

**APPENDIX I:
WATER RESOURCES REPORTS**

CONCEPTUAL DRAINAGE STUDY

FOR

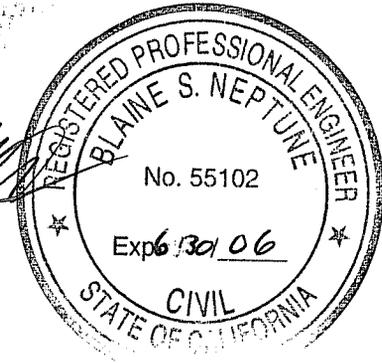
Home Depot Yucca Valley, CA

Project # 04-098
10/10/05

Prepared By:



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Introduction

At the request of Home Depot, Inc., McIntosh & Associates has prepared a conceptual drainage plan for the proposed Home Depot site located in the Town of Yucca Valley, California. This plan consists of two distinct stormwater management components – the conveyance of onsite parking area stormwater runoff, and the detention and metered release of the remaining onsite water and all offsite stormwater. The following paragraphs describe the proposed drainage program which is based on the current conceptual site development plan. Conceptually, this plan is designed to limit post-development discharge downstream to pre-development levels.

Post-development onsite stormwater runoff will be managed in two ways - roof drainage from the proposed building and garden center will be combined with driveway and parking lot runoff from the south, east, and west sides of the proposed building and the garden center, and will be conveyed to an onsite detention basin for storage and subsequent controlled release (See Sheet CB). Stormwater runoff from the remainder of the parking lot and driveways to the north of the proposed building and garden center will be conveyed by way of a storm drain system to a discharge structure to be located near the northeast corner of the site, and from there it will be returned to the natural drainage-course which crosses that area (See Sheet CB).

Onsite stormwater runoff associated with the “Out Parcels” located to the north of the Home Depot parking area will also be conveyed via the storm drain system to the discharge structure previously mentioned.

Offsite stormwater drainage, which currently flows across the Home Depot site, will be collected at proposed inlet structures to be constructed in two existing natural drainage swales on the south side of the proposed Palisades Drive and will be conveyed to the onsite detention basin. Stormwater runoff which is currently conveyed in two additional drainage swales which cross the Home Depot site, by way of the proposed Wal-Mart site, will also be intercepted by proposed inlet structures on the south side of the proposed Palisades Drive and conveyed by pipe to the Home Depot detention basin, where it will be combined with the onsite and offsite flows described previously (See Sheet CB).

The combined storage within the detention basin will be discharged on a metered basis through a buried stormdrain system, combined with the onsite flows from the Home Depot site, and will be conveyed to a point near the northeast corner of the site at a rate approaching pre-development flow rates at this location. The detention basin discharge piping will be sized to accommodate the required discharge volumes and to meet the requirements of the Town of Yucca Valley (See Sheet CB).

The attached conceptual grading/drainage plan shows the components of the proposed stormdrain system. The onsite stormdrains will be sized to convey the peak design storm - plus, where needed, the metered discharge from the detention basin.

Hydrology

The proposed Home Depot site is located within a 50 acre tributary watershed to the Covington Wash¹ located approximately 1000 ft. east of the project.

The Covington wash has a tributary area of approx. 12,222 acres and the Home Depot project is near its downstream end (see figure 1).

The Home Depot project and the out parcels take up approx. 18 acres of the 50 acre contributing watershed. The first step in determining the size of the detention basin was to find out how much runoff the predeveloped conditions generated. Using the rational method and predeveloped runoff coefficient of 0.25 the peak discharge for the 50 acres is approx. 40.00 cfs.

¹ Town of Yucca Valley Master Plan of Drainage, June 1999 prepared by John M. Tettemer & Associates Inc.

The goal for development will be to allow some of the project to drain un-detained while detaining the upstream undeveloped runoff and a portion of the developed. As long as the total runoff does not exceed the historic flow rates then this method is acceptable. The post developed peak flow is approx. 73.28 cfs. A runoff coefficient of 0.9 was used for developed conditions. It was also assumed that 16 acres of the site would use developed runoff coefficient and 2 acres (the detention basin) would still use the undeveloped runoff coefficient. Because not all of the developed flows will drain to the detention basin it was necessary to quantify those flows draining into the basin vs. the flows released from the site un-detained.

Summary:

Pre-Developed Runoff:	Q = 40.00 cfs
Post-Developed Runoff:	Q = 73.28 cfs
Post-Developed Runoff Un-detained	Q = 27.36 cfs
Post-Developed Runoff Detained	Q = 45.92 cfs

The next step was to size the detention basin to accommodate the peak runoff of 45.92 and release it from the basin at rate equal to or less than 12.64 cfs. The 12.64 was derived from taking the Pre-Developed Q of 40.00 and subtracting the Post-Developed Q of 27.36.

A detention basin 6' deep with 2:1 side slopes and a bottom dimension of 20' x 155' is adequate. An outlet structure with an 11" circular orifice will restrict the water released from the basin to 7.78 cfs at 6' of depth. A stage storage discharge relationship included in this study shows these results.

The next step was to combine the hydrographs from the detained and undetained runoff to make sure that the predeveloped peak was not exceeded. This combined hydrograph shows that the peak discharge from the site will be 33.13 cfs, approximately 7 cfs less than the historic peak.

