

ENGINEERING, SURVEYING & LAND PLANNING  
**S R**  
SAVOY, RUGGLES & BOHM, P.A.  
P.A.

FINAL DRAINAGE PLAN  
FOR  
BRENTWOOD SOUTH ADDITION  
WICHITA  
SEDGWICK COUNTY, KANSAS

JUNE 8, 2001

# BRENTWOOD SOUTH ADDITION DRAINAGE ANALYSIS

June 7, 2001

## INTRODUCTION

This report contains supporting documentation and calculations for the proposed storm water sewer system serving Brentwood South Addition. The existing site is an undeveloped 80 acre tract approximately ¼ mile east of Webb Road and north of Pawnee Avenue. The site is currently pasture with tree rows along both sides and across the property. There is existing offsite drainage to the site from both the east and the west.

The site will be developed with single family residences with an onsite detention pond to control storm runoff. The detention pond has been sized to handle the future undetained developed runoff from the proposed Maple Shade Addition and another 7.1 acre area south of Christ Community Church Addition. It is also designed to receive the existing runoff from Christ Community Church Addition.

## HYDROLOGY

The HEC-HMS (HEC-1) computer model is used to determine the peak flow rates for the system based on system flow time, soil types, and peaking coefficients. The 100 year water surface for the proposed detention pond is 1366.5 based on this analysis. The HEC-HMS output is included in this report. The rational method for determining peak flows is used for the storm water sewer basins located within the plat.

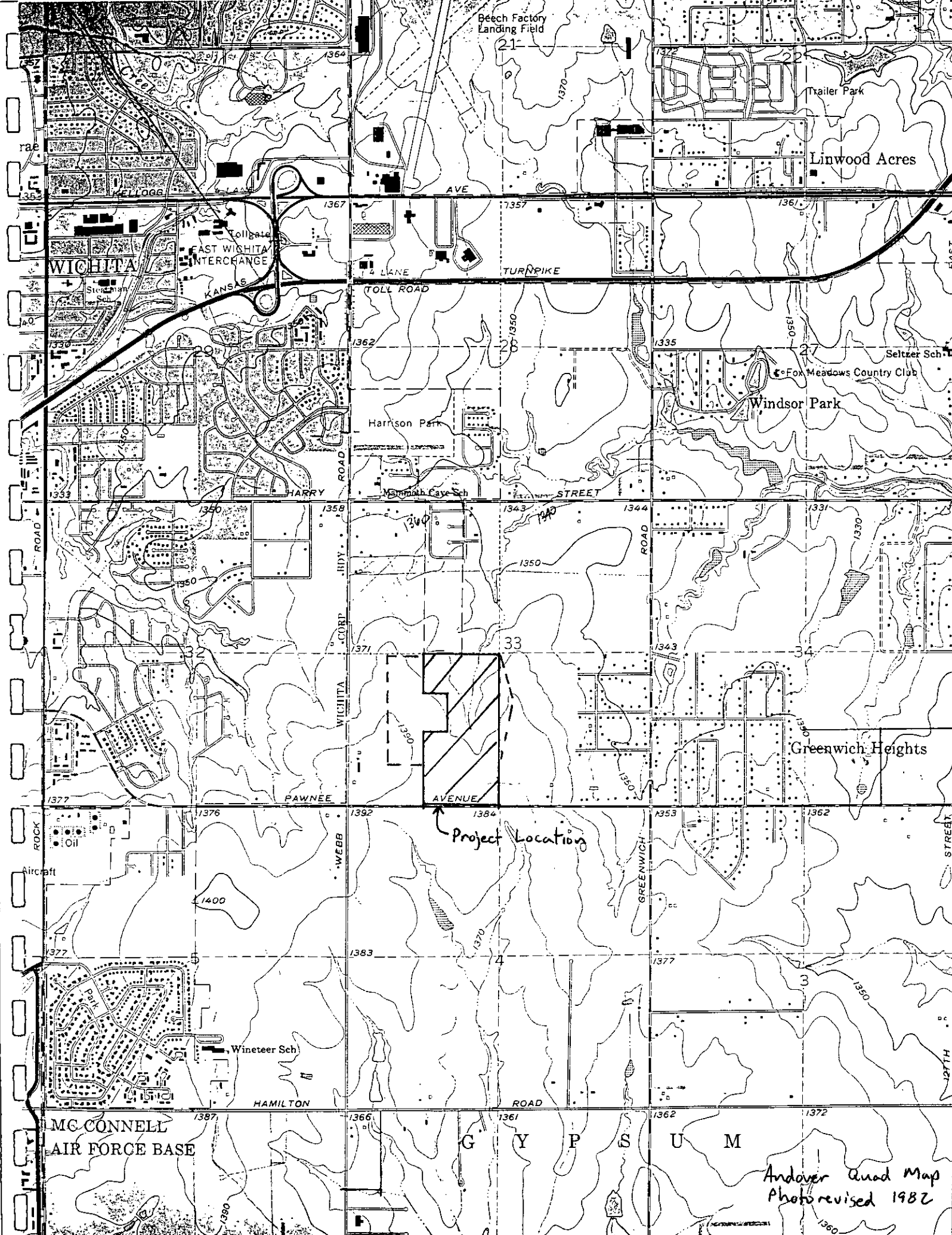
## HYDRAULICS

The StormCAD computer model by Haestad Methods, Inc. is used in the analysis of the storm water sewer system. This model determines the peak flow rates and pipe capacities based on input data taken from survey information and the City of Wichita design criteria for drainage and storm sewer systems. The StormCAD computer model then routes the flow rates through the pipe system to determine the hydraulic grade line of the system. The hydraulic grade line is the depth of flow in the pipes or the level that water will rise to in structures connected to the pipes. The output from the analysis of the storm sewer for the 100-year frequency event can be found in this report.

CONCLUSION

According to the analysis of the 100-year frequency storm, the proposed storm sewer and pond system will discharge less than the existing discharge into the existing drainage channel at the north end of the proposed addition. With the exception of line 2, all storm water drain systems shown on this plan are designed to carry the 100-year frequency rainfall event. Line 2 has been designed to overtop into the adjacent reserve and thence into the proposed detention pond through the existing drainage swale that runs through the middle of the site.

The Consulting Engineer may reduce the size of pipes to the 2-year frequency rainfall event during design provided that the street and lot grading allows for conveyance of the 100-year frequency rainfall event without damage to any properties located outside the street right-of-way. All calculations shall be submitted to the City Engineer for approval prior to construction of the storm water sewer system.



