STONE LUXURY LIVING
DRAINAGE CALCULATIONS – SUMMARY
7/20/2022

DESCRIPTION OF PROJECT

Stone Luxury Living is an approximately 7.74 Acre development located in the City of Bryant, Arkansas south of Hwy.5/N old Stagecoach road. There is one large drainage basin on the site.

Stormwater Calculations were prepared with the intent to comply with the City of Bryant's Drainage Code. The primary intent of this analysis is to produce a drainage system adequately sized to convey post development runoff while attenuating post development discharge levels equal to or less than pre development flows.

Hydraulic calculations were made using the Rational Method. Design frequencies were analyzed for 2, 5, 10, 25, 50, and 100 year return periods.

These calculations are divided into the following sections:

Summary of Drainage Basins

Summary of Inlets

Summary of Pipes

Storage Summary

Appendices

Exhibit A – Pre-Development Drainage Basins

Exhibit B – Post-Development Drainage Basins

STONE LUXURY LIVING

DRAINAGE CALCULATIONS – SUMMARY

7/20/2022

SUMMARY OF DRAINAGE BASINS

PRE-DEVELOPMENT CONDITIONS

The entire area for pre-existing drainage area of the site drains to a ditch to the southwest. This site has concrete paved roads and mobile homes.

POST-DEVELOPMENT CONDITIONS

This site is being developed into duplex houses. Slopes range from 1% to4%. Post-developed runoff coefficient is lower than pre-developed runoff coefficient.

SUMMARY OF INLETS

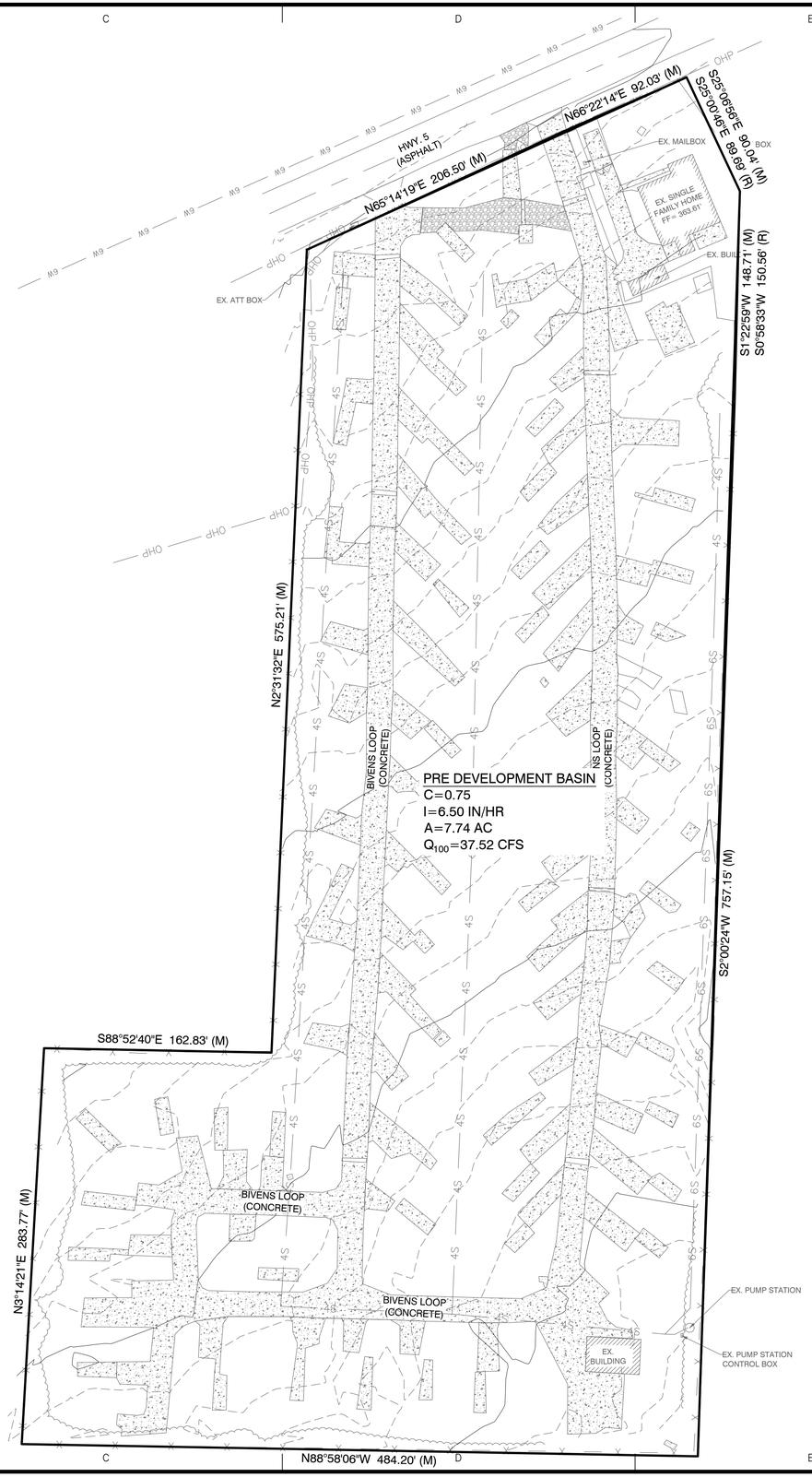
On the drainage plan you will see labels for all of the inlets for these calculations. The flows shown are for the 25-year return storm. The distance from the face of the curb to the center of the street is 15 feet.