Conclusion:

Detaining the offsite undeveloped runoff and a portion of the developed on-site runoff will be adequate to reduce the peak discharge to its historic rate. Allowing a portion of the developed runoff to flow to its historic path un-detained will not adversely affect any downstream facilities. The Covington wash has a peak runoff of 10,980 cfs with a time of concentration far exceeding that of the proposed development. This means that peak runoff from the site will be downstream a long time before the peak of 10,980 cfs occurs.

The limit of the city master study is Yucca Mesa road approximately ¼ of a mile east of the site so this study could not determine any impacts downstream. However because the peak discharge from the site will be only 33.13 cfs. Approx. 0.3% of the overall runoff it can be surmised that this development will have no adverse affects on any downstream facilities.

A more detailed hydrology study showing all drainage facilities will be required at the time of development

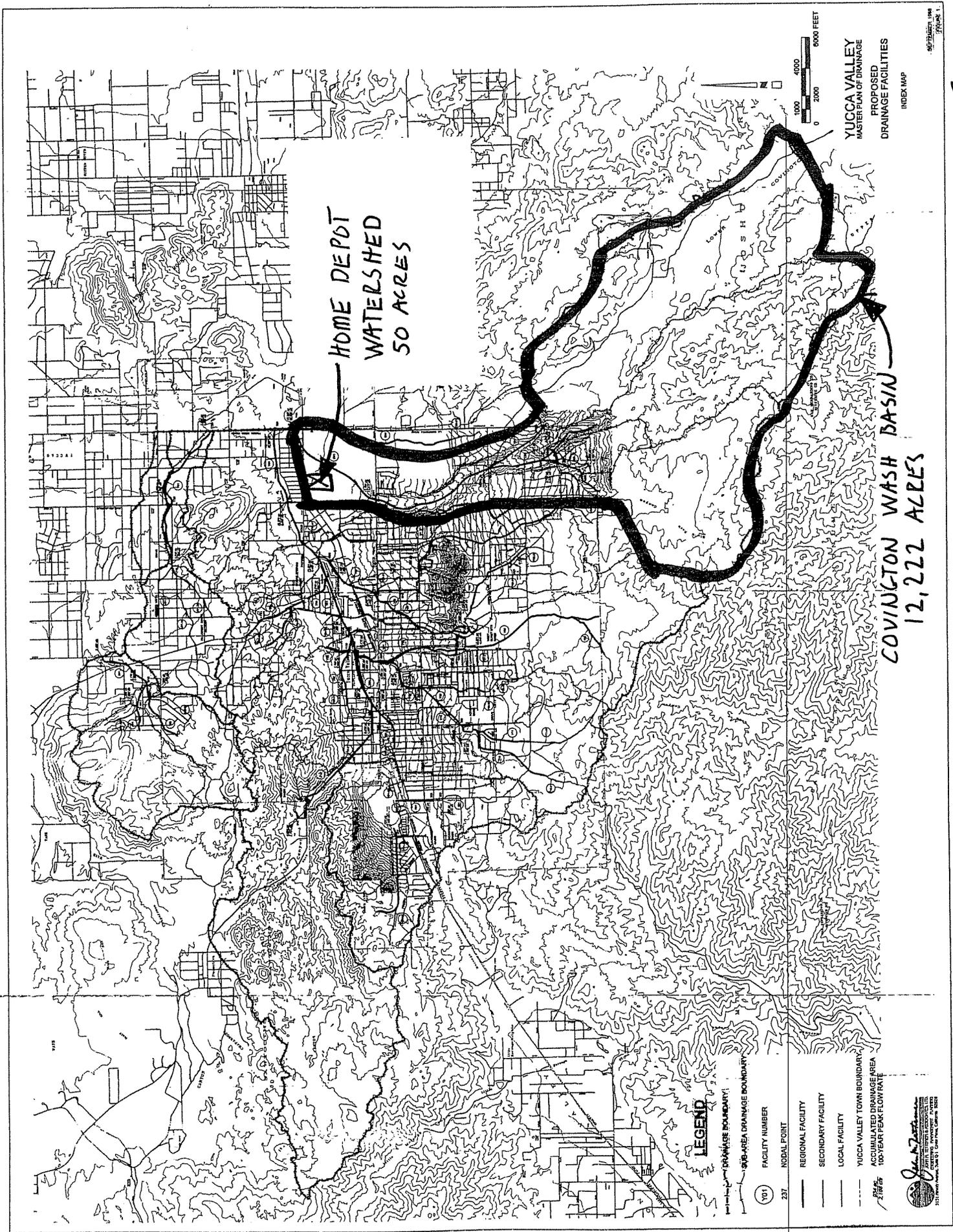


FIGURE 1

Tabular And Curvilinear Flood Hydrographs For: HD-Yucca Valley Pre Developed

Home Depot Only

Contributing Watershed Area = 38.87 acres

Flood Frequency = 100 years.

Time of Concentration = 15 minutes.

Peak Discharge = 40.00 cfs.

Time to Peak of the Flood Hydrograph = 20.7 minutes.

