BAX ENGINEERING

Project: THE MANORS AT ROYALL SPRINGS
Date: 2/1/94 Project No: 93-3774
Designed: S.O.K. Checked:
REV. MARCH 4, 1994

STATE OF MISSOURI
SCOTT O. KOLKMEYER
NUMBER E-24744
REGISTERED PROFESSIONAL ENGINEER
3/2/94

STORMWATER DETENTION ANALYSIS

GENERAL SITE DATA & RUNOFF CALCULATIONS

1.) The purpose of this analysis is to estimate the increase in the stormwater runoff rate due to development of the tract of land of the proposed subdivision to be known as "The Manors at Royall Springs". The tract of property proposed for development contains 67.713 acres. The analysis will estimate the attenuation characteristics of the stormwater detention facilities that are proposed as part of the site improvements. Based upon such estimates, a comparison is made between the pre-developed rate of stormwater runoff and the post-developed rate of stormwater runoff for the subwatersheds of the proposed subdivision.

2.) In this analysis, a 25 year-20 minute design storm will be used for detention purposes. A 100 year-20 minute design storm shall also be checked for safe passage through the detention basin.

3.) The tract of land under pre-developed conditions shall be considered undeveloped at 0% - 5% impervious. The pre-developed P.I. for the site shall therefore be 2.31 c.f.s./A^c for the design 25 year-20 minute storm.

4.) The tract of land under post developed conditions will be a residential subdivision. The post developed P.I. for the developed areas shall therefore be 3.26 c.f.s./A^c for the design 25 year-20 minute storm.

5.) The area of the proposed subdivision generally consists of two subwatersheds. These subwatersheds shall be known as the north subwatershed and the south subwatershed throughout the remainder of this analysis. The subwatersheds shall be analyzed individually to insure that the peak rate of runoff leaving each subwatershed after development is less than or equal to the peak rate of runoff leaving each subwatershed prior to development of the subdivision.

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(a) The areas of the subwatershed under predeveloped conditions as well as post developed conditions are as follows:

South subwatershed:
Predeveloped area = 16.93 A^c
Post developed area = 14.98 A^c

North subwatershed:
Predeveloped area = 50.78 A^c
Post developed area = 52.73 A^c

7.) The north subwatershed contains 11 A^c of common ground not including the detention basin which shall remain generally at 0%-5% impervious and therefore detention shall not be provide for such 11 acres.

8) The required attenuation due to development of the subdivision is estimated at: (Attenuation = Post developed discharge - Pre developed discharge)

South subwatershed:

$$\text{Attenuation} = (14.98\ A^c \times 3.26\ \text{c.f.s./}A^c) - (16.93\ A^c \times 2.31\ \text{c.f.s./}A^c)$$
$$= 48.83\ \text{c.f.s.} - 39.11\ \text{c.f.s.}$$
$$= 9.72\ \text{c.f.s.}$$

North subwatershed:

$$\text{Attenuation} = ((52.73A^c - 11A^c) \times 3.26\ \text{c.f.s/}A^c) + (11A^c \times 2.31\ \text{c.f.s/}A^c) - (50.78A^c \times 2.31\ \text{c.f.s./}A^c)$$
$$= 136.04\ \text{c.f.s.} + 25.41\ \text{c.f.s.} - 117.30\ \text{c.f.s.}$$
$$= 44.15\ \text{c.f.s.}$$

The total required attenuation of the two basins is 9.72 c.f.s. + 44.15 c.f.s. = 53.87 c.f.s.

When estimating the required attenuation for the entire subdivision, the attenuation is:

$$\text{Attenuation} = (67.71A^c - 11A^c) \times (3.26\ \text{c.f.s./}A^c - 2.31\ \text{c.f.s./}A^c)$$
$$= 56.71\ A^c \times 0.95\ \text{c.f.s./}A^c$$
$$= 53.87\ \text{c.f.s.} \checkmark$$

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INFLOW HYDROGRAPH CALCULATIONS

1.) From the drainage area map of the project, the total inflow to the detention basins are found as:

South Basin: (Wet Basin or Lake)

Inflow 15 Year-20 minute storm, $Q_{15/20} = 30.23$ C.F.S.

Inflow 25 Year-20 minute storm, $Q_{25/20} = Q_{15/20} \times 1.235$

$Q_{25/20} = 30.23$ C.F.S. $\times 1.235$

$= 37.33$ C.F.S.

North Basin: (Dry Basin)

Inflow 15 Year-20 minute storm, $Q_{15/20} = 39.55$ C.F.S.

$Q_{25/20} = Q_{15/20} \times 1.235$

$Q_{25/20} = 39.55$ C.F.S. $\times 1.235$

$= 48.84$ C.F.S.

2.) The permitted release rate of each basin is found by subtracting the required attenuation of each basin from the total inflow of each basin.

South Basin:

Permitted release rate = 37.33 C.F.S. − 9.72 C.F.S. = 27.61 C.F.S.

North Basin:

Permitted release rate = 48.84 C.F.S. − 44.15 C.F.S. = 4.69 C.F.S.