SUMMARY OF PIPES

All pipes used in this project are HDPE and RCP. Therefore, a manning's of 0.012 was used on all pipes in the analysis.

STORAGE SUMMARY

Storage is not required.



DATE	REVISION	BY

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STONE LUXURY LIVING
BRYANT, ARKANSAS

CONTENTS:

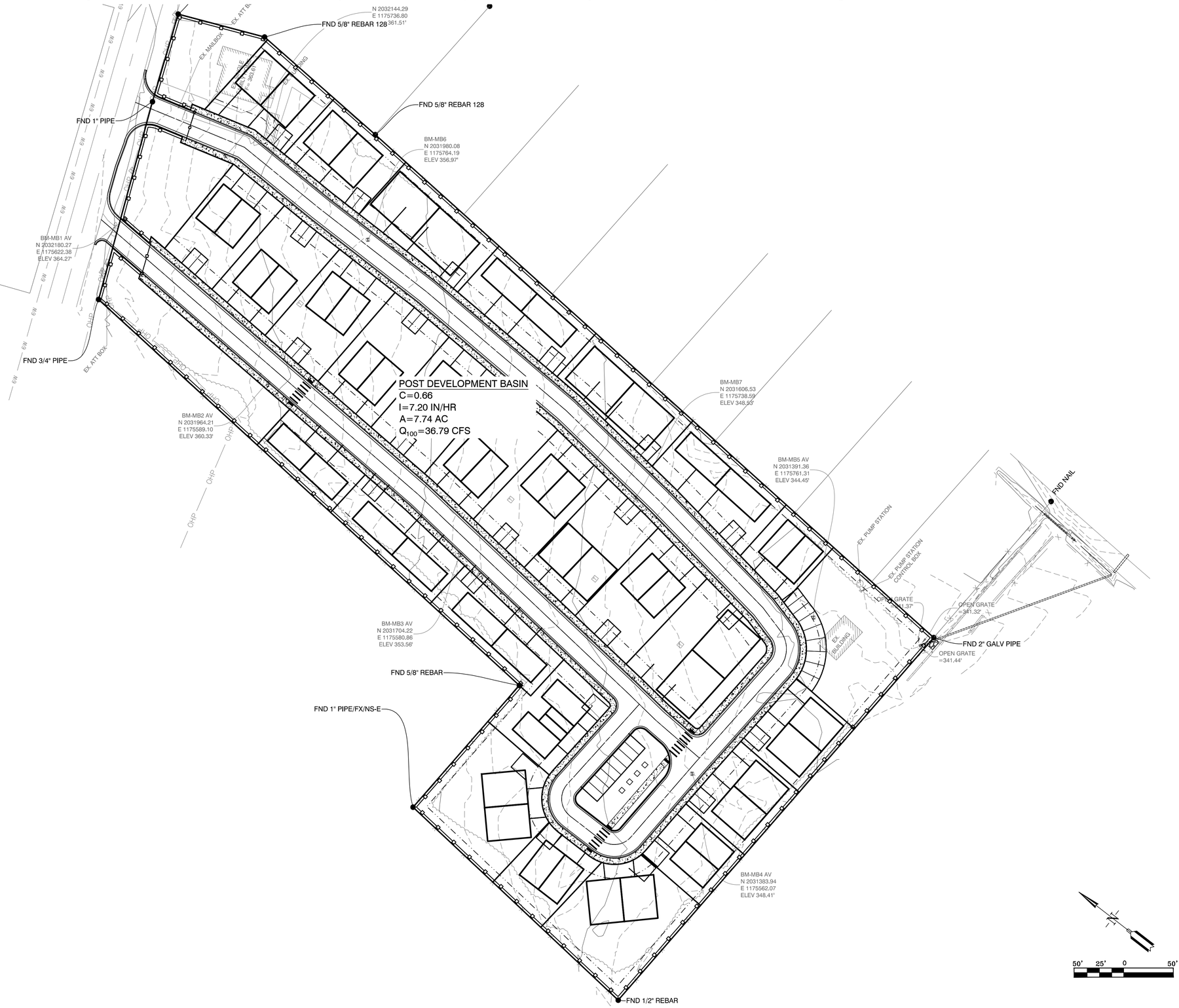
PRE DEVELOPMENT BASIN

PROJECT NO: 22070

DATE: JUNE 2, 2022

SHEET NO: 1.0

a:\Projects\2022 Projects\220701 Stone Luxury Living Manufactured Park, OR Reserve Elite Condos Enterprises, Inc. 8/25 Hwy 5\Drawings\CAD\Design\220701 Stone Luxury Living - Drainage Basin.dwg



DATE	REVISION	BY

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STONE LUXURY LIVING
PLANNED UNIT DEVELOPMENT
CITY OF BRYANT
SALINE COUNTY, ARKANSAS

PRELIMINARY

CONTENTS:

POST DEVELOPMENT BASIN

PROJECT NO: 22070

DATE: JUNE 2022

SHEET NO: 2.0

J:\Projects\2022 Projects\22070 Stone Luxury Living Manufactured Park (SE Bypass Elem Complex Enterprise Inc 8329 Hwy 5)\Drawings\SWDA\Design\22070 Stone Luxury Living 8329 Hwy 5 Bryant Ltrp Design 80-Drainage Design.dwg

