MARK GOODWIN

& ASSOCIATES

CONSULTING ENGINEERS

DRAINAGE CALCULATIONS

for

MONTGOMERY STORAGE UNITS

February 1996

NEW MEXICO
11929
REGISTERED PROFESSIONAL ENGINEER
2-14-96

D. MARK GOODWIN & ASSOCIATES

4-24-96
5-21-96
11-18-96

D. Mark Goodwin & Associates, P.A.
Consulting Engineers and Surveyors

PROJECT Montgomery Storage Units
SUBJECT Drainage Calcs
BY GJK DATE 2-13-96
CHECKED ______ DATE ______
SHEET 1 OF ___
Revised 5-21-96 11-18-96

- THE TOTAL SITE CONSISTS OF 6.5619 ACRES.
- PER THE PREDESIGN CONFERENCE THIS SITE WILL BE ALLOWED 1 CFS/AC DISCHARGE = 6.5619 CFS
- THE SITE IS DIVIDED INTO 5 BASINS.
- OFFSITE FLOWS FROM THE RESIDENTIAL BACK YARDS WILL BE ROUTED ALONG THE BACK OF THE NORTH ROW OF BUILDINGS TO THE WEST.
- THIS SITE DOES NOT LIE WITHIN A FLOOD PLAIN.
- RUNOFF OF THE SITE WILL BE HANDLED BY A SERIES OF PONDS WITH FINAL DISCHARGE TO THE STORMDRAIN IN MONTGOMERY.

* AREA I DRAINS THE WESTERN PORTION OF THE STORAGE UNIT PARCEL INTO POND D. THIS THEN DRAINS INTO POND A. 2.3201 AC. 100% TYPE "D"

* AREA II DRAINS THE EASTERN PORTION OF THE STORAGE UNIT PARCEL TO AREA III

* AREA III DRAINS THE OFFICE AREA OF THE STORAGE UNIT PARCEL INTO POND C. 1.1779 AC 8.89% "B" 91.11% "D"

* AREA IV DRAINS THE EASTERN OUT PARCEL INTO POND B. 1.1132 AC 20.97% "B" 79.63% "D"

* AREA V DRAINS THE WESTERN OUTPARCEL INTO POND A. 1.1070 AC

AREA I DRAINS TO UNDERGROUND STORAGE AREA D
AREA II & III DRAIN TO UNDERGROUND STORAGE AREA C
AREA IV DRAIN TO UNDERGROUND STORAGE AREA B
AREA V DRAINS TO POND A
UGS - C DRAINS TO UGS-B
UGS-D AND UGS-B DRAIN TO POND A
POND A DISCHARGES TO MONTGOMERY STORMDRAIN

- FIND AREA THAT DRAIN TO EACH POND

	BASIN I	BASIN II / BASIN III	BASIN IV	BASIN V
TOTAL AREA	2.3201 AC	1.1779 AC	1.1132 AC	1.1070 AC
GREEN AREA	0	8.89%	20.97%	13.05%
TYPE "D"	100%	91.11%	79.03%	86.95%

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PROJECT Montgomery Storage Units
SUBJECT Drainage Calcs
BY GJK DATE 2-13-96
CHECKED ______ DATE ______
SHEET 2 OF ___
Revised 5-21-96 11-18-96

- A portion of IV & V will discharge directly offsite to the Montgomery roadway. This is because this area can not drain to the ponds. The low point of these areas are below the bottom of the ponds.

AREA IV = 0.0793 AC
GREEN AREA = 0
TYPE "D" = 100%

AREA V = 0.7644 AC
GREEN AREA = 11.46%
TYPE "D" = 88.54%

FROM HYMO OUTPUT SHEETS 4-9
Q = 0.41 CFS
Q = 3.70 CFS

THIS FLOW WILL BE SUBTRACTED FROM ALLOWABLE DISCHARGE
6.5619 - 0.41 - 3.70 = 2.4519 CFS
USE THIS TO ROUTE POND

- SIZE UNDERGROUND STORAGE AREAS AND POND.

UGS - D USE A 7" ORIFICE A=0.267

ELEV	STORAGE	OUTFLOW
88.60	0.0	0.0
89.60	0.126	1.08
90.60	0.252	1.68
91.10	0.314	1.91

UGS - C USE A 5" ORIFICE A= 0.136

ELEV	STORAGE	OUTFLOW
92.00	0.0	0.0
93.00	0.068	0.58
94.00	0.136	0.88
94.50	0.170	0.99

UGS - B USE A 5" ORIFICE A=0.136

ELEV	STORAGE	OUTFLOW
87.00	0.0	0.0
88.00	0.081	0.58
89.00	0.162	0.88
89.50	0.203	0.99

POND A USE AN 8" ORIFICE A=0.349

ELEV	STORAGE	OUTFLOW
86.00	0.0	0.0
87.00	0.051	1.38
88.00	0.102	2.17
89.00	0.155	2.75
89.50	0.208	2.99

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PROJECT Montgomery Storage Units
SUBJECT Drainage Calcs
BY GJK DATE 1-18-96
CHECKED ______ DATE ______
SHEET 3 OF ____

FROM AHYMO OUTPUT SHEETS 10-21

POND	PEAK DISCHARGE	MAX WATER ELEVATION
UGS-D	1.867	91.005
UGS-C	0.910	94.139
UGS-B	0.933	89.241
POND-A	2.897	89.307

- FIND TOTAL DISCHARGE FROM SITE

$Q = 3.70_{off} + 2.897_{on}$
$= 6.597 \approx 6.5617$ OK

- FOR THE UNDERGROUND STORAGE WE WILL USE THE INFILTRATOR SYSTEM. SEE ATTACHED.

```
START                   TIME=0.0
***** HYDROGRAPH FOR MONTGOMERY STORAGE DRAINAGE BASIN A  IV OFF
RAINFALL                TYPE=1 RAIN QUARTER=0.0 IN
                        RAIN ONE=2.17 IN RAIN SIX=2.65 IN
                        RAIN DAY=3.20 IN DT=0.03333 HR
COMPUTE NM HYD          ID=1 HYD NO=101.1 AREA=0.000124 SQ MI
                        PER A=00.00 B=0 C=00 D=100
                        TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD                ID=1 CODE=1
FINISH
```

AHYMO PROGRAM (AHYMO194) - AMAFCA Hydrologic Model - January, 1994
RUN DATE (MON/DAY/YR) = 05/21/1996
START TIME (HR:MIN:SEC) = 08:42:33 USER NO.= M_GOODWN.I01
INPUT FILE = MONTDBA.DAT

START TIME=0.0

***** HYDROGRAPH FOR MONTGOMERY STORAGE DRAINAGE BASIN A

RAINFALL TYPE=1 RAIN QUARTER=0.0 IN

RAIN ONE=2.17 IN RAIN SIX=2.65 IN

RAIN DAY=3.20 IN DT=0.03333 HR

COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2 - PEAK AT 1.40 HR.

DT = .033330 HOURS END TIME = 5.999400 HOURS

.0000	.0029	.0059	.0090	.0121	.0153	.0186
.0219	.0253	.0288	.0324	.0361	.0398	.0437
.0477	.0518	.0560	.0604	.0649	.0696	.0744
.0794	.0845	.0899	.0955	.1013	.1075	.1138
.1206	.1277	.1351	.1411	.1476	.1544	.1691
.2020	.2527	.3255	.4248	.5554	.7219	.9292
1.1822	1.4170	1.5151	1.5979	1.6715	1.7385	1.8002
1.8575	1.9110	1.9611	2.0083	2.0529	2.0949	2.1347
2.1725	2.2082	2.2422	2.2744	2.3050	2.3127	2.3200
2.3268	2.3334	2.3398	2.3458	2.3517	2.3574	2.3628
2.3681	2.3733	2.3783	2.3831	2.3879	2.3925	2.3970
2.4014	2.4057	2.4099	2.4140	2.4180	2.4219	2.4258
2.4296	2.4333	2.4370	2.4406	2.4441	2.4476	2.4510
2.4544	2.4577	2.4610	2.4642	2.4674	2.4705	2.4736
2.4766	2.4796	2.4826	2.4855	2.4884	2.4913	2.4941
2.4969	2.4996	2.5023	2.5050	2.5077	2.5103	2.5129
2.5155	2.5181	2.5206	2.5231	2.5256	2.5280	2.5305
2.5329	2.5352	2.5376	2.5399	2.5423	2.5446	2.5468
2.5491	2.5513	2.5536	2.5558	2.5579	2.5601	2.5623
2.5644	2.5665	2.5686	2.5707	2.5727	2.5748	2.5768
2.5789	2.5809	2.5829	2.5848	2.5868	2.5888	2.5907
2.5926	2.5945	2.5964	2.5983	2.6002	2.6021	2.6039
2.6057	2.6076	2.6094	2.6112	2.6130	2.6148	2.6165
2.6183	2.6201	2.6218	2.6235	2.6252	2.6270	2.6287
2.6304	2.6320	2.6337	2.6354	2.6370	2.6387	2.6403
2.6419	2.6436	2.6452	2.6468	2.6484	2.6500	

COMPUTE NM HYD ID=1 HYD NO=101.1 AREA=0.000124 SQ MI

PER A=00.00 B=0 C=00 D=100

TP=0.1333 HR MASS RAINFALL=-1

K = .072649HR TP = .133300HR K/TP RATIO = .545000 SHAPE CONSTANT, N = 7.106420
UNIT PEAK = .48956 CFS UNIT VOLUME = .9751 B = 526.28 P60 = 2.1700
AREA = .000124 SQ MI IA = .10000 INCHES INF = .04000 INCHES PER HOUR

RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT = .033330

6

PRINT HYD ID=1 CODE=1

PARTIAL HYDROGRAPH 101.10

RUNOFF VOLUME = 2.40371 INCHES = .0159 ACRE-FEET
PEAK DISCHARGE RATE = .41 CFS AT 1.500 HOURS BASIN AREA = .0001 SQ. MI.

FINISH

NORMAL PROGRAM FINISH END TIME (HR:MIN:SEC) = 08:42:39

```
START                   TIME=0.0
***** HYDROGRAPH FOR MONTGOMERY STORAGE DRAINAGE BASIN B  V OFF
RAINFALL                TYPE=1 RAIN QUARTER=0.0 IN
                        RAIN ONE=2.17 IN RAIN SIX=2.65 IN
                        RAIN DAY=3.20 IN DT=0.03333 HR
COMPUTE NM HYD          ID=1 HYD NO=101.1 AREA=0.001194 SQ MI
                        PER A=00.00 B=11.46 C=00 D=88.54
                        TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD                ID=1 CODE=1
FINISH
```

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     AHYMO PROGRAM (AHYMO194) - AMAFCA Hydrologic Model - January, 1994
          RUN DATE (MON/DAY/YR) = 05/21/1996
          START TIME (HR:MIN:SEC) = 08:47:49     USER NO.= M_GOODWN.I01
          INPUT FILE = MONTDBB.DAT


 START                    TIME=0.0

 ***** HYDROGRAPH FOR MONTGOMERY STORAGE DRAINAGE BASIN B

 RAINFALL                 TYPE=1 RAIN QUARTER=0.0 IN

                          RAIN ONE=2.17 IN RAIN SIX=2.65 IN

                          RAIN DAY=3.20 IN DT=0.03333 HR


                     COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2
- PEAK AT 1.40 HR.
                     DT =    .033330 HOURS       END TIME =     5.999400 HOURS
                        .0000   .0029   .0059   .0090   .0121   .0153   .0186
                        .0219   .0253   .0288   .0324   .0361   .0398   .0437
                        .0477   .0518   .0560   .0604   .0649   .0696   .0744
                        .0794   .0845   .0899   .0955   .1013   .1075   .1138
                        .1206   .1277   .1351   .1411   .1476   .1544   .1691
                        .2020   .2527   .3255   .4248   .5554   .7219   .9292
                       1.1822  1.4170  1.5151  1.5979  1.6715  1.7385  1.8002
                       1.8575  1.9110  1.9611  2.0083  2.0529  2.0949  2.1347
                       2.1725  2.2082  2.2422  2.2744  2.3050  2.3127  2.3200
                       2.3268  2.3334  2.3398  2.3458  2.3517  2.3574  2.3628
                       2.3681  2.3733  2.3783  2.3831  2.3879  2.3925  2.3970
                       2.4014  2.4057  2.4099  2.4140  2.4180  2.4219  2.4258
                       2.4296  2.4333  2.4370  2.4406  2.4441  2.4476  2.4510
                       2.4544  2.4577  2.4610  2.4642  2.4674  2.4705  2.4736
                       2.4766  2.4796  2.4826  2.4855  2.4884  2.4913  2.4941
                       2.4969  2.4996  2.5023  2.5050  2.5077  2.5103  2.5129
                       2.5155  2.5181  2.5206  2.5231  2.5256  2.5280  2.5305
                       2.5329  2.5352  2.5376  2.5399  2.5423  2.5446  2.5468
                       2.5491  2.5513  2.5536  2.5558  2.5579  2.5601  2.5623
                       2.5644  2.5665  2.5686  2.5707  2.5727  2.5748  2.5768
                       2.5789  2.5809  2.5829  2.5848  2.5868  2.5888  2.5907
                       2.5926  2.5945  2.5964  2.5983  2.6002  2.6021  2.6039
                       2.6057  2.6076  2.6094  2.6112  2.6130  2.6148  2.6165
                       2.6183  2.6201  2.6218  2.6235  2.6252  2.6270  2.6287
                       2.6304  2.6320  2.6337  2.6354  2.6370  2.6387  2.6403
                       2.6419  2.6436  2.6452  2.6468  2.6484  2.6500