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3.) Calculate the time of concentration:

South Basin:

The most remote point of origination lies at the south property line of the site near the central area of property. More specifically it is generally at station 17+85 ± of the proposed Royallmanor Lane. The flow will generally travel 330 feet over pavement to where it is picked up by a curb inlet. The flow will then travel approximately 1460 feet via storm sewers to the basin. The travel time is estimated as follows:

a. Travel time pavement: (see sheet 5)
length = 330' ± elevation difference = 3' ±
T_t = 4 min. × 0.4 = 1.6 min.

b. Travel time sewer:
assume average sewer velocity = 7 ft./sec. Length = 1460' ±
$T_t = \frac{1460\ ft}{1} \times \frac{1}{7\ ft/sec} \times \frac{min}{60\ sec.} = 3.48$ min.

c. Time of concentration, T_c = 1.6 min. + 3.48 min. = 5.08 min. ⇒ use 5 minutes.

North Basin:

The most remote point of origination lies near the south property line of the project near the southwest property corner of the project. More specifically it is located near station 24+00 ± of the proposed Royallmanor Lane. The flow will generally travel 540 feet west over pavement to where it is picked up by a curb inlet. The flow will then travel approximately 925 feet ± via storm sewers to the detention basin. The travel time is estimated as follows:

a. Travel time pavement: (see sheet 5)
length = 540' ± elevation difference = 5' ± T_t = 6 min × 0.4 = 2.4 min.

b. Travel time sewer: assume average sewer velocity = 7 ft./sec. Length = 925' ±
$T_t = \frac{925}{1} \times \frac{1}{7\ ft./sec.} \times \frac{min}{60\ sec.} = 2.20$ min.

c. Time of concentration, T_c = 2.4 min. + 2.20 min. = 4.6 min. ⇒ use 4 minutes.