Stormwater Calcs - Stone Luxury Living Manufactured Park
Using Rational Method

Pre-development

Calculated Tc values - Drainage Basin 1

$$Tc = \frac{56 * L^{.6} * n^{.6}}{i^{.4} * S^{.3}} \text{ seconds}$$

L1 =	100	feet	L1 =	185	feet	L1 =	100	feet	L1 =	575	feet
n1 =	0.15	Sheet Flow	n1 =	0.03	Grass, Natural S	n1 =	0.013	Concrete	n1 =	0.03	Grass, Natural Streams More Stones & Weeds
S1 =	0.02	ft/ft	S1 =	0.03	ft/ft	S1 =	0.03	ft/ft	S1 =	0.03	ft/ft
$I_{assumed}$ =	5.30	inches	$I_{assumed}$ =	5.30	inches	$I_{assumed}$ =	5.30	inches	$I_{assumed}$ =	5.30	inches
$Tc_{calculated}$	472	seconds	$Tc_{calculated}$	230	seconds	$Tc_{calculated}$	96	seconds	$Tc_{calculated}$	454	seconds
$Tc_{calculated}$	7.86	minutes	$Tc_{calculated}$	3.84	minutes	$Tc_{calculated}$	1.61	minutes	$Tc_{calculated}$	7.57	minutes

Tc =	20.88	minutes	Tc for 25-yr Storm from Exhibit 400-1 of Bryant Drainage Manual
I =	5.30	inches	i for 25-yr Storm from Exhibit 400-1 of Bryant Drainage Manual
Use Tc =	**21.00**	minutes	

I_{100} =	6.5	Inches	I_{10} =	4.8	Inches
I_{50} =	5.9	Inches	I_5 =	4.3	Inches
I_{25} =	5.30	Inches	I_2 =	3.6	Inches

