

**PRELIMINARY
STORMWATER MANAGEMENT
REPORT**

FOR

**LIBERTY JUNCTION
LIBERTYVILLE, ILLINOIS**

PREPARED FOR:

ILM Homes, Inc.
605 N. Michigan Avenue – 4th Floor
Chicago, Illinois 60611

MAY 18, 2021



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INTRODUCTION AND PROJECT UNDERSTANDING

Pearson, Brown and Associates, Inc. (PBA) prepared this preliminary stormwater management report for the Liberty Junction project in Libertyville, Illinois. Ninety townhome units in sixteen buildings are proposed along with roadways, open space and stormwater management areas.

The detention facilities planned for Liberty Junction will also provide volume for a future commercial area east of the site along Milwaukee Avenue.

The Liberty Junction residential area totals about 10.57 acres with an estimated 10.40 acres planned to be hydrologically disturbed. This zone all lies west of a planned connector road ROW corridor between Adler Drive and Route 137.

Historic records show substantial pre-1992 impervious area coverage on the parcels involved with this project both in the planned residential and commercial areas. A hotel, restaurant, parking areas and a golf course all previously existed in the area.

Areas along the proposed connector roadway that are north of the proposed residential access location currently drain towards Route 137. This condition is planned to be maintained in the proposed condition as the impervious total is planned to be less than the pre-existing coverage. The pre-1992 existing impervious Exhibit 2 shows 1.33 acres of coverage in the north zone. This compares favorably to the proposed Wildberry parking improvement and northern roadway corridor proposed impervious total of 1.29 acres shown on Exhibit 3.

2.73 acres of pre-1992 impervious coverage are shown on Exhibit 1.

The areas to the south including the future commercial generally drain from east to west towards Bull Creek.

The low point of the planned residential area is in the far northwest corner. A former irrigation pond for the golf course used to exist in this area was determined to not be a regulated wetland area. In fact, no regulated wetland areas were found associated with this project based on a recent analysis performed by Hey & Associates, Inc.

North of Adler Drive, the roadway corridor tributary to the proposed detention system is 0.58 acres.

The future commercial area in the southeast corner north of Adler Drive and just west of Route 21 is 2.39 acres.

The following table summarizes the proposed residential zone impervious coverage data.

RESIDENTIAL ZONE WEST OF 60' ROW:

	<u>Area (sf)</u>		
6 unit bldgs	55121		
5 unit bldgs	27561		
main roadway	33400		
north garage courts (3)	24735		
west zone pavement	17440		
9 & 10 garage court	8250		
11 & 12 garage court	8335		
13 & 14 garage court	7105		
15 & 16 garage court	8250		
4' main walk - outside	5525		
4' walk inner circle	625		
avg std courtyard walks (north (3))	3360		
larger c.y. walks (3)	3480		
rem c.y. walks	2470		
porch stoops	2350		
plaza feature	3600		
total	211607	sf	
	4.86	ac	
hyd dist site area - resid zone	10.40	ac	
RCN calc			
impervious	4.86	CN	mult
pervious	5.54	98	476.28
		80	443.2
		total >>	919.48
	Composite RCN = >>	88	

A full set of preliminary engineering plans is attached to this report. This set contains many of the typical exhibits included in storm reports such as the location map, existing conditions, proposed grading plan etc. A review of the Historic Flood of record and FEMA FIRM panel layers from the Lake County G.I.S. system shows no zones of flooding or SFHA zones associated with the area. Detail Sheet 9 includes preliminary detention calculations for the residential zone, partial connector road corridor, and future commercial areas. Required detention volume is approximately 5 acre-feet with 5.48 ac-ft proposed onsite.