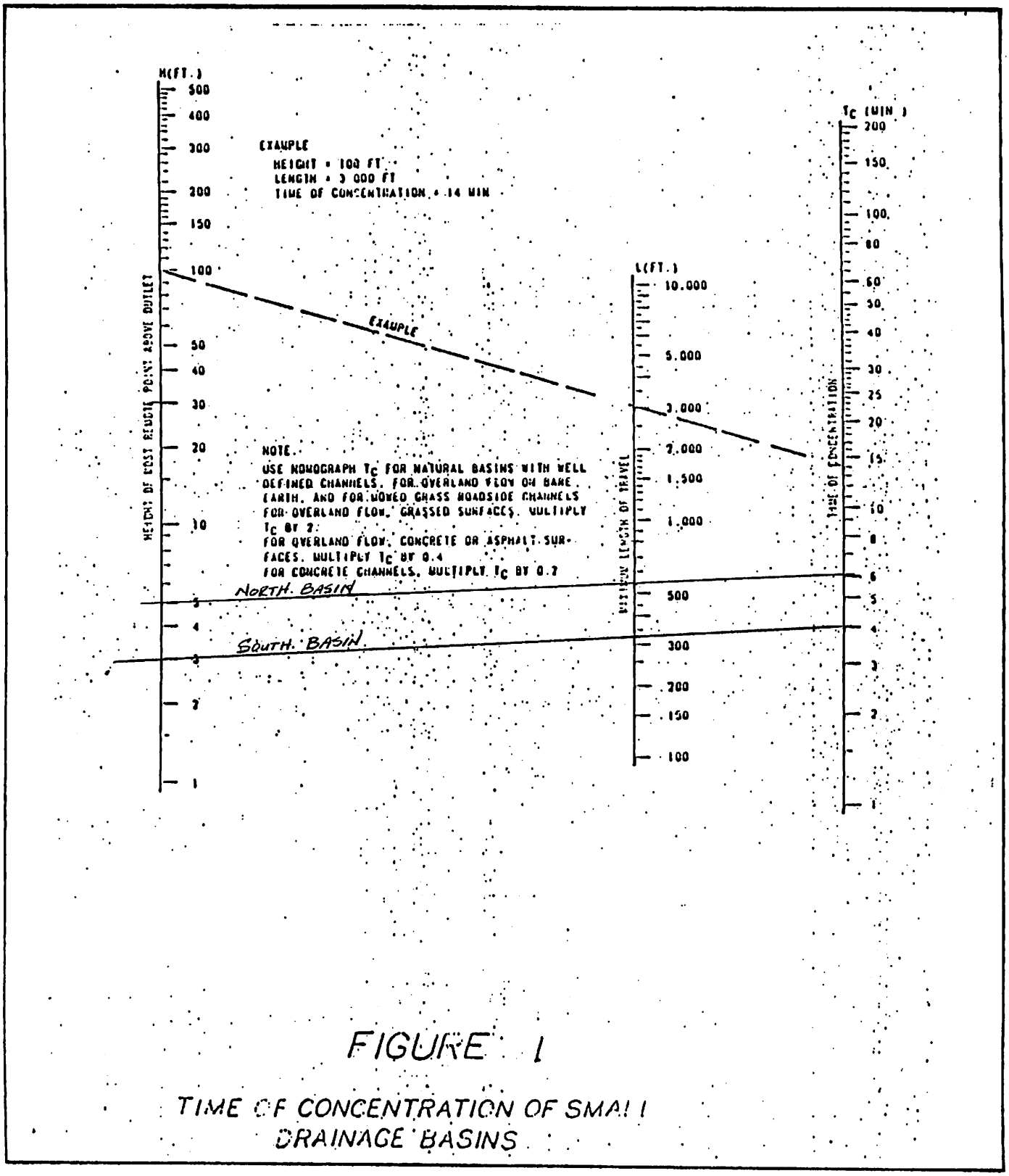

FIGURE 1

TIME OF CONCENTRATION OF SMALL DRAINAGE BASINS

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STORM ROUTING CALCULATIONS & RESULTS

1.) A computer program was used to route the design 25 year - 20 minute storm through the detention basins. As shown in the attached routing calculations (sht's. 7-10) the peak outflows of the basins are:

South Basin: Peak outflow = 9.41 c.f.s. @ Elevation 519.70
(Attenuation required = 9.72 c.f.s. Attenuation provided = 27.92 c.f.s.)

North Basin: Peak outflow = 4.37 c.f.s. @ Elevation 530.43
(Attenuation required = 44.15 c.f.s. Attenuation provided = 44.47 c.f.s.)

TOTAL ATTENUATION PROVIDED BY BASINS = 72.39 c.f.s. (53.87 c.f.s. REQUIRED)

2.) A 100 year-20 minute design storm was also routed through the basins. It was routed assuming the north basin was empty and the south basin was at normal pool elevation. The low flow was assumed blocked for both basins. The routing calculations are attached on sheets 11-14. The 100 year-20 minute storm elevations are:

South Basin: elevation = 520.59
North Basin: elevation = 531.31

3.) A 15 year-20 minute design storm was routed through the basins in order to arrive at a starting water surface elevation for the storm sewer pipe hydraulics beginning at the detention basin. The routing calculations are attached on sheets 15-18. The 15 year-20 minute storm elevations are:

South Basin: elevation = 519.32
North Basin: elevation = 529.78

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DATA REPORT

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DATE .....: 02-02-1994

PROJECT NAME ..: THE MANORS AT ROYAL SPRINGS SOUTH BASIN (SOUTH BASIN SHALL BE CONSIDERED A LAKE OR WET BASIN.)
PROJECT NUMBER : 93-3774
CALCULATED BY .: S.O.K.

THE STORM FREQUENCY .....: 25 YEAR STORM

THE STORM DURATION .....: 20 MINUTES

TOTAL TIME OF CONCENTRATION .....: 5 MINUTE(S)

MANUAL ENTRY METHOD FOR Tc
Tc = 5

Q (C.F.S.) ENTERING THE BASIN ...: 37.33 C.F.S.

ELEVATION : 517.70 AREA .....: 15270 (Normal Pool Elevation = 517.70)

ELEVATION : 518.00 AREA .....: 16860

ELEVATION : 520.00 AREA .....: 21420

ELEVATION : 522.00 AREA .....: 27650

OVERFLOW STRUCTURE INFORMATION
THE OVERFLOW STRUCTURE SILL ELEVATION ...: 520.75
THE OVERFLOW STRUCTURE TOTAL SILL LENGTH : 12.56 FEET
THE C VALUE .....: 3.00
THE REQUIRED HEIGHT OF THE SILL OPENING .: THE SILL IS NOT REACHED

SQUARE OR RECTANGULAR ORIFICE INFORMATION
SQUARE OR RECTANGULAR ORIFICE NUMBER : 1
THE WIDTH .....: 18 INCHES
THE HEIGHT .....: 18 INCHES
THE FLOWLINE ELEVATION .....: 517.70

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DBASIN VERSION 1.2B
DETENTION BASIN CALCULATIONS

PROJECT: THE MANORS AT ROYAL SPRINGS SOUTH BASIN
PROJECT NO.: 93-3774
DATE: 02-02-1994
BY: S.O.K.

ELEVATION	AREA	INCREMENTAL VOLUME	ACTUAL ACCUM. VOLUME
517.70	15270	0	0
518.00	16860	4819	4819
520.00	21420	38280	43099
522.00	27650	49070	92169