 COMPUTE NM HYD           ID=1 HYD NO=101.1 AREA=0.001194 SQ MI

                          PER A=00.00 B=11.46 C=00 D=88.54

                          TP=0.1333 HR MASS RAINFALL=-1


        K =    .072649HR     TP =    .133300HR     K/TP RATIO =    .545000     SHAPE
 CONSTANT, N =  7.106420
        UNIT PEAK =    4.1738     CFS   UNIT VOLUME =     .9965        B =    526.28
     P60 = 2.1700
        AREA =       .001057 SQ MI     IA =      .10000 INCHES     INF =    .04000 I
NCHES PER HOUR
```

NCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT = .033330

9

K = .134018HR TP = .133300HR K/TP RATIO = 1.005385 SHAPE CONSTANT, N = 3.511218
UNIT PEAK = .32966 CFS UNIT VOLUME = .9591 B = 321.15 P60 = 2.1700
AREA = .000137 SQ MI IA = .50000 INCHES INF = 1.25000 INCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT = .033330

PRINT HYD ID=1 CODE=1

PARTIAL HYDROGRAPH 101.10

RUNOFF VOLUME = 2.23738 INCHES = .1425 ACRE-FEET
PEAK DISCHARGE RATE = 3.70 CFS AT 1.500 HOURS BASIN AREA = .0012 SQ. MI.

FINISH

NORMAL PROGRAM FINISH END TIME (HR:MIN:SEC) = 08:47:56

```
START                  TIME=0.0
*****
*****   HYDROGRAPH FOR DISCHARGE FROM MONTGOMERY STORAGE PONDS
*****   INTO STORM DRAIN IN MONTGOMERY BLVD. THIS HYDROGRAPH WILL
*****   COMBINE ALL THREE PONDS.
*****
**BASIN II & III
RAINFALL                TYPE=1 RAIN QUARTER=0.0 IN
                        RAIN ONE=2.17 IN RAIN SIX=2.65 IN
                        RAIN DAY=3.20 IN DT=0.03333 HR

COMPUTE NM HYD          ID=1 HYD NO=101 AREA=0.00184 SQ MI
                        PER A=0 PER B=8.89 PER C=0 PER D=91.11
                        TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD               ID=1 CODE=1
*
*       ROUTE FLOW TO POND C FROM BASIN II & III 5" ORIFICE
*
***** HYDROGRAPH FOR POND C
***** RESERVOIR ROUTE THE DEVELOPED STORM
ROUTE RESERVOIR        ID=2 HYD NO=102 INFLOW ID=1 CODE=24
                       OUTFLOW (CFS)      STORAGE(AC-FT)    ELEVATION(FT)
                          0.0                0.0                92.0
                          0.58               0.068              93.0
                          0.88               0.136              94.0
                          0.99               0.170              94.5
PRINT HYD               ID=2 CODE=1
**BASIN I
RAINFALL                TYPE=1 RAIN QUARTER=0.0 IN
                        RAIN ONE=2.17 IN RAIN SIX=2.65 IN
                        RAIN DAY=3.20 IN DT=0.03333 HR

COMPUTE NM HYD          ID=3 HYD NO=103 AREA=0.003625 SQ MI
                        PER A=0 PER B=0 PER C=0 PER D=100
                        TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD               ID=3 CODE=1
*
*       ROUTE FLOW TO POND D FROM BASIN I 7" ORIFICE
*
***** HYDROGRAPH FOR POND D
***** RESERVOIR ROUTE THE DEVELOPED STORM
ROUTE RESERVOIR        ID=4 HYD NO=104 INFLOW ID=3 CODE=24
                       OUTFLOW (CFS)      STORAGE(AC-FT)    ELEVATION(FT)
                          0.0                0.0                88.60
                          1.08               0.126              89.60
                          1.68               0.252              90.60
                          1.91               0.314              91.10

PRINT HYD               ID=4 CODE=1
**BASIN IV
RAINFALL                TYPE=1 RAIN QUARTER=0.0 IN
                        RAIN ONE=2.17 IN RAIN SIX=2.65 IN
                        RAIN DAY=3.20 IN DT=0.03333 HR

COMPUTE NM HYD          ID=5 HYD NO=105 AREA=0.001739 SQ MI
                        PER A=0 PER B=21.68 PER C=0 PER D=78.32
                        TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD               ID=5 CODE=1
```

```
*
ADD HYD                 ID=6  HYD NO=106  ID=2  ID=5
PRINT HYD               ID=6  CODE=1                                     11
*
*      ROUTE FLOW TO POND B FROM BASIN IV & POND C 5" ORIFICE
*
***** HYDROGRAPH FOR POND B
***** RESERVOIR ROUTE THE DEVELOPED STORM
ROUTE RESERVOIR        ID=7 HYD NO=107 INFLOW ID=6 CODE=24
                       OUTFLOW (CFS)    STORAGE(AC-FT)   ELEVATION(FT)
                          0.0              0.0               87.00
                          0.58             0.081             88.00
                          0.88             0.162             89.00
                          0.99             0.203             89.50

PRINT HYD               ID=7 CODE=1
*
*****
**BASIN V
COMPUTE NM HYD          ID=8  HYD NO=108  AREA=0.001730 SQ MI
                        PER A=0 B=18.28 C=0 D=81.72
                        TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD               ID=8 CODE=1
*
ADD HYD                 ID=9  HYD NO=109  ID=4  ID=7
PRINT HYD               ID=9  CODE=1
*
ADD HYD                 ID=10 HYD NO=110  ID=8  ID=9
PRINT HYD               ID=10 CODE=1
*
* ROUTING THROUGH POND A FROM POND B & POND D & BASIN V 8" ORIFICE
*
ROUTE RESERVOIR         ID=11 HYD NO=111  INFLOW ID=10 CODE=24
                        OUTFLOW(CFS)      STORAGE(AC-FT)     ELEVATION(FT)
                           0.0               0.0                 86.0
                           1.38              0.038               87.0
                           2.17              0.086               88.0
                           2.75              0.147               89.0
                           2.99              0.183               89.50
PRINT HYD               ID=11 CODE=1
FINISH
```

AHYMO PROGRAM (AHYMO194) - AMAFCA Hydrologic Model - January, 1994
RUN DATE (MON/DAY/YR) = 11/18/1996
START TIME (HR:MIN:SEC) = 14:34:16   USER NO.= M_GOODWN.I01
INPUT FILE = msu.dat

START   TIME=0.0

*****

*****   HYDROGRAPH FOR DISCHARGE FROM MONTGOMERY STORAGE PONDS

*****   INTO STORM DRAIN IN MONTGOMERY BLVD. THIS HYDROGRAPH WILL

*****   COMBINE ALL THREE PONDS.

*****

**BASIN II & III

RAINFALL   TYPE=1 RAIN QUARTER=0.0 IN

RAIN ONE=2.17 IN RAIN SIX=2.65 IN

RAIN DAY=3.20 IN DT=0.03333 HR

COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2 - PEAK AT 1.40 HR.

DT = .033330 HOURS   END TIME = 5.999400 HOURS

.0000	.0029	.0059	.0090	.0121	.0153	.0186
.0219	.0253	.0288	.0324	.0361	.0398	.0437
.0477	.0518	.0560	.0604	.0649	.0696	.0744
.0794	.0845	.0899	.0955	.1013	.1075	.1138
.1206	.1277	.1351	.1411	.1476	.1544	.1691
.2020	.2527	.3255	.4248	.5554	.7219	.9292
1.1822	1.4170	1.5151	1.5979	1.6715	1.7385	1.8002
1.8575	1.9110	1.9611	2.0083	2.0529	2.0949	2.1347
2.1725	2.2082	2.2422	2.2744	2.3050	2.3127	2.3200
2.3268	2.3334	2.3398	2.3458	2.3517	2.3574	2.3628
2.3681	2.3733	2.3783	2.3831	2.3879	2.3925	2.3970
2.4014	2.4057	2.4099	2.4140	2.4180	2.4219	2.4258
2.4296	2.4333	2.4370	2.4406	2.4441	2.4476	2.4510
2.4544	2.4577	2.4610	2.4642	2.4674	2.4705	2.4736
2.4766	2.4796	2.4826	2.4855	2.4884	2.4913	2.4941
2.4969	2.4996	2.5023	2.5050	2.5077	2.5103	2.5129
2.5155	2.5181	2.5206	2.5231	2.5256	2.5280	2.5305
2.5329	2.5352	2.5376	2.5399	2.5423	2.5446	2.5468

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2.5491  2.5513  2.5536  2.5558  2.5579  2.5601  2.5623
2.5644  2.5665  2.5686  2.5707  2.5727  2.5748  2.5768
2.5789  2.5809  2.5829  2.5848  2.5868  2.5888  2.5907
2.5926  2.5945  2.5964  2.5983  2.6002  2.6021  2.6039   13
2.6057  2.6076  2.6094  2.6112  2.6130  2.6148  2.6165
2.6183  2.6201  2.6218  2.6235  2.6252  2.6270  2.6287
2.6304  2.6320  2.6337  2.6354  2.6370  2.6387  2.6403
2.6419  2.6436  2.6452  2.6468  2.6484  2.6500

COMPUTE NM HYD        ID=1 HYD NO=101 AREA=0.00184 SQ MI

                      PER A=0 PER B=8.89 PER C=0 PER D=91.11

                      TP=0.1333 HR MASS RAINFALL=-1


      K =   .072649HR    TP =   .133300HR    K/TP RATIO =   .545000     SHAPE
 CONSTANT, N =  7.106420
      UNIT PEAK =   6.6186    CFS   UNIT VOLUME =    .9976        B =   526.28
    P60 = 2.1700
      AREA =       .001676 SQ MI     IA =    .10000 INCHES    INF =    .04000 I
NCHES PER HOUR
      RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT
=   .033330


      K =   .134018HR    TP =   .133300HR    K/TP RATIO =  1.005385     SHAPE
 CONSTANT, N =  3.511218
      UNIT PEAK =   .39409    CFS   UNIT VOLUME =    .9654        B =   321.15
    P60 = 2.1700
      AREA =       .000164 SQ MI     IA =    .50000 INCHES    INF =   1.25000 I
NCHES PER HOUR
      RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT
=   .033330

PRINT HYD             ID=1 CODE=1

                                   PARTIAL HYDROGRAPH   101.00


      RUNOFF VOLUME =      2.27468 INCHES      =        .2232 ACRE-FEET
      PEAK DISCHARGE RATE =        5.76 CFS  AT   1.500 HOURS   BASIN AREA =
 .0018 SQ. MI.



*

*       ROUTE FLOW TO POND C FROM BASIN II & III 5" ORIFICE

*

***** HYDROGRAPH FOR POND C

***** RESERVOIR ROUTE THE DEVELOPED STORM

ROUTE RESERVOIR      ID=2 HYD NO=102 INFLOW ID=1 CODE=24

                     OUTFLOW (CFS)     STORAGE(AC-FT)   ELEVATION(FT)

                        0.0               0.0              92.0

                        0.58              0.068            93.0

                        0.88              0.136            94.0
```

0.99 0.170 94.5

* * * * * * * * * * * * * * * * *

TIME (HRS)	INFLOW (CFS)	ELEV (FEET)	VOLUME (AC-FT)	OUTFLOW (CFS)
.00	.00	92.00	.000	.00
.80	.00	92.00	.000	.00
1.60	3.97	93.43	.097	.71
2.40	.26	93.99	.135	.88
3.20	.07	93.35	.092	.69
4.00	.05	92.83	.056	.48
4.80	.05	92.51	.035	.29
5.60	.05	92.32	.022	.19
6.40	.00	92.21	.014	.12
7.20	.00	92.12	.008	.07
8.00	.00	92.07	.005	.04
8.80	.00	92.04	.003	.02
9.60	.00	92.02	.001	.01
10.40	.00	92.01	.001	.01
11.20	.00	92.01	.000	.00

PEAK DISCHARGE = .910 CFS - PEAK OCCURS AT HOUR 2.13
MAXIMUM WATER SURFACE ELEVATION = 94.139
MAXIMUM STORAGE = .1454 AC-FT INCREMENTAL TIME= .033330HR
S

PRINT HYD ID=2 CODE=1

PARTIAL HYDROGRAPH 102.00

RUNOFF VOLUME = 2.27452 INCHES = .2232 ACRE-FEET
PEAK DISCHARGE RATE = .91 CFS AT 2.133 HOURS BASIN AREA =
.0018 SQ. MI.