Worksheet only valid for storms with Tc less than 60 minutes

Q=CIA 40.00

C= 0.25

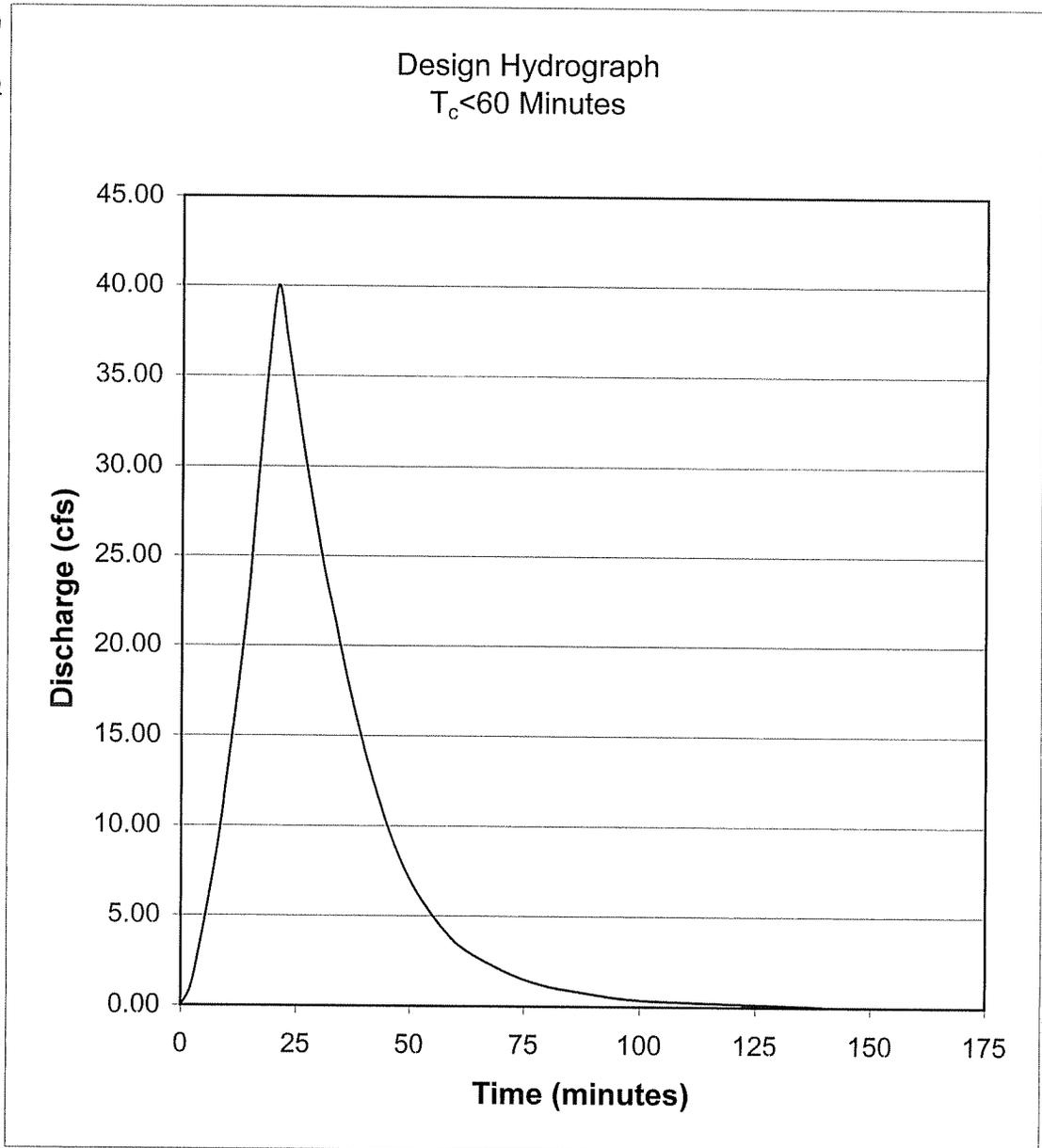
I= 3.20

A= 50.00

Concentration Point: _____

Tabular Hydrograph

Time (minutes)	Discharge (cubic ft/s)
0.00	0.00
2.07	1.00
4.14	3.48
6.21	6.40
8.28	9.72
10.35	13.84
12.42	18.04
14.49	23.04
16.56	29.52
18.63	35.48
20.70	40.00
22.77	36.96
24.84	33.56
26.91	30.24
28.98	27.12
31.05	24.16
33.12	21.80
35.19	19.28
37.26	16.96
39.33	14.88
41.40	12.92
45.54	9.64
49.68	7.16
53.82	5.44
57.96	4.08
62.10	3.12
70.38	1.96
78.66	1.20
86.94	0.80
95.22	0.48
103.50	0.32
144.90	0.00



Tabular And Curvilinear Flood Hydrographs For: HD-Yucca Valley Post Developed

Home Depot Only

Contributing Watershed Area = 38.87 acres

Flood Frequency = 100 years.

Time of Concentration = 15 minutes.

Peak Discharge = 73.28 cfs.

Time to Peak of the Flood Hydrograph = 20.7 minutes.