Stormwater Calcs - Stone Luxury Living Manufactured Park
Using Rational Method

Post-development

Calculated Tc values - Drainage Basin 1

$$Tc = \frac{56 * L^{.6} * n^{.6}}{i^{.4} * S^{.3}} \text{ seconds}$$

L1 =	100	feet
n1 =	0.15	Sheet Flow
S1 =	0.02	ft/ft
$I_{assumed}$ =	6.00	inches
$Tc_{calculated}$	449	seconds
$Tc_{calculated}$	7.48	minutes

$$Tc = \frac{i6 * L^{.6} * n^{.6}}{i^{.4} * S^{.3}} \text{ seconds}$$

L1 =	710	feet
n1 =	0.013	Asphalt
S1 =	0.025	ft/ft
$I_{assumed}$ =	6.00	inches
$Tc_{calculated}$	314	seconds
$Tc_{calculated}$	5.23	minutes

L1 =	140	feet
n1 =	0.013	Culvert
S1 =	0.016	ft/ft
$I_{assumed}$ =	6.00	inches
$Tc_{calculated}$	135	seconds
$Tc_{calculated}$	2.26	minutes

Tc =	14.97	minutes
I =	6.00	inches
Use Tc =	**15.00**	minutes

Tc for 25-yr Storm from Exhibit 400-1 of Bryant Drainage Manual
i for 25-yr Storm from Exhibit 400-1 of Bryant Drainage Manual

I_{100} =	7.2	Inches	I_{10} =	5.4	Inches
I_{50} =	6.6	Inches	I_{5} =	4.8	Inches
I_{25} =	6.0	Inches	I_{2} =	4.1	Inches

Stormwater Calcs - Stone Luxury Living Manufactured Park
using Rational Method

Pre-development

Calculated C values - Drainage Basin 1

	Area	C_{100}	C_{50}	C_{25}	C_{10}	C_5	C_2
Gravel	0.04	0.65	0.55	0.5	0.35	0.3	0.25
Greenspace	3.59	0.49	0.45	0.42	0.38	0.36	0.33
Roof	1.94	0.97	0.92	0.88	0.83	0.8	0.75
Concrete	2.17	0.97	0.92	0.88	0.83	0.8	0.75
Total Area =	**7.74**	**0.75**	**0.70**	**0.66**	**0.62**	**0.59**	**0.55**

(C values taken from Table 400-2 of City of Bryant Drainage Manual)

Pasture/Range, Average, 2-7%
Mobile Home/Roof
Concrete/Roof

Stormwater Calcs - Stone Luxury Living Manufactured Park
using Rational Method

Post-development

Calculated C values - Drainage Basin 1

	Area	**C_{100}**	**C_{50}**	**C_{25}**	**C_{10}**	**C_5**	**C_2**	
								(C values taken from Table 400-2 of City of Bryant Drainage Manual)
Sidewalk and Parking Area	1.13	0.97	0.92	0.88	0.83	0.8	0.75	Concrete
Roof	1.31	0.7	0.65	0.6	0.5	0.45	0.4	Roof
Green Space	3.96	0.46	0.42	0.39	0.35	0.32	0.29	Grass-Good Condition, Average 2-7%
Road	1.34	0.95	0.9	0.86	0.81	0.77	0.73	Asphalt
Total Area =	**7.74**	**0.66**	**0.62**	**0.58**	**0.53**	**0.49**	**0.45**	

Stormwater Calcs - Stone Luxury Living Manufactured Park
using Rational Method

Pre-development

Drainage Basin 1

Q_{100} =	37.52	CFS	Q_{50}=	31.97	CFS	Q_{25} =	27.27	CFS	Q_{10} =	22.99	CFS
c =	0.75		c =	0.70		c =	0.66		c =	0.62	
i=	6.50	in/hr	i=	5.90	in/hr	i=	5.30	in/hr	i=	4.80	in/hr
A=	7.74	acres	A=	7.74	acres	A=	7.74	acres	A=	7.74	acres

Q_5 =	19.75	CFS	Q_2 =	15.40	CFS
c =	0.59		c =	0.55	
i=	4.30	in/hr	i=	3.60	in/hr
A=	7.74	acres	A=	7.74	acres