Proposed basin area stage-storage is tabulated below:

south basin:

	<u>elev</u> ft	<u>area</u> ac	<u>avg</u> ac	<u>interval</u> ft	<u>vol</u> ac-ft
outlet	699.2	0.44			
hw	703.5	0.64	0.54	4.3	2.32

southwest basin:

	<u>elev</u> ft	<u>area</u> ac	<u>avg</u> ac	<u>interval</u> ft	<u>vol</u> ac-ft
outlet	699.2	0.11			
hw	703.5	0.2	0.155	4.3	0.67

northwest basin:

	<u>elev</u> ft	<u>area</u> ac	<u>avg</u> ac	<u>interval</u> ft	<u>vol</u> ac-ft
outlet	699.2	0.26			
hw	703.5	0.40	0.33	4.3	1.42

central basin:

	<u>elev</u> ft	<u>area</u> ac	<u>avg</u> ac	<u>interval</u> ft	<u>vol</u> ac-ft
outlet	699.2	0.19			
hw	703.5	0.31	0.25	4.3	1.07

total >>>> 5.48

The proposed lowest attached garage floor elevations are all well elevated above the anticipated peak operating elevation with the spillway. (Proposed crest elevation is 703.50 located at the northwest basin compared to lowest proposed attached garage floor elevation of 706.50). The basin zones are planned to be connected with equalizer pipes with sufficient capacity (minimum 24" dia. currently planned) to allow for safe exchange of stormwater between the basin zones as needed.

Runoff Volume Reduction

Residential Zone proposed impervious = 4.86 ac

Southern portion of connector roadway impervious = 0.34 ac (out of 0.58 acre area)

Future Commercial planned impervious = 2.03 ac @ 85% coverage

Total = 7.23 acres

Provided storage to infiltrate is about 0.33 ac-ft [14374 c.f.] (in 4" zone below outlet in all basins)

(basin bottom area totals approximately 1 acre)

RVR quantity = 1988 cf/acre

Percent of annual rainfall events from WDO Appendix O = > 70%

Preliminary Restrictor Design: (13.6 ac +/- tributary area)

100yr release rate based on 0.15 cfs/ac = 2.04 cfs

2yr release rate based on 0.04 cfs/ac = 0.54 cfs

System HWL = 703.50

Restrictor Invert = 699.20

Since the diameter required to control the 100yr release was determined to be greater than 6", the system will be designed with both an upper and lower restrictor within the outlet control structure. The 2yr required volume is estimated to be about 1.50 ac-ft and is planned to be provided at about elevation 700.40 in the system. We found that a 4.5" diameter lower restrictor at the outlet elevation will properly control the 2yr release rate. This orifice releases 1.08 cfs when the system is at high water, however, so the upper restrictor needs to be sized to release the difference between the 2.04 cfs 100yr rate and 1.08 cfs, or 0.96 cfs. A 5" diameter upper restrictor at an invert of 701.15 is proposed.

Preliminary calculations are provided below.

<u>ORIFICE CALCULATIONS: (IDEAL REQD. SIZE)</u>		<u>$Q=CA*(2GH)^{0.5}$</u> (ORIFICE EQN:)
Trib. Area	13.60	ac
Release rate based on 0.15 cfs/ac	2.04	cfs
IDEAL RESTRICTOR	6.21	INCH DIAMETER
HIGH WATER LEVEL:	703.50	
RESTRICTOR INVERT:	699.20	
ORIFICE AREA: "A"	0.2103	SF
HEAD "H"	4.04	FT
COEFFICIENT "C"	0.60	SQUARE EDGE
<u>DISCHARGE</u>	<u>2.036</u>	<u>CFS</u>

LOWER: (Allowable release rate = 0.54 cfs)		<u>$Q=CA*(2GH)^{0.5}$</u> (ORIFICE EQN:)
<u>ORIFICE CALCULATIONS:</u>		
PROPOSED RESTRICTOR	4.50	INCH DIAMETER
HIGH WATER LEVEL:	700.40	
RESTRICTOR INVERT:	699.20	
ORIFICE AREA: "A"	0.1104	SF
HEAD "H"	1.01	FT
COEFFICIENT "C"	0.60	SQUARE EDGE
<u>DISCHARGE</u>	<u>0.535</u>	<u>CFS</u>