**BASIN I

RAINFALL TYPE=1 RAIN QUARTER=0.0 IN

RAIN ONE=2.17 IN RAIN SIX=2.65 IN

RAIN DAY=3.20 IN DT=0.03333 HR

COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2
- PEAK AT 1.40 HR.

DT = .033330 HOURS END TIME = 5.999400 HOURS

.0000	.0029	.0059	.0090	.0121	.0153	.0186
.0219	.0253	.0288	.0324	.0361	.0398	.0437
.0477	.0518	.0560	.0604	.0649	.0696	.0744
.0794	.0845	.0899	.0955	.1013	.1075	.1138
.1206	.1277	.1351	.1411	.1476	.1544	.1691
.2020	.2527	.3255	.4248	.5554	.7219	.9292
1.1822	1.4170	1.5151	1.5979	1.6715	1.7385	1.8002
1.8575	1.9110	1.9611	2.0083	2.0529	2.0949	2.1347
2.1725	2.2082	2.2422	2.2744	2.3050	2.3127	2.3200
2.3268	2.3334	2.3398	2.3458	2.3517	2.3574	2.3628
2.3681	2.3733	2.3783	2.3831	2.3879	2.3925	2.3970
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

2.4014	2.4057	2.4099	2.4140	2.4180	2.4219	2.4258
2.4296	2.4333	2.4370	2.4406	2.4441	2.4476	2.4510
2.4544	2.4577	2.4610	2.4642	2.4674	2.4705	2.4736
2.4766	2.4796	2.4826	2.4855	2.4884	2.4913	2.4941
2.4969	2.4996	2.5023	2.5050	2.5077	2.5103	2.5129
2.5155	2.5181	2.5206	2.5231	2.5256	2.5280	2.5305
2.5329	2.5352	2.5376	2.5399	2.5423	2.5446	2.5468
2.5491	2.5513	2.5536	2.5558	2.5579	2.5601	2.5623
2.5644	2.5665	2.5686	2.5707	2.5727	2.5748	2.5768
2.5789	2.5809	2.5829	2.5848	2.5868	2.5888	2.5907
2.5926	2.5945	2.5964	2.5983	2.6002	2.6021	2.6039
2.6057	2.6076	2.6094	2.6112	2.6130	2.6148	2.6165
2.6183	2.6201	2.6218	2.6235	2.6252	2.6270	2.6287
2.6304	2.6320	2.6337	2.6354	2.6370	2.6387	2.6403
2.6419	2.6436	2.6452	2.6468	2.6484	2.6500	

15

COMPUTE NM HYD   ID=3 HYD NO=103 AREA=0.003625 SQ MI

PER A=0 PER B=0 PER C=0 PER D=100

TP=0.1333 HR MASS RAINFALL=-1

K = .072649HR   TP = .133300HR   K/TP RATIO = .545000   SHAPE CONSTANT, N = 7.106420
UNIT PEAK = 14.312 CFS   UNIT VOLUME = .9985   B = 526.28
P60 = 2.1700
AREA = .003625 SQ MI   IA = .10000 INCHES   INF = .04000 INCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT = .033330

PRINT HYD   ID=3 CODE=1

PARTIAL HYDROGRAPH 103.00

RUNOFF VOLUME = 2.40371 INCHES = .4647 ACRE-FEET
PEAK DISCHARGE RATE = 11.82 CFS AT 1.500 HOURS BASIN AREA = .0036 SQ. MI.

*

* ROUTE FLOW TO POND D FROM BASIN I 7" ORIFICE

*

***** HYDROGRAPH FOR POND D

***** RESERVOIR ROUTE THE DEVELOPED STORM

ROUTE RESERVOIR   ID=4 HYD NO=104 INFLOW ID=3 CODE=24

OUTFLOW (CFS)	STORAGE(AC-FT)	ELEVATION(FT)
0.0	0.0	88.60
1.08	0.126	89.60
1.68	0.252	90.60
1.91	0.314	91.10

* * * * * * * * * * * * * * * * *

TIME (HRS)	INFLOW (CFS)	ELEV (FEET)	VOLUME (AC-FT)	OUTFLOW (CFS)
.00	.00	88.60	.000	.00
.80	.00	88.60	.000	.00
1.60	8.09	90.19	.201	1.44
2.40	.55	90.84	.282	1.79
3.20	.15	90.14	.194	1.40
4.00	.11	89.56	.121	1.04
4.80	.10	89.19	.074	.63
5.60	.10	88.97	.047	.40
6.40	.01	88.84	.030	.26
7.20	.00	88.74	.017	.15
8.00	.00	88.68	.010	.08
8.80	.00	88.64	.006	.05
9.60	.00	88.63	.003	.03
10.40	.00	88.61	.002	.02
11.20	.00	88.61	.001	.01
12.00	.00	88.60	.001	.00

PEAK DISCHARGE = 1.867 CFS - PEAK OCCURS AT HOUR 2.13
MAXIMUM WATER SURFACE ELEVATION = 91.005
MAXIMUM STORAGE = .3023 AC-FT INCREMENTAL TIME= .033330HR
S

PRINT HYD ID=4 CODE=1

PARTIAL HYDROGRAPH 104.00

RUNOFF VOLUME = 2.40363 INCHES = .4647 ACRE-FEET
PEAK DISCHARGE RATE = 1.87 CFS AT 2.133 HOURS BASIN AREA =
.0036 SQ. MI.

**BASIN IV

RAINFALL TYPE=1 RAIN QUARTER=0.0 IN

RAIN ONE=2.17 IN RAIN SIX=2.65 IN

RAIN DAY=3.20 IN DT=0.03333 HR

COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2
- PEAK AT 1.40 HR.

DT = .033330 HOURS END TIME = 5.999400 HOURS

.0000	.0029	.0059	.0090	.0121	.0153	.0186
.0219	.0253	.0288	.0324	.0361	.0398	.0437
.0477	.0518	.0560	.0604	.0649	.0696	.0744
.0794	.0845	.0899	.0955	.1013	.1075	.1138
.1206	.1277	.1351	.1411	.1476	.1544	.1691
.2020	.2527	.3255	.4248	.5554	.7219	.9292
1.1822	1.4170	1.5151	1.5979	1.6715	1.7385	1.8002
1.8575	1.9110	1.9611	2.0083	2.0529	2.0949	2.1347
2.1725	2.2082	2.2422	2.2744	2.3050	2.3127	2.3200
2.3268	2.3334	2.3398	2.3458	2.3517	2.3574	2.3628
2.3681	2.3733	2.3783	2.3831	2.3879	2.3925	2.3970
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

2.4014	2.4057	2.4099	2.4140	2.4180	2.4219	2.4258
2.4296	2.4333	2.4370	2.4406	2.4441	2.4476	2.4510
2.4544	2.4577	2.4610	2.4642	2.4674	2.4705	2.4736
2.4766	2.4796	2.4826	2.4855	2.4884	2.4913	2.4941 17
2.4969	2.4996	2.5023	2.5050	2.5077	2.5103	2.5129
2.5155	2.5181	2.5206	2.5231	2.5256	2.5280	2.5305
2.5329	2.5352	2.5376	2.5399	2.5423	2.5446	2.5468
2.5491	2.5513	2.5536	2.5558	2.5579	2.5601	2.5623
2.5644	2.5665	2.5686	2.5707	2.5727	2.5748	2.5768
2.5789	2.5809	2.5829	2.5848	2.5868	2.5888	2.5907
2.5926	2.5945	2.5964	2.5983	2.6002	2.6021	2.6039
2.6057	2.6076	2.6094	2.6112	2.6130	2.6148	2.6165
2.6183	2.6201	2.6218	2.6235	2.6252	2.6270	2.6287
2.6304	2.6320	2.6337	2.6354	2.6370	2.6387	2.6403
2.6419	2.6436	2.6452	2.6468	2.6484	2.6500	

COMPUTE NM HYD ID=5 HYD NO=105 AREA=0.001739 SQ MI

PER A=0 PER B=21.68 PER C=0 PER D=78.32

TP=0.1333 HR MASS RAINFALL=-1

K = .072649HR TP = .133300HR K/TP RATIO = .545000 SHAPE CONSTANT, N = 7.106420
UNIT PEAK = 5.3772 CFS UNIT VOLUME = .9973 B = 526.28
P60 = 2.1700
AREA = .001362 SQ MI IA = .10000 INCHES INF = .04000 INCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT = .033330

K = .134018HR TP = .133300HR K/TP RATIO = 1.005385 SHAPE CONSTANT, N = 3.511218
UNIT PEAK = .90831 CFS UNIT VOLUME = .9851 B = 321.15
P60 = 2.1700
AREA = .000377 SQ MI IA = .50000 INCHES INF = 1.25000 INCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT = .033330

PRINT HYD ID=5 CODE=1

PARTIAL HYDROGRAPH 105.00

RUNOFF VOLUME = 2.08905 INCHES = .1938 ACRE-FEET
PEAK DISCHARGE RATE = 5.10 CFS AT 1.500 HOURS BASIN AREA = .0017 SQ. MI.

*

ADD HYD ID=6 HYD NO=106 ID=2 ID=5

PRINT HYD ID=6 CODE=1

PARTIAL HYDROGRAPH 106.00

RUNOFF VOLUME = 2.18372 INCHES = .4168 ACRE-FEET
PEAK DISCHARGE RATE = 5.61 CFS AT 1.500 HOURS BASIN AREA =

.0036 SQ. MI.

*

*   ROUTE FLOW TO POND B FROM BASIN IV & POND C 5" ORIFICE

*

***** HYDROGRAPH FOR POND B

***** RESERVOIR ROUTE THE DEVELOPED STORM

ROUTE RESERVOIR   ID=7 HYD NO=107 INFLOW ID=6 CODE=24

OUTFLOW (CFS)	STORAGE(AC-FT)	ELEVATION(FT)
0.0	0.0	87.00
0.58	0.081	88.00
0.88	0.162	89.00
0.99	0.203	89.50

* * * * * * * * * * * * * * * * * *

TIME (HRS)	INFLOW (CFS)	ELEV (FEET)	VOLUME (AC-FT)	OUTFLOW (CFS)
.00	.00	87.00	.000	.00
.80	.00	87.00	.000	.00
1.60	4.27	88.17	.095	.63
2.40	1.11	89.22	.180	.93
3.20	.74	89.19	.177	.92
4.00	.52	88.98	.160	.87
4.80	.33	88.64	.133	.77
5.60	.23	88.28	.104	.66
6.40	.12	87.93	.076	.54
7.20	.07	87.64	.052	.37
8.00	.04	87.43	.035	.25
8.80	.02	87.29	.023	.17
9.60	.01	87.19	.015	.11
10.40	.01	87.12	.010	.07
11.20	.00	87.08	.007	.05
12.00	.00	87.05	.004	.03
12.80	.00	87.03	.003	.02
13.60	.00	87.02	.002	.01
14.40	.00	87.01	.001	.01
15.20	.00	87.01	.001	.00

PEAK DISCHARGE =   .933 CFS - PEAK OCCURS AT HOUR   2.67
MAXIMUM WATER SURFACE ELEVATION =   89.241
MAXIMUM STORAGE =   .1817 AC-FT   INCREMENTAL TIME=   .033330HR

S

PRINT HYD   ID=7 CODE=1

PARTIAL HYDROGRAPH   107.00

RUNOFF VOLUME =   2.18351 INCHES   =   .4168 ACRE-FEET

PEAK DISCHARGE RATE = .93 CFS AT 2.666 HOURS BASIN AREA =
.0036 SQ. MI.