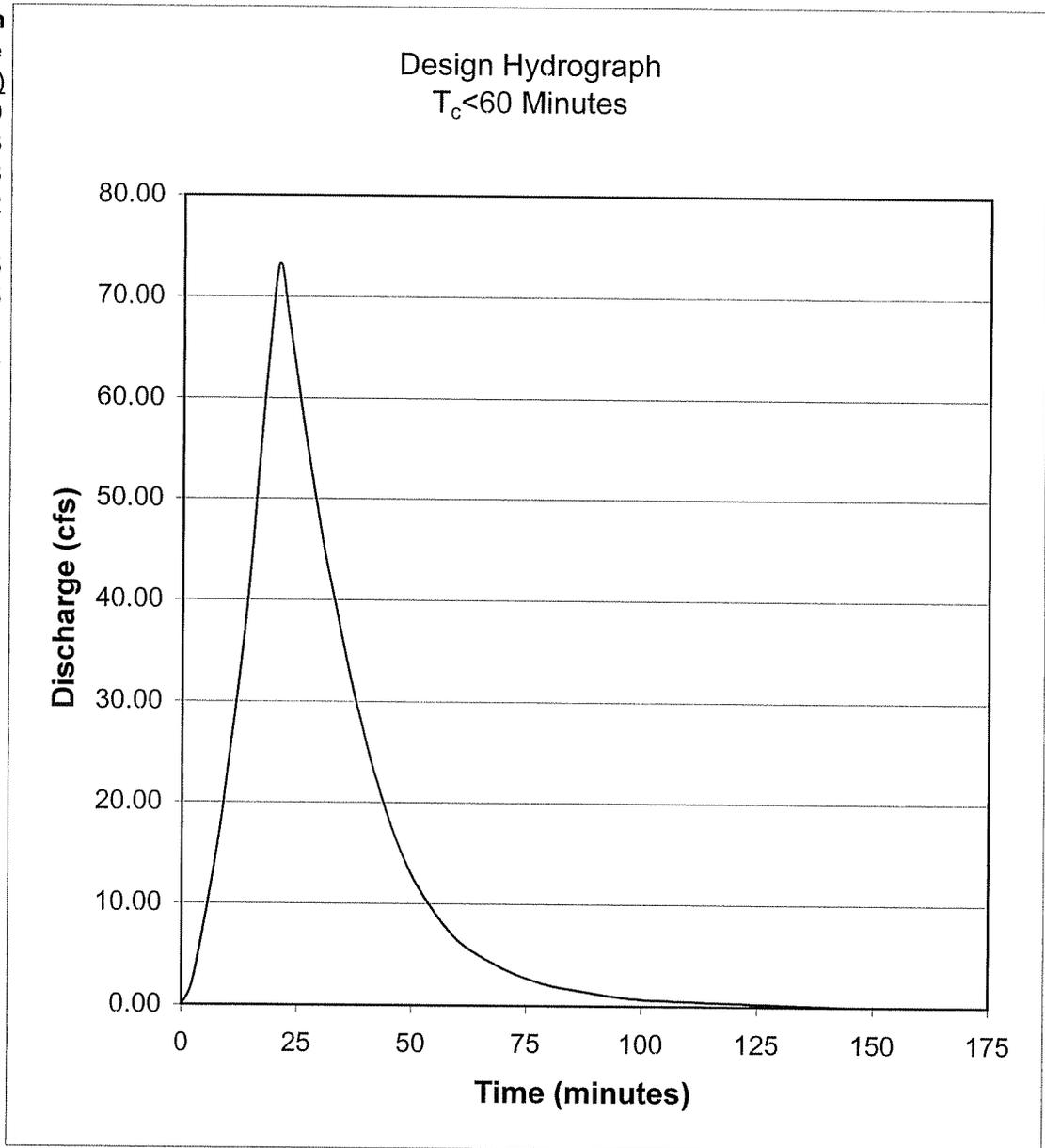
Worksheet only valid for storms with Tc less than 60 minutes

Q=CIA	27.20	46.08
C=	0.25	0.9
I=	3.20	3.2
A=	34.00	16

Concentration Point: _____

Tabular Hydrograph

Time (minutes)	Discharge (cubic ft/s)
0.00	0.00
2.07	1.83
4.14	6.38
6.21	11.72
8.28	17.81
10.35	25.35
12.42	33.05
14.49	42.21
16.56	54.08
18.63	65.00
20.70	73.28
22.77	67.71
24.84	61.48
26.91	55.40
28.98	49.68
31.05	44.26
33.12	39.94
35.19	35.32
37.26	31.07
39.33	27.26
41.40	23.67
45.54	17.66
49.68	13.12
53.82	9.97
57.96	7.47
62.10	5.72
70.38	3.59
78.66	2.20
86.94	1.47
95.22	0.88
103.50	0.59
144.90	0.00



Tabular And Curvilinear Flood Hydrographs For: HD-Yucca Valley Post Developed Undetained

Home Depot Only

Contributing Watershed Area = 38.87 acres

Flood Frequency = 100 years.

Time of Concentration = 15 minutes.

Peak Discharge = 27.36 cfs.

Time to Peak of the Flood Hydrograph = 20.7 minutes.

