	-	-	7.9	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	51	374	68	81	281	53	108	259	88	89	184	51
Future Volume (veh/h)	51	374	68	81	281	53	108	259	88	89	184	51
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.99	0.99		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1885	1885	1885	1870	1870	1870	1841	1841	1841
Adj Flow Rate, veh/h	58	425	77	88	305	58	121	291	99	101	209	58
Peak Hour Factor	0.88	0.88	0.88	0.92	0.92	0.92	0.89	0.89	0.89	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	1	1	1	2	2	2	4	4	4
Cap, veh/h	440	600	109	346	614	117	319	441	477	298	322	89
Arrive On Green	0.06	0.39	0.39	0.07	0.40	0.40	0.07	0.24	0.24	0.07	0.23	0.23
Sat Flow, veh/h	1781	1537	278	1795	1536	292	1781	1870	1558	1753	1381	383
Grp Volume(v), veh/h	58	0	502	88	0	363	121	291	99	101	0	267
Grp Sat Flow(s),veh/h/ln	1781	0	1816	1795	0	1828	1781	1870	1558	1753	0	1764
Q Serve(g_s), s	1.7	0.0	21.0	2.5	0.0	13.4	4.5	12.7	4.2	3.8	0.0	12.3
Cycle Q Clear(g_c), s	1.7	0.0	21.0	2.5	0.0	13.4	4.5	12.7	4.2	3.8	0.0	12.3
Prop In Lane	1.00		0.15	1.00		0.16	1.00		1.00	1.00		0.22
Lane Grp Cap(c), veh/h	440	0	708	346	0	731	319	441	477	298	0	412
V/C Ratio(X)	0.13	0.00	0.71	0.25	0.00	0.50	0.38	0.66	0.21	0.34	0.00	0.65
Avail Cap(c_a), veh/h	473	0	708	361	0	731	325	441	477	309	0	412
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.0	0.0	23.1	16.5	0.0	20.2	24.1	31.1	23.2	24.0	0.0	31.2
Incr Delay (d2), s/veh	0.1	0.0	5.9	0.4	0.0	2.4	0.7	7.5	1.0	0.7	0.0	7.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	9.6	1.0	0.0	5.9	1.8	6.2	1.6	1.6	0.0	6.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.1	0.0	29.0	16.9	0.0	22.6	24.9	38.7	24.2	24.7	0.0	38.9
LnGrp LOS	B	A	C	B	A	C	C	D	C	C	A	D
Approach Vol, veh/h		560			451			511			368	
Approach Delay, s/veh		27.6			21.5			32.6			35.0	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.7	41.1	11.2	27.0	9.9	42.0	10.9	27.2
Change Period (Y+Rc), s	4.5	6.0	4.5	6.0	4.5	6.0	4.5	6.0
Max Green Setting (Gmax), s	7.0	34.0	7.0	21.0	7.0	34.0	7.0	21.0
Max Q Clear Time (g_c+I1), s	4.5	23.0	6.5	14.3	3.7	15.4	5.8	14.7
Green Ext Time (p_c), s	0.0	2.4	0.0	0.8	0.0	2.0	0.0	1.0

Intersection Summary	
HCM 6th Ctrl Delay	28.9
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	109	360	313	102	59	80
Future Vol, veh/h	109	360	313	102	59	80
Conflicting Peds, #/hr	4	0	0	4	4	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	91	91	82	82	68	68
Heavy Vehicles, %	3	3	7	7	4	4
Mvmt Flow	120	396	382	124	87	118

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	510	0	-	0	1088	449
Stage 1	-	-	-	-	448	-
Stage 2	-	-	-	-	640	-
Critical Hdwy	4.13	-	-	-	6.44	6.24
Critical Hdwy Stg 1	-	-	-	-	5.44	-
Critical Hdwy Stg 2	-	-	-	-	5.44	-
Follow-up Hdwy	2.227	-	-	-	3.536	3.336
Pot Cap-1 Maneuver	1050	-	-	-	237	606
Stage 1	-	-	-	-	639	-
Stage 2	-	-	-	-	521	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1046	-	-	-	208	603
Mov Cap-2 Maneuver	-	-	-	-	303	-
Stage 1	-	-	-	-	563	-
Stage 2	-	-	-	-	519	-