TIME (MIN)	INFLOW (C.F.S.)	INCR. VOL. (CU.FT.)	OUTFLOW (C.F.S.)	NET. DET. (CU.FT.)	ELEV.
0	0.00	0	0.00	0	517.70
1	7.47	448	0.02	447	517.73
2	14.93	1343	0.11	1336	517.79
3	22.40	2680	0.29	2662	517.87
4	29.86	4454	0.62	4416	517.98
5	37.33	6656	1.11	6590	518.10
6	37.33	8830	1.68	8729	518.21
7	37.33	10968	2.31	10830	518.33
8	37.33	13070	3.15	12881	518.44
9	37.33	15120	3.81	14892	518.54
10	37.33	17132	4.58	16857	518.65
11	37.33	19096	5.36	18775	518.75
12	37.33	21015	6.14	20646	518.85
13	37.33	22886	6.96	22468	518.95
14	37.33	24708	7.72	24245	519.04
15	37.33	26485	8.61	25968	519.14
16	37.33	28208	9.16	27658	519.23
17	37.33	29898	9.21	29345	519.32
18	37.33	31585	9.25	31030	519.40
19	37.33	33270	9.30	32712	519.49
20	37.33	34952	9.35	34391	519.58
21	29.86	36183	9.38	35620	519.64
22	22.40	36964	9.40	36400	519.68
23	14.93	37296	9.41	36731	519.70
24	7.47	37179	9.41	36615	519.70
25	0.00	36615	9.39	36051	519.67
26	0.00	36051	9.38	35488	519.64
27	0.00	35488	9.36	34927	519.61
28	0.00	34927	9.35	34366	519.58
29	0.00	34366	9.33	33806	519.55
30	0.00	33806	9.32	33247	519.52

ADDITIONAL INFORMATION

PEAK OUTFLOW = 9.41 C.F.S. AT 23 MINUTES AT HIGH WATER ELEVATION 519.70
REQUIRED DETENTION = 9.72 C.F.S. MINIMUM.

DATA REPORT

DATE .....: 03-04-1994

PROJECT NAME ..: THE MANORS AT ROYALL SPRINGS NORTH BASIN
PROJECT NUMBER : 93-3774
CALCULATED BY .: S.O.K.

THE STORM FREQUENCY .....: 25 YEAR STORM

THE STORM DURATION .....: 20 MINUTES

TOTAL TIME OF CONCENTRATION .....: 4 MINUTE(S)

MANUAL ENTRY METHOD FOR Tc
Tc = 4

Q (C.F.S.) ENTERING THE BASIN ...: 48.84 C.F.S.

ELEVATION :	525.00	AREA .....:	0
ELEVATION :	526.00	AREA .....:	6500
ELEVATION :	528.00	AREA .....:	10660
ELEVATION :	530.00	AREA .....:	15690
ELEVATION :	532.00	AREA .....:	20900

OVERFLOW STRUCTURE INFORMATION
THE OVERFLOW STRUCTURE SILL ELEVATION ...: 531.40
THE OVERFLOW STRUCTURE TOTAL SILL LENGTH : 12.56 FEET
THE C VALUE .....: 3.00
THE REQUIRED HEIGHT OF THE SILL OPENING .: THE SILL IS NOT REACHED

SQUARE OR RECTANGULAR ORIFICE INFORMATION
SQUARE OR RECTANGULAR ORIFICE NUMBER : 1
THE WIDTH .....: 6 INCHES
THE HEIGHT .....: 10 INCHES
THE FLOWLINE ELEVATION .....: 525.00

DETENTION BASIN CALCULATIONS

PROJECT: THE MANORS AT ROYALL SPRINGS NORTH BASIN (DRY BASIN)
PROJECT NO.: 93-3774
DATE: 03-04-1994
BY: S.O.K.

ELEVATION	AREA	INCREMENTAL VOLUME	ACTUAL ACCUM. VOLUME
525.00	0	0	0
526.00	6500	3250	3250
528.00	10660	17160	20410
530.00	15690	26350	46760
532.00	20900	36590	83350

TIME (MIN)	INFLOW (C.F.S.)	INCR. VOL. (CU.FT.)	OUTFLOW (C.F.S.)	NET. DET. (CU.FT.)	ELEV.
0	0.00	0	0.00	0	525.00
1	12.21	733	0.15	723	525.23
2	24.42	2189	0.86	2137	525.68
3	36.63	4335	1.30	4256	526.13
4	48.84	7187	1.61	7090	526.46
5	48.84	10020	1.99	9901	526.79
6	48.84	12831	2.31	12692	527.12
7	48.84	15623	2.59	15467	527.45
8	48.84	18397	2.84	18227	527.77
9	48.84	21158	3.04	20975	528.06
10	48.84	23905	3.18	23714	528.27
11	48.84	26645	3.32	26446	528.48
12	48.84	29376	3.45	29169	528.69
13	48.84	32100	3.57	31886	528.89
14	48.84	34816	3.69	34595	529.10
15	48.84	37525	3.80	37297	529.30
16	48.84	40228	3.91	39993	529.51
17	48.84	42923	4.02	42683	529.71
18	48.84	45613	4.12	45366	529.92
19	48.84	48296	4.21	48043	530.09
20	48.84	50974	4.28	50717	530.24
21	36.63	52915	4.33	52655	530.34
22	24.42	54120	4.36	53858	530.41
23	12.21	54591	4.37	54329	530.43
24	0.00	54329	4.37	54066	530.42
25	0.00	54066	4.36	53805	530.40
26	0.00	53805	4.35	53544	530.39
27	0.00	53544	4.35	53283	530.38
28	0.00	53283	4.34	53022	530.36
29	0.00	53022	4.33	52762	530.35
30	0.00	52762	4.33	52503	530.33

ADDITIONAL INFORMATION

PEAK OUTFLOW = 4.37 C.F.S. AT 23 MINUTES AT HIGH WATER ELEVATION 530.43
REQUIRED DETENTION = 44.15 C.F.S. MINIMUM.