Beech Factory  
Landing Field

Trailer Park

Linwood Acres

WICHITA

EAST WICHITA  
INTERCHANGE

KANSAS

TOLL ROAD

TURNPIKE

Seltzer Sch

Fox Meadows Country Club

Windsor Park

Harrison Park

McDonough Cays Sch

STREET

1362

1350

1344

1331

1350

1358

1343

1343

1330

1371

1350

1343

1330

1350

1377

1350

1343

1330

1376

1392

1384

1353

1362

1400

1383

1370

1377

1362

1377

1383

1370

1377

1362

1387

1366

1361

1362

1372

MC CONNELL  
AIR FORCE BASE

G Y P S U M

Andover Quad Map  
Photo revised 1982

Project Location

1362

1350

1344

1331

1350

1358

1343

1343

1330

1371

1350

1343

1330

1350

1377

1350

1343

1330

1376

1392

1384

1353

1362

1400

1383

1370

1377

1362

1377

1383

1370

1377

1362

1387

1366

1361

1362

1372

MC CONNELL  
AIR FORCE BASE

G Y P S U M

Andover Quad Map  
Photo revised 1982

Project Location

1362

1350

1344

1331

1350

1358

1343

1343

1330

1371

1350

1343

1330

1350

1377

1350

1343

1330

1376

1392

1384

1353

1362

1400

1383

1370

1377

1362

1377

1383

1370

1377

1362

1387

1366

1361

1362

1372

MC CONNELL  
AIR FORCE BASE

G Y P S U M

Andover Quad Map  
Photo revised 1982

Project Location

1362

1350

1344

1331

1350

1358

1343

1343

1330

1371

1350

1343

1330

1350

1377

1350

1343

1330

1376

1392

1384

1353

1362

1400

1383

1370

1377

1362

1377

1383

1370

1377

1362

1387

1366

1361

1362

1372

MC CONNELL  
AIR FORCE BASE

G Y P S U M

Andover Quad Map  
Photo revised 1982

Project Location

1362

1350

1344

1331

1350

1358

1343

1343

1330

1371

1350

1343

1330

1350

1377

1350

1343

1330

1376

1392

1384

1353

1362

1400

1383

1370

1377

1362

1377

1383

1370

1377

1362

1387

1366

1361

1362

1372

MC CONNELL  
AIR FORCE BASE

G Y P S U M

Andover Quad Map  
Photo revised 1982

Project Location

1362

1350

1344

1331

1350

1358

1343

1343

1330

1371

1350

1343

1330

1350

1377

1350

1343

1330

1376

1392

1384

1353

1362

1400

1383

1370

1377

1362

1377

1383

1370

1377

1362

1387

1366

1361

1362

1372

MC CONNELL  
AIR FORCE BASE

G Y P S U M

Andover Quad Map  
Photo revised 1982

Project Location

1362

1350

1344

1331

1350

1358

1343

1343

1330

1371

1350

1343

1330

1350

1377

1350

1343

1330

1376

1392

1384

1353

1362

1400

1383

1370

1377

1362

1377

1383

1370

1377

1362

1387

1366

1361

1362

1372

MC CONNELL  
AIR FORCE BASE

G Y P S U M

Andover Quad Map  
Photo revised 1982

Project Location

1362

1350

1344

1331

1350

1358

1343

1343

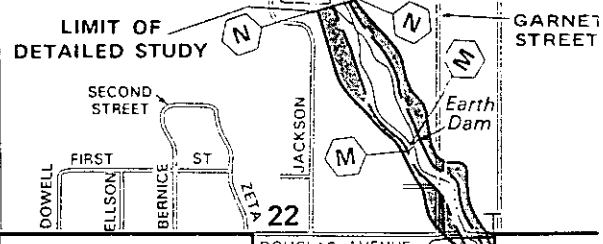
1330

1371

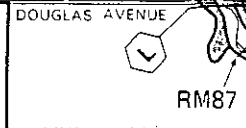
1350

13

FEMA FIRM 200321 0225  
June 3, 1986



21

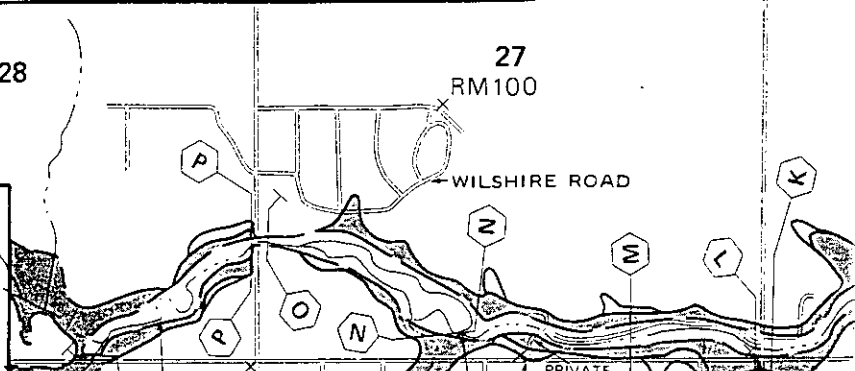


RM87

City of Wichita  
AREA NOT INCLUDED

28

27  
RM100



RM102

RM101  
Spring Branch

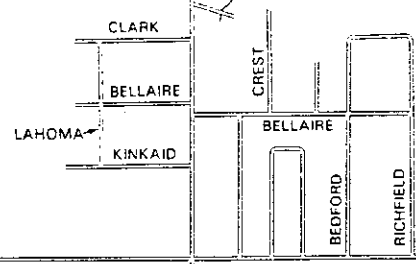
RM99

RM98

33

34

City of Wichita  
AREA NOT INCLUDED



PAWNEE

Project Location

5

4

3

ROAD

GREENWICH

STREET

HAMILTON

HEC-RMS  
(HEC-1)  
DATA

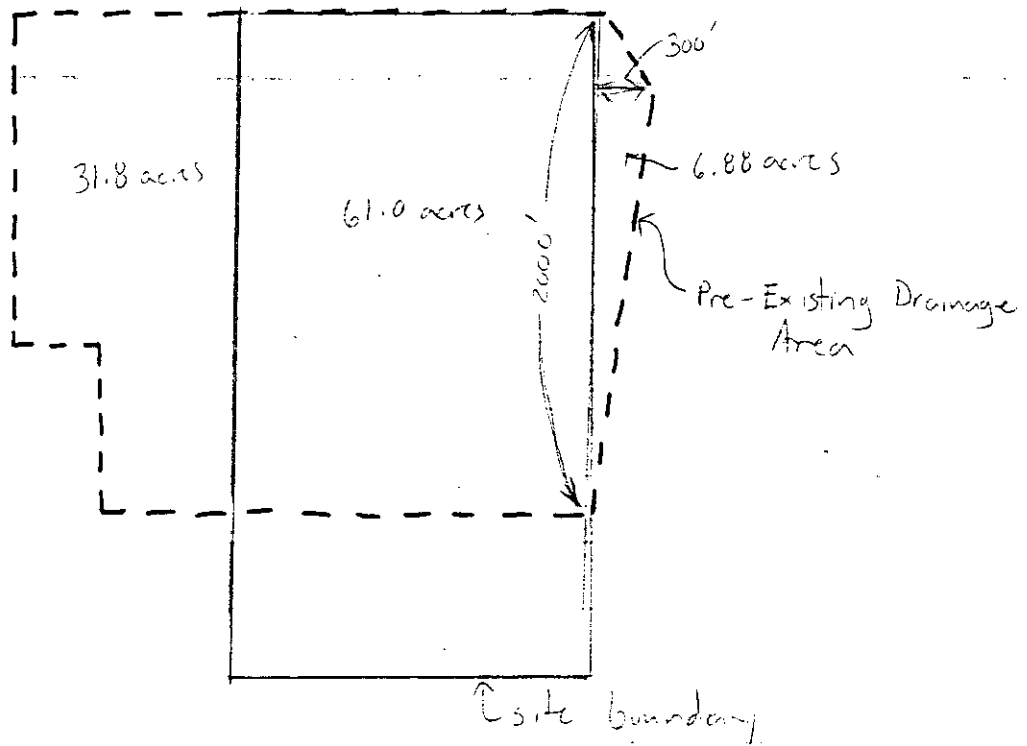
SRB

SAVOY, RUGGLES & BOHM, P.A.

# Brentwood South Pond Design

RWL 6-7-01

## Pre-Developed Area



Total Area =  $31.8 + 61.0 + 6.9 = 99.7$  acres = 0.16 sq. mi

SCS Curve Number = 84 (Type D Soil - Pasture)

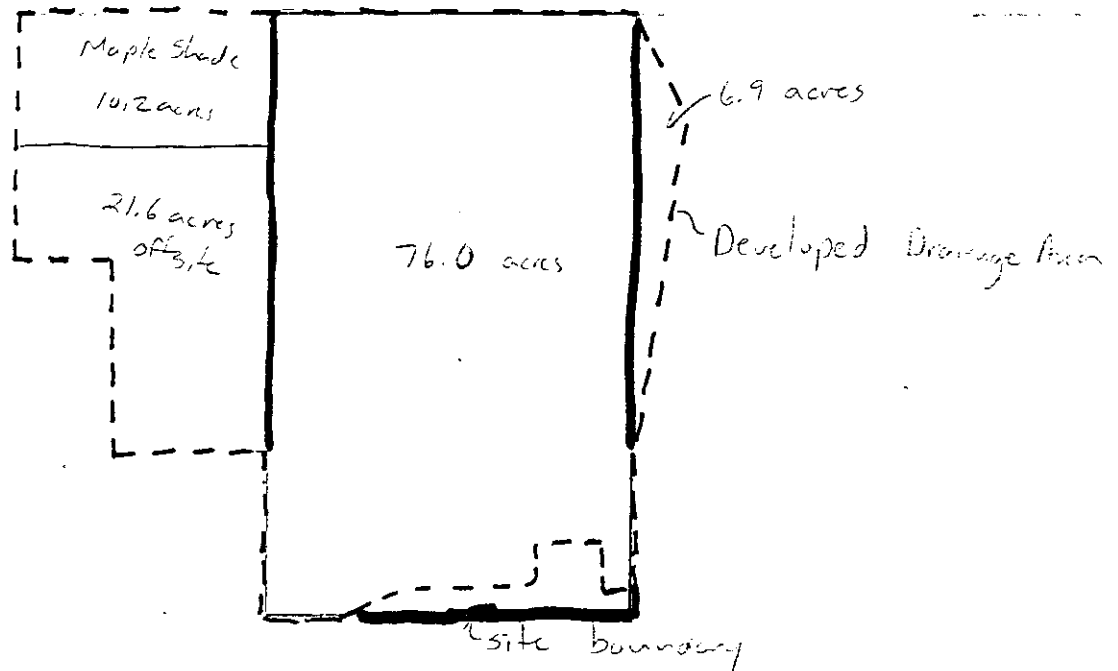
$T_c = 46.1$  minutes (2200 ft gross flow) velocity method

SCS Lag =  $0.6 T_c = 0.6 (46.1) = 27.7$  minutes

From HEC-1  $Q_{100} = 391.0$  cfs

Brentwood South Pond Design

KUL 6-7-01

Developed SiteMaple Shade off-site

10.2 acres

CN = 90

 $T_c = 25$  minutesSCS Lag =  $0.6 T_c = 15$  minutesOther off-site

28.5 acres

CN = 84

 $T_c = 25$  minutesSCS Lag =  $0.6 T_c = 15$  minutesOnsite

76.0 acres

CN = 90

38% Impervious (1/4 acre lots)

 $T_c = 30$  minutesSCS Lag =  $0.6 T_c = 18$  minutes

Pond Info

Static Pool = 1362.5

Outlet structure 2 - 8'x4' RCBC L=120'

<u>Elevation</u>	<u>Area (acres)</u>	<u>Q (cfs) from HY-8</u>
1362.5	3.10	0
1363	3.33	14
1364	3.81	74
1365	4.31	163
1366	4.81	272
1366.5	5.16	330
1367	5.51	382
1368	6.60	483

HMS \* Summary of Results for Existing Basin

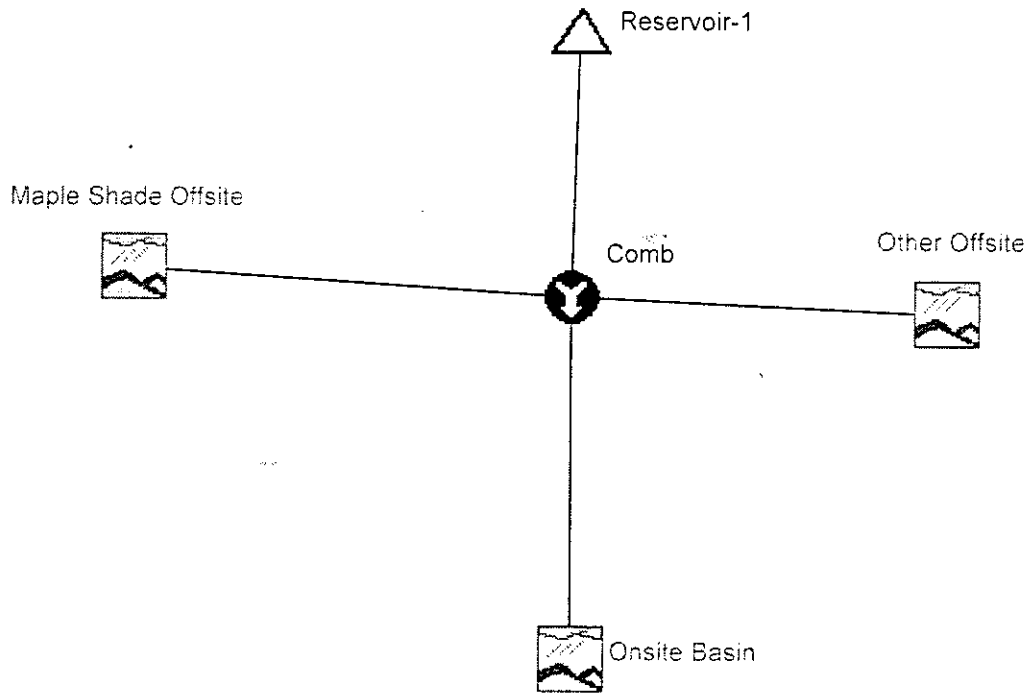
Project : Brentwood South

Run Name : Existing Basin

Start of Run : 24Apr01 0000 Basin Model : Basin 1  
End of Run : 24Apr01 2400 Met. Model : 100 year  
Execution Time : 07Jun01 1108 Control Specs : Control 1

Computed Results

Peak Discharge	: 391.03 (cfs)	Date/Time of Peak Discharge	: 24 Apr 01 1220
Total Precipitation	: 7.80 (in)	Total Direct Runoff	: 5.85 (in)
Total Loss	: 1.90 (in)	Total Baseflow	: 0.00 (in)
Total Excess	: 5.90 (in)	Total Discharge	: 5.85 (in)



# HMS \* Summary of Results

Project : Brentwood South Pond

Run Name : Developed

Start of Run : 24Apr01 0000 Basin Model : Basin 2  
 End of Run : 24Apr01 2400 Met. Model : 100 year  
 Execution Time : 07Jun01 1313 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
Maple Shade Offsite	61.348	24 Apr 01 1205	6.1231	0.016
Subbasin-1	418.69	24 Apr 01 1210	44.598	0.119
Other Offsite	115.70	24 Apr 01 1205	10.654	0.034
Comb	593.78	24 Apr 01 1210	61.376	0.169
Reservoir-1	329.92	24 Apr 01 1225	60.247	0.169

HMS \* Summary of Results for Reservoir-1

Project : Brentwood South      Run Name : Developed

Start of Run : 24Apr01 0000    Basin Model : Basin 2  
End of Run : 24Apr01 2400    Met. Model : 100 year  
Execution Time : 07Jun01 1204    Control Specs : Control 1

Computed Results

Peak Inflow : 630.95 (cfs)    Date/Time of Peak Inflow : 24 Apr 01 1210  
Peak Outflow : 347.63 (cfs)    Date/Time of Peak Outflow : 24 Apr 01 1225  
Total Inflow : 6.75 (in)      Peak Storage : 17.186 (in)  
Total Outflow : 6.63 (in)      Peak Elevation : 1366.7 (in)

HMS \* Summary of Results for Maple Shade

Offsite

Project : Brentwood South

Run Name : Developed

Start of Run : 24Apr01 0000 Basin Model : Basin 2

End of Run : 24Apr01 2400 Met. Model : 100 year

Execution Time : 07Jun01 1204 Control Specs : Control 1

Computed Results

Peak Discharge : 61.348 (cfs) Date/Time of Peak Discharge : 24 Apr 01 1205

Total Precipitation : 7.80 (in) Total Direct Runoff : 7.18 (in)

Total Loss : 0.60 (in) Total Baseflow : 0.00 (in)

Total Excess : 7.20 (in) Total Discharge : 7.18 (in)

HMS \* Summary of Results for Onsite Basin

Project : Brentwood South

Run Name : Developed

Start of Run : 24Apr01 0000 Basin Model : Basin 2

End of Run : 24Apr01 2400 Met. Model : 100 year

Execution Time : 07Jun01 1204 Control Specs : Control 1

Computed Results

Peak Discharge	: 418.69 (cfs)	Date/Time of Peak Discharge	: 24 Apr 01 1210
Total Precipitation	: 7.80 (in)	Total Direct Runoff	: 7.03 (in)
Total Loss	: 0.74 (in)	Total Baseflow	: 0.00 (in)
Total Excess	: 7.06 (in)	Total Discharge	: 7.03 (in)

HMS \* Summary of Results for Other Offsite

Project : Brentwood South      Run Name : Developed

Start of Run : 24Apr01 0000    Basin Model : Basin 2  
End of Run : 24Apr01 2400    Met. Model : 100 year  
Execution Time : 07Jun01 1204    Control Specs : Control 1

Computed Results

Peak Discharge : 153.13 (cfs)    Date/Time of Peak Discharge : 24 Apr 01 1205  
Total Precipitation : 7.80 (in)    Total Direct Runoff : 5.88 (in)  
Total Loss : 1.90 (in)    Total Baseflow : 0.00 (in)  
Total Excess : 5.90 (in)    Total Discharge : 5.88 (in)