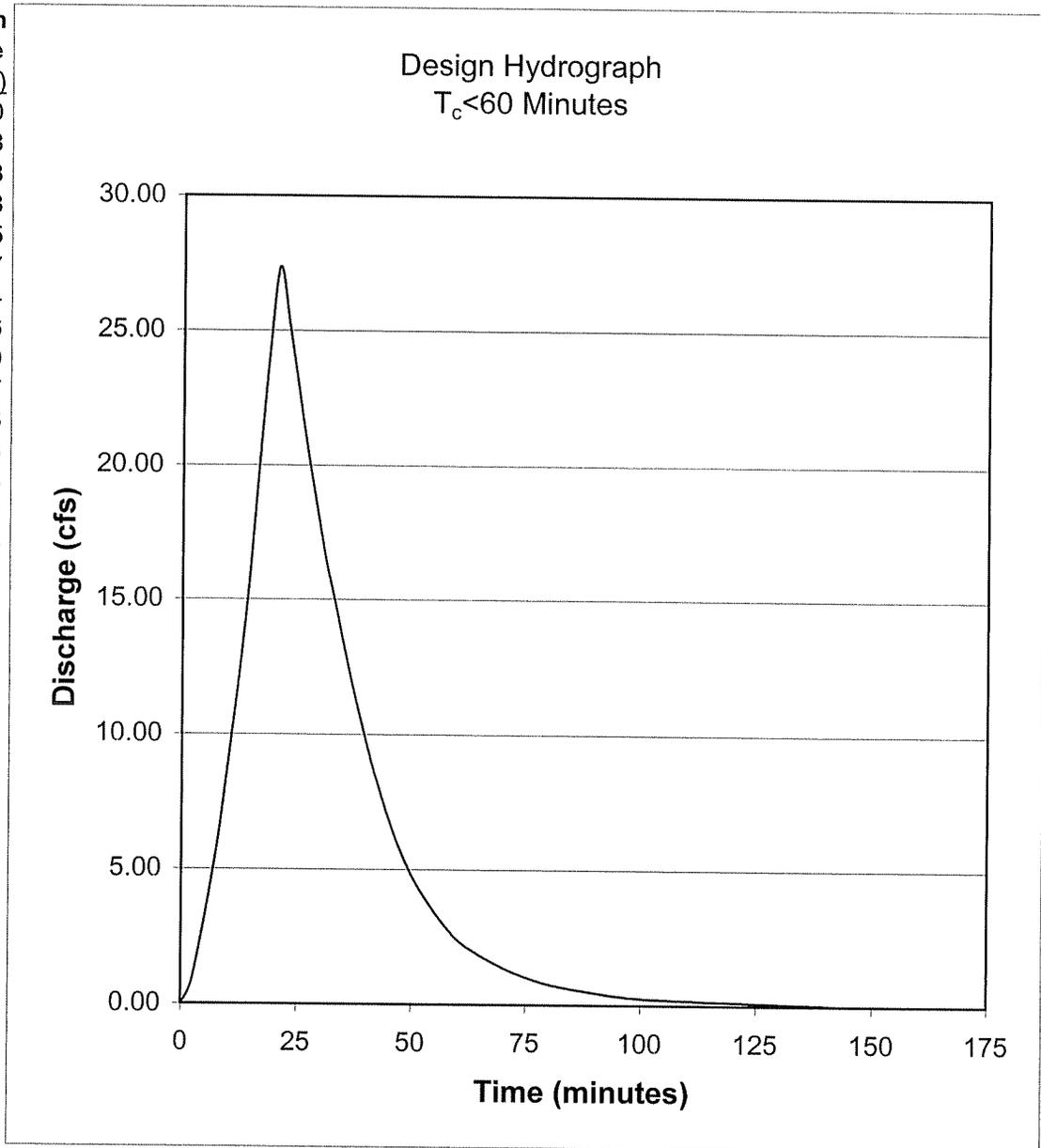
Worksheet only valid for storms with Tc less than 60 minutes

Q=CIA 27.36
C= 0.9
I= 3.2
A= 9.5

Concentration Point: _____

Tabular Hydrograph

Time (minutes)	Discharge (cubic ft/s)
0.00	0.00
2.07	0.68
4.14	2.38
6.21	4.38
8.28	6.65
10.35	9.47
12.42	12.34
14.49	15.76
16.56	20.19
18.63	24.27
20.70	27.36
22.77	25.28
24.84	22.96
26.91	20.68
28.98	18.55
31.05	16.53
33.12	14.91
35.19	13.19
37.26	11.60
39.33	10.18
41.40	8.84
45.54	6.59
49.68	4.90
53.82	3.72
57.96	2.79
62.10	2.13
70.38	1.34
78.66	0.82
86.94	0.55
95.22	0.33
103.50	0.22
144.90	0.00



Tabular And Curvilinear Flood Hydrographs For: HD-Yucca Valley Post Developed to Detention Basin

Home Depot Only

Contributing Watershed Area = 38.87 acres

Flood Frequency = 100 years.

Time of Concentration = 15 minutes.

Peak Discharge = 45.92 cfs.

Time to Peak of the Flood Hydrograph = 20.7 minutes.