LOWER RESTRICTOR RELEASE RATE AT HWL:		<u>$Q=CA*(2GH)^{0.5}$</u> (ORIFICE EQN:)
<u>ORIFICE CALCULATIONS:</u>		
PROPOSED RESTRICTOR	4.50	INCH DIAMETER
HIGH WATER LEVEL:	703.50	
RESTRICTOR INVERT:	699.20	
ORIFICE AREA: "A"	0.1104	SF
HEAD "H"	4.11	FT
COEFFICIENT "C"	0.60	SQUARE EDGE
<u>DISCHARGE</u>	<u>1.078</u>	<u>CFS</u>

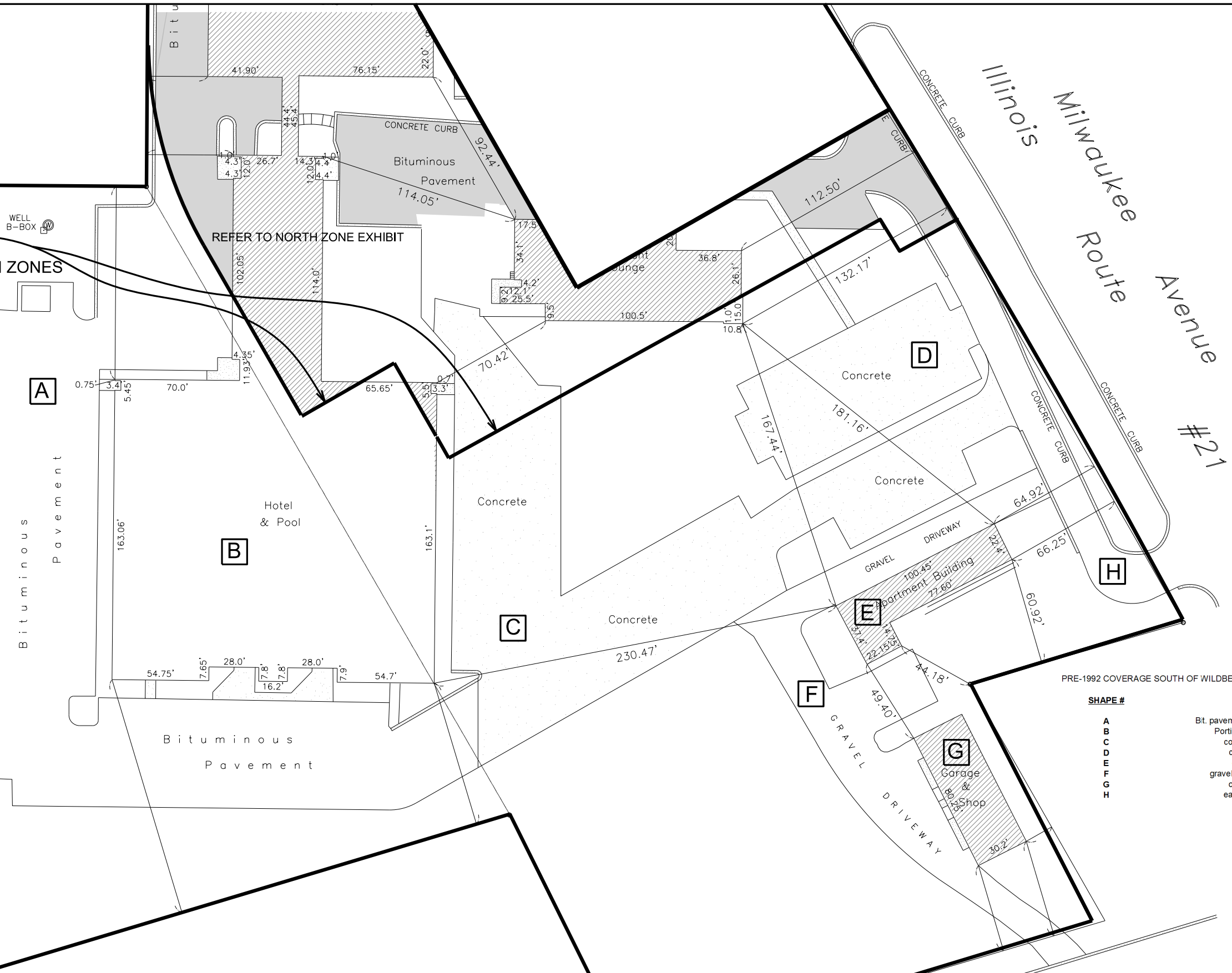
SIZE UPPER RESTRICTOR WITH INVERT ABOVE 2YR LEVEL TO RELEASE 0.96 CFS:		<u>$Q=CA*(2GH)^{0.5}$</u> (ORIFICE EQN:)
<u>ORIFICE CALCULATIONS:</u>		
PROPOSED RESTRICTOR	5.00	INCH DIAMETER
HIGH WATER LEVEL:	703.50	
RESTRICTOR INVERT:	701.15	
ORIFICE AREA: "A"	0.1363	SF
HEAD "H"	2.14	FT
COEFFICIENT "C"	0.60	SQUARE EDGE
<u>DISCHARGE</u>	<u>0.961</u>	<u>CFS</u>