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DATA REPORT

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DATE .....: 02-02-1994

PROJECT NAME ..: THE MANORS AT ROYAL SPRINGS SOUTH BASIN (SOUTH BASIN SHALL BE CONSIDERED A LAKE OR WET BASIN.)
PROJECT NUMBER : 93-3774
CALCULATED BY .: S.O.K.

THE STORM FREQUENCY .....: 100 YEAR STORM

THE STORM DURATION .....: 20 MINUTES

TOTAL TIME OF CONCENTRATION .....: 5 MINUTE(S)

MANUAL ENTRY METHOD FOR Tc
Tc = 5

Q (C.F.S.) ENTERING THE BASIN ...: 47.78 C.F.S.

ELEVATION : 517.70 AREA .....: 15270 (NORMAL POOL ELEVATION 517.70)

ELEVATION : 518.00 AREA .....: 16860

ELEVATION : 520.00 AREA .....: 21420

ELEVATION : 522.00 AREA .....: 27650

OVERFLOW STRUCTURE INFORMATION
THE OVERFLOW STRUCTURE SILL ELEVATION ...: 520.75
THE OVERFLOW STRUCTURE TOTAL SILL LENGTH : 12.56 FEET
THE C VALUE .....: 3.00
THE REQUIRED HEIGHT OF THE SILL OPENING .: THE SILL IS NOT REACHED

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DBASIN VERSION 1.2B
DETENTION BASIN CALCULATIONS

PROJECT: THE MANORS AT ROYAL SPRINGS SOUTH BASIN
PROJECT NO.: 93-3774
DATE: 02-02-1994
BY: S.O.K.

ELEVATION	AREA	INCREMENTAL VOLUME	ACTUAL ACCUM. VOLUME
517.70	15270	0	0
518.00	16860	4819	4819
520.00	21420	38280	43099
522.00	27650	49070	92169

TIME (MIN)	INFLOW (C.F.S.)	INCR. VOL. (CU.FT.)	OUTFLOW (C.F.S.)	NET. DET. (CU.FT.)	ELEV.
0	0.00	0	0.00	0	517.70
1	9.56	573	0.00	573	517.74
2	19.11	1720	0.00	1720	517.81
3	28.67	3440	0.00	3440	517.92
4	38.22	5734	0.00	5734	518.05
5	47.78	8600	0.00	8600	518.20
6	47.78	11467	0.00	11467	518.35
7	47.78	14334	0.00	14334	518.50
8	47.78	17201	0.00	17201	518.65
9	47.78	20068	0.00	20068	518.80
10	47.78	22934	0.00	22934	518.95
11	47.78	25801	0.00	25801	519.10
12	47.78	28668	0.00	28668	519.25
13	47.78	31535	0.00	31535	519.40
14	47.78	34402	0.00	34402	519.55
15	47.78	37268	0.00	37268	519.70
16	47.78	40135	0.00	40135	519.85
17	47.78	43002	0.00	43002	520.00
18	47.78	45869	0.00	45869	520.12
19	47.78	48736	0.00	48736	520.23
20	47.78	51602	0.00	51602	520.35
21	38.22	53896	0.00	53896	520.45
22	28.67	55616	0.00	55616	520.52
23	19.11	56763	0.00	56763	520.56
24	9.56	57336	0.00	57336	520.59
25	0.00	57336	0.00	57336	520.59
26	0.00	57336	0.00	57336	520.59
27	0.00	57336	0.00	57336	520.59
28	0.00	57336	0.00	57336	520.59
29	0.00	57336	0.00	57336	520.59
30	0.00	57336	0.00	57336	520.59

ADDITIONAL INFORMATION

PEAK OUTFLOW = 0.00 C.F.S. AT 30 MINUTES AT HIGH WATER ELEVATION 520.59
REQUIRED DETENTION = N/A C.F.S. MINIMUM.

DATA REPORT

DATE .....: 03-04-1994

PROJECT NAME ..: THE MANORS AT ROYALL SPRINGS NORTH BASIN (DRY BASIN)
PROJECT NUMBER : 93-3774
CALCULATED BY .: S.O.K.

THE STORM FREQUENCY .....: 100 YEAR STORM

THE STORM DURATION .....: 20 MINUTES

TOTAL TIME OF CONCENTRATION .....: 4 MINUTE(S)

MANUAL ENTRY METHOD FOR Tc
Tc = 4

Q (C.F.S.) ENTERING THE BASIN ...: 62.52 C.F.S.