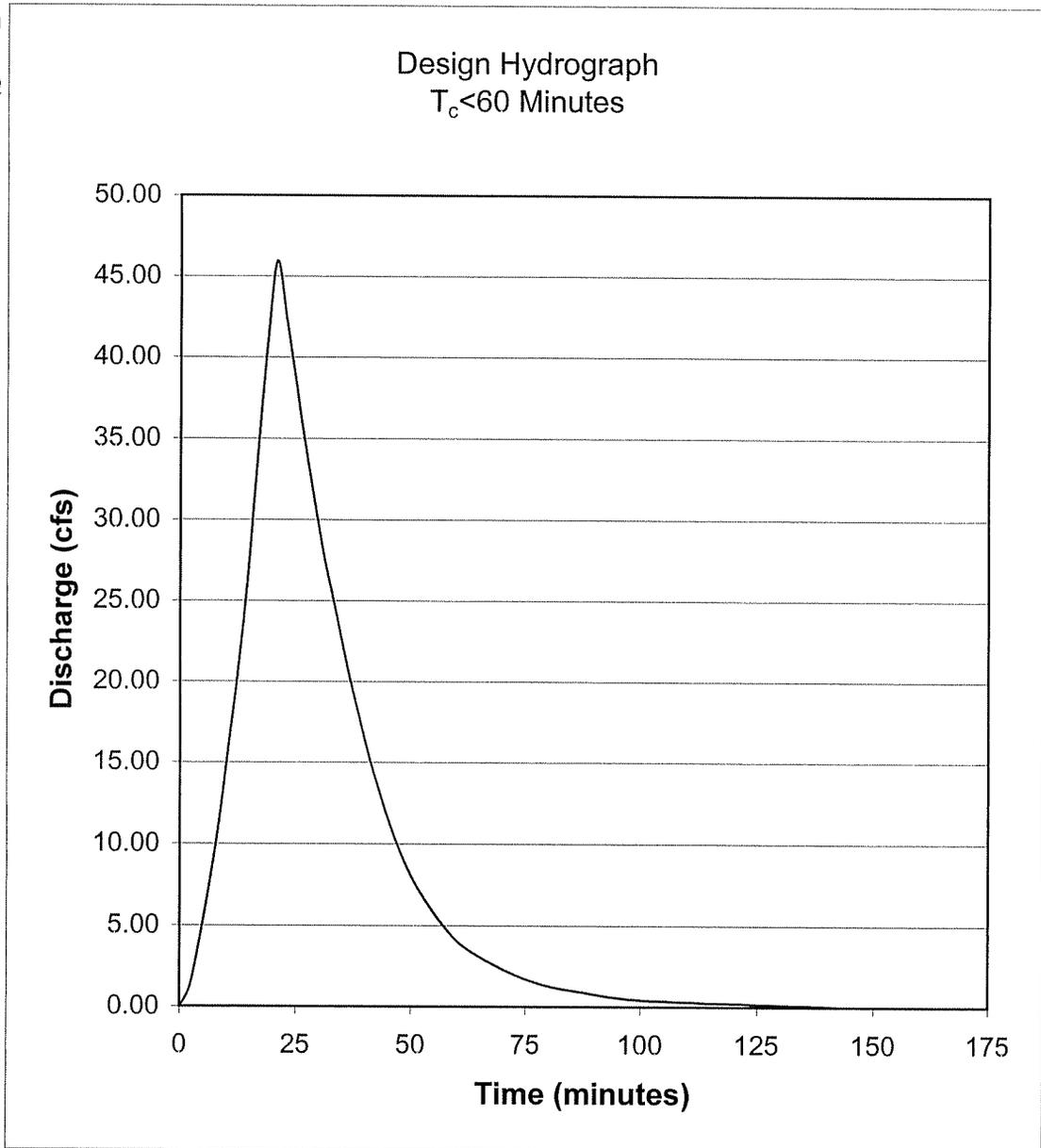
Worksheet only valid for storms with Tc less than 60 minutes

Q=CIA	27.20	18.72
C=	0.25	0.9
I=	3.20	3.2
A=	34.00	6.5

Concentration Point: _____

Tabular Hydrograph

Time (minutes)	Discharge (cubic ft/s)
0.00	0.00
2.07	1.15
4.14	4.00
6.21	7.35
8.28	11.16
10.35	15.89
12.42	20.71
14.49	26.45
16.56	33.89
18.63	40.73
20.70	45.92
22.77	42.43
24.84	38.53
26.91	34.72
28.98	31.13
31.05	27.74
33.12	25.03
35.19	22.13
37.26	19.47
39.33	17.08
41.40	14.83
45.54	11.07
49.68	8.22
53.82	6.25
57.96	4.68
62.10	3.58
70.38	2.25
78.66	1.38
86.94	0.92
95.22	0.55
103.50	0.37
144.90	0.00



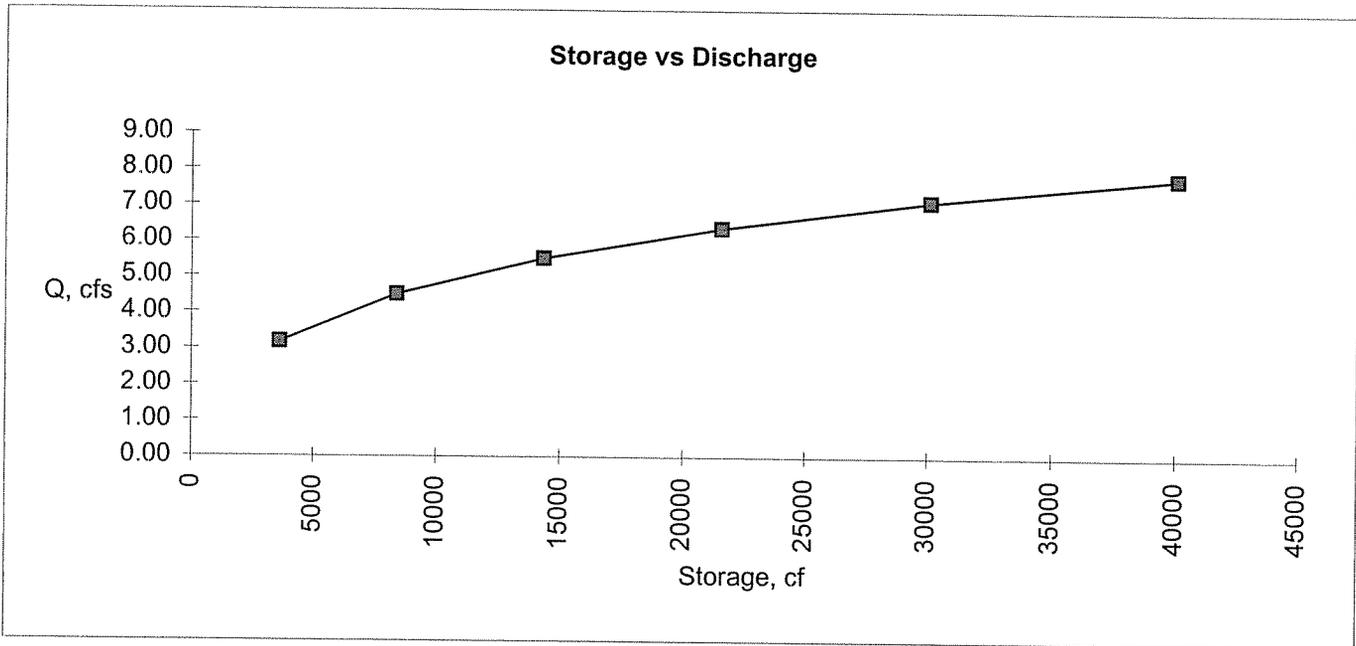
Volume Relationship for South Detention Basin