Conclusions:

The proposed naturalized basins will provide detention, water quality treatment, and runoff volume reduction for the project. Restricted releases are planned to be controlled from the southernmost basin within a structure located in a maintainable location along Adler Drive. An overland spillway location is provided from the northwest basin. No outlet pipes leading downstream offsite are proposed from the northwest basin. The outlet control structure along Adler Drive can and will also likely be configured to allow for emergency release flows over an internal weir.

EXHIBITS

DIVIDING LINE BETWEEN NORTH AND SOUTH ZONES



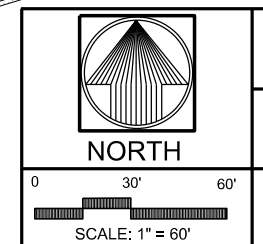
REFER TO NORTH ZONE EXHIBIT

PRE-1992 COVERAGE SOUTH OF WILDBERRY AND PROPOSED ROADWAY SUMMIT:

SHAPE #	DESCRIPTION	AREA (ac)
A	Bt. pavement. Curb and walks at west	0.86
B	Portion of old hotel and pool	0.68
C	conc lot areas - central	0.54
D	conc lot areas - east	0.18
E	old apartment bldg	0.05
F	gravel and hma areas at south	0.25
G	old garage and shop	0.05
H	east driveway and curb	0.12
TOTAL		2.73