ELEVATION :	525.00	AREA .....:	0
ELEVATION :	526.00	AREA .....:	6500
ELEVATION :	528.00	AREA .....:	10660
ELEVATION :	530.00	AREA .....:	15690
ELEVATION :	532.00	AREA .....:	20900

OVERFLOW STRUCTURE INFORMATION
THE OVERFLOW STRUCTURE SILL ELEVATION ...: 531.40
THE OVERFLOW STRUCTURE TOTAL SILL LENGTH : 12.56 FEET
THE C VALUE .....: 3.00
THE REQUIRED HEIGHT OF THE SILL OPENING .: THE SILL IS NOT REACHED

SQUARE OR RECTANGULAR ORIFICE INFORMATION
SQUARE OR RECTANGULAR ORIFICE NUMBER : 1
THE WIDTH .....: 6 INCHES
THE HEIGHT .....: 10 INCHES
THE FLOWLINE ELEVATION .....: 525.00

DBASIN VERSION 1.2B
DETENTION BASIN CALCULATIONS

PROJECT: THE MANORS AT ROYALL SPRINGS NORTH BASIN
PROJECT NO.: 93-3774
DATE: 03-04-1994
BY: S.O.K.

ELEVATION	AREA	INCREMENTAL VOLUME	ACTUAL ACCUM. VOLUME
525.00	0	0	0
526.00	6500	3250	3250
528.00	10660	17160	20410
530.00	15690	26350	46760
532.00	20900	36590	83350

TIME (MIN)	INFLOW (C.F.S.)	INCR. VOL. (CU.FT.)	OUTFLOW (C.F.S.)	NET. DET. (CU.FT.)	ELEV.
0	0.00	0	0.00	0	525.00
1	15.63	938	0.22	925	525.29
2	31.26	2800	1.27	2724	525.87
3	46.89	5538	1.35	5457	526.27
4	62.52	9208	1.90	9094	526.70
5	62.52	12845	2.31	12706	527.12
6	62.52	16458	2.66	16298	527.54
7	62.52	20049	2.97	19870	527.96
8	62.52	23622	3.17	23431	528.25
9	62.52	27183	3.34	26982	528.52
10	62.52	30733	3.51	30523	528.79
11	62.52	34274	3.66	34054	529.06
12	62.52	37805	3.81	37577	529.33
13	62.52	41328	3.95	41091	529.59
14	62.52	44842	4.09	44596	529.86
15	62.52	48347	4.21	48095	530.09
16	62.52	51846	4.30	51588	530.28
17	62.52	55339	4.39	55076	530.47
18	62.52	58827	4.48	58558	530.66
19	62.52	62309	4.57	62035	530.85
20	62.52	65786	4.65	65507	531.04
21	46.89	68320	4.72	68037	531.18
22	31.26	69913	4.76	69628	531.27
23	15.63	70566	4.77	70279	531.31
24	0.00	70279	4.76	69993	531.29
25	0.00	69993	4.76	69708	531.27
26	0.00	69708	4.75	69423	531.26
27	0.00	69423	4.74	69138	531.24
28	0.00	69138	4.74	68854	531.23
29	0.00	68854	4.73	68570	531.21
30	0.00	68570	4.73	68287	531.20

ADDITIONAL INFORMATION

PEAK OUTFLOW = 4.77 C.F.S. AT 23 MINUTES AT HIGH WATER ELEVATION 531.31
REQUIRED DETENTION = N/A C.F.S. MINIMUM.

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                              DATA REPORT
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DATE .....: 02-02-1994

PROJECT NAME ..: THE MANORS AT ROYAL SPRINGS SOUTH BASIN (SOUTH BASIN SHALL BE CONSIDERED A LAKE OR WET BASIN.)
PROJECT NUMBER : 93-3774
CALCULATED BY .: S.O.K.

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THE STORM FREQUENCY .....:   15 YEAR STORM

THE STORM DURATION .....:   20 MINUTES

TOTAL TIME OF CONCENTRATION .....:    5 MINUTE(S)

MANUAL ENTRY METHOD FOR Tc
Tc =   5

Q (C.F.S.) ENTERING THE BASIN ...:   30.23 C.F.S.

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ELEVATION :    517.70     AREA .....:    15270 (NORMAL POOL ELEVATION 517.70)

ELEVATION :    518.00     AREA .....:    16860

ELEVATION :    520.00     AREA .....:    21420

ELEVATION :    522.00     AREA .....:    27650


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OVERFLOW STRUCTURE INFORMATION
THE OVERFLOW STRUCTURE SILL ELEVATION ...:  520.75
THE OVERFLOW STRUCTURE TOTAL SILL LENGTH :   12.56 FEET
THE C VALUE .....:    3.00
THE REQUIRED HEIGHT OF THE SILL OPENING .:   THE SILL IS NOT REACHED

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SQUARE OR RECTANGULAR ORIFICE INFORMATION
SQUARE OR RECTANGULAR ORIFICE NUMBER :    1
THE WIDTH .....:   18   INCHES
THE HEIGHT .....:   18   INCHES
THE FLOWLINE ELEVATION .....:  517.70

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DBASIN VERSION 1.2B
DETENTION BASIN CALCULATIONS

PROJECT: THE MANORS AT ROYAL SPRINGS SOUTH BASIN
PROJECT NO.: 93-3774
DATE: 02-02-1994
BY: S.O.K.