Basin: Home Depot Yucca Valley

Detention Basin Values:

Basin Bottom Width:	20.00 ft.	Rectangular Weir Values:
Basin Bottom Length:	155.00 ft.	Width: ft.
Bottom Area:	3100.00 sf	Circular Orifice Values:
Sideslopes:	3.00 to 1.00	Diameter: 11.0 in.
Depth Increment:	1.00 ft.	Rectangular Orifice Values:
Outlet Type (Weir/Circular Orifice/Rectangular Orifice):	circular orifice	Height: 1.9 ft.
		Length: 3.1 ft.

Depth feet	WS Area S.F.	Add. Volume C.F.	Available Total Volume C.F.	Outlet Discharge C.F.S.
1.00	4186	3637.0	3637.0	3.18
2.00	5344	4759.0	8396.0	4.49
3.00	6574	5953.0	14349.0	5.50
4.00	7876	7219.0	21568.0	6.36
5.00	9250	8557.0	30125.0	7.11
6.00	10696	9967.0	40092.0	7.78



RESERVOIR ROUTE - STORAGE INDICATION METHOD

Detention Basin for Home Depot Only

Delta T (hrs): 0.029

Reservoir Characteristics:

Disch.,(cfs)	Storage, cf	S/T+Q/2,(cfs)
Q1: 3.18	S1: 3637.00	36.4
Q2: 4.49	S2: 8396.00	82.7
Q3: 5.50	S3: 14349.00	140.2
Q4: 6.36	S4: 21568.00	209.8
Q5: 7.11	S5: 30125.00	292.1
Q6: 7.78	S6: 40092.00	387.9

Peak Inflow (cfs): 45.92 Discharge
Peak Outflow (cfs): 7.78 Diameter 11.00
Max. Storage Req'd(cf): 40092.32