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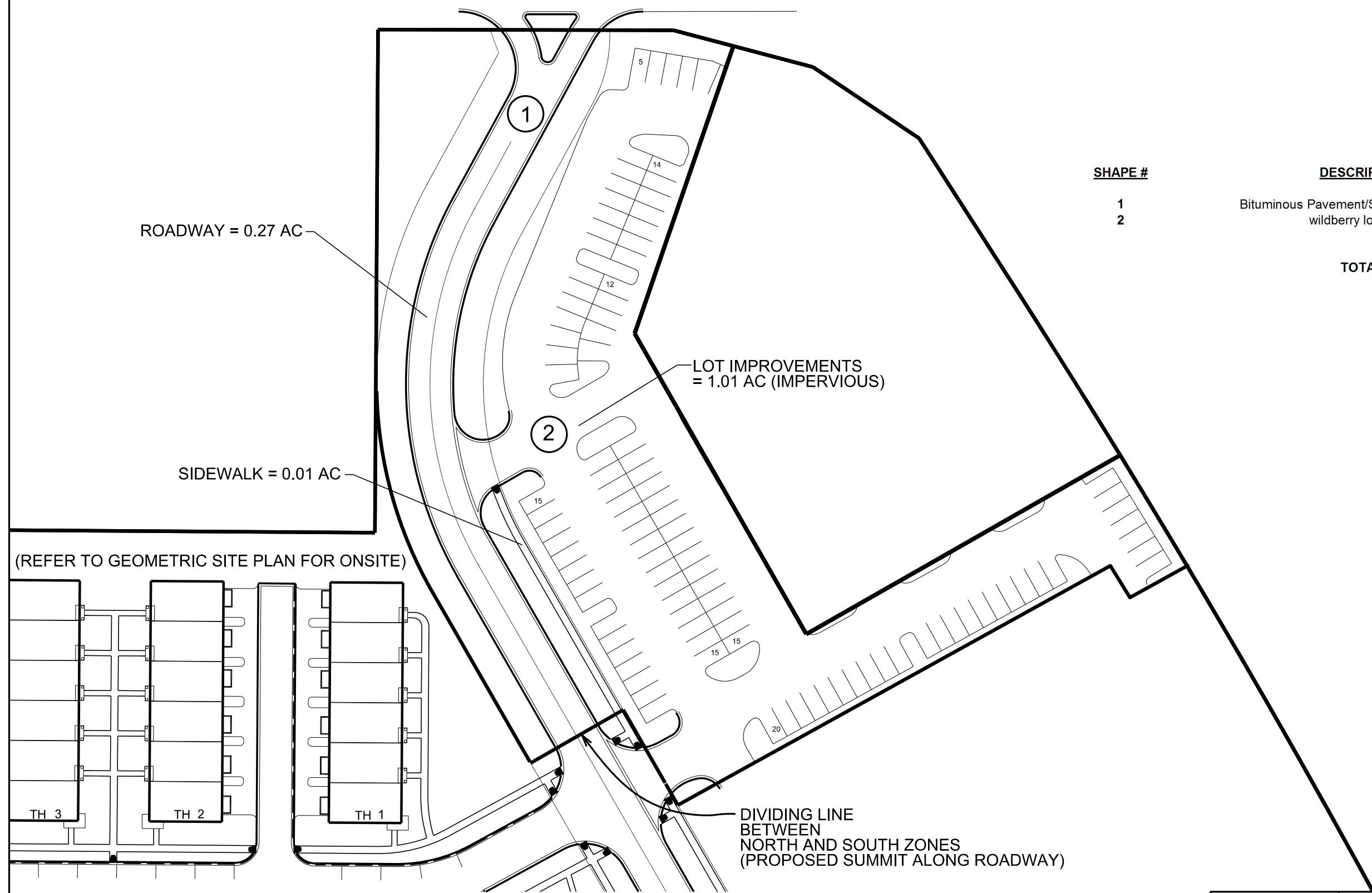


TITLE:
PRE-1992 IMPERVIOUS COVERAGE SOUTH ZONE
 PROJECT:
 LIBERTY JUNCTION
 PROJECT NO.: 2103

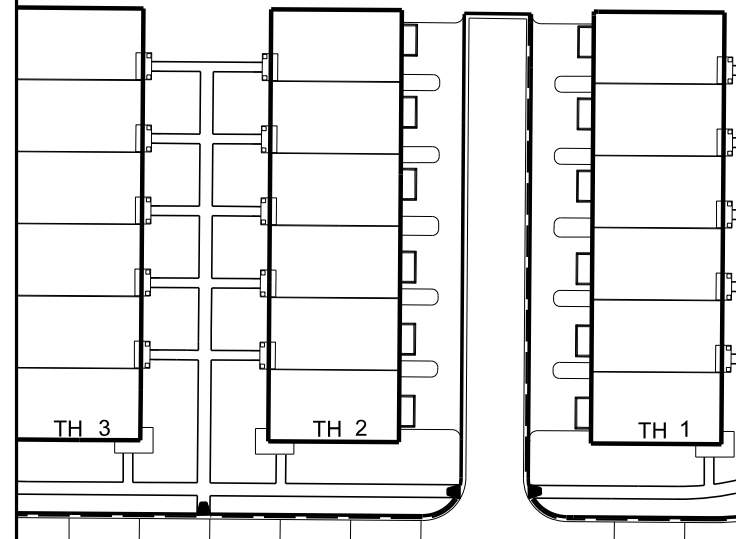
EXHIBIT
1
 DATE: 05/18/21

Adler Drive

Illinois Milwaukee Route Avenue #21



(REFER TO GEOMETRIC SITE PLAN FOR ONSITE)



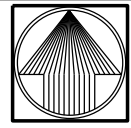

(REFER TO EXHIBIT 4 FOR SOUTH OFFSITE ZONE)