ELEVATION	AREA	INCREMENTAL VOLUME	ACTUAL ACCUM. VOLUME
517.70	15270	0	0
518.00	16860	4819	4819
520.00	21420	38280	43099
522.00	27650	49070	92169

TIME (MIN)	INFLOW (C.F.S.)	INCR. VOL. (CU.FT.)	OUTFLOW (C.F.S.)	NET. DET. (CU.FT.)	ELEV.
0	0.00	0	0.00	0	517.70
1	6.05	363	0.02	361	517.73
2	12.09	1087	0.08	1082	517.77
3	18.14	2171	0.22	2157	517.84
4	24.18	3608	0.46	3581	517.93
5	30.23	5394	0.87	5342	518.04
6	30.23	7156	1.23	7082	518.13
7	30.23	8896	1.73	8792	518.22
8	30.23	10606	2.20	10474	518.31
9	30.23	12287	2.90	12113	518.40
10	30.23	13927	3.41	13723	518.48
11	30.23	15537	3.95	15300	518.56
12	30.23	17113	4.58	16838	518.65
13	30.23	18652	5.21	18340	518.73
14	30.23	20154	5.82	19804	518.81
15	30.23	21618	6.38	21235	518.88
16	30.23	23049	7.04	22626	518.96
17	30.23	24440	7.64	23982	519.03
18	30.23	25796	8.25	25301	519.10
19	30.23	27114	8.88	26582	519.17
20	30.23	28396	9.17	27846	519.24
21	24.18	29297	9.19	28745	519.28
22	18.14	29833	9.21	29281	519.31
23	12.09	30007	9.21	29454	519.32
24	6.05	29817	9.21	29264	519.31
25	0.00	29264	9.19	28713	519.28
26	0.00	28713	9.17	28162	519.25
27	0.00	28162	9.16	27613	519.22
28	0.00	27613	9.15	27064	519.20
29	0.00	27064	8.88	26531	519.17
30	0.00	26531	8.61	26015	519.14

ADDITIONAL INFORMATION

PEAK OUTFLOW = 9.21 C.F.S. AT 23 MINUTES AT HIGH WATER ELEVATION 519.32
REQUIRED DETENTION = N/A C.F.S. MINIMUM.

DATE .....: 03-04-1994

PROJECT NAME ..: THE MANORS AT ROYALL SPRINGS NORTH BASIN (DRY BASIN)
PROJECT NUMBER : 93-3774
CALCULATED BY .: S.O.K.

THE STORM FREQUENCY .....: 15 YEAR STORM

THE STORM DURATION .....: 20 MINUTES

TOTAL TIME OF CONCENTRATION .....: 4 MINUTE(S)

MANUAL ENTRY METHOD FOR Tc
Tc = 4

Q (C.F.S.) ENTERING THE BASIN ...: 39.55 C.F.S.

ELEVATION :	525.00	AREA .....:	0
ELEVATION :	526.00	AREA .....:	6500
ELEVATION :	528.00	AREA .....:	10660
ELEVATION :	530.00	AREA .....:	15690
ELEVATION :	532.00	AREA .....:	20900

OVERFLOW STRUCTURE INFORMATION
THE OVERFLOW STRUCTURE SILL ELEVATION ...: 531.40
THE OVERFLOW STRUCTURE TOTAL SILL LENGTH : 12.56 FEET
THE C VALUE .....: 3.00
THE REQUIRED HEIGHT OF THE SILL OPENING .: THE SILL IS NOT REACHED

SQUARE OR RECTANGULAR ORIFICE INFORMATION
SQUARE OR RECTANGULAR ORIFICE NUMBER : 1
THE WIDTH .....: 6 INCHES
THE HEIGHT .....: 10 INCHES
THE FLOWLINE ELEVATION .....: 525.00

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DETENTION BASIN CALCULATIONS

PROJECT: THE MANORS AT ROYALL SPRINGS NORTH BASIN
PROJECT NO.: 93-3774
DATE: 03-04-1994
BY: S.O.K.

ELEVATION	AREA	INCREMENTAL VOLUME	ACTUAL ACCUM. VOLUME
525.00	0	0	0
526.00	6500	3250	3250
528.00	10660	17160	20410
530.00	15690	26350	46760
532.00	20900	36590	83350