HMS \* Summary of Results for Comb

Project : Brentwood South

Run Name : Developed

Start of Run : 24Apr01 0000 Basin Model : Basin 2

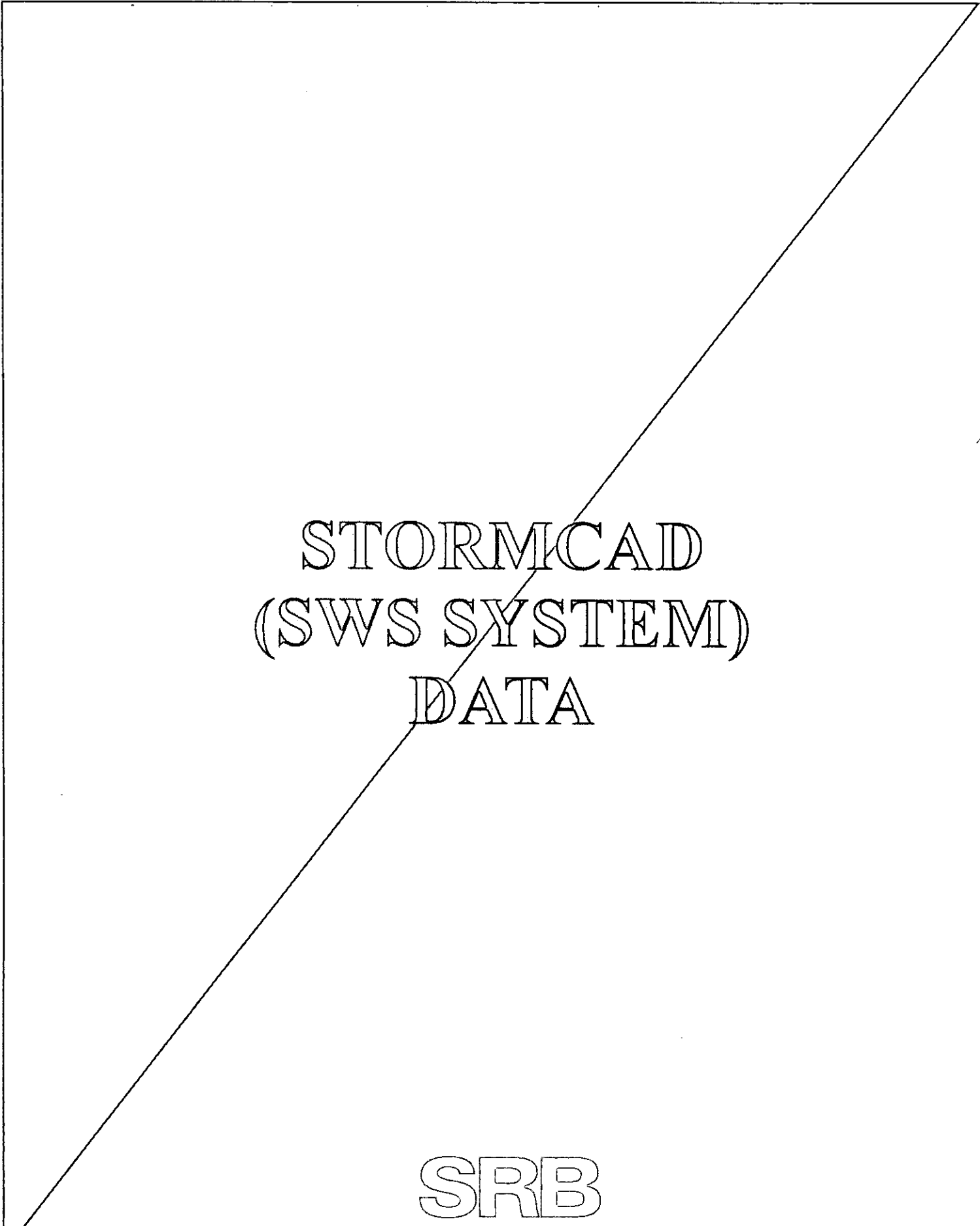
End of Run : 24Apr01 2400 Met. Model : 100 year

Execution Time : 07Jun01 1204 Control Specs : Control 1

Computed Results

Peak Outflow : 630.95 (cfs) Date/Time of Peak Outflow : 24 Apr 01 1210

Total Outflow : 6.75 (in)



STORMCAD  
(SWS SYSTEM)  
DATA

SRB

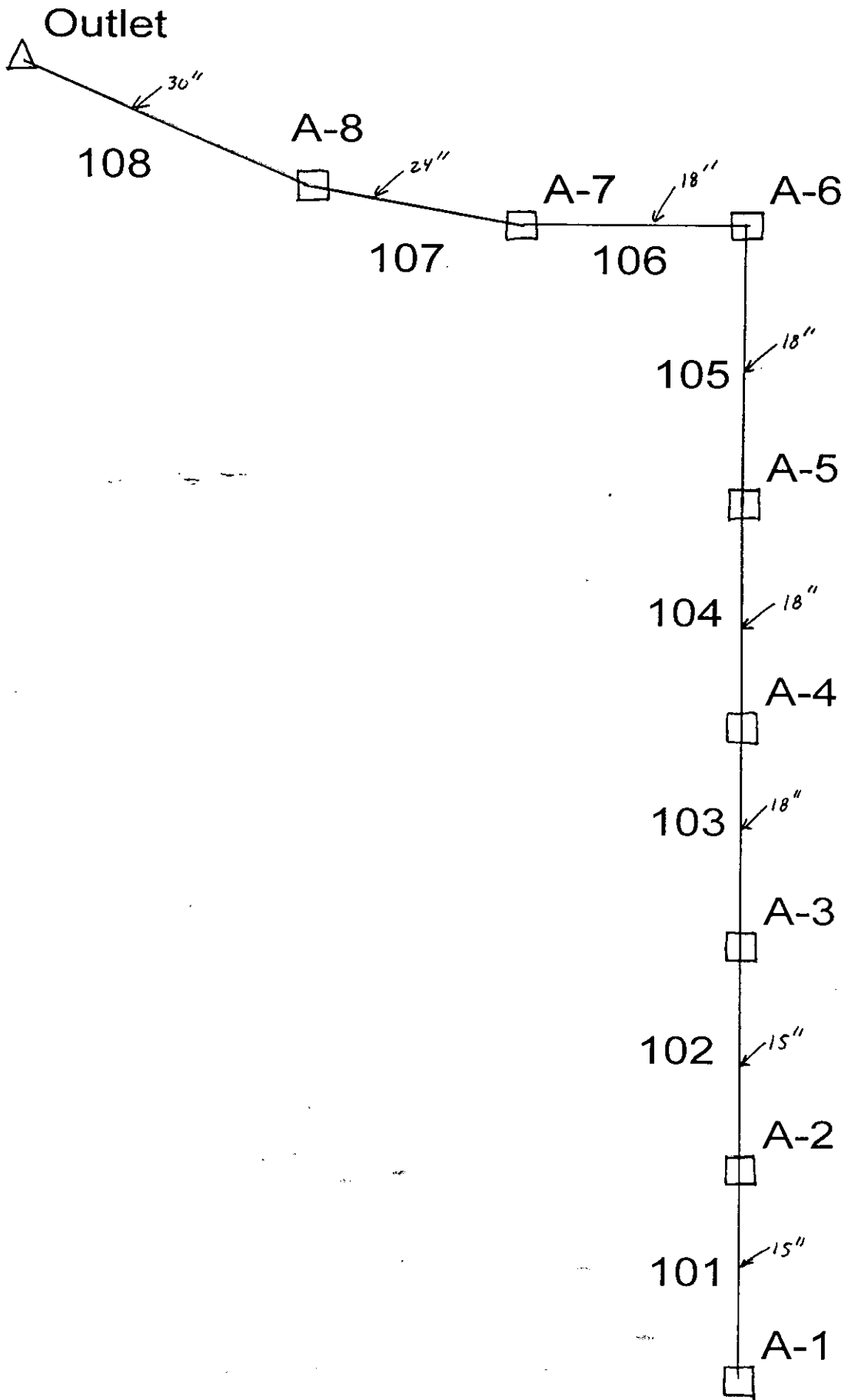
SAVOY, RUGGLES & BOHM, P.A.

**BRENTWOOD SOUTH ADDITION  
DRAINAGE SUMMARY  
June 7, 2001**

AREA		Tc (Min.)	Soil Type "D"		I2	I100	Q2	Q100
No.	Acres		C2	C100				
A1	0.39	15	0.30	0.65	3.73	7.37	0.44	1.87
A2	0.31	15	0.30	0.65	3.73	7.37	0.35	1.49
A3	0.33	15	0.30	0.65	3.73	7.37	0.37	1.58
A4	0.48	15	0.30	0.65	3.73	7.37	0.54	2.30
A5	0.35	15	0.30	0.65	3.73	7.37	0.39	1.68
A6	0.27	15	0.30	0.65	3.73	7.37	0.30	1.29
A7	2.03	15	0.50	0.76	3.73	7.37	3.79	11.37
A8	1.65	15	0.50	0.76	3.73	7.37	3.08	9.24
B1	0.51	15	0.30	0.65	3.73	7.37	0.57	2.44
B2	0.58	15	0.30	0.65	3.73	7.37	0.65	2.78
B3	1.04	15	0.30	0.65	3.73	7.37	1.16	4.98
* B4	4.36	19	0.50	0.76	3.42	6.68	7.46	22.13
* B5	3.05	19	0.50	0.76	3.42	6.68	5.22	15.48
C1	2.28	19.6	0.30	0.65	3.39	6.59	2.32	9.77
C2	0.37	15	0.30	0.65	3.73	7.37	0.41	1.77
C3	0.97	15	0.50	0.76	3.73	7.37	1.81	5.43
C4	1.56	15	0.50	0.76	3.73	7.37	2.91	8.74
C5	0.77	15	0.30	0.65	3.73	7.37	0.86	3.69
* D1	2.57	22	0.50	0.76	3.17	6.28	4.07	12.27
D2	5.26	22	0.50	0.76	3.17	6.28	8.34	25.10
E1	3.68	15	0.50	0.76	3.73	7.37	6.86	20.61
E2	1.44	15	0.50	0.76	3.73	7.37	2.69	8.07
F1	2.09	15	0.50	0.76	3.73	7.37	3.90	11.71
F2	4.41	15	0.50	0.76	3.73	7.37	8.22	24.70
F3	0.65	15	0.30	0.65	3.73	7.37	0.73	3.11
F4	0.63	15	0.50	0.76	3.73	7.37	1.17	3.53
G	2.39	15	0.50	0.76	3.73	7.37	4.46	13.39
H	2.18	15	0.50	0.76	3.73	7.37	4.07	12.21
I	19.21	15	0.40	0.70	3.73	7.37	28.66	99.10
OS1	2.00	15	0.50	0.76	3.73	7.37	3.73	11.20
OS2	3.85	20.5	0.30	0.65	3.73	7.37	4.31	18.44
OS3	0.98	15	0.30	0.65	3.73	7.37	1.10	4.69
OS4	9.93	19	0.30	0.65	3.42	6.68	10.19	43.12
OS5	10.20	15	0.57	0.79	3.73	7.37	21.69	59.39
OS6	2.83	15	0.50	0.76	3.73	7.37	5.28	15.85
OS7	2.00	15	0.50	0.76	3.73	7.37	3.73	11.20

Note: Runoff generated by StormCAD may be lower due to increased system time of concentration

\* These areas drain to sumps that allow 100 year overflow or served by bypass inlets.  
See StormCAD output for inlet flows