Post-development

Drainage Basin 1

Q_{100} =	36.79	CFS	Q_{50}=	31.43	CFS	Q_{25} =	26.87	CFS	Q_{10} =	21.96	CFS
c =	0.66		c =	0.62		c =	0.58		c =	0.53	
i=	7.20	in/hr	i=	6.60	in/hr	i=	6.00	in/hr	i=	5.40	in/hr
A=	7.74	acres	A=	7.74	acres	A=	7.74	acres	A=	7.74	acres

Q_5 =	18.21	CFS	Q_2 =	14.35	CFS
c =	0.49		c =	0.45	
i=	4.80	in/hr	i=	4.10	in/hr
A=	7.74	acres	A=	7.74	acres

Stormwater Calcs - Stone Luxury Living Manufactured Park
Existing Culverts Capacity

OUTLET CULVERT

Pipe	From	To	Design Flow (cfs):	Slope (ft/ft):	Diameter (inches)	No. Pipes	Manning's	Area Full (sf)	Wetted Perimeter Full (ft)	Hydraulic Radius Full (ft)	Flow Capacity (cfs)
16" HDPE	North	South		0.0106	16	1	0.012	1.40	4.189	0.333333333	8.55

GRAVEL DRIVEWAY CULVERT

Pipe	From	To	Design Flow (cfs):	Slope (ft/ft):	Diameter (inches)	No. Pipes	Manning's	Area Full (sf)	Wetted Perimeter Full (ft)	Hydraulic Radius Full (ft)	Flow Capacity (cfs)
18" CMP	North	South		0.0188	18	1	0.024	1.77	4.712	0.375	7.79
				REVERSE GRADE							

SHOBE ROAD

Pipe	From	To	Design Flow (cfs):	Slope (ft/ft):	Diameter (inches)	No. Pipes	Manning's	Area Full (sf)	Wetted Perimeter Full (ft)	Hydraulic Radius Full (ft)	Flow Capacity (cfs)
24" RCP	WEST	EAST		0.0389	24	1	0.012	3.14	6.283	0.5	48.34

Stormwater Calcs - Stone Luxury Living Manufactured Park

Existing Ditch Capacity

Mannings equation for ditch **Last Section**

n= 0.022 based on n for open channel earth with short grass, few weeds

Depth (ft)	Bottom Width (ft)	Top (ft)	area (ft^2)	rH	slope (ft/ft)	Velocity (ft/s)	Q (cfs)
1.18	0.00	6.60	3.89	0.52	1.250%	4.91	19.11

Mannings equation for ditch **First Section**

n= 0.022 based on n for open channel earth with short grass, few weeds

Depth (ft)	Bottom Width (ft)	Top (ft)	area (ft^2)	rH	slope (ft/ft)	Velocity (ft/s)	Q (cfs)
1.4	0.00	6.50	4.55	0.51	1.500%	5.32	24.21

Mannings equation for ditch **Gravel Driveway Culvert**

n= 0.022 based on n for open channel earth with short grass, few weeds

Depth (ft)	Bottom Width (ft)	Top (ft)	area (ft^2)	rH	slope (ft/ft)	Velocity (ft/s)	Q (cfs)
1.5	0.00	8.00	6.00	0.63	1.500%	6.11	36.67

Stormwater Calcs - Stone Luxury Living Manufactured Park
Proposed Culverts

Pipe	From	To	Design Flow (cfs):	Slope (ft/ft):	Diameter (inches)	No. Pipes	Manning's	Area Full (sf)	Wetted Perimeter Full (ft)	Hydraulic Radius Full (ft)	Flow Capacity (cfs)	% Capacity
18" HDPE	CI-12	CI-11	1.87	0.0100	18	1	0.012	1.77	4.712	0.375	11.38	16%
18" HDPE	CI-11	CI-9	3.82	0.0220	18	1	0.012	1.77	4.712	0.375	16.88	23%
18" HDPE	CI-10	CI-9	1.53	0.0100	18	1	0.012	1.77	4.712	0.375	11.38	13%
18" HDPE	CI-9	CI-8	7.03	0.0170	18	1	0.012	1.77	4.712	0.375	14.84	47%
18" HDPE	CI-8	CI-7	9.03	0.0110	18	1	0.012	1.77	4.712	0.375	11.94	76%
18" HDPE	CI-7	CI-6	13.63	0.0190	18	1	0.012	1.77	4.712	0.375	15.69	87%
18" HDPE	CI-1	CI-2	1.68	0.0100	18	1	0.012	1.77	4.712	0.375	11.38	15%
18" HDPE	CI-2	CI-3	4.47	0.0250	18	1	0.012	1.77	4.712	0.375	17.99	25%
18" HDPE	CI-4	CI-3	1.87	0.0100	18	1	0.012	1.77	4.712	0.375	11.38	16%
18" HDPE	CI-3	CI-5	6.34	0.0120	18	1	0.012	1.77	4.712	0.375	12.47	51%
18" HDPE	CI-5	CI-6	8.29	0.0150	18	1	0.012	1.77	4.712	0.375	13.94	59%
24" HDPE	CI-6	JB-1	27.27	0.0130	24	1	0.012	3.14	6.283	0.5	27.94	98%
GRAVEL DRIVEWAY CULVERT												
29"X18" RCAP	NORTH	SOUTH	27.27	0.0150	24	1	0.012	3.14	6.283	0.5	30.02	91%