*

*****

**BASIN V

COMPUTE NM HYD ID=8 HYD NO=108 AREA=0.001730 SQ MI

PER A=0 B=18.28 C=0 D=81.72

TP=0.1333 HR MASS RAINFALL=-1

K = .072649HR TP = .133300HR K/TP RATIO = .545000 SHAPE
CONSTANT, N = 7.106420
UNIT PEAK = 5.5816 CFS UNIT VOLUME = .9973 B = 526.28
P60 = 2.1700
AREA = .001414 SQ MI IA = .10000 INCHES INF = .04000 I
NCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT
= .033330

K = .134018HR TP = .133300HR K/TP RATIO = 1.005385 SHAPE
CONSTANT, N = 3.511218
UNIT PEAK = .76190 CFS UNIT VOLUME = .9823 B = 321.15
P60 = 2.1700
AREA = .000316 SQ MI IA = .50000 INCHES INF = 1.25000 I
NCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT
= .033330

PRINT HYD ID=8 CODE=1

PARTIAL HYDROGRAPH 108.00

RUNOFF VOLUME = 2.13840 INCHES = .1973 ACRE-FEET
PEAK DISCHARGE RATE = 5.16 CFS AT 1.500 HOURS BASIN AREA =
.0017 SQ. MI.

*

ADD HYD ID=9 HYD NO=109 ID=4 ID=7

PRINT HYD ID=9 CODE=1

PARTIAL HYDROGRAPH 109.00

RUNOFF VOLUME = 2.29371 INCHES = .8813 ACRE-FEET
PEAK DISCHARGE RATE = 2.77 CFS AT 2.166 HOURS BASIN AREA =
.0072 SQ. MI.

*

ADD HYD ID=10 HYD NO=110 ID=8 ID=9

PRINT HYD ID=10 CODE=1

PARTIAL HYDROGRAPH 110.00

RUNOFF VOLUME = 2.26361 INCHES = 1.0786 ACRE-FEET
PEAK DISCHARGE RATE = 6.65 CFS AT 1.533 HOURS BASIN AREA = .0089 SQ. MI.

*

* ROUTING THROUGH POND A FROM POND B & POND D & BASIN V 8" ORIFICE

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ROUTE RESERVOIR ID=11 HYD NO=111 INFLOW ID=10 CODE=24

OUTFLOW(CFS)	STORAGE(AC-FT)	ELEVATION(FT)
0.0	0.0	86.0
1.38	0.038	87.0
2.17	0.086	88.0
2.75	0.147	89.0
2.99	0.183	89.50

* * * * * * * * * * * * * * * * * *

TIME (HRS)	INFLOW (CFS)	ELEV (FEET)	VOLUME (AC-FT)	OUTFLOW (CFS)
.00	.00	86.00	.000	.00
.80	.00	86.00	.000	.00
1.60	5.66	88.07	.090	2.21
2.40	2.95	89.31	.169	2.90
3.20	2.38	89.10	.154	2.80
4.00	1.96	88.58	.122	2.51
4.80	1.45	87.88	.080	2.07
5.60	1.11	87.18	.046	1.52
6.40	.80	86.72	.027	.99
7.20	.52	86.46	.018	.64
8.00	.34	86.30	.011	.41
8.80	.22	86.19	.007	.26
9.60	.14	86.12	.005	.17
10.40	.09	86.08	.003	.11
11.20	.06	86.05	.002	.07
12.00	.04	86.03	.001	.04
12.80	.02	86.02	.001	.03
13.60	.01	86.01	.000	.02
14.40	.01	86.01	.000	.01
15.20	.00	86.00	.000	.01
16.00	.00	86.00	.000	.00

PEAK DISCHARGE = 2.897 CFS - PEAK OCCURS AT HOUR 2.47
MAXIMUM WATER SURFACE ELEVATION = 89.307
MAXIMUM STORAGE = .1691 AC-FT INCREMENTAL TIME= .033330HR

S

PRINT HYD ID=11 CODE=1

PARTIAL HYDROGRAPH 111.00

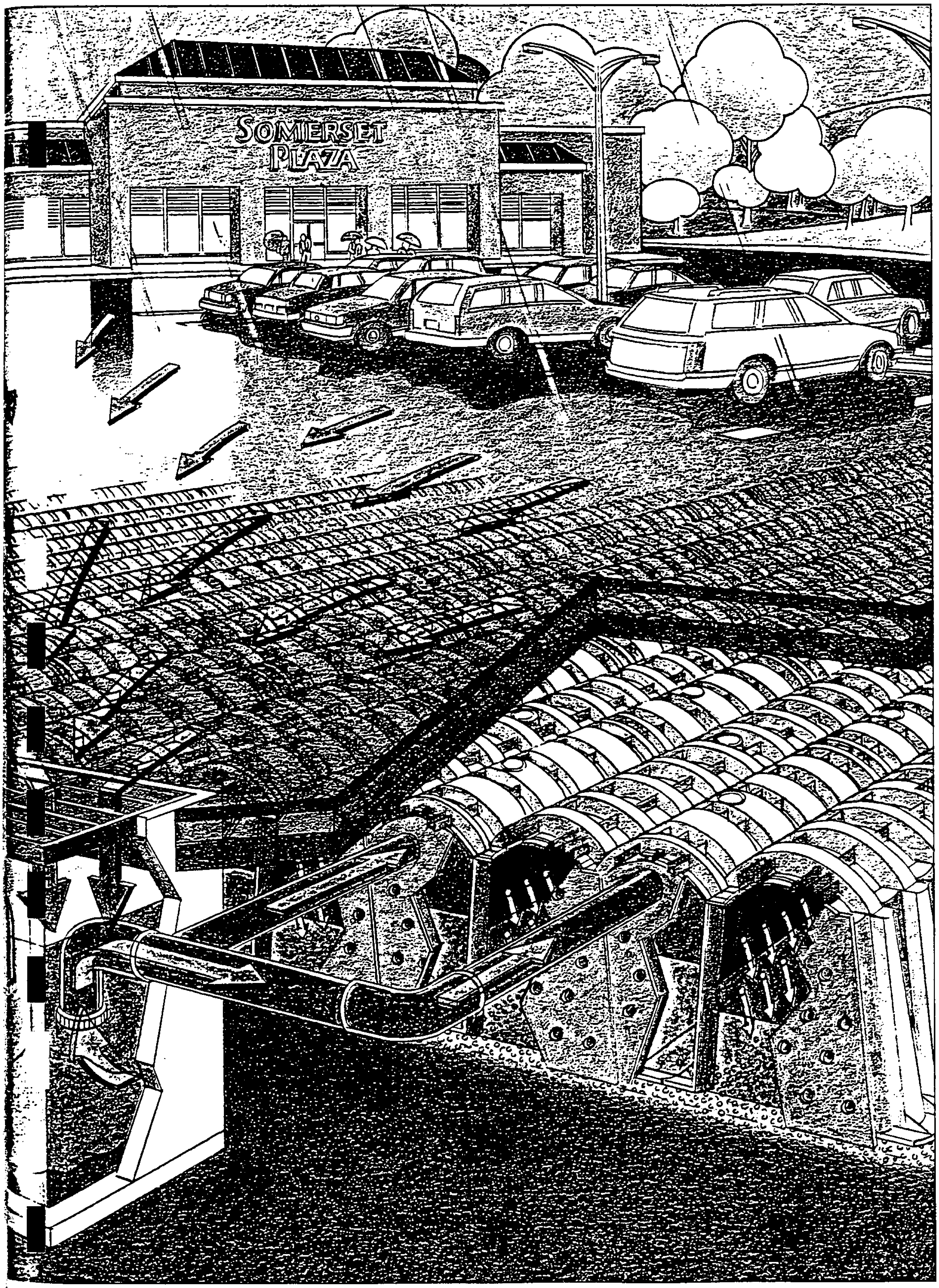
RUNOFF VOLUME = 2.26360 INCHES = 1.0786 ACRE-FEET
PEAK DISCHARGE RATE = 2.90 CFS AT 2.466 HOURS BASIN AREA = .0089 SQ. MI.

FINISH

NORMAL PROGRAM FINISH END TIME (HR:MIN:SEC) = 14:34:23

The Maximizer™ Chamber System for Stormwater Management.

INFILTRATOR SYSTEMS INC



Design · Installation · Maintenance

FOREWORD

This manual is intended to help the design professional plan a subsurface stormwater Maximizer Chamber System that will meet all of Infiltrator Systems Inc.'s standards and specifications.

When more stringent requirements are imposed on the design process by local regulations, they must be followed.

For design and technical assistance, call Infiltrator Systems' Engineering Department at ***1-800-221-4436.***

INTRODUCING INFILTRATOR SYSTEMS INC.

Infiltrator stormwater systems.

After 9 years and the installation of more than 200,000 chambers in subsurface detention and retention systems, Infiltrator Systems Inc. has once again advanced the state of the art. By studying the needs of the engineering community and conducting extensive research and testing, Infiltrator Systems has developed a product which offers both maximum storage capacity and high strength - The Maximizer Chamber System. The Maximizer Chamber System is the culmination of an extensive effort which utilized Infiltrator Systems' expertise in the analysis of plastic structures, as well as the design expertise of the engineering community. The result: the most viable subsurface stormwater disposal system on the market.

Environmentally concerned company.

Infiltrator Systems devotes over $500,000 a year to research and development, creating new products that operate more efficiently and conserve natural resources. Infiltrator Systems' products take better care of the environment by recharging the groundwater, controlling flooding, avoiding stagnant ponds, and saving land for green areas and other productive uses.

Infiltrator septic chamber systems.

The original—and still leading—polymer chamber system was developed by Infiltrator Systems to replace old-fashioned stone and pipe leachfields. Our patented, high-strength polymer chambers have greater infiltrative capacity than stone and pipe and are much easier to install, creating a totally modern approach for residential and commercial septic systems. To date, 5 million Infiltrator chambers have been installed throughout the United States and overseas.

INFILTRATOR® SYSTEMS INC

PRODUCT APPLICATION.

The patent-pending Maximizer Chamber System is ideal for subsurface stormwater storage in detention facilities, and for exfiltration in retention systems. It's an excellent alternative to all other methods of stormwater attenuation, including surface ponds. The Maximizer system can be used under pavement or vegetated surfaces, for commercial, industrial, recreational and even residential developments.

STORAGE AND STRENGTH CAPABILITY.

Maximizer chambers are open-bottomed structures that have orifices in the sidewalls for optimal lateral water movement throughout the chamber bed. Successive rows of chambers are connected using PowerArch™ bridges. This unique feature ensures that practically 100% of the void space under the top of the chamber-bridge system is available for water storage.

Both Maximizer chambers and PowerArch bridges are molded from high-density polyethylene for maximum strength and resistance to chemicals typically found in stormwater runoff. The system is designed to provide the needed storage volume and the greatest possible infiltrative soil-to-chamber bed interface. Its low profile makes it ideal for use in areas with high water tables.