## Combined Pipe/Node Report

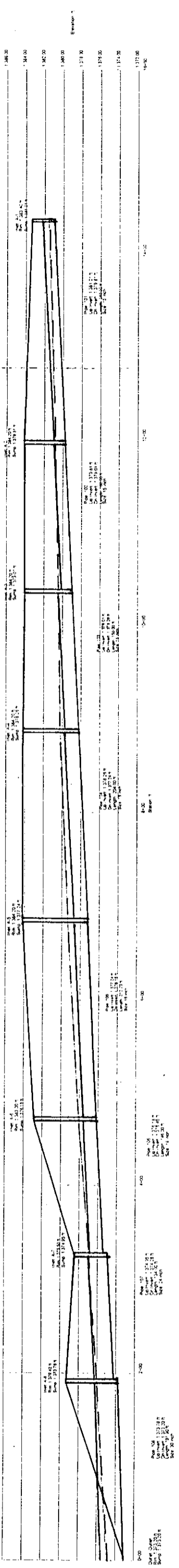
Pipe	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	Inlet Q (cfs)	Size	Cap (cfs)	V avg (ft/s)	Up Invert (ft)	Dn Invert (ft)	S (ft/ft)
101	A-1	A-2	240.00	0.39	0.65	0.25	0.25	1.86	15 inch	4.57	2.61	1,381.01	1,379.81	0.005000
102	A-2	A-3	160.00	0.31	0.65	0.20	0.46	1.52	15 inch	4.57	2.80	1,379.81	1,379.01	0.005000
103	A-3	A-4	150.00	0.33	0.65	0.21	0.67	1.59	18 inch	7.43	2.66	1,379.01	1,378.26	0.005000
104	A-4	A-5	204.00	0.48	0.65	0.31	0.98	2.32	18 inch	7.43	3.80	1,378.26	1,377.24	0.005000
105	A-5	A-6	212.70	0.35	0.65	0.23	1.21	1.69	18 inch	7.42	4.58	1,377.24	1,376.18	0.004984
106	A-6	A-7	146.00	0.27	0.65	0.18	1.38	1.30	18 inch	7.43	5.15	1,376.18	1,375.45	0.005000
107	A-7	A-8	134.00	2.03	0.76	1.54	2.93	11.46	24 inch	16.00	6.23	1,374.95	1,374.28	0.005000
108	A-8	Outlet	191.90	1.65	0.76	1.25	4.18	9.32	30 inch	22.55	6.49	1,373.78	1,373.20	0.003022

## Node Report

Node	Inlet A (acres)	C	Up Flow Time (min)	Sys Flow Time (min)	Q (cfs)	Rim (ft)	Gr Elev (ft)	HGL In (ft)	HGL Out (ft)	Sump (ft)	Add. Q (cfs)	Known Flow (cfs)
A-1	0.39	0.65	0.00	15.00	1.86	1,383.40	1,383.40	1,381.57	1,381.57	1,381.01	0.00	0.00
A-2	0.31	0.65	16.54	16.54	3.26	1,384.20	1,384.20	1,380.87	1,380.87	1,379.81	0.00	0.00
A-3	0.33	0.65	17.50	17.50	4.69	1,384.20	1,384.20	1,380.50	1,380.50	1,379.01	0.00	0.00
A-4	0.48	0.65	18.44	18.44	6.72	1,384.20	1,384.20	1,380.20	1,380.20	1,378.26	0.00	0.00
A-5	0.35	0.65	19.34	19.34	8.09	1,384.20	1,384.20	1,379.37	1,379.37	1,377.24	0.00	0.00
A-6	0.27	0.65	20.11	20.11	9.09	1,383.00	1,383.00	1,378.10	1,378.10	1,376.18	0.00	0.00
A-7	2.03	0.76	20.58	20.58	19.05	1,378.50	1,378.50	1,377.01	1,377.01	1,374.95	0.00	0.00
A-8	1.65	0.76	20.94	20.94	27.02	1,379.42	1,379.42	1,376.08	1,376.08	1,373.78	0.00	0.00
Outlet	N/A	N/A	21.44	21.44	N/A	1,373.20	1,373.20	1,374.97	1,374.97	1,373.20	N/A	N/A

# Pipe Report

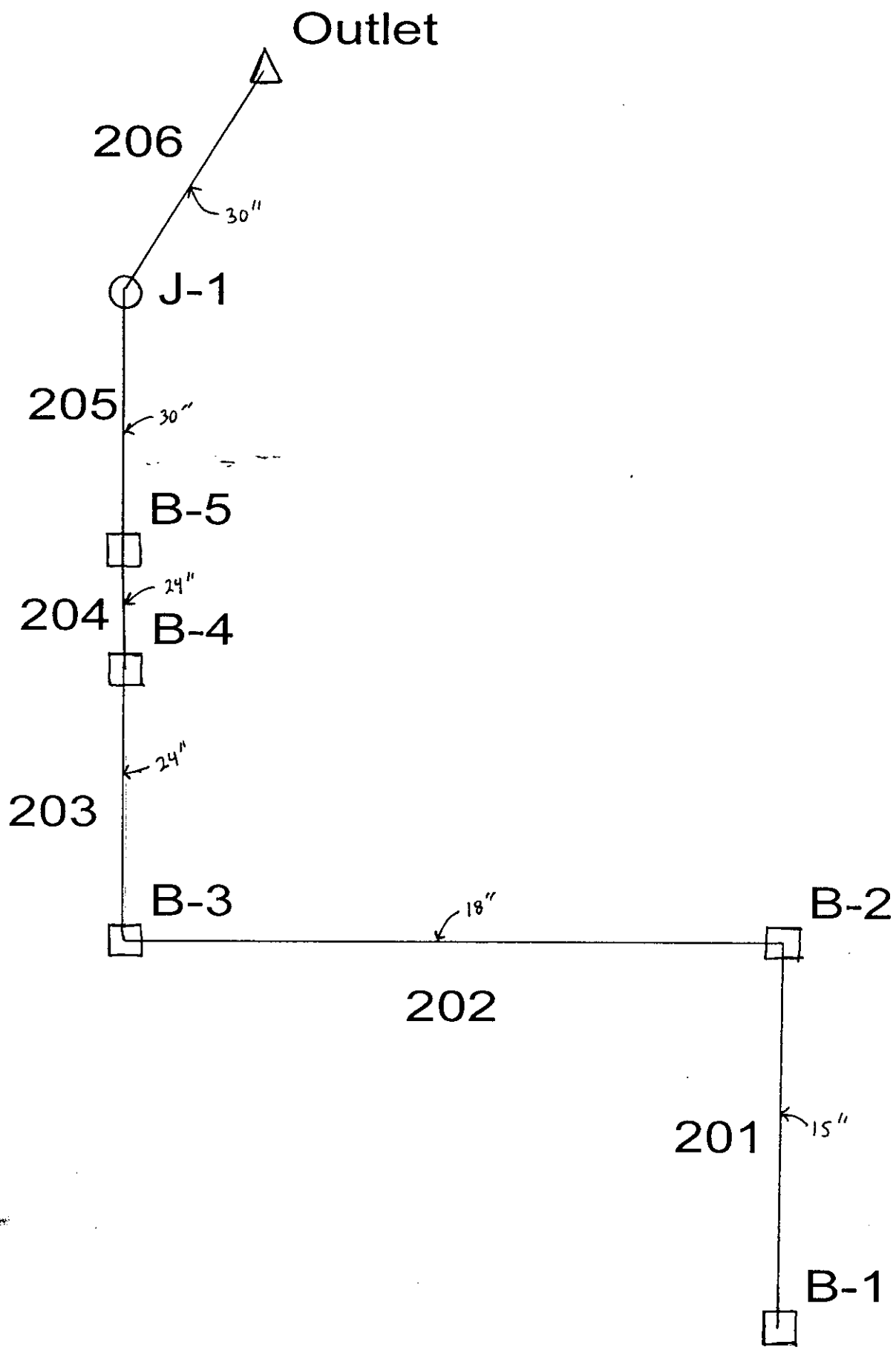
Pipe	Up Node	Dn Node	Q (cfs)	Length (ft)	S (ft/ft)	Size	Roughness	Cap (cfs)	Up Invert (ft)	Dn Invert (ft)	Up Cover (ft)	Dn Cover (ft)	Up HGL (ft)	Dn HGL (ft)
101	A-1	A-2	1.86	240.00	0.005000	15 inch	0.013	4.57	1,381.01	1,379.81	1.14	3.14	1,381.57	1,380.87
102	A-2	A-3	3.26	160.00	0.005000	15 inch	0.013	4.57	1,379.81	1,379.01	3.14	3.94	1,380.87	1,380.50
103	A-3	A-4	4.69	150.00	0.005000	18 inch	0.013	7.43	1,379.01	1,378.26	3.69	4.44	1,380.50	1,380.20
104	A-4	A-5	6.72	204.00	0.005000	18 inch	0.013	7.43	1,378.26	1,377.24	4.44	5.46	1,380.20	1,379.37
105	A-5	A-6	8.09	212.70	0.004984	18 inch	0.013	7.42	1,377.24	1,376.18	5.46	5.32	1,379.37	1,378.10
106	A-6	A-7	9.09	146.00	0.005000	18 inch	0.013	7.43	1,376.18	1,375.45	5.32	1.55	1,378.10	1,377.01
107	A-7	A-8	19.05	134.00	0.005000	24 inch	0.013	16.00	1,374.95	1,374.28	1.55	3.14	1,377.01	1,376.08
108	A-8	Outlet	27.02	191.90	0.003022	30 inch	0.013	22.55	1,373.78	1,373.20	3.14	-2.50	1,376.08	1,374.97
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A



Project Title: Brentwood South  
 f:\haestad\mcbrentwood\southline1.stm  
 06/08/01 08:49:20 AM

Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 (203) 755-1666

Project Engineer: Kenneth Lee, P.E.  
 StormCAD v1.0  
 Page 1 of 1



## Combined Pipe/Node Report

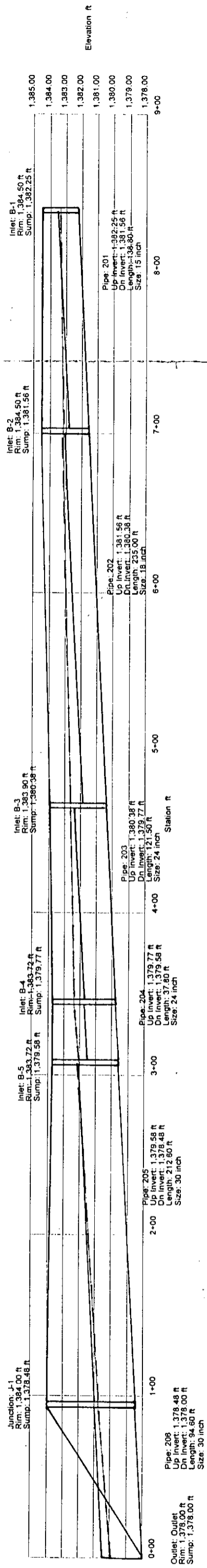
Pipe	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	Inlet Q (cfs)	Size	Cap (cfs)	V avg (ft/s)	Up Invert (ft)	Dn Invert (ft)	S (ft/ft)
201	B-1	B-2	138.80	0.51	0.65	0.33	0.33	2.46	15 inch	4.57	2.07	1,382.25	1,381.56	0.005000
202	B-2	B-3	235.00	0.58	0.65	0.38	0.71	2.80	18 inch	7.43	2.90	1,381.56	1,380.38	0.005000
203	B-3	B-4	121.50	1.04	0.65	0.68	1.38	5.02	24 inch	16.00	3.09	1,380.38	1,379.77	0.005000
204	B-4	B-5	37.80	0.1e-2	0.76	0.76e-3	1.39	0.01	24 inch	16.00	6.80	1,379.77	1,379.58	0.005000
205	B-5	J-1	212.60	0.1e-2	0.76	0.76e-3	1.39	0.01	30 inch	29.53	6.96	1,379.58	1,378.48	0.005184
206	J-1	Outlet	94.60	N/A	N/A	N/A	1.39	N/A	30 inch	29.29	7.56	1,378.48	1,378.00	0.005100