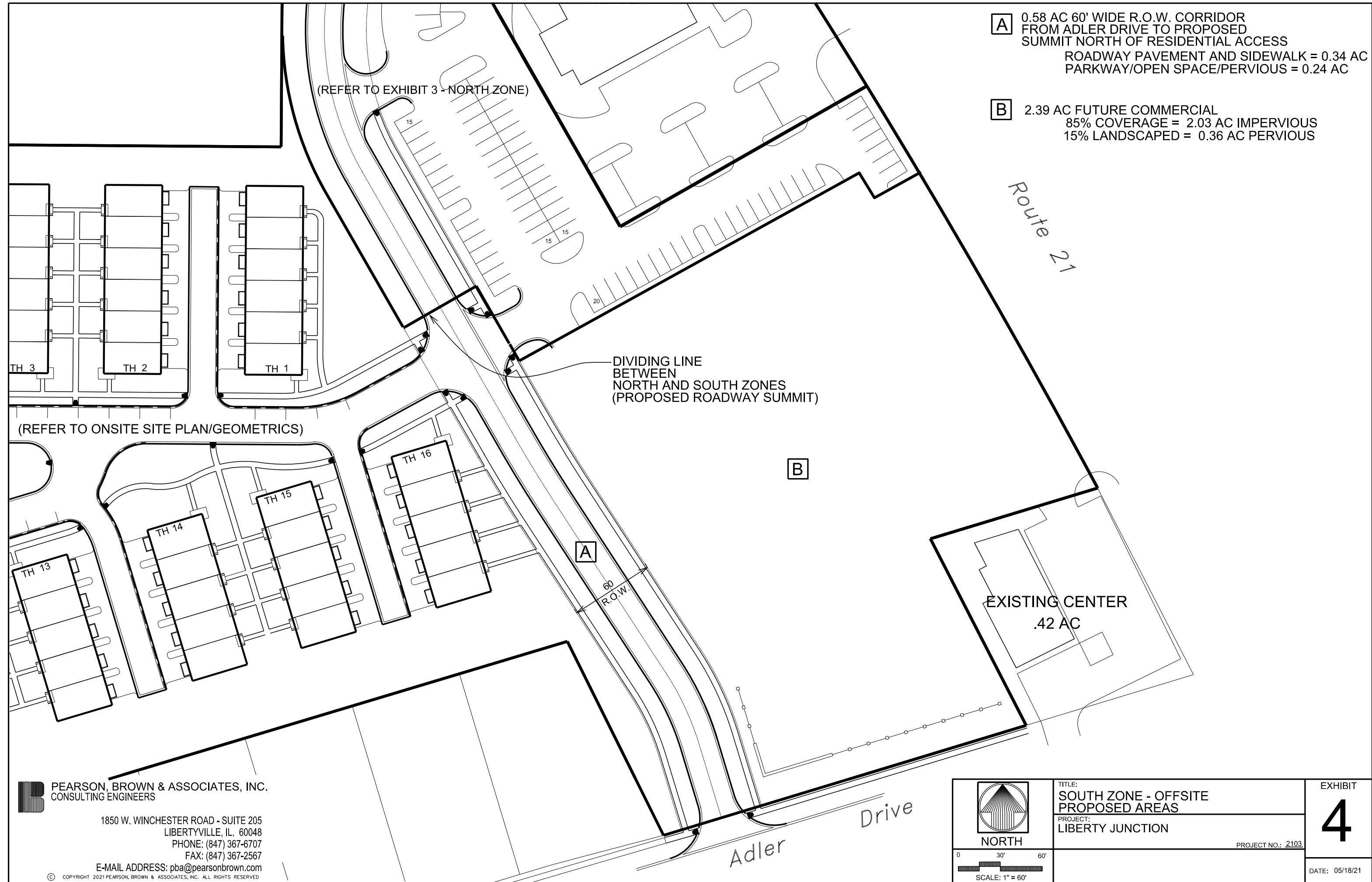
SHAPE #	DESCRIPTION	IMPERVIOUS COVERAGE: AREA (ac)
1	Bituminous Pavement/Sidewalk North Zone	0.28
2	wildberry lot paving	1.01
TOTAL		1.29