GRADING & DRAINAGE NOTES:

1. NOTES ABOUT GRADING & DRAINAGE

SDMH-C1
C=0.53
I=7.20 IN/HR
A=0.44 AC
Q_{10}=1.68 CFS

SDMH-C2
C=0.53
I=7.20 IN/HR
A=0.73 AC
Q_{10}=2.79 CFS

SDMH-C12
C=0.53
I=7.20 IN/HR
A=0.49 AC
Q_{10}=1.87 CFS

SDMH-C4
C=0.53
I=7.20 IN/HR
A=0.49 AC
Q_{10}=1.87 CFS

SDMH-C11
C=0.53
I=7.20 IN/HR
A=0.51 AC
Q_{10}=1.95 CFS

SDMH-C10
C=0.53
I=7.20 IN/HR
A=0.40 AC
Q_{10}=1.53 CFS

SDMH-C3
C=0.53
I=7.20 IN/HR
A=0.65 AC
Q_{10}=2.48 CFS

SDMH-C9
C=0.53
I=7.20 IN/HR
A=0.45 AC
Q_{10}=1.72 CFS

SDMH-C5
C=0.53
I=7.20 IN/HR
A=0.51 AC
Q_{10}=1.95 CFS

SDMH-C6
C=0.53
I=7.20 IN/HR
A=0.40 AC
Q_{10}=1.53 CFS

SDMH-C8
C=0.53
I=7.20 IN/HR
A=0.44 AC
Q_{10}=1.68 CFS

SDMH-C7
C=0.53
I=7.20 IN/HR
A=0.73 AC
Q_{10}=2.79 CFS

FND 5/8" REBAR 128
N 2032144.29
E 1175736.80
361.51'
FND 1" PIPE
FND 5/8" REBAR 128
FND 3/4" PIPE
FND 5/8" REBAR
FND 1" PIPE/FX/NS-E
FND 1/2" REBAR
FND NAIL
FND 2" GALV PIPE

BM-MB1 AV
N 2032190.27
E 1175622.38
ELEV 364.27'

BM-MB2 AV
N 2031964.21
E 1175589.10
ELEV 360.33'

BM-MB3 AV
N 2031704.22
E 1175580.86
ELEV 353.56'

BM-MB4 AV
N 2031383.94
E 1175562.07
ELEV 348.41'

BM-MB5 AV
N 2031391.36
E 1175761.31
ELEV 344.45'

BM-MB6
N 2031980.08
E 1175764.19
ELEV 356.97'

BM-MB7
N 2031606.53
E 1175738.59
ELEV 348.93'

CI-1 4'X4' ARDOT TYPE MO
CI-2 4'X4' ARDOT TYPE MO
CI-3 4'X4' ARDOT TYPE MO
CI-4 4'X4' ARDOT TYPE MO
CI-5 4'X4' ARDOT TYPE MO
CI-6 5'X5' ARDOT TYPE MO
CI-7 4'X4' ARDOT TYPE MO
CI-8 4'X4' ARDOT TYPE MO
CI-9 4'X4' ARDOT TYPE MO
CI-11 4'X4' ARDOT TYPE MO
CI-12 4'X4' ARDOT TYPE MO
JB-1 5'X5' ARDOT TYPE E W_9" BACK OPENING