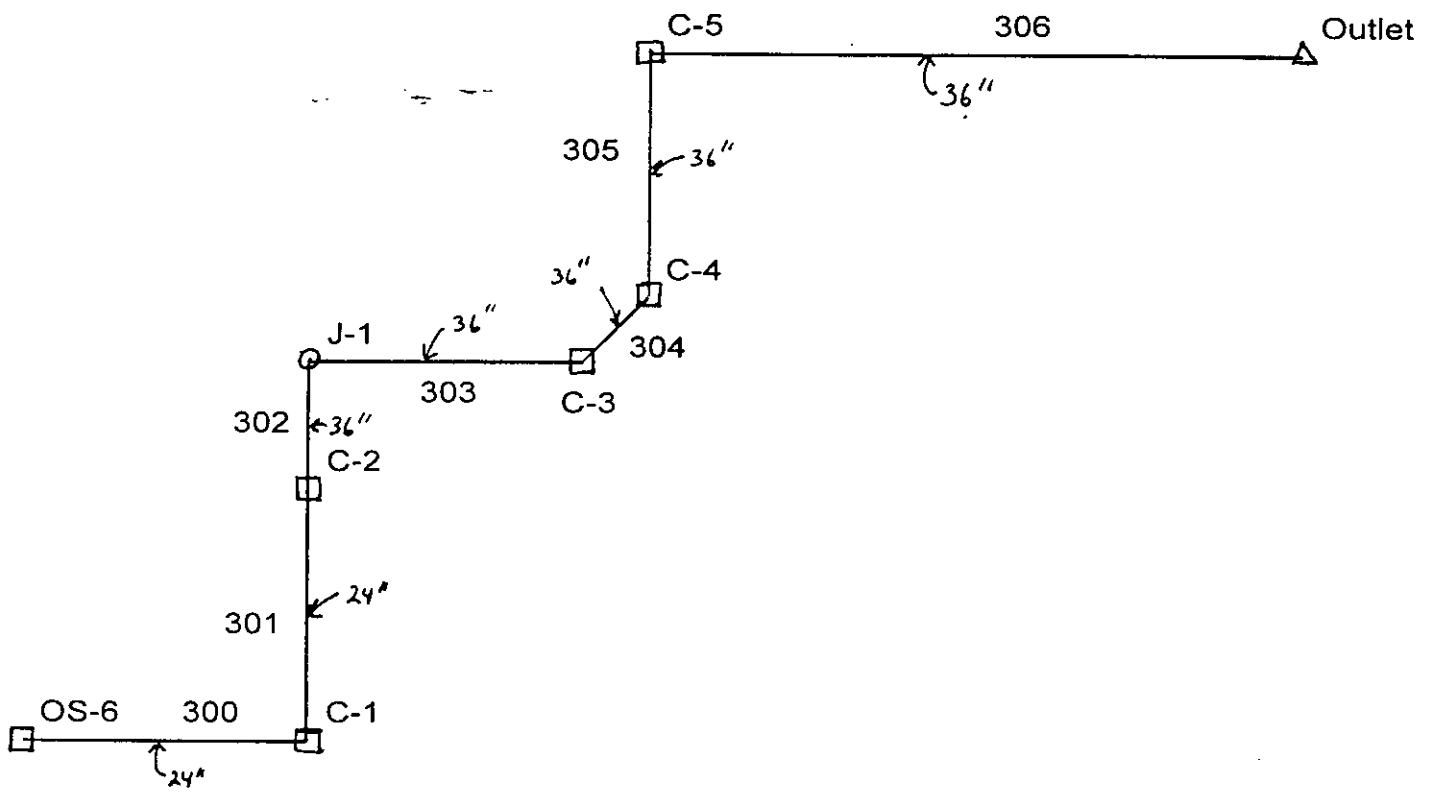
## Node Report

Node	Inlet A (acres)	C	Up Flow Time (min)	Sys Flow Time (min)	Q (cfs)	Rim (ft)	Gr Elev (ft)	HGL In (ft)	HGL Out (ft)	Sump (ft)	Add. Q (cfs)	Known Flow (cfs)
B-1	0.51	0.65	0.00	15.00	2.46	1,384.50	1,384.50	1,383.36	1,383.36	1,382.25	0.00	0.00
B-2	0.58	0.65	16.12	16.13	5.13	1,384.50	1,384.50	1,383.17	1,383.17	1,381.56	0.00	0.00
B-3	1.04	0.65	17.48	17.48	9.70	1,383.90	1,383.90	1,382.61	1,382.61	1,380.38	0.00	0.00
B-4	0.1e-2	0.76	18.13	19.00	21.35	1,383.72	1,383.72	1,382.39	1,382.39	1,379.77	12.00	0.00
B-5	0.1e-2	0.76	19.09	19.10	33.33	1,383.72	1,383.72	1,382.05	1,382.05	1,379.58	12.00	0.00
J-1	N/A	N/A	19.61	19.61	33.21	1,384.00	1,384.00	1,380.76	1,380.76	1,378.48	N/A	N/A
Outlet	N/A	N/A	19.82	19.82	N/A	1,378.00	1,378.00	1,379.96	1,379.96	1,378.00	N/A	N/A

# Pipe Report

Pipe	Up Node	Dn Node	Q (cfs)	Length (ft)	S (ft/ft)	Size	Roughness	Cap (cfs)	Up Invert (ft)	Dn Invert (ft)	Up Cover (ft)	Dn Cover (ft)	Up HGL (ft)	Dn HGL (ft)
201	B-1	B-2	2.46	138.80	0.005000	15 inch	0.013	4.57	1,382.25	1,381.56	1.00	1.69	1,383.36	1,383.17
202	B-2	B-3	5.13	235.00	0.005000	18 inch	0.013	7.43	1,381.56	1,380.38	1.44	2.02	1,383.17	1,382.61
203	B-3	B-4	9.70	121.50	0.005000	24 inch	0.013	16.00	1,380.38	1,379.77	1.52	1.95	1,382.61	1,382.39
204	B-4	B-5	21.35	37.80	0.005000	24 inch	0.013	16.00	1,379.77	1,379.58	1.95	2.14	1,382.39	1,382.05
205	B-5	J-1	33.33	212.60	0.005184	30 inch	0.013	29.53	1,379.58	1,378.48	1.64	3.02	1,382.05	1,380.76
206	J-1	Outlet	33.21	94.60	0.005100	30 inch	0.013	29.29	1,378.48	1,378.00	3.02	2.50	1,380.76	1,379.96
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A





## Combined Pipe/Node Report

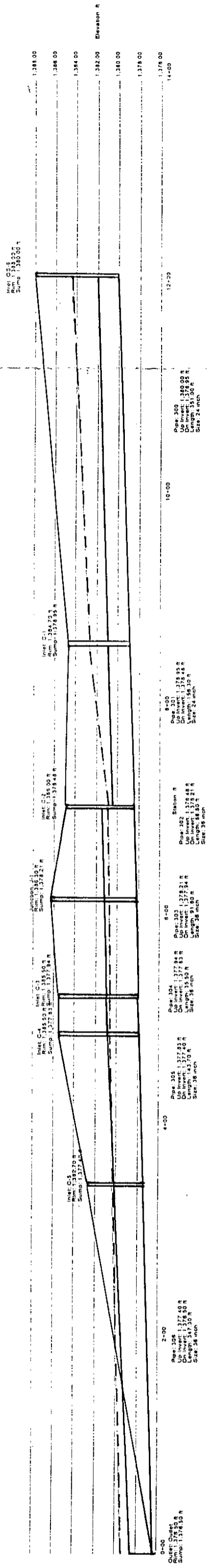
Pipe	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	Inlet Q (cfs)	Size	Cap (cfs)	V avg (ft/s)	Up Invert (ft)	Dn Invert (ft)	S (ft/ft)
300	OS-6	C-1	351.00	2.83	0.76	2.15	2.15	15.98	24 inch	12.39	5.09	1,380.00	1,378.95	0.003000
301	C-1	C-2	156.30	2.28	0.65	1.48	3.63	9.85	24 inch	12.39	7.68	1,378.95	1,378.48	0.003000
302	C-2	J-1	88.80	0.37	0.65	0.24	3.87	1.79	36 inch	36.53	4.04	1,378.48	1,378.21	0.003000
303	J-1	C-3	91.80	N/A	N/A	N/A	3.87	N/A	36 inch	36.53	3.80	1,378.21	1,377.94	0.003000
304	C-3	C-4	35.50	0.97	0.76	0.74	4.61	5.48	36 inch	36.53	4.35	1,377.94	1,377.83	0.003000
305	C-4	C-5	143.70	1.56	0.76	1.19	5.80	8.81	36 inch	36.53	5.45	1,377.83	1,377.40	0.003000
306	C-5	Outlet	347.30	0.77	0.65	0.50	6.30	3.72	36 inch	33.93	6.83	1,377.40	1,376.50	0.002588

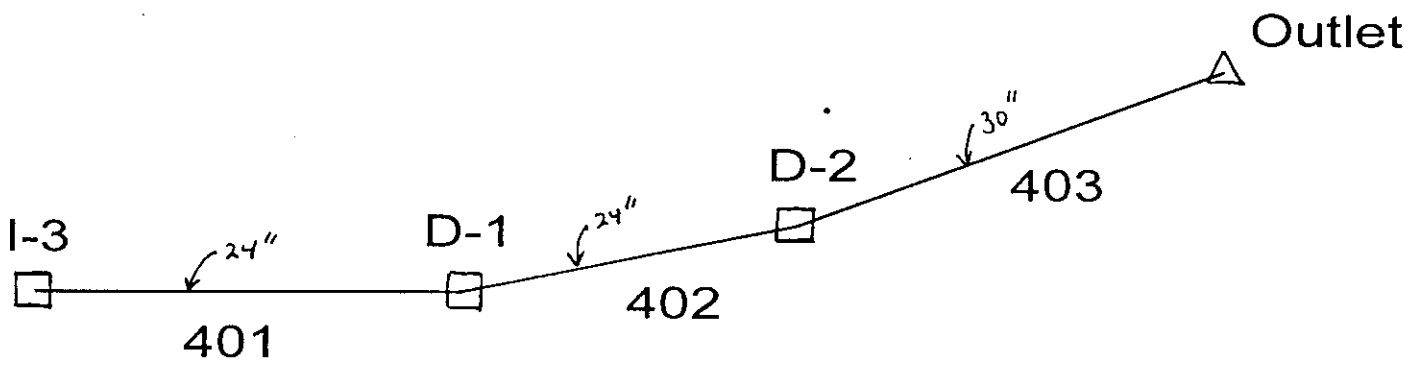
## Node Report

Node	Inlet A (acres)	C	Up Flow Time (min)	Sys Flow Time (min)	Q (cfs)	Rim (ft)	Gr Elev (ft)	HGL In (ft)	HGL Out (ft)	Sump (ft)	Add. Q (cfs)	Known Flow (cfs)
OS-6	2.83	0.76	0.00	15.00	15.98	1,388.00	1,388.00	1,384.44	1,384.44	1,380.00	0.00	0.00
C-1	2.28	0.65	16.15	19.64	24.13	1,384.70	1,384.70	1,382.69	1,382.69	1,378.95	0.00	0.00
C-2	0.37	0.65	19.98	19.98	25.51	1,385.00	1,385.00	1,380.91	1,380.91	1,378.48	0.00	0.00
J-1	N/A	N/A	20.35	20.35	25.32	1,386.30	1,386.30	1,380.81	1,380.81	1,378.21	N/A	N/A
C-3	0.97	0.76	20.75	20.75	29.91	1,385.50	1,385.50	1,380.72	1,380.72	1,377.94	0.00	0.00
C-4	1.56	0.76	20.88	20.88	37.50	1,385.50	1,385.50	1,380.66	1,380.66	1,377.83	0.00	0.00
C-5	0.77	0.65	21.32	21.32	40.39	1,382.70	1,382.70	1,380.19	1,380.19	1,377.40	0.00	0.00
Outlet	N/A	N/A	22.17	22.17	N/A	1,376.50	1,376.50	1,378.57	1,378.57	1,376.50	N/A	N/A

# Pipe Report

Pipe	Up Node	Dn Node	Q (cfs)	Length (ft)	S (ft/ft)	Size	Roughness	Cap (cfs)	Up Invert (ft)	Dn Invert (ft)	Up Cover (ft)	Dn Cover (ft)	Up HGL (ft)	Dn HGL (ft)
300	OS-6	C-1	15.98	351.00	0.003000	24 inch	0.013	12.39	1,380.00	1,378.95	6.00	3.75	1,384.44	1,382.69
301	C-1	C-2	24.13	156.30	0.003000	24 inch	0.013	12.39	1,378.95	1,378.48	3.75	4.52	1,382.69	1,380.91
302	C-2	J-1	25.51	88.80	0.003000	36 inch	0.013	36.53	1,378.48	1,378.21	3.52	5.09	1,380.91	1,380.81
303	J-1	C-3	25.32	91.80	0.003000	36 inch	0.013	36.53	1,378.21	1,377.94	5.09	4.56	1,380.81	1,380.72
304	C-3	C-4	29.91	35.50	0.003000	36 inch	0.013	36.53	1,377.94	1,377.83	4.56	4.67	1,380.72	1,380.66
305	C-4	C-5	37.50	143.70	0.003000	36 inch	0.013	36.53	1,377.83	1,377.40	4.67	2.30	1,380.66	1,380.18
306	C-5	Outlet	40.39	347.30	0.002588	36 inch	0.013	33.93	1,377.40	1,376.50	2.30	-3.00	1,380.19	1,378.57
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A