TIME (MIN)	INFLOW (C.F.S.)	INCR. VOL. (CU.FT.)	OUTFLOW (C.F.S.)	NET. DET. (CU.FT.)	ELEV.
0	0.00	0	0.00	0	525.00
1	9.89	593	0.12	586	525.19
2	19.77	1773	0.63	1735	525.55
3	29.66	3515	1.29	3437	526.04
4	39.55	5810	1.39	5727	526.30
5	39.55	8100	1.75	7995	526.57
6	39.55	10368	2.04	10246	526.83
7	39.55	12619	2.30	12481	527.10
8	39.55	14854	2.52	14703	527.36
9	39.55	17076	2.73	16912	527.62
10	39.55	19285	2.91	19110	527.87
11	39.55	21483	3.06	21300	528.09
12	39.55	23673	3.17	23482	528.25
13	39.55	25855	3.28	25659	528.42
14	39.55	28032	3.38	27829	528.58
15	39.55	30202	3.48	29993	528.75
16	39.55	32366	3.58	32151	528.91
17	39.55	34524	3.68	34304	529.08
18	39.55	36677	3.76	36451	529.24
19	39.55	38824	3.85	38593	529.40
20	39.55	40966	3.94	40729	529.57
21	29.66	42509	4.00	42269	529.68
22	19.77	43455	4.04	43213	529.75
23	9.89	43806	4.05	43563	529.78
24	0.00	43563	4.04	43321	529.76
25	0.00	43321	4.03	43079	529.74
26	0.00	43079	4.03	42837	529.73
27	0.00	42837	4.02	42596	529.71
28	0.00	42596	4.01	42356	529.69
29	0.00	42356	4.00	42116	529.67
30	0.00	42116	3.98	41877	529.65

ADDITIONAL INFORMATION

PEAK OUTFLOW = 4.05 C.F.S. AT 23 MINUTES AT HIGH WATER ELEVATION 529.78
REQUIRED DETENTION = N/A C.F.S. MINIMUM.

Project: _____

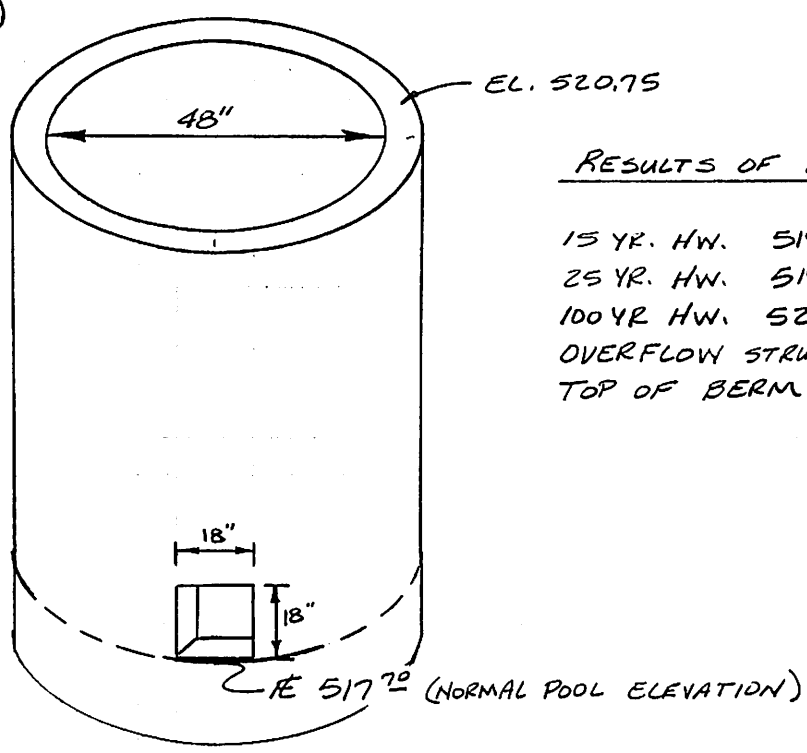
Date: _____ Project No: _____

Designed: _____ Checked: _____

STRUCTURE DETAILS

SOUTH BASIN:

(WET DETENTION BASIN, LAKE)

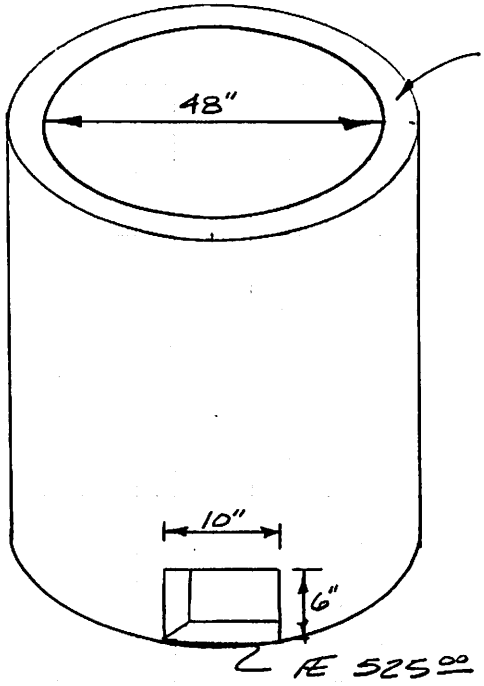


RESULTS OF ROUTING CALCULATIONS

15 YR. HW. 519.32
25 YR. HW. 519.70
100 YR HW. 520.59
OVERFLOW STRUCTURE EL. 520.75
TOP OF BERM EL. 522.5

NORTH BASIN:

(DRY DETENTION BASIN)



RESULTS OF ROUTING CALCULATIONS

15 YR. HW. 529.78
25 YR. HW. 530.43
100 YR. HW 531.31
OVERFLOW STRUCTURE EL. 531.4
TOP OF BERM EL. 533.0

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