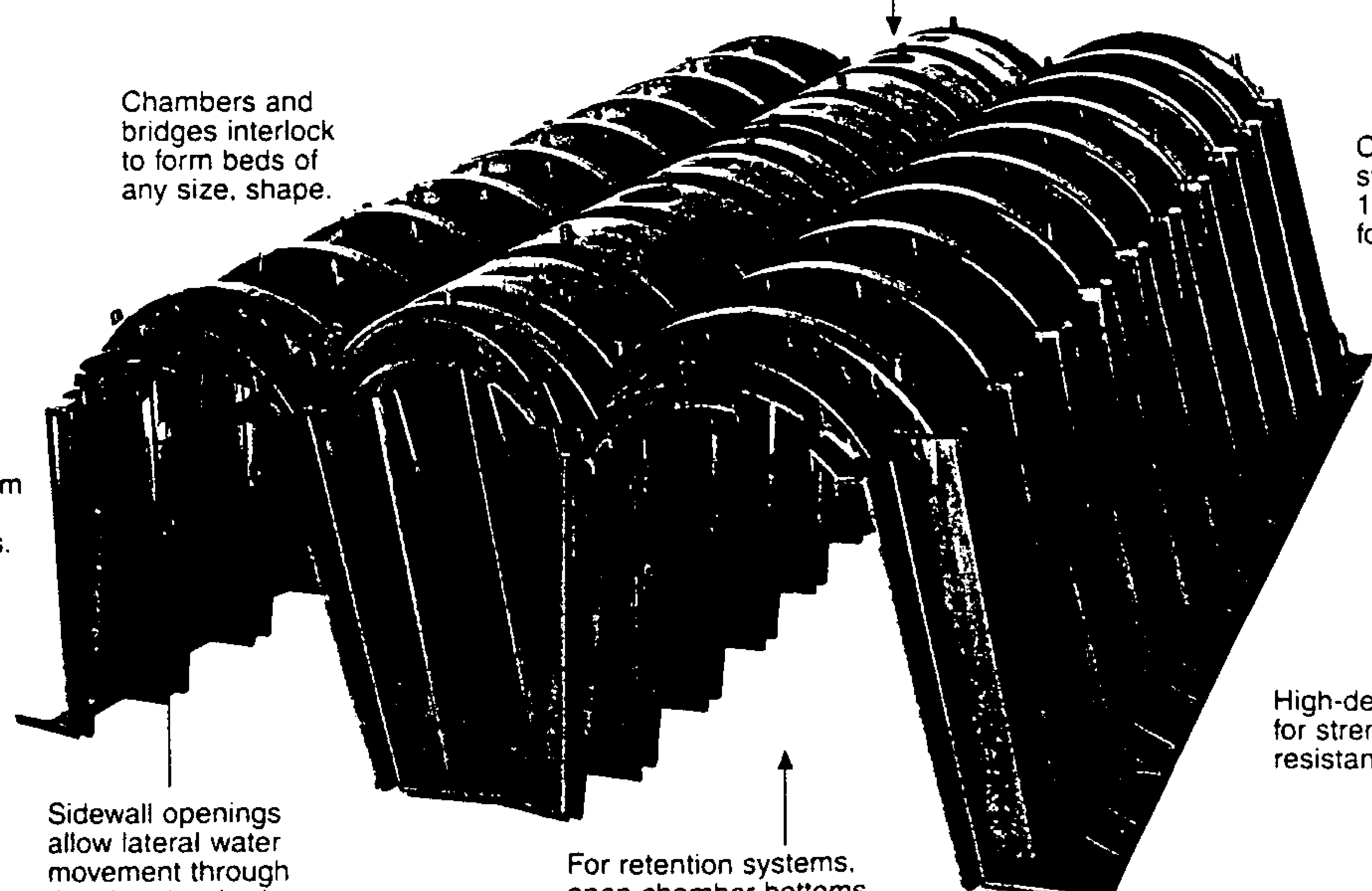
Maximizer chambers have a 31 cubic foot capacity. The void between chambers (under the PowerArch bridge) is 16 cubic feet. Each square foot of chamber bed can store approximately 2.15 cubic feet of water. The Maximizer chamber and PowerArch bridge have been field-tested for structural strength and exceed an AASHTO H-20 (32,000 lbs./axle) capacity with 18" of properly compacted cover.

CLEANOUT CAPABILITY.

The Maximizer Chamber System can be cleaned with a water jet and vacuum pump. The system is designed to receive pipe inlets between the chambers under the PowerArch bridges. Sediment which falls into this area is trapped and given time to settle, where it can be contained and later collected. As a result, the sediment is prohibited from migrating into the stone below the chambers. Proper pretreatment of runoff (e.g.: catch basin sumps, hooded inlets, gross particle separators), and the inherent storage capability of the Maximizer system minimizes the need for frequent cleanings.

DESIGN CAPABILITY.

One of the greatest advantages of the Maximizer system is its design flexibility. Adaptable to beds and trenches of various sizes and configurations, the Maximizer Chamber System allows the designer to fit a stormwater attenuation system on nearly any site.



INFILTRATOR SYSTEMS INC

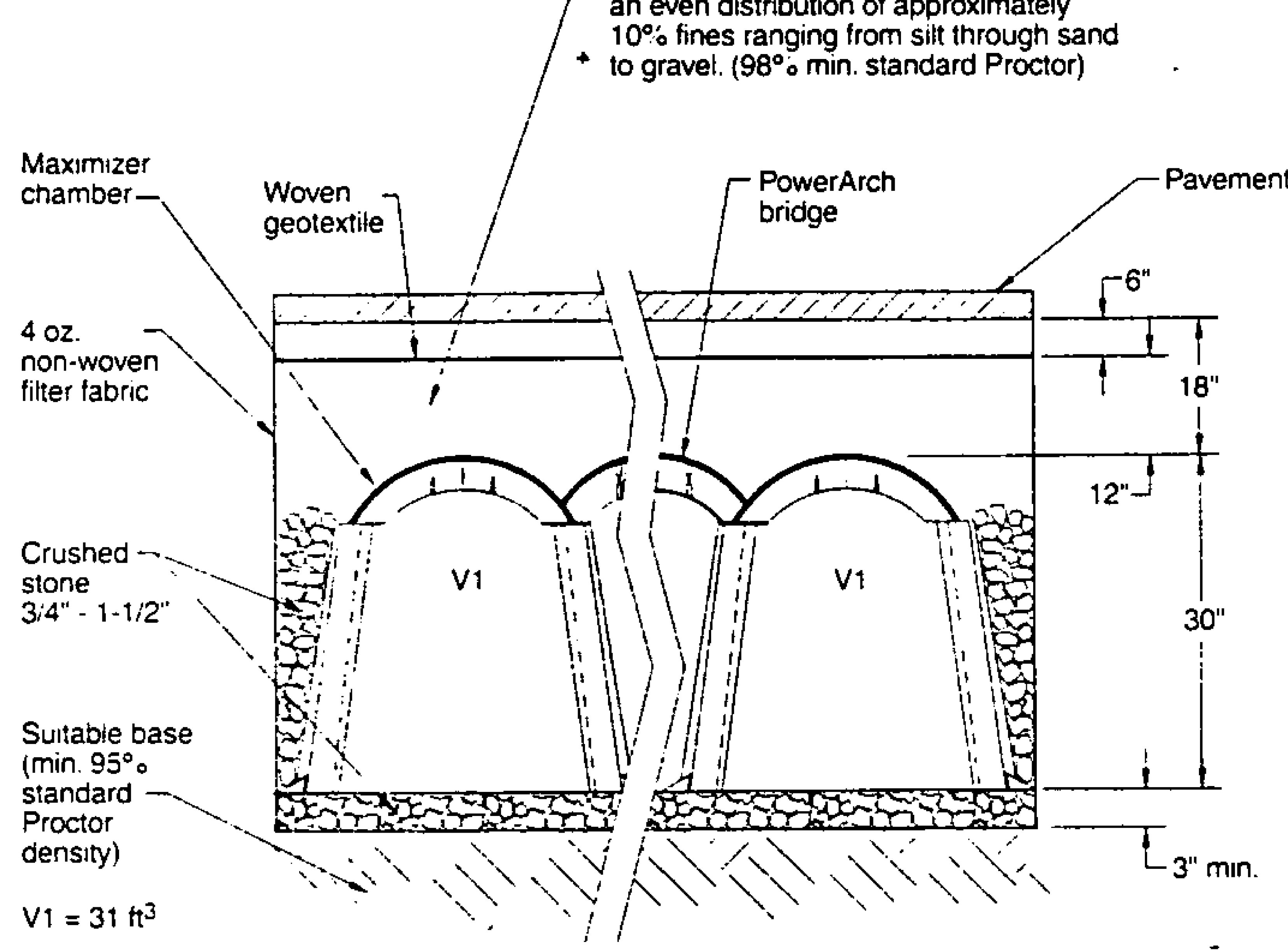
The Maximizer Chamber System is manufactured by Infiltrator Systems Inc. of Old Saybrook, Connecticut. The system is comprised of Maximizer chambers, PowerArch™ bridges, and endplates which fit the chamber ends and bridge ends, respectively. These structures are injection molded from high-density polyethylene. The density of the polyethylene is a minimum 0.950 grams/cubic centimeter (ASTM D1248, D1505).

	MAXIMIZER CHAMBER	POWERARCH BRIDGE
Size, W x L x H	34" x 87" x 30"	19.5" x 43.5" x 6"
Volume	31 cu. ft.	16 cu. ft.

The top of each Maximizer unit is arched and the bottom is completely open. Both the top and sidewalls are corrugated for structural support. The inner corrugations have two 1.25" diameter holes at 12" and 18" from the base.

Each Maximizer unit has a nominal wall thickness of 0.15" and a bearing footprint of 3.61 square feet. Each unit has a minimum sidewall open area of 0.043 square feet per linear foot or 0.31 square feet per unit. The sidewall openings measure 1.25" in diameter. There are 18 holes on each side of the chamber (36 total). The units have interlocking latches to allow for indefinite extension of the chambers into rows. A 2" overlap is provided at joints between chambers. (Figure 1 shows the Maximizer system with various system specifications.)

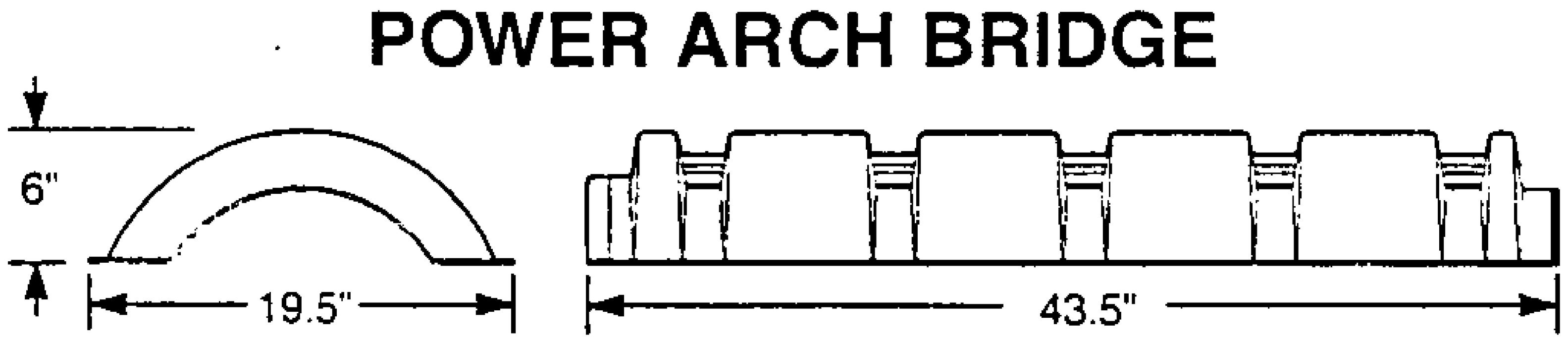
FIGURE 1



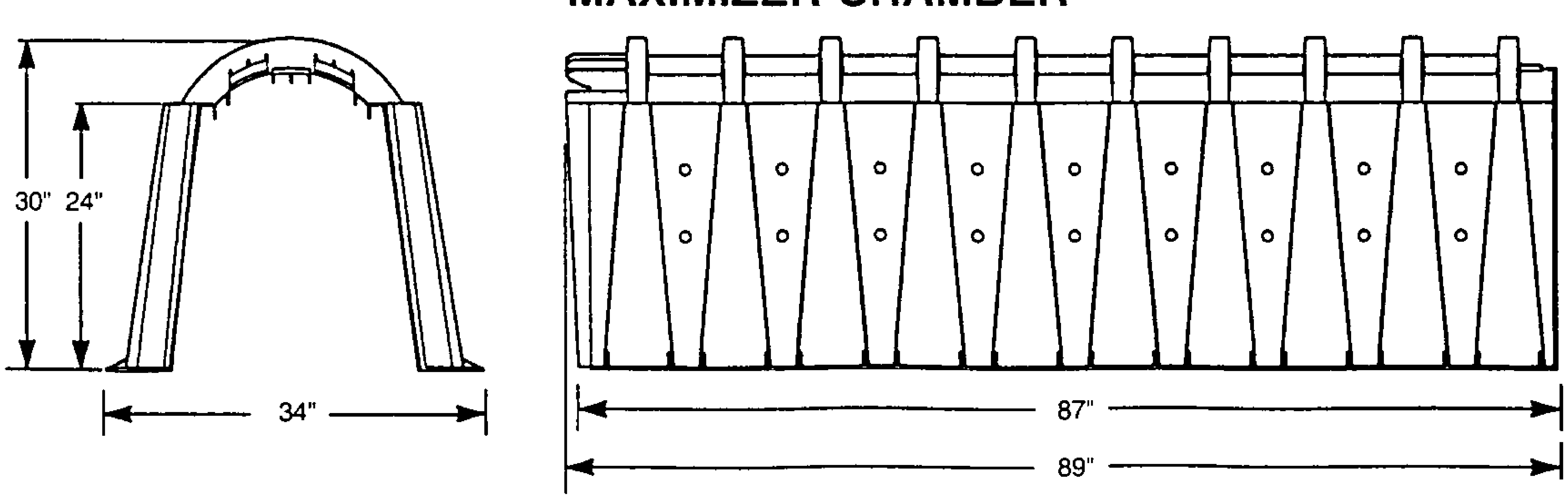
The PowerArch bridge spans the void between two chamber sidewalls. The top of the PowerArch bridge is arched and corrugated for structural strength. The nominal wall thickness of the PowerArch bridge is 0.15". Like the Maximizer chamber, the PowerArch bridge is equipped with interlocks that allow for the construction of rows of indefinite length. A 1.25" overlap is provided at the joints between the bridges. Two PowerArch bridges are needed to connect two parallel Maximizer chambers.