## Combined Pipe/Node Report

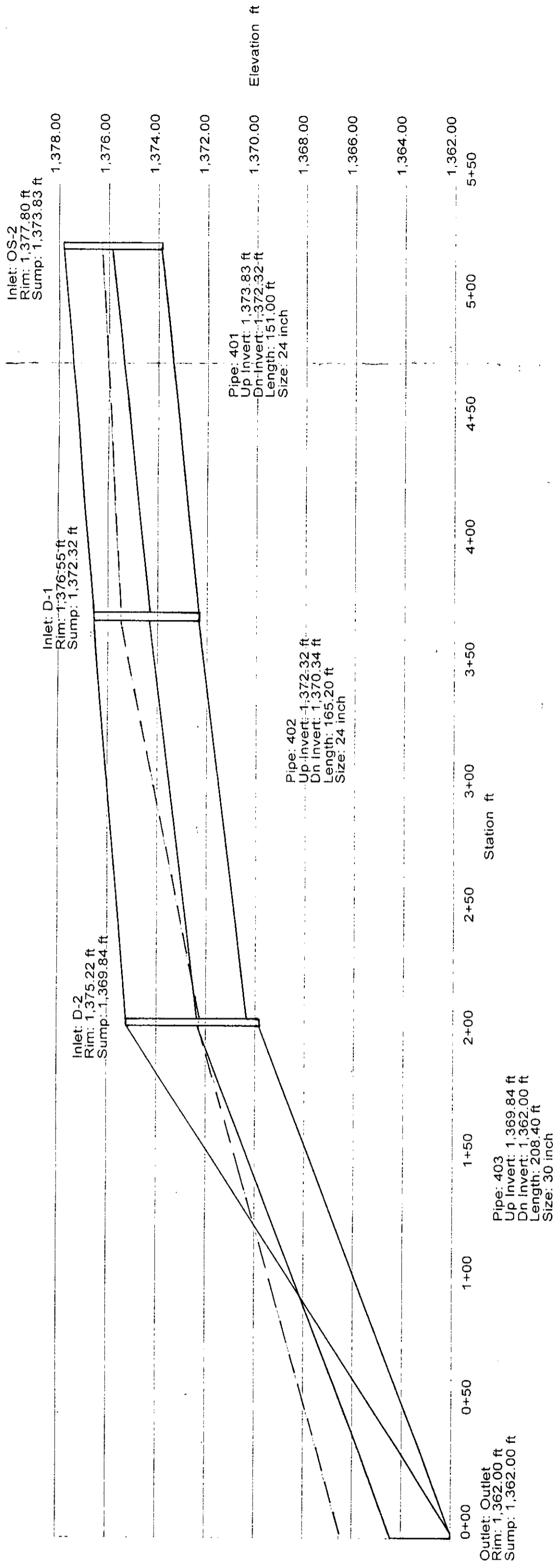
Pipe	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	Inlet Q (cfs)	Size	Cap (cfs)	V avg (ft/s)	Up Invert (ft)	Dn Invert (ft)	S (ft/ft)
401	OS-2	D-1	151.00	3.85	0.65	2.50	2.50	16.31	24 inch	22.62	5.19	1,373.83	1,372.32	0.010000
402	D-1	D-2	165.20	0.1e-3	0.76	0.76e-4	4.02	0.48e-3	24 inch	24.77	10.07	1,372.32	1,370.34	0.011985
403	D-2	Outlet	208.40	5.26	0.76	4.00	9.54	25.30	30 inch	79.55	13.51	1,369.84	1,362.00	0.037620

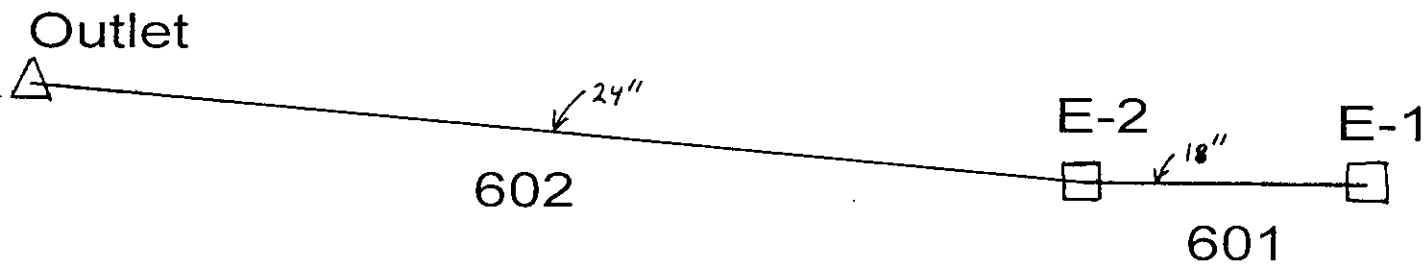
## Node Report

Node	Inlet A (acres)	C	Up Flow Time (min)	Sys Flow Time (min)	Q (cfs)	Rim (ft)	Gr Elev (ft)	HGL In (ft)	HGL Out (ft)	Sump (ft)	Add. Q (cfs)	Known Flow (cfs)
OS-2	3.85	0.65	0.00	20.50	16.31	1,377.80	1,377.80	1,376.27	1,376.27	1,373.83	0.00	0.00
D-1	0.1e-3	0.76	20.98	22.00	31.46	1,376.55	1,376.55	1,375.49	1,375.49	1,372.32	6.00	0.00
D-2	5.26	0.76	22.27	22.27	66.04	1,375.22	1,375.22	1,372.27	1,372.27	1,369.84	0.00	0.00
Outlet	N/A	N/A	22.53	22.53	N/A	1,362.00	1,362.00	1,366.50	1,366.50	1,362.00	N/A	N/A

# Pipe Report

Pipe	Up Node	Dn Node	Q (cfs)	Length (ft)	S (ft/ft)	Size	Roughness	Cap (cfs)	Up Invert (ft)	Dn Invert (ft)	Up Cover (ft)	Dn Cover (ft)	Up HGL (ft)	Dn HGL (ft)
401	OS-2	D-1	16.31	151.00	0.010000	24 inch	0.013	22.62	1,373.83	1,372.32	1.97	2.23	1,376.27	1,375.49
402	D-1	D-2	31.46	165.20	0.011985	24 inch	0.013	24.77	1,372.32	1,370.34	2.23	2.88	1,375.49	1,372.27
403	D-2	Outlet	66.04	208.40	0.037620	30 inch	0.013	79.55	1,369.84	1,362.00	2.88	-2.50	1,372.27	1,366.50
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A





## Combined Pipe/Node Report

Pipe	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	Inlet Q (cfs)	Size	Cap (cfs)	V avg (ft/s)	Up Invert (ft)	Dn Invert (ft)	S (ft/ft)
601	E-1	E-2	36.00	3.68	0.76	2.80	2.80	20.78	18 inch	7.43	11.78	1,369.44	1,369.26	0.005000
602	E-2	Outlet	219.60	1.44	0.76	1.09	3.89	8.13	24 inch	39.69	9.36	1,368.76	1,362.00	0.030783

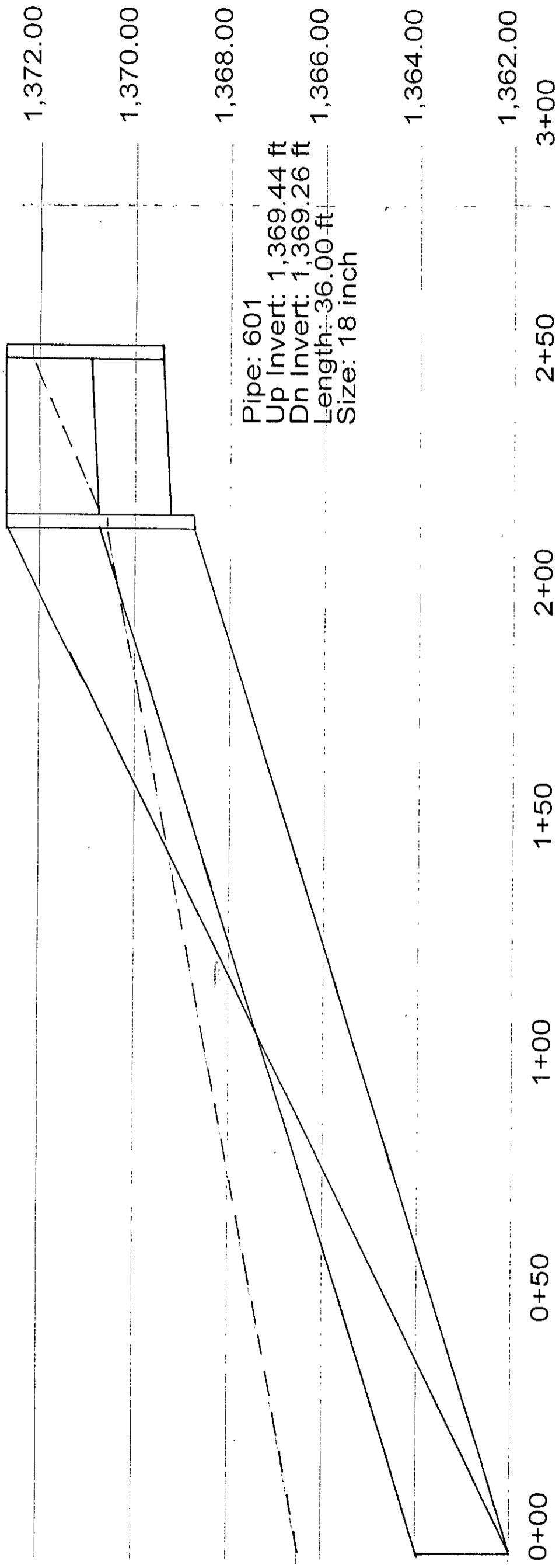
## Node Report

Node	Inlet A (acres)	C	Up Flow Time (min)	Sys Flow Time (min)	Q (cfs)	Rim (ft)	Gr Elev (ft)	HGL In (ft)	HGL Out (ft)	Sump (ft)	Add. Q (cfs)	Known Flow (cfs)
E-1	3.68	0.76	0.00	15.00	20.78	1,372.69	1,372.69	1,372.16	1,372.16	1,369.44	0.00	0.00
E-2	1.44	0.76	15.05	15.05	28.87	1,372.69	1,372.69	1,370.60	1,370.60	1,368.76	0.00	0.00
Outlet	N/A	N/A	15.44	15.44	N/A	1,362.00	1,362.00	1,366.50	1,366.50	1,362.00	N/A	N/A

# Pipe Report

Pipe	Up Node	Dn Node	Q (cfs)	Length (ft)	S (ft/ft)	Size	Roughness	Cap (cfs)	Up Invert (ft)	Dn Invert (ft)	Up Cover (ft)	Dn Cover (ft)	Up HGL (ft)	Dn HGL (ft)
601	E-1	E-2	20.78	36.00	0.005000	18 inch	0.013	7.43	1,369.44	1,369.26	1.75	1.93	1,372.16	1,370.73
602	E-2	Outlet	28.87	219.60	0.030783	24 inch	0.013	39.69	1,368.76	1,362.00	1.93	-2.00	1,370.60	1,366.50
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Inlet: E-2      Inlet: E-1  
 Rim: 1,372.69 ft   Rim: 1,372.69 ft  
 Sump: 1,368.76 ft   Sump: 1,369.44 ft