Approach	EB	WB	SB
HCM Control Delay, s	2.1	0	16.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1046	-	-	-	303	603
HCM Lane V/C Ratio	0.115	-	-	-	0.286	0.195
HCM Control Delay (s)	8.9	-	-	-	21.6	12.4
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.4	-	-	-	1.2	0.7

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	461	26	11	382	16	8
Future Vol, veh/h	461	26	11	382	16	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	83	83	83	88
Heavy Vehicles, %	4	4	7	7	7	4
Mvmt Flow	524	30	13	460	19	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	554	0	1025	539
Stage 1	-	-	-	-	539	-
Stage 2	-	-	-	-	486	-
Critical Hdwy	-	-	4.17	-	6.47	6.24
Critical Hdwy Stg 1	-	-	-	-	5.47	-
Critical Hdwy Stg 2	-	-	-	-	5.47	-
Follow-up Hdwy	-	-	2.263	-	3.563	3.336
Pot Cap-1 Maneuver	-	-	992	-	255	539
Stage 1	-	-	-	-	575	-
Stage 2	-	-	-	-	608	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	992	-	252	539
Mov Cap-2 Maneuver	-	-	-	-	380	-
Stage 1	-	-	-	-	568	-
Stage 2	-	-	-	-	608	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	14.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	420	-	-	992	-
HCM Lane V/C Ratio	0.068	-	-	0.013	-
HCM Control Delay (s)	14.2	-	-	8.7	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Intersection: 1: 172nd Avenue & Robbins Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	TR
Maximum Queue (ft)	48	206	69	172	100	100	70	104	182
Average Queue (ft)	13	89	23	74	38	41	24	32	79
95th Queue (ft)	39	161	53	143	81	93	58	76	151
Link Distance (ft)		570		360		429			599
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	100		100		165		165	65	
Storage Blk Time (%)		8	0	4				1	15
Queuing Penalty (veh)		2	0	2				2	7

Intersection: 2: Robbins Road & S. Griffin Street

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	109	12	84	66	70
Average Queue (ft)	43	1	11	21	31
95th Queue (ft)	88	9	47	52	58
Link Distance (ft)		405	746		555
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	100			150	
Storage Blk Time (%)	1				
Queuing Penalty (veh)	1				

Intersection: 3: Site Drive & Robbins Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	18	54
Average Queue (ft)	1	21
95th Queue (ft)	10	48
Link Distance (ft)		498
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 14

Intersection: 1: 172nd Avenue & Robbins Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	TR
Maximum Queue (ft)	199	325	134	227	135	296	228	120	265
Average Queue (ft)	37	163	38	108	56	130	39	63	139
95th Queue (ft)	113	276	89	193	111	228	113	124	242
Link Distance (ft)		570		360		429			599
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	100		100		165		165	65	
Storage Blk Time (%)		22	0	10		5		6	32
Queuing Penalty (veh)		12	1	8		9		14	29

Intersection: 2: Robbins Road & S. Griffin Street

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	78	21	49	91	73
Average Queue (ft)	32	1	4	34	35
95th Queue (ft)	64	13	24	69	63
Link Distance (ft)		395	746		555
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	100			150	
Storage Blk Time (%)	0			0	
Queuing Penalty (veh)	0			0	