The Maximizer Chamber System exceeds an H-20 load rating standard of the American Association of State Highway and Transportation Officials (AASHTO), and is capable of supporting 32,000 lbs./axle with 18" of properly prepared cover (excluding pavement).

POWER ARCH BRIDGE



MAXIMIZER CHAMBER



Call 1-800-221-4436 for free technical and product information.

In order to help ensure a proper installation and satisfy conditions of the product warranty, certain minimum design criteria must be met. The following items must be included in each design to meet the standards and specifications of Infiltrator Systems Inc.

1 To help ensure that the installation is in accordance with Infiltrator Systems' current standards and specifications, a note indicating that the contractor must contact Infiltrator Systems Inc. prior to installation has to be placed on the plans. Notes and drawings are available on the Maximizer CAD disk. Construction must be in accordance with Infiltrator Systems' current installation guidelines. This applies to material specifications as well as construction methods. **Contact Infiltrator Systems Inc. to ensure you have the latest guidelines.**

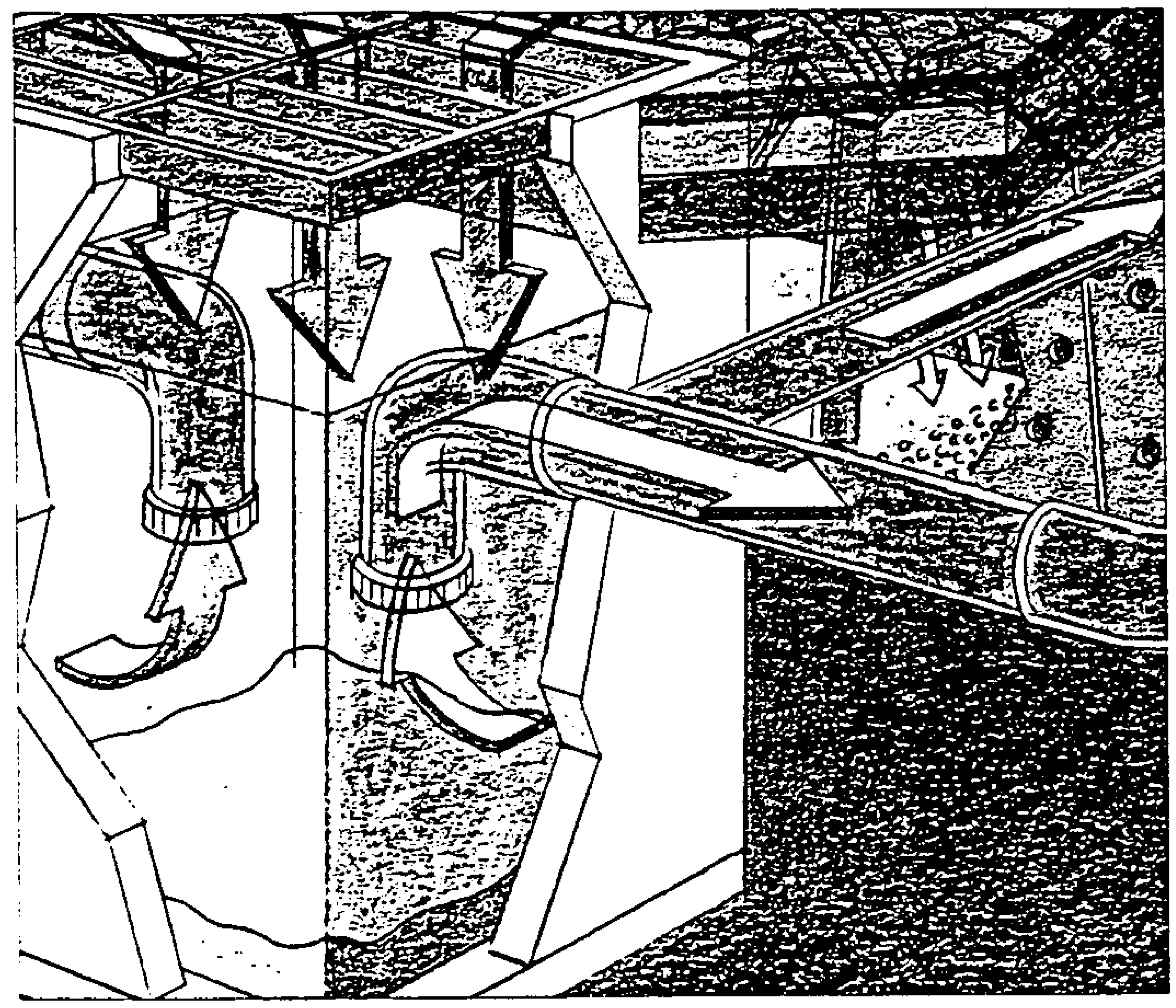
2 A minimum 3" thick layer of ¾" - 1½" crushed stone must be specified on the bottom of the chamber bed. This stone layer will be leveled and compacted with a vibratory roller to provide a flat, smooth surface for placement of the Maximizer chambers. **In retention systems,** the crushed stone needs to be washed to prevent fines from clogging the soil surface. Crushed stone must also be used in lieu of soil backfill around the perimeter of the chamber bed in order to take advantage of the infiltrative surface provided by the excavation sidewall and provide proper structural support. This stone has to be compacted with at least two passes of a vibratory plate compactor in maximum one foot lifts.

3 Soil compaction must be a minimum of 98% of standard Proctor density (95% in single-grain sands) or according to local code, whichever is more restrictive. Compaction of stone is outlined in the current installation guidelines, pages 26-31.

4 In loose, sandy soils with a blow count less than 6 in the base (Standard Penetration Test), the chamber bed must be properly compacted to 95% standard Proctor density using hydraulic (flooding) or mechanical means.

5 Be sure to add a note on the plan alerting the contractor to dig an extra 2 feet around the base of the chamber bed excavation to allow working space for setting chambers and to facilitate the backfill compaction.

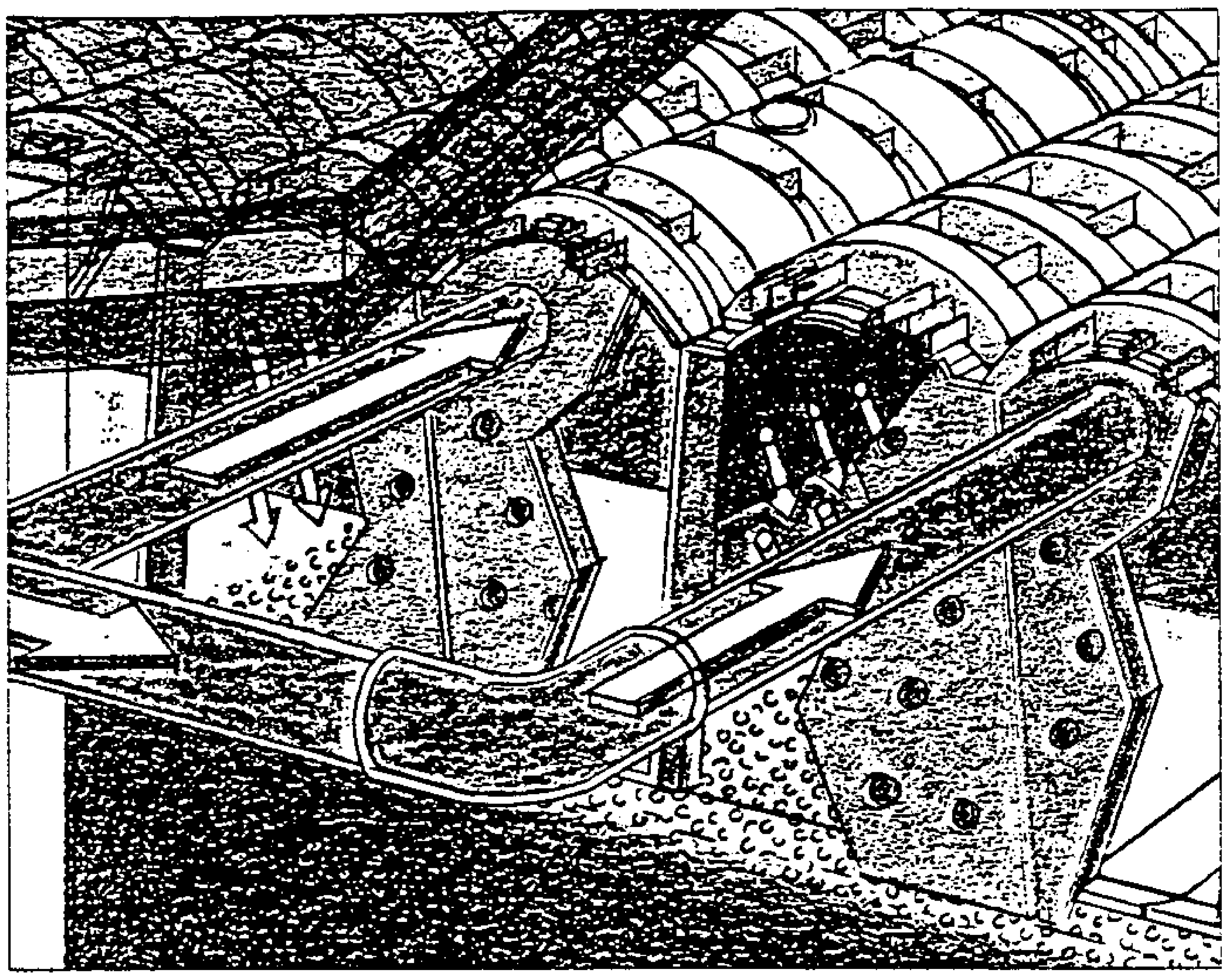
6 In all systems, crushed stone is used as backfill around the bed's perimeter. The sidewalls of the excavation must be draped with filter fabric to prevent soil from intruding into the stone. Structural support need not be provided by this filter fabric, and a non-woven, 4 oz./sq. yd. geotextile such as *Mirafi 140N* or equivalent is sufficient.



This illustration shows a water collection and inlet system with downward facing 90° elbows.

7 The water collection and inlet system should be designed to intercept as much sediment and organic debris as reasonably possible. Catch basin sumps, downward facing 90° elbows on the catch basin pipe outlets, settling tanks, sand filters, and other measures can all be considered for this purpose. These can also be used in combination with one another for the best results. The most common and easiest method is to use 90° elbows in conjunction with adequate catch basin sumps. Illustrations of these measures can be found on pages 21-22. All water quality inlets need to be inspected on a regular basis and maintained as necessary. It is recommended that a "Maintenance and Inspection Schedule" for the stormwater management system be included as part of the design. (See page 25.)

8 Erosion and sediment control measures should be an integral part of the plan, and must be designed to protect the site both during and after construction. These practices may have a direct impact on the water quality of the site. Erosion and sedimentation can be controlled by vegetation means, temporary sediment barriers (silt fence, hay bales, fabric wrapped catch basin grates), and strategic stormwater runoff management. Wherever possible, planning should aim at preventing erosion. (See pages 23-25 for more detail on erosion and sediment control planning.)



Pictured here are the header and manifold pipes inleting through the PowerArch end plates.

9 The most common way to feed stormwater into the chamber bed is through a header and manifold pipe system. The Maximizer system can accommodate up to an 8" diameter pipe at the PowerArch and a 12" diameter pipe at the chamber. Typically, the inlet pipes will enter the chamber bed through the PowerArch end plates. Here are several tips to minimize the cost of inletting (See page 21 for illustrations):

- Use the smallest number of inlet pipes which, collectively, are capable of passing the anticipated flow from the design storm (max. 8" pipe).
- When determining the number of inlet manifold pipes required for the chamber system, note that every Maximizer chamber allows for a maximum lateral flow of 0.5 cfs per side. After a length of 2 chambers, the lateral flow exceeds the 8 inch inlet pipe's flow capacity of approximately 1.5 cfs (at 1% slope). Therefore, there is no need to inlet every chamber row.
- Minimize the length of the header pipe by determining the minimum number of manifold pipes needed and accessing every other PowerArch section until the desired number of inlet pipes are in place. The orifices in the Maximizer chamber sidewalls will allow water to spread throughout the chamber bed.
- The Maximizer Cleanout System is an option for rows which receive water directly from inlet pipes. (See page 24 for more detailed design information regarding this cleanout feature.)

A second method of distributing water throughout the chamber system is to run perforated pipe through the stone layer at the chamber system's perimeter or within the chamber bed. The length of perforated pipe and number of perforations must be sufficient to pass the anticipated flows from the design storm. Only the top half of the pipe should be perforated; the bottom half will remain unperforated and used to collect sediment that has escaped from contributing structures. (See page 19 for illustration.) Stock perforated pipe may be used in lieu of custom-drilled pipe if the bottom half of the pipe is wrapped in filter fabric. This fabric can be fastened with plastic wire ties at intervals not exceeding 4 feet.