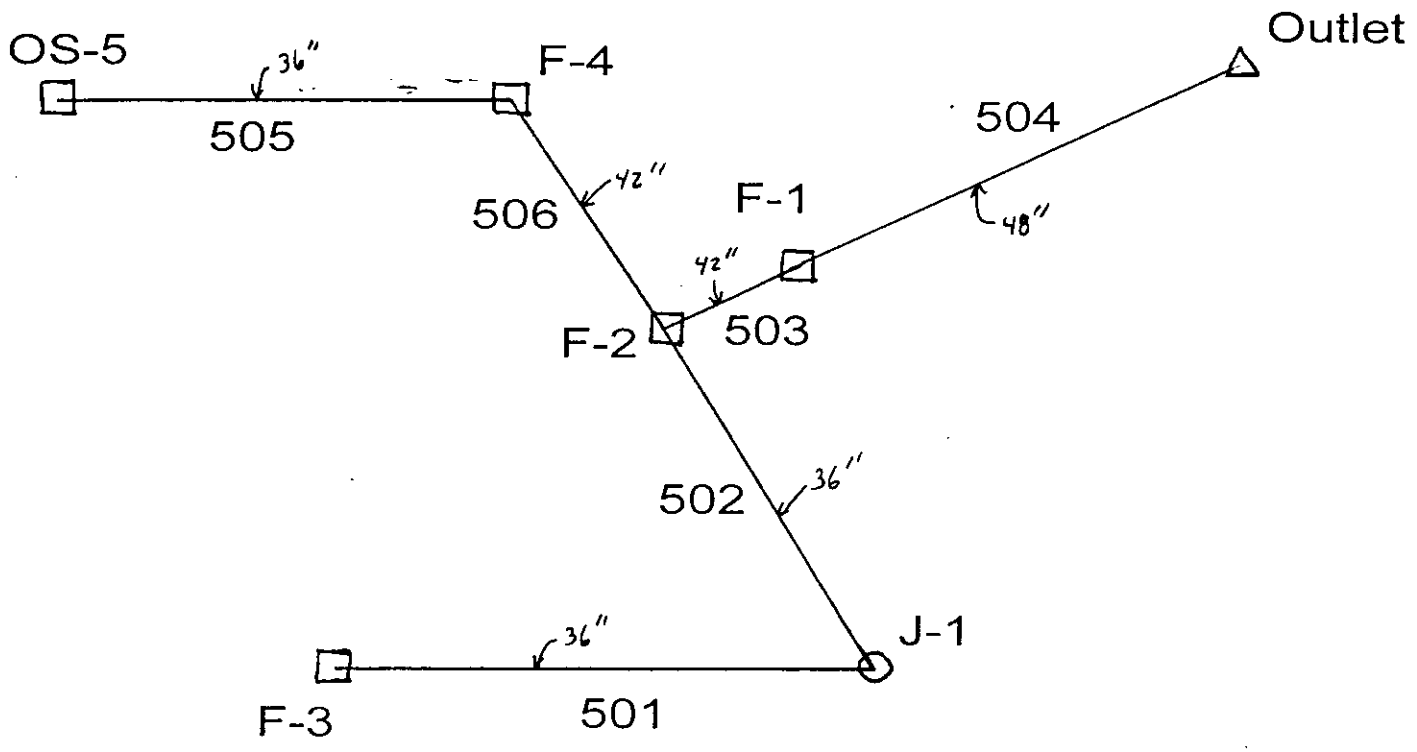
Elevation ft

Pipe: 601  
 Up Invert: 1,369.44 ft  
 Dn Invert: 1,369.26 ft  
 Length: 36.00 ft  
 Size: 18 inch

Station ft

Outlet: Outlet  
 Rim: 1,362.00 ft  
 Sump: 1,362.00 ft

Pipe: 602  
 Up Invert: 1,368.76 ft  
 Dn Invert: 1,362.00 ft  
 Length: 219.60 ft  
 Size: 24 inch



## Combined Pipe/Node Report

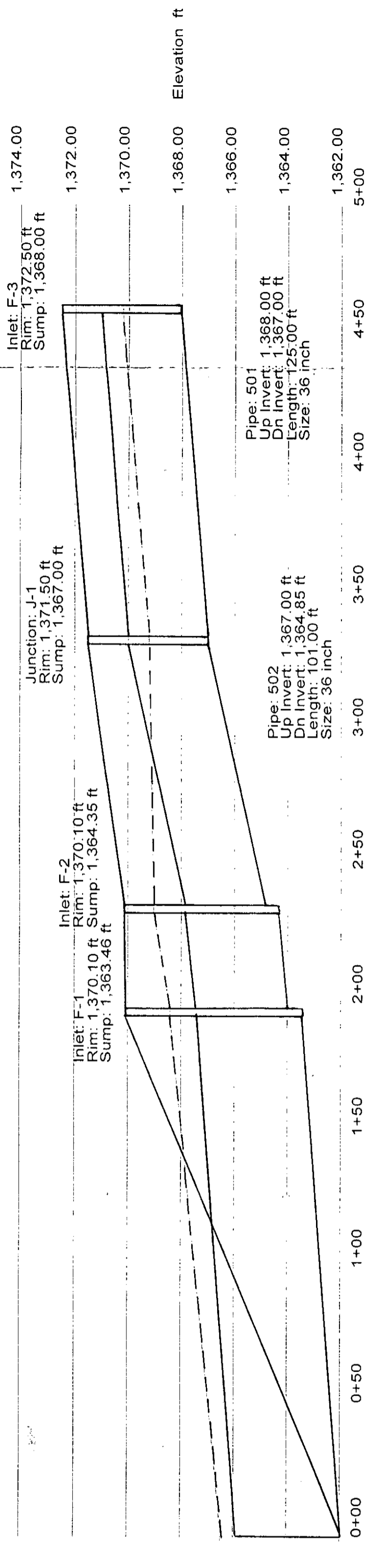
Pipe	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	Inlet Q (cfs)	Size	Cap (cfs)	V avg (ft/s)	Up Invert (ft)	Dn Invert (ft)	S (ft/ft)
505	OS-5	F-4	328.20	10.20	0.79	8.06	8.06	59.86	36 inch	81.66	8.99	1,370.89	1,365.97	0.014991
506	F-4	F-2	223.00	0.62	0.76	0.47	8.53	3.50	42 inch	71.30	6.49	1,365.47	1,364.35	0.005022
501	F-3	J-1	125.00	0.65	0.65	0.42	6.87	3.14	36 inch	59.65	8.32	1,368.00	1,367.00	0.008000
502	J-1	F-2	101.00	N/A	N/A	N/A	6.87	N/A	36 inch	97.31	7.43	1,367.00	1,364.85	0.021287
503	F-2	F-1	39.00	4.41	0.76	3.35	19.39	24.90	42 inch	100.60	13.55	1,364.35	1,363.96	0.010000
504	F-1	Outlet	196.00	2.09	0.76	1.59	20.98	11.80	48 inch	123.97	11.21	1,363.46	1,362.00	0.007449

## Node Report

Node	Inlet A (acres)	C	Up Flow Time (min)	Sys Flow Time (min)	Q (cfs)	Rim (ft)	Gr Elev (ft)	HGL In (ft)	HGL Out (ft)	Sump (ft)	Add. Q (cfs)	Known Flow (cfs)
OS-5	10.20	0.79	0.00	15.00	59.86	1,375.80	1,375.80	1,373.39	1,373.39	1,370.89	0.00	0.00
F-4	0.62	0.76	15.61	15.61	62.48	1,371.25	1,371.25	1,369.90	1,369.90	1,365.47	0.00	0.00
F-3	0.65	0.65	0.00	18.70	46.75	1,372.50	1,372.50	1,370.23	1,370.23	1,368.00	0.00	0.00
J-1	N/A	N/A	18.95	18.95	46.46	1,371.50	1,371.50	1,369.22	1,369.22	1,367.00	N/A	N/A
F-2	4.41	0.76	19.18	19.18	130.35	1,370.10	1,370.10	1,369.04	1,369.04	1,364.35	0.00	0.00
F-1	2.09	0.76	19.22	19.22	140.86	1,370.10	1,370.10	1,368.38	1,368.38	1,363.46	0.00	0.00
Outlet	N/A	N/A	19.52	19.52	N/A	1,362.00	1,362.00	1,366.50	1,366.50	1,362.00	N/A	N/A

# Pipe Report

Pipe	Up Node	Dn Node	Q (cfs)	Length (ft)	S (ft/ft)	Size	Roughness	Cap (cfs)	Up Invert (ft)	Dn Invert (ft)	Up Cover (ft)	Dn Cover (ft)	Up HGL (ft)	Dn HGL (ft)
505	OS-5	F-4	59.86	328.20	0.014991	36 inch	0.013	81.66	1,370.89	1,365.97	1.91	2.28	1,373.39	1,369.90
506	F-4	F-2	62.48	223.00	0.005022	42 inch	0.013	71.30	1,365.47	1,364.35	2.28	2.25	1,369.90	1,369.04
501	F-3	J-1	46.75	125.00	0.008000	36 inch	0.013	59.65	1,368.00	1,367.00	1.50	1.50	1,370.23	1,369.22
502	J-1	F-2	46.46	101.00	0.021287	36 inch	0.013	97.31	1,367.00	1,364.85	1.50	2.25	1,369.22	1,369.04
503	F-2	F-1	130.35	39.00	0.010000	42 inch	0.013	100.60	1,364.35	1,363.96	2.25	2.64	1,369.04	1,368.38
504	F-1	Outlet	140.86	196.00	0.007449	48 inch	0.013	123.97	1,363.46	1,362.00	2.64	-4.00	1,368.38	1,366.50
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A



Inlet: F-3  
Rim: 1,372.50 ft  
Sump: 1,368.00 ft

Junction: J-1  
Rim: 1,371.50 ft  
Sump: 1,367.00 ft

Inlet: F-2  
Rim: 1,370.10 ft  
Sump: 1,364.35 ft

Inlet: F-1  
Rim: 1,370.10 ft  
Sump: 1,363.46 ft

Outlet: Outlet  
Rim: 1,362.00 ft  
Sump: 1,362.00 ft

Station ft

0+00 1+50 2+00 2+50 3+00 3+50 4+00 4+50 5+00

Elevation ft

1,374.00

1,372.00

1,370.00

1,368.00

1,366.00

1,364.00

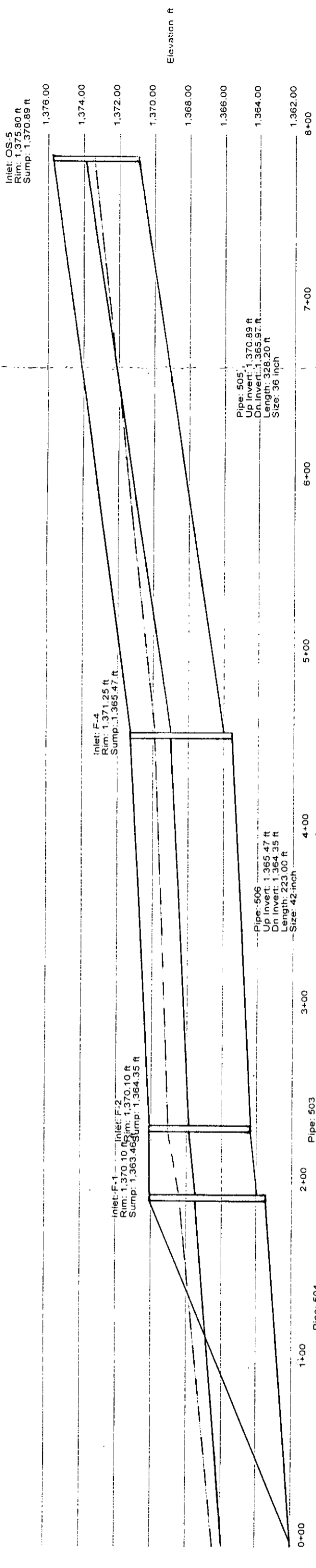
1,362.00

Pipe: 501  
Up Invert: 1,368.00 ft  
Dn Invert: 1,367.00 ft  
Length: 125.00 ft  
Size: 36 inch

Pipe: 502  
Up Invert: 1,367.00 ft  
Dn Invert: 1,364.85 ft  
Length: 101.00 ft  
Size: 36 inch

Pipe: 503  
Up Invert: 1,364.35 ft  
Dn Invert: 1,363.96 ft  
Length: 39.00 ft  
Size: 42 inch

Pipe: 504  
Up Invert: 1,363.46 ft  
Dn Invert: 1,362.00 ft  
Length: 196.00 ft  
Size: 48 inch





DRAINAGE  
PLAN

SRB

SAVOY, RUGGLES & BOHM, P.A.