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 NORTH	TITLE: PARTIAL CONNECTOR ROAD AND WILDBERRY PARKING PROPOSED COVERAGE (NORTH ZONE)	EXHIBIT 3
	PROJECT: LIBERTY JUNCTION	
SCALE: 1" = 60' 	PROJECT NO.: 2103	DATE: 05/18/21



A 0.58 AC 60' WIDE R.O.W. CORRIDOR FROM ADLER DRIVE TO PROPOSED SUMMIT NORTH OF RESIDENTIAL ACCESS
ROADWAY PAVEMENT AND SIDEWALK = 0.34 AC
PARKWAY/OPEN SPACE/PERVIOUS = 0.24 AC

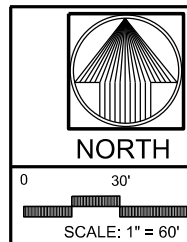
B 2.39 AC FUTURE COMMERCIAL
85% COVERAGE = 2.03 AC IMPERVIOUS
15% LANDSCAPED = 0.36 AC PERVIOUS

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TITLE:
SOUTH ZONE - OFFSITE
PROPOSED AREAS

PROJECT:
LIBERTY JUNCTION

PROJECT NO.: 2103

EXHIBIT

4

DATE: 05/18/21

NEW R.O.W. CORRIDOR DATA: south of proposed summit at north residential return P.C.

AREA	0.58	AC	<u>CN</u>
PAVED	0.28	AC	98
SW ALLOWANCE	0.06	AC	98
UNPAVED	0.24	AC	80
COMPOSITE CN FOR 0.58 AC>>>>			
		91	

NEW COMMERCIAL ZONE - SOUTH = 2.39 AC

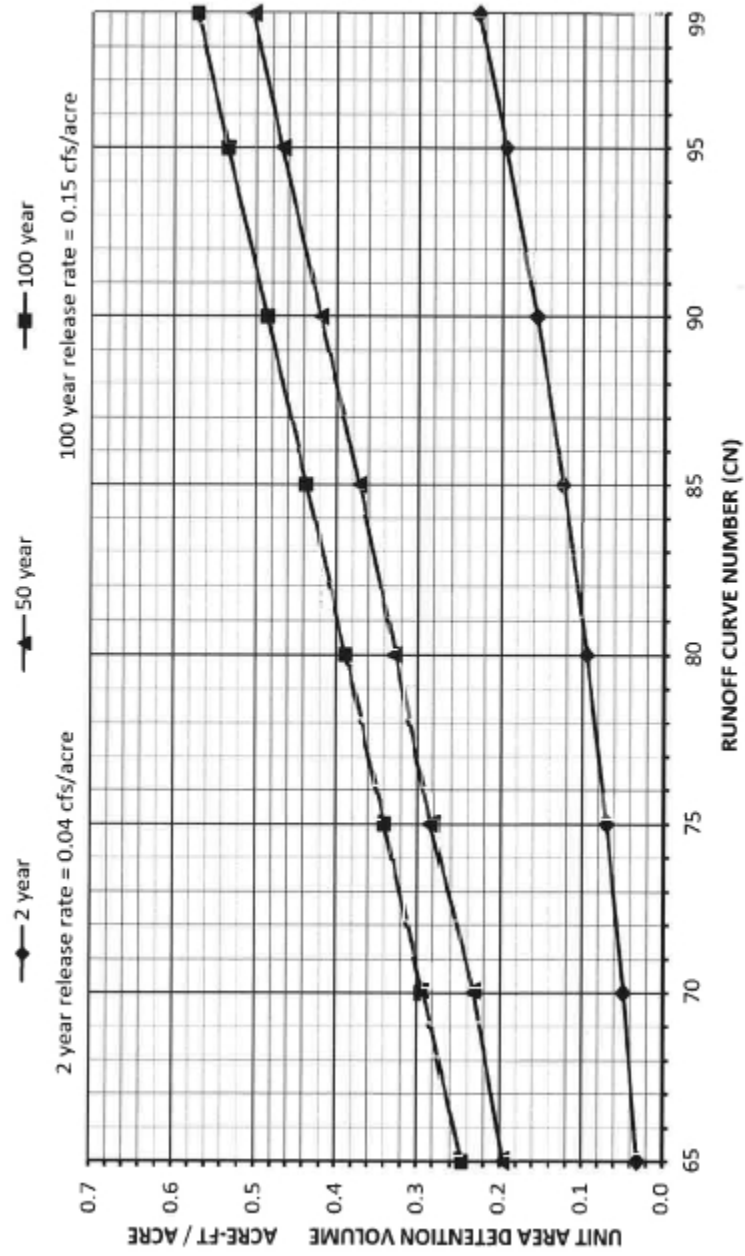
85% COVERAGE	2.03	AC	98
15% L/S	0.36	AC	80
COMPOSITE CN FOR 2.39 AC>>>>			
		95	