100yr-1hr Flows

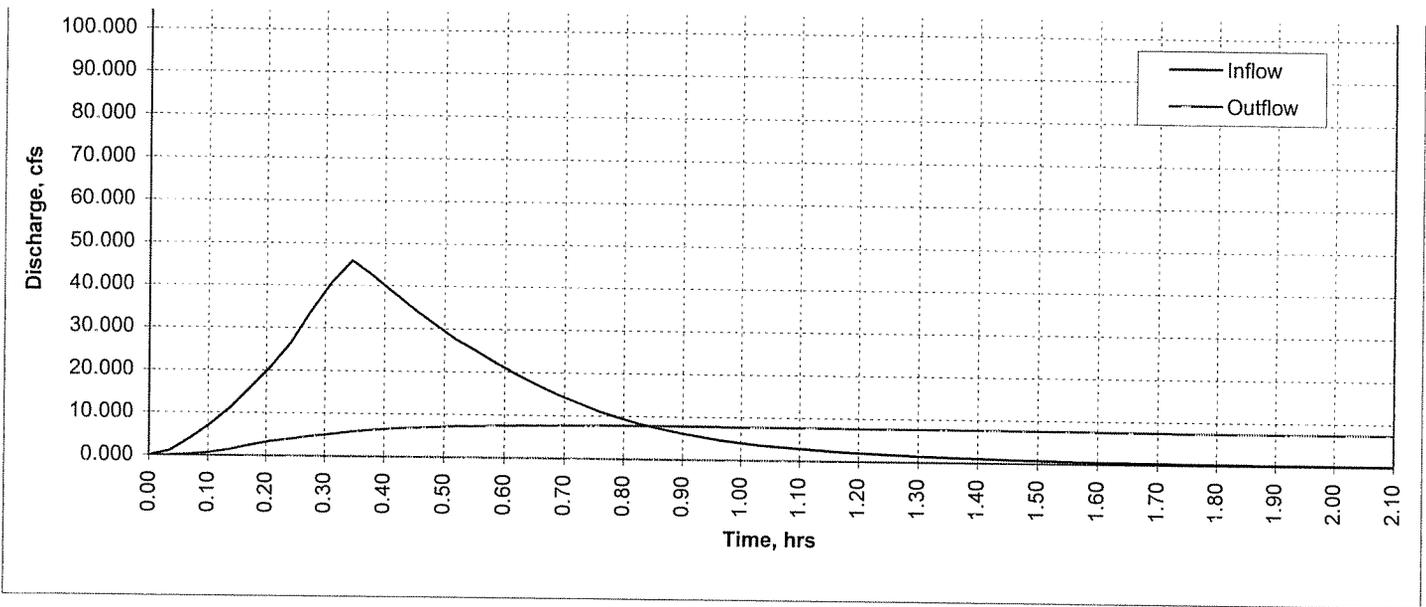
Time, Hrs	Total Inflow,	Inflow				Outflow	Vol,cf	Total Vol,af
	cfs	Avg., l	S/T+ Q/2	O2'	O2"			
0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.035	1.148	0.57	0.57	0.05	0.00	0.05	114.62	0.003
0.069	3.995	2.57	3.10	0.27	0.00	0.27	503.51	0.010
0.104	7.347	5.67	8.50	0.74	0.00	0.74	1193.18	0.018
0.138	11.159	9.25	17.01	1.48	0.00	1.48	2203.23	0.027
0.173	15.888	13.52	29.05	2.53	0.00	2.53	3597.42	0.038
0.207	20.710	18.30	44.81	3.42	0.00	3.42	5402.87	0.050
0.242	26.450	23.58	64.98	3.99	0.00	3.99	7747.65	0.063
0.276	33.889	30.17	91.16	4.64	0.00	4.64	10800.94	0.081
0.311	40.731	37.31	123.82	5.22	0.00	5.22	14508.66	0.098
0.345	45.920	43.33	161.93	0.00	5.77	5.77	18700.34	0.110
0.380	42.430	44.18	200.34	0.00	6.24	6.24	22478.59	0.102
0.414	38.527	40.48	234.58	0.00	6.58	6.58	25813.71	0.092
0.449	34.716	36.62	264.62	0.00	6.86	6.86	28722.35	0.083
0.483	31.134	32.92	290.69	0.00	7.09	7.09	31232.25	0.075
0.518	27.736	29.43	313.03	0.00	7.25	7.25	33370.59	0.066
0.552	25.026	26.38	332.15	0.00	7.39	7.39	35211.94	0.060
0.587	22.133	23.58	348.35	0.00	7.50	7.50	36739.30	0.053
0.621	19.470	20.80	361.64	0.00	7.60	7.60	37978.78	0.047
0.656	17.082	18.28	372.32	0.00	7.67	7.67	38961.07	0.041
0.690	14.832	15.96	380.61	0.00	7.73	7.73	39702.34	0.036
0.759	11.067	12.95	385.82	0.00	7.77	7.77	40046.64	0.027
0.828	8.220	9.64	387.70	0.00	7.78	7.78	40092.32	0.020
0.897	6.245	7.23	387.15	0.00	7.78	7.78	39932.27	0.015
0.966	4.684	5.46	384.83	0.00	7.76	7.76	39610.92	0.011
1.035	3.582	4.13	381.21	0.00	7.74	7.74	39177.21	0.009
1.173	2.250	2.92	376.39	0.00	7.70	7.70	38608.02	0.005
1.311	1.378	1.81	370.50	0.00	7.66	7.66	37952.10	0.003
1.449	0.918	1.15	363.99	0.00	7.61	7.61	37253.06	0.002
1.587	0.551	0.73	357.11	0.00	7.57	7.57	36520.74	0.001
1.725	0.367	0.46	350.00	0.00	7.52	7.52	35774.50	0.001
2.415	0.000	0.18	342.67	0.00	7.46	7.46	34995.33	0.000

South Detention Basin Routing

110.000 McIntosh Associates

100.000 PROJECTS\04098\studies\HYDROLOGY\HD Site Detention-IV.xls

Routing



Tabular And Curvilinear Flood Hydrographs For: HD-Yucca Valley Combined Hydrograph

Home Depot Only

Contributing Watershed Area = 50.00 acres Flood Frequency = 100

Time of Concentration = 15 minutes. **Peak Discharge** = 33.13
 Time to Peak of the Flood Hydrograph = 20.7 minutes.

Worksheet only valid for storms with Tc less than 60 minutes

Q=CIA
C=
I=
A=

Concentration Point: _____

Tabular Hydrograph

Time (minutes)	Undetained (cubic ft/s)	Detained (cubic ft/s)	Total (cubic ft/s)
0.00	0.00	0.00	0.00
2.07	0.68	0.05	0.73
4.14	2.38	0.27	2.65
6.21	4.38	0.74	5.12
8.28	6.65	1.48	8.13
10.35	9.47	2.53	12.00
12.42	12.34	3.42	15.76
14.49	15.76	3.99	19.75
16.56	20.19	4.64	24.83
18.63	24.27	5.22	29.48
20.70	27.36	5.77	33.13
22.77	25.28	6.24	31.52
24.84	22.96	6.58	29.54
26.91	20.68	6.86	27.54
28.98	18.55	7.09	25.64
31.05	16.53	7.25	23.78
33.12	14.91	7.39	22.30
35.19	13.19	7.50	20.69
37.26	11.60	7.60	19.20
39.33	10.18	7.67	17.85
41.40	8.84	7.73	16.57
45.54	6.59	7.77	14.36
49.68	4.90	7.78	12.68
53.82	3.72	7.78	11.50
57.96	2.79	7.76	10.55
62.10	2.13	7.74	9.87
70.38	1.34	7.70	9.04
78.66	0.82	7.66	8.48
86.94	0.55	7.61	8.16
95.22	0.33	7.57	7.89
103.50	0.22	7.52	7.73
144.90	0.00	7.46	7.46