Still another method of inletting runoff into the chamber bed is through the use of leaching catch basins.
In this case, the catch basins are set in stone within the interior of the chamber bed. Water flows through the sides of the catch basin structures, through the stone blinding, and into the Maximizer chambers.

10 A reinforcement-grade woven geotextile must be applied after the first 12" of compacted backfill, as illustrated in the installation requirements. Geotextiles appropriate for this purpose include Amoco 2006 or equivalent geotextile with the following minimum specifications:

Grab Tensile Strength	300 lbs.
Grab Strength Elongation	15%
Mullen Burst	600 PSI
Puncture	120 lbs.
Trapezoid Tear	120 lbs.
UV Resistance	70%

11 It is important to have an adequate pavement design in traffic bearing applications. All such designs should meet or exceed local codes and regulations. Pavement thickness is not included in the 18" of required cover, unless the pavement consists of reinforced concrete.

12 Infiltrator Systems Inc. recommends a minimum of one 4" diameter vent pipe for every 1,000 square feet of bed area (or equivalent). Ventilation pipes must be outletted to "daylight" and protected from traffic loading and accumulation of trash.

13 All plans must be approved by Infiltrator Systems Inc. prior to implementation. Forward the plans to: Staff Engineer, Infiltrator Systems Inc., 4 Business Park Road, Old Saybrook, CT 06475.

DETERMINING THE SYSTEM'S FUNCTION.

When developing a Maximizer chamber bed plan, the design engineer must first determine the purpose of the system. The need may be for stormwater retention or detention applications, "first flush" storage, or some combination of these.

In order to meet the project objectives, it's important to consider the natural characteristics of the site and adjacent sites to be able to determine the size and configuration of the chamber bed(s). Soils, topography, water table elevation, restrictive layers (e.g.: ledge, hardpan), and surface drainage patterns are some of the factors that must be assessed in the preliminary stages of design work.

All pertinent regulatory concerns must also be addressed throughout the entire design process. For design and technical support, contact Infiltrator Systems Inc. at **1-800-221-4436.**

REGULATORY REQUIREMENTS.

Regulations often dictate the type of system to be used in a particular application.

Detention - A detention system is one in which a calculated volume of stormwater needs to be stored within the chamber bed before being released. Outflow is allowed at a predetermined rate based on particular regulatory mandates and the calculated peak runoff for both predevelopment and post-development conditions. Detention systems involve the use of controlled-flow outlets, usually in the form of multi-stage orifices or weirs, sized to allow specific flows at various vertical stages within the storage system. Detention systems are designed to drain completely within a specified time period, usually less than 48 hours.

Retention - In a retention system, a calculated volume of stormwater also needs to be stored within the chamber bed system. Normally, no principal outlet is used in retention systems and infiltration into the soil is the primary mechanism for draining water from the bed. Where retention systems are planned, soil permeability and depth to the water table become especially important. Depth to bedrock or other restrictive layers must also be determined. In retention systems, it is very important to intercept sediments and organic materials suspended within the stormwater before they reach the chamber bed.

First Flush Attenuation - A first flush attenuation system provides storage for the first 0.5" to 1.0" of rainfall over the contributing watershed. The first flush of stormwater runoff from paved areas and other impervious surfaces carries a large percentage of the pollutants. Where the protection of groundwater is of primary concern, it is advantageous to store this water and subject it to the soil's filtration and renovation capabilities.

Flow exceeding the first flush must be directed towards a stream, storm sewer or other outlet where it can be disposed of according to proper engineering practice. The first flush design is similar to that of a retention facility, except it is usually of a significantly lesser volume. Interception of solids through the use of water quality inlets is very important to the longevity of this type of system.

PRELIMINARY SITE INVENTORY AND EVALUATION.

It is critically important to know the characteristics of the job site. Listed below are some of the items that should be quantified and qualified before proceeding with the final design. Remember, *nothing takes the place of on-site investigation.*

Soils - Soil properties will have a great effect on the design of a chamber bed system used primarily for exfiltration (retention). An extensive subsurface exploration can detail soil types, locate the water table and bedrock elevations, and expose any additional limiting layers that may affect the soil's ability to transmit water. Hydraulic conductivity (permeability) should be determined in all soil layers either to the water table or to an underlying restrictive layer, such as rock or hardpan. Permeabilities are usually expressed in feet per day, and the most reliable permeability values are derived from on-site sampling and laboratory analyses.

In chamber beds used for either retention or detention, soils should be examined for their structural suitability.

Loose sands and clays subject to shrinking and swelling will need special consideration during the design process. For best results, either test pits or drilled borings should be used for site sampling. Careful notes documenting these observations must be recorded and kept as part of the project file.

Hydrology - Site hydrology will determine how much water flows into the site and at what rate peak flows will approach the design point, the chamber bed. A hydrologic analysis of proposed future site conditions must be performed and compared to an analysis of present, undeveloped site conditions. This comparison can be used to assess the need for various drainage structures and their respective sizing. Hydrologic data can also aid the design engineer in evaluating whether the site would benefit most from detention, retention or first flush attenuation.

Off-Site Conditions - The design engineer should consider the size, condition, and capacity of any off-site structures or watercourses which will receive water from the site after the development is complete. The need for remedial action to prevent accelerated erosion or hydraulic overloading should be indicated.

HYDROLOGIC SOIL PROPERTIES CLASSIFIED BY SOIL TEXTURE

Texture Class	Effective Water Capacity (Cw) Inch per Inch	Minimum Infiltration Rate (f) Inches per Hour	Hydrologic Soil Grouping
Sand	0.36	8.27	A
Loamy Sand	0.31	2.41	A
Sandy Loam	0.25	1.02	B
Loam	0.19	.52	B
Silt Loam	0.17	.27	C
Sandy Clay Loam	0.14	.17	C
Clay Loam	0.14	.08	D
Silty Clay Loam	0.11	.06	D
Sandy Clay	0.09	.05	D
Silty Clay	0.09	.02	D
Clay	0.04	.02	D

PRELIMINARY SYSTEM SIZING.

SYSTEM CAPACITY.

For preliminary sizing, divide the required storage volume (V_S) by 44.0 cu. ft./chamber to estimate the number of chambers needed:

V_S / 44.0 cu. ft. = C (appropriate number of chambers).

C x 20.5 sq. ft. = A (area needed).

After the type of system (i.e.: detention, retention, first-flush) and the needed storage volume have been determined, a preliminary layout with respect to site limitations and regulatory constraints/requirements can be drawn. (Refer to page 17, Maximizer Materials Worksheet for more details.)

Table 1 on the following page illustrates the average Maximizer chamber volume. This varies with the width of the bed, from a minimum of 31 cubic feet per chamber in one row configuration to a maximum of 47 cubic feet per chamber as the number of rows increases. The reason for this variability is due to the storage capacity under the PowerArch bridges. This capacity is non-existent in a one row system, but increases as the chambers are placed side by side. The average volume is expressed by the equation:

From this equation, the designer is able to determine the average volume of each Maximizer chamber in the bed, including the volume available between chambers, and under the PowerArch bridges. For example, a chamber bed with 100 Maximizer chambers that is 10 chambers wide has a total capacity of 4,540 cubic feet (45.4 cubic feet/chamber in a 10 row bed).

$V_{avg} = 31+16((R-1)/R)$, which reduces to $V_{avg} = 47-16/R$, refer to Table 1.

("R" equals the number of rows in the chamber bed layout.)

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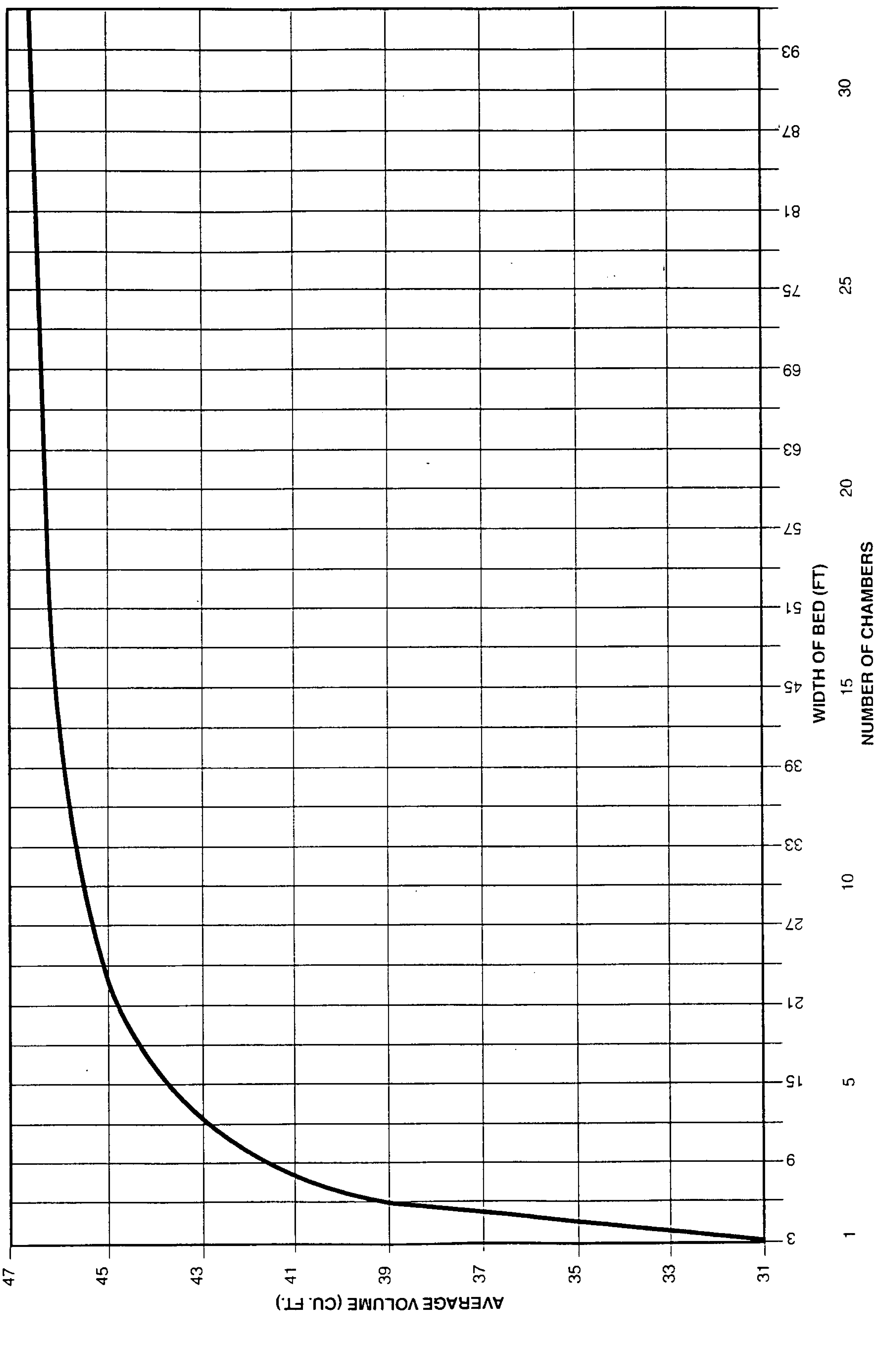
TABLE 1: AVERAGE MAXIMIZER CHAMBER VOLUME