RESIDENTIAL PLUS ABOVE 2 AREAS WILL REQUIRE DETENTION

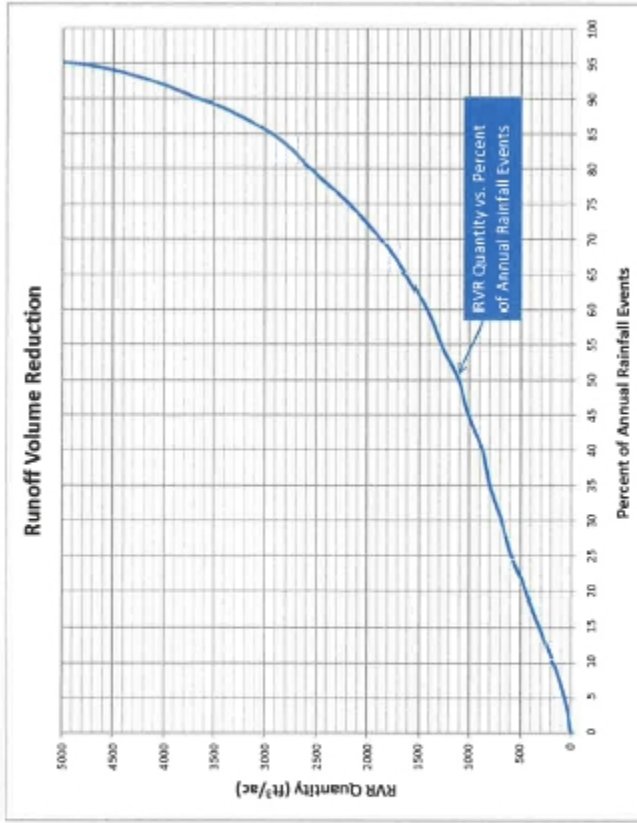
Prelim Req'd. Detention:

	<u>Areas: (ac)</u>	<u>CN</u>	<u>mult</u>
	0.58	91	52.78
	2.39	95	227.05
residential zone	10.40	88	915.2
total	13.37		1195.03
comp CN >>>	89.4		
	rounded to 90		

Appendix K: Detention Volume Versus Curve Number



Appendix O: Runoff Volume Reduction



100% Impervious values		
Percent of Annual Rainfall Events	Runoff Depth (in)	RVR Quantity (ft³/ac) new impervious
0	0	0
5	0.02	70
10	0.05	180
15	0.09	320
20	0.12	450
25	0.16	590
30	0.19	690
35	0.22	800
40	0.24	870
45	0.26	1010
50	0.30	1110
55	0.35	1280
60	0.39	1420
65	0.45	1630
70	0.51	1870
75	0.60	2180
80	0.70	2560
85	0.81	2940
90	1.01	3660
95	1.35	4900
99	2.41	8760

Runoff Depth based on Figure 3 of the Center For Watershed Protection Report.

Runoff Depth = P*P, where:

P = Rainfall Depth (inches)

Revised Runoff Coefficient = 0.95 for 100% impervious cover [0.05+0.09P], where P is 100% [Impervious cover]

RVR Quantity = Runoff Depth (in) / 12 (in/ft) * 43560 (ft²/ac)