SRB

SCALE 1" = 100'  
IRGN = \*

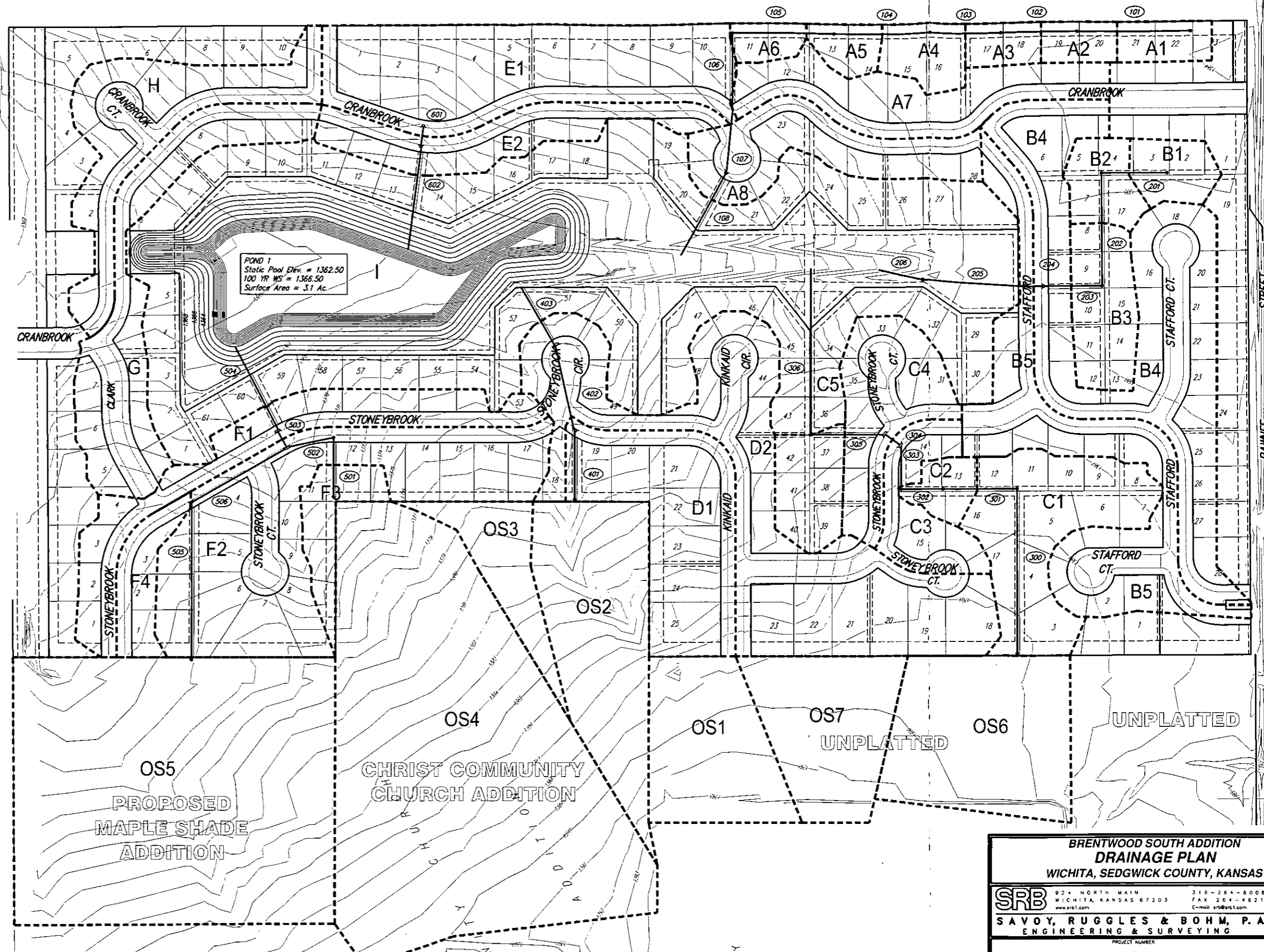
BRENTWOOD SOUTH ADDITION  
DRAINAGE SUMMARY  
June 7, 2001

AREA No.	Acres	Tc (Min.)	C2	C100	I2	I100	Q2	Q100
A1	0.39	15	0.30	0.65	3.73	7.37	0.44	1.87
A2	0.31	15	0.30	0.65	3.73	7.37	0.35	1.49
A3	0.33	15	0.30	0.65	3.73	7.37	0.37	1.58
A4	0.48	15	0.30	0.65	3.73	7.37	0.54	2.20
A5	0.35	15	0.30	0.65	3.73	7.37	0.39	1.68
A6	0.27	15	0.30	0.65	3.73	7.37	0.30	1.29
A7	2.03	15	0.50	0.76	3.73	7.37	3.79	11.37
A8	1.89	15	0.50	0.76	3.73	7.37	3.08	9.24
B1	0.51	15	0.30	0.65	3.73	7.37	0.57	2.44
B2	0.58	15	0.30	0.65	3.73	7.37	0.65	2.78
B3	1.04	15	0.30	0.65	3.73	7.37	1.16	4.98
B4	4.36	19	0.50	0.76	3.42	6.68	7.46	22.13
B5	3.05	19	0.50	0.76	3.42	6.68	5.22	15.48
C1	2.28	19.6	0.30	0.65	3.39	6.59	2.32	9.77
C2	0.37	15	0.30	0.65	3.73	7.37	0.41	1.77
C3	0.97	15	0.50	0.76	3.73	7.37	1.81	5.43
C4	1.56	15	0.50	0.76	3.73	7.37	2.91	8.74
C5	0.77	15	0.30	0.65	3.73	7.37	0.86	3.89
D1	2.57	22	0.50	0.76	3.73	6.28	4.07	12.27
D2	5.26	22	0.50	0.76	3.17	6.28	8.34	25.10
E1	3.68	15	0.50	0.76	3.73	7.37	6.86	20.61
E2	1.44	15	0.50	0.76	3.73	7.37	2.09	8.07
F1	2.08	15	0.50	0.76	3.73	7.37	3.90	11.71
F2	4.41	15	0.50	0.76	3.73	7.37	8.22	24.70
F3	0.65	15	0.30	0.65	3.73	7.37	0.73	3.11
F4	0.63	15	0.50	0.76	3.73	7.37	1.17	3.53
G	2.39	15	0.50	0.76	3.73	7.37	4.46	13.39
H	2.18	15	0.50	0.76	3.73	7.37	4.07	12.21
I	19.21	15	0.40	0.70	3.73	7.37	28.66	99.10
OS1	2.00	15	0.50	0.76	3.73	7.37	3.73	11.20
OS2	3.85	20.5	0.30	0.65	3.73	7.37	4.31	18.44
OS3	0.98	15	0.30	0.65	3.73	7.37	1.10	4.58
OS4	9.93	19	0.30	0.65	3.42	6.68	10.19	43.12
OS5	10.20	15	0.57	0.79	3.73	7.37	21.69	59.39
OS6	2.83	15	0.50	0.76	3.73	7.37	5.28	15.85
OS7	2.00	15	0.50	0.76	3.73	7.37	3.73	11.20

Note: Runoff generated by StormCAD may be lower due to increased system Tc.  
\* These areas drain to sumps that allow 100 year overflow or served by bypass inlets.  
See StormCAD output for inlet flows.

PIPE SUMMARY

Pipe	Size	Grade	Q (cfs)
101	15"	0.50%	1.9
102	15"	0.50%	3.3
103	18"	0.50%	4.7
104	18"	0.50%	6.7
105	18"	0.50%	8.1
106	18"	0.50%	9.1
107	24"	0.50%	19.1
108	30"	0.30%	27.0
201	15"	0.50%	2.6
202	18"	0.50%	5.1
203	24"	0.50%	9.7
204	24"	0.50%	21.4
205	30"	0.52%	33.3
206	30"	0.51%	33.2
300	24"	0.51%	16.0
301	24"	0.51%	24.1
302	36"	0.30%	25.5
303	36"	0.30%	25.5
304	36"	0.30%	29.9
305	36"	0.30%	37.5
306	36"	0.28%	49.4
401	24"	1.00%	16.3
402	24"	1.00%	140.5
403	30"	3.76%	66.0
501	36"	0.80%	46.8
502	36"	2.13%	46.4
503	42"	1.00%	130.0
504	42"	1.00%	140.5
505	36"	1.50%	59.9
506	42"	0.50%	62.5
601	18"	0.50%	20.8
602	24"	3.08%	28.9

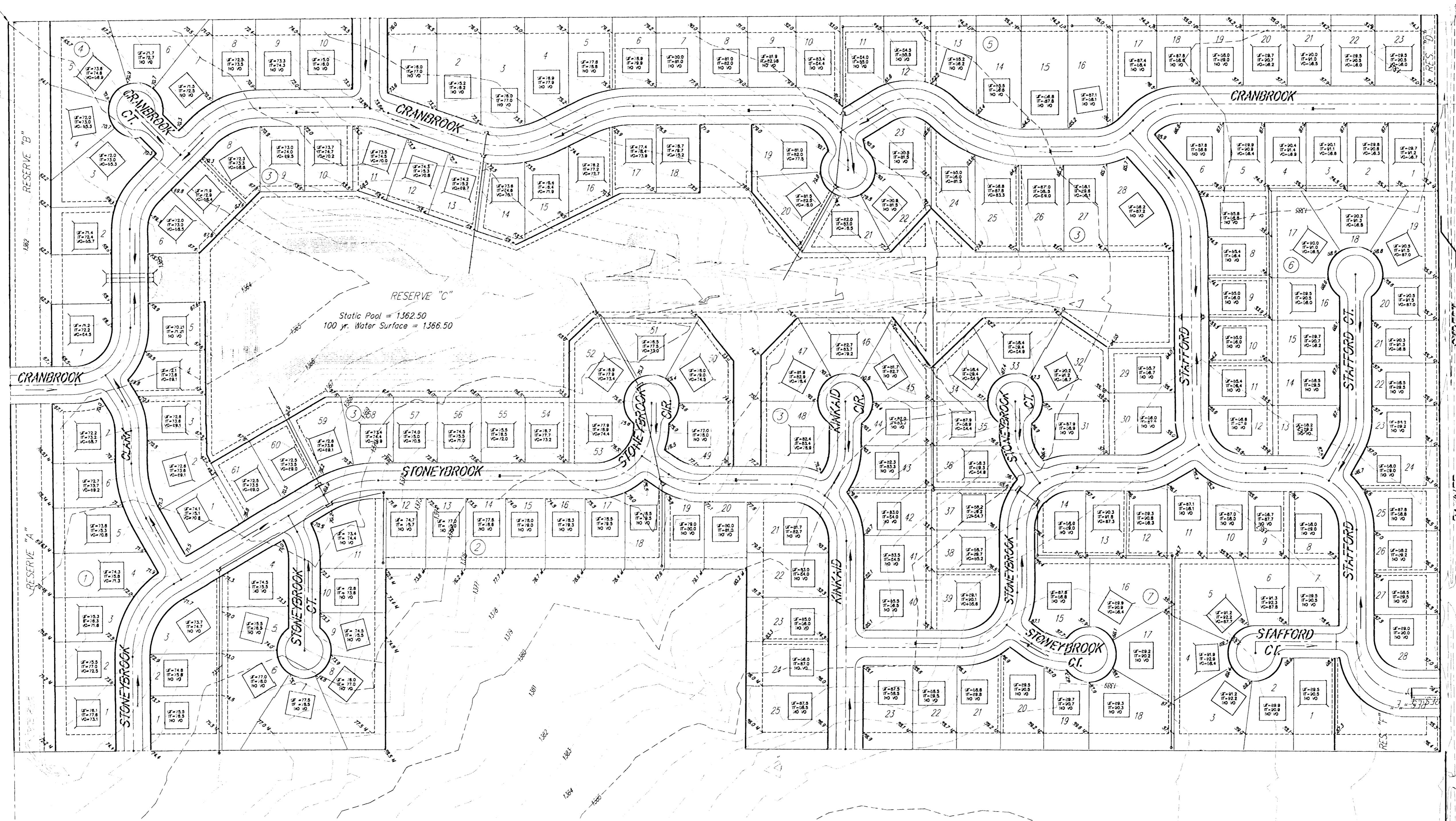


**BRENTWOOD SOUTH ADDITION  
DRAINAGE PLAN**  
WICHITA, SEDGWICK COUNTY, KANSAS

<b>SRB</b>	924 NORTH MAIN WICHITA, KANSAS 67203 www.srb.com	316-264-8008 FAX 316-264-4521 E-mail: srb@srb.com
<b>SAVOY, RUGGLES &amp; BOHM, P.A.</b> ENGINEERING & SURVEYING		
PROJECT NUMBER		
DESIGN KWL	DRAWN KWL	UTILITY KWL
REVIEW KWL	DATE June 7, 2001	REVISED

SHEET 1 OF 1

N.E. COR. SW 1/4  
SEC. 33-27S-2E



**SRB**  
SCALE 1" = 20'  
IRON =

<b>BRENTWOOD SOUTH ADDITION GRADING PLAN WICHITA, KANSAS</b>					
<b>SRB</b>	924 NORTH MAIN WICHITA, KANSAS 67203 www.srb.com		316-264-8008 FAX 264-4621 E-mail: srb@srb.com		SHEET OF
	<b>SAVOY, RUGGLES &amp; BOHM, P. A. ENGINEERING &amp; SURVEYING</b>				
PROJECT NUMBER					
DESIGN	DRAWN	UTILITY	REVIEW	DATE	REVISED
KWL	RA			June 8, 2001	
DWG. FILE: GRADING.DWG					