EX. ATT BOX
EX. MAILBOX
EX. ATT BOX
EX. PUMP STATION
EX. PUMP STATION CONTROL BOX
OHP
6W
RATE =.37'
OPEN GRATE =341.32'
OPEN GRATE =341.44'

0+00
1+00
2+00
3+00
4+00
5+00
6+00
6+56
6+61

50' 25' 0 50'

BY	REVISION	DATE

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STONE LUXURY LIVING
PLANNED UNIT DEVELOPMENT
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PRELIMINARY

CONTENTS:
INLET BASIN MAP

PROJECT NO: 22070
DATE: JUNE 2022
SHEET NO: 1.0

J:\Projects\2022 Projects\22070 Stone Luxury Living Manufactured Park, OD Aspen Dale Cordell, Enterprise Inc 8319 Hwy 5 Bryant, Ar\Drawings\Civil\Cad\Design\22070 Stone Luxury Living 8319 Hwy 5 Bryant, Ar Drainage Design.dwg

Stormwater Calcs - Stone Luxury Living Manufactured Park
using Rational Method
Post Development Flowrates

CI-1

Q_{10} =	1.68	CFS
c =	0.53	
i=	7.20	in/hr
A=	0.44	acres

CI-2

Q_{10} =	2.79	CFS
c =	0.53	
i=	7.20	in/hr
A=	0.73	acres

CI-3

Q_{10} =	2.48	CFS
c =	0.53	
i=	7.20	in/hr
A=	0.65	acres

CI-4

Q_{10} =	1.07	CFS
c =	0.53	
i=	7.20	in/hr
A=	0.28	acres

CI-5

Q_{10} =	2.52	CFS
c =	0.53	
i=	7.20	in/hr
A=	0.66	acres

CI-6

Q_{10} =	1.72	CFS
c =	0.53	
i=	7.20	in/hr
A=	0.45	acres

CI-7

Q_{10} =	2.79	CFS
c =	0.53	
i=	7.20	in/hr
A=	0.73	acres

CI-8

Q_{10} =	1.68	CFS
c =	0.53	
i=	7.20	in/hr
A=	0.44	acres

CI-9

Q_{10} =	1.72	CFS
c =	0.53	
i=	7.20	in/hr
A=	0.45	acres

CI-10

Q_{10} =	1.53	CFS
c =	0.53	
i=	7.20	in/hr
A=	0.40	acres

CI-11

Q_{10} =	1.95	CFS
c =	0.53	
i=	7.20	in/hr
A=	0.51	acres

CI-12

Q_{10} =	1.87	CFS
c =	0.53	
i=	7.20	in/hr
A=	0.49	acres

Stormwater Calcs - Stone Luxury Living Manufactured Park - CURB INLETS

10-YEAR STORM					Weir				
				Q	Q=3.0LY^1.5		Required	Actual	
Area #	Area	I	C	(cfs)	Q (cfs)	Y (ft)	L (ft)	L (ft)	
CI-1	0.44	7.20	0.53	1.68	1.68	0.49	**1.63**	**4**	4' box
CI-2	0.73	7.20	0.53	2.79	2.79	0.49	**2.71**	**4**	4' box
CI-3	0.65	7.20	0.53	2.48	2.48	0.49	**2.41**	**4**	4' box
CI-4	0.49	7.20	0.53	1.87	1.87	0.49	**1.82**	**4**	4' box
CI-5	0.51	7.20	0.53	1.95	1.95	0.49	**1.89**	**4**	4' box
CI-6	0.40	7.20	0.53	1.53	1.53	0.49	**1.48**	**4**	4' box
CI-7	0.73	7.20	0.53	2.79	2.79	0.49	**2.71**	**4**	4' box
CI-8	0.44	7.20	0.53	1.68	1.68	0.49	**1.63**	**4**	4' box
CI-9	0.45	7.20	0.53	1.72	1.72	0.49	**1.67**	**4**	4' box
CI-10	0.40	7.20	0.53	1.53	1.53	0.49	**1.48**	**4**	4' box
CI-11	0.51	7.20	0.53	1.95	1.95	0.49	**1.89**	**4**	4' box
CI-12	0.49	7.20	0.53	1.87	1.87	0.49	**1.82**	**4**	5' box