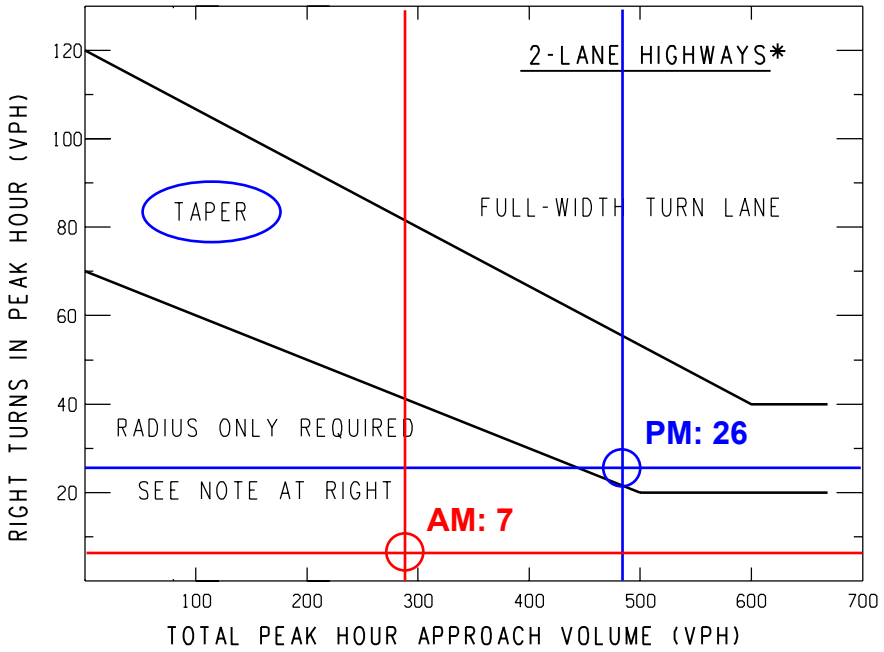
Intersection: 3: Site Drive & Robbins Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	34	60
Average Queue (ft)	2	20
95th Queue (ft)	17	50
Link Distance (ft)		485
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 73

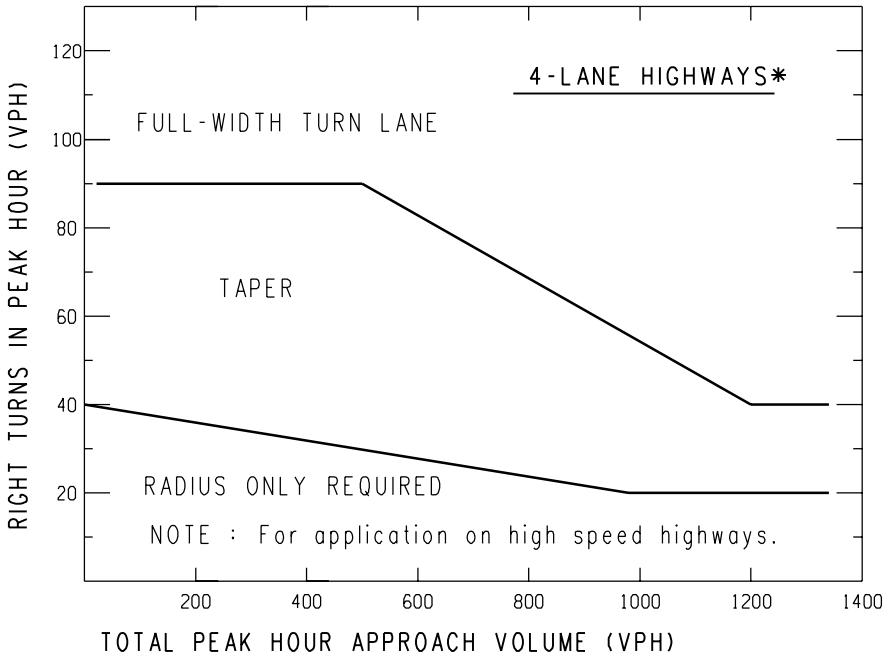
ROBBINS ROAD & SITE DRIVE RT LANE WARRANT



NOTE:
For posted speeds at or under 45 mph, peak hour right turns greater than 40 vph, and total peak hour approach less than 300 vph, adjust right turn volumes.

Adjust peak hour right turns = Peak hour right turns - 20

AM: 292
PM: 487



*If a center left-turn lane exists(i.e. 3 or 5 lane highway), subtract the number of left turns in approach volume from the total approach volume to get an adjusted total approach volume.

Sample Problem:
The Design Speed is 55 mph. The Peak Hour Approach Volume is 300 vph. The Number of Right Turns in the Peak Hour is 100 vph. Determine if a right turn lane is recommended.

Solution:
Figure indicates that the intersection of 300 vph and 100 vph is located above the upper trend line; thus,a right-turn lane may be recommended.

MDOT Michigan Department of Transportation TRAFFIC AND SAFETY NOTE	TRAFFIC VOLUME GUIDELINES FOR RIGHT-TURN LANES AND TAPERS		
DRAWN BY: MTS CHECKED BY: JAT	08/05/2004 PLAN DATE:	604A	SHEET 2 OF 2
FILE: K:/DGN/ts notes/Note604A tsn.dgn		REV. 08/05/2004	