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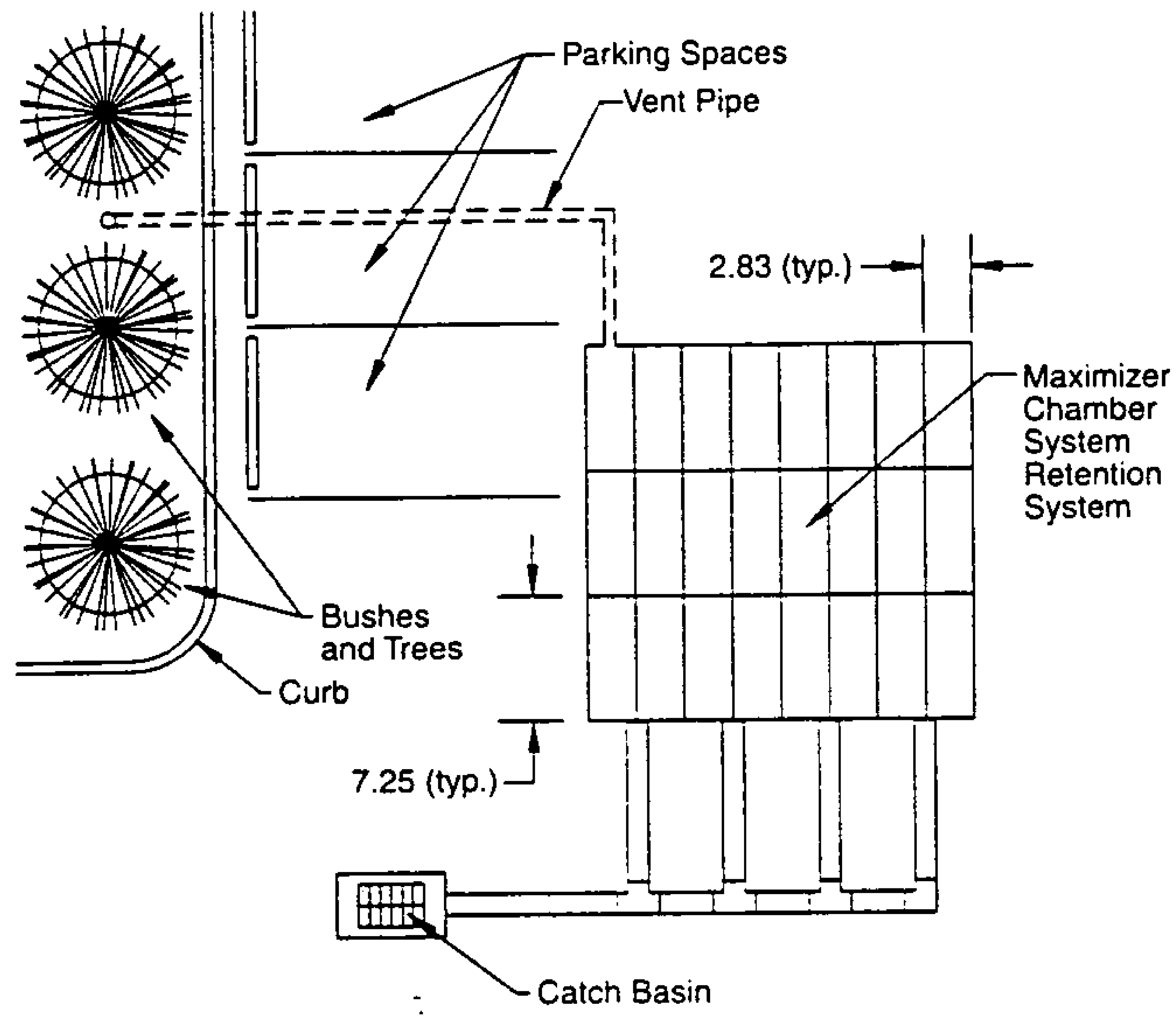
EXAMPLE 1: RETENTION FACILITY.

A landowner wishes to develop a strip mall on a 5 acre parcel which is now wooded. Due to regulatory constraints, all stormwater runoff from a 10-year frequency, 24-hour duration storm event must be stored on site. There are no restrictive layers and the water table is 12 feet from the planned finished grade. The soil is sandy loam with a permeability of 6 feet per day (Q).

The design engineer, knowing that his client can spare none of his land surface to drainage facilities, opts to use the Maximizer Chamber System. The engineer decides to use USDA, Soil Conservation Service (now Natural Resources Conservation Service), TR-55 – Urban Hydrology for Small Watersheds. For the purposes of this example, it will be assumed that the user of this manual is familiar with TR-55. "Given" values, below, are hypothetical and reflect the changes from a wooded area into the proposed strip mall, which will be about 80 percent covered with impervious surfaces, including pavement and rooftop.

There is no principal outlet to the retention system. However, the design engineer decides to install a 4" pipe to ensure that the system drains between rainfall events. To prevent pressure flow, vents are planned at strategic locations. Although venting is important in all subsurface stormwater systems, it is especially important in retention systems where no other relief is provided for pressure buildup. Infiltrator Systems Inc. recommends a minimum of one 4" diameter vent pipe for every 500 square feet of bed area (or equivalent). Ventilation pipes must be outletted to "daylight" and protected from loading and accumulation of trash.



The amount of retention volume needed will depend heavily on rainfall intensity and duration, and the quality of runoff reaching the chamber bed. The cleaner the water, the longer the soil porosity will remain unencumbered with intrusion of fine soil separates which can lead to clogging at the infiltrative surface. With this in mind, make sure that all contributing catch basins are equipped with adequate sumps and hooded outlets.

FIND THE STORAGE VOLUME NEEDED TO HANDLE THE 10-YEAR STORM:

The peak hypothetical flow for the 10-year storm (Q_i) from the contributing drainage area is 10 cfs. The total anticipated volume of runoff (V_r) is 3.85" over 5 acres:

V_r = (3.85") (5.0 acres) (1 ft./12") = 1.60 ac. ft.

From TR-55.

FIND THE AREA NEEDED TO STORE 1.60 ACRE FEET OF RUNOFF:

1.60 ac. ft. x 43,560 cu. ft./1 ac. ft. = 69,696 cu. ft.

To get the approximate square footage of the Maximizer chamber bed needed, use a storage capacity of 2.15 cu. ft./sq. ft of bed to store 1.60 ac. ft.:

69,696 cu. ft./2.15 cu. ft./sq. ft. = 32,420 sq. ft. of bed to store 1.60 ac. ft.

FIND THE AREA NEEDED FOR EXFILTRATION:

Using Darcy's Law: Q = KiA where:

K = permeability of the soil (saturated) in feet per day;

i = hydraulic gradient (ft./ft.) and will equal 1.0 on most sites chosen for exfiltration;

A = area available for exfiltration.

Note: Although no safety factor has been incorporated into this example, Infiltrator Systems Inc. recommends the use of a reasonable safety factor when estimating the infiltrative capacity of the soil to account for long-term soil clogging. Long-term infiltration rates will vary with soil conditions and land use management practices.

Where retention systems are required, regulations may also stipulate a maximum draw down period, during which the exfiltration bed must drain completely. It's not uncommon to plan for a maximum draw down period of ten days. Since about 32,420 sq. ft. of chamber bed is needed to store the anticipated runoff, check to see that this area is sufficient to exfiltrate the runoff within the desired period.

Q = 6 ft./day x 1.0 ft./ft. x 32,420 sq. ft. = 194,520 cu. ft./day or 4.47 ac. ft.

1.60 ac. ft./4.47 ac. ft./day = 0.36 days or 8.6 hours will be needed to drain the chamber bed.

Since this far exceeds the infiltration rate required to drain the bed within the required ten day period, the bed size of 32,420 sq. ft. is adequate not only to provide for the needed exfiltration, but also to supply the required storage.

Note: The maximum bed size is 300 chambers. For this example, assume that the beds will be limited to 90 feet in width, including overexcavating the perimeter.

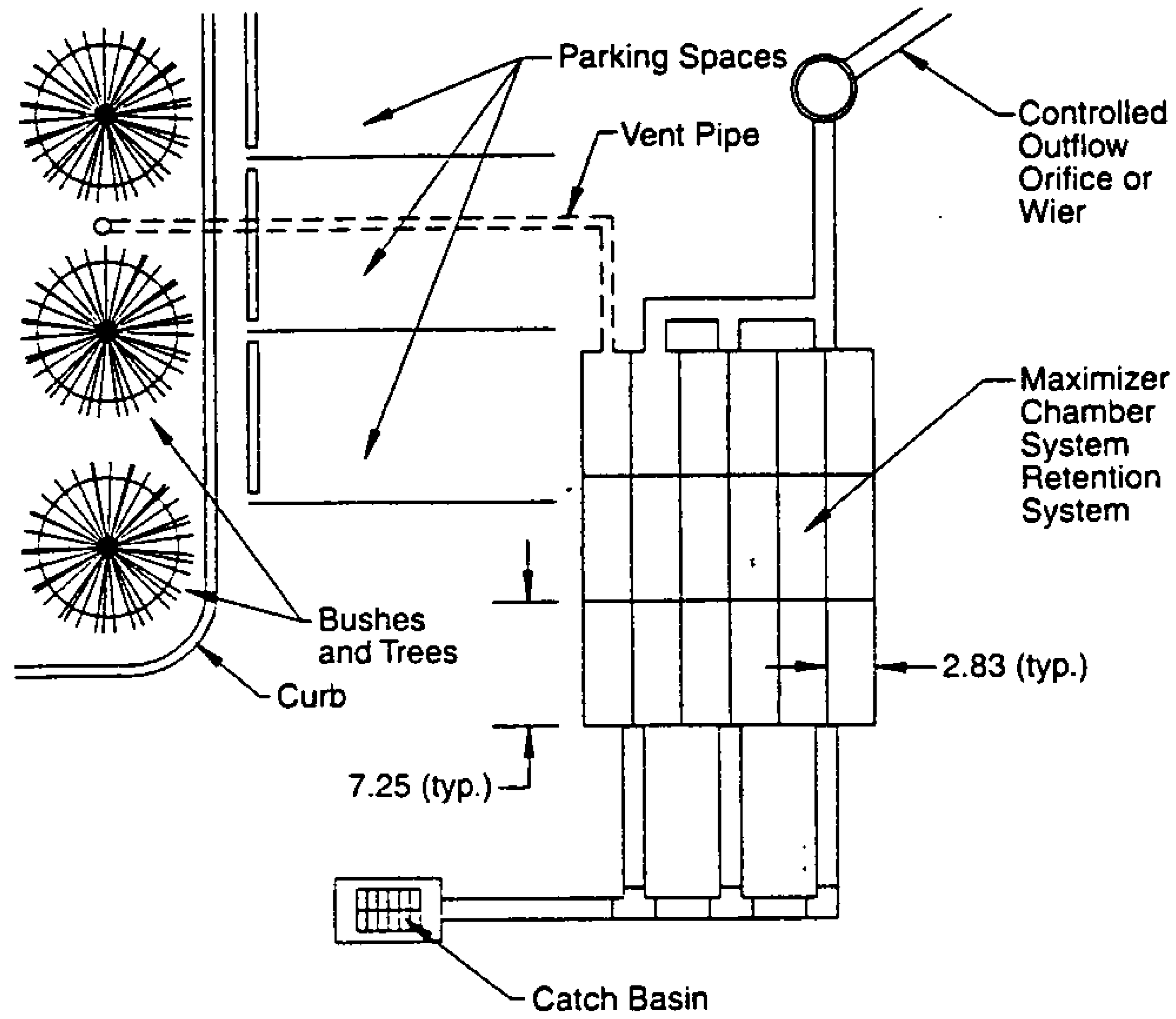
To determine bed size, use Table 1 on page 7 and assume 30 rows of chambers. The average storage volume is 46.5 cubic feet per chamber, including the volume beneath the bridges.

69,696 cu. ft./46.5 cu. ft./chamber = 1,499 Maximizer chambers.

Use five chamber beds, each 30 chambers wide and 10 chambers long.
This will require a total of 1500 Maximizer chambers.

EXAMPLE 2: DETENTION FACILITY

A landowner wishes to develop a strip mall on a 5 acre parcel of land from which runoff discharges into a nearby road drainage system. Due to regulatory constraints, the landowner cannot increase peak discharges produced by the 10-year frequency, 24-hour duration storm event. The soils are slowly permeable and won't contribute significantly to draining the detention facility. The landowner hires a professional engineer to generate a site design, including a stormwater detention system. The landowner needs all the land on the site for his proposed commercial development, and after considering a surface pond, decides that a subsurface facility under the parking area is most sensible. The engineer decides to use USDA, Soil Conservation Service (now known as Natural Resources Conservation Service), TR-55 because volumes are an integral part of this hydrologic analysis method. For the purposes of this design example, it will be assumed that the user of this manual is familiar with TR-55. "Given" values, below, are hypothetical and reflect the changes from a wooded area into the proposed strip mall which



will be about 80 percent covered with impervious surfaces, including pavement and rooftop. The drainage area will be synonymous with the 5 acre site. In most cases, water contributed from off-site sources must also be considered.

Q_o = Peak discharge (cfs) from the watershed (present) before development, used as the maximum allowable discharge from the detention facility for the design storm.

Q_i = Peak discharge (cfs) from the watershed (future) after development, used as the peak inflow to the detention bed for the design storm.

V_r = Volume of runoff (in./ac. or ac. ft.) from the drainage area.

V_s = Volume of storage (in./ac. or ac. ft.) to be provided.

As mentioned earlier, the discharges and runoff for this example are already given to help simplify the problem. The volume of detention storage required is calculated by using the graph in Table 2 and the equation, $\mathbf{V_s = (V_s/V_r)\,V_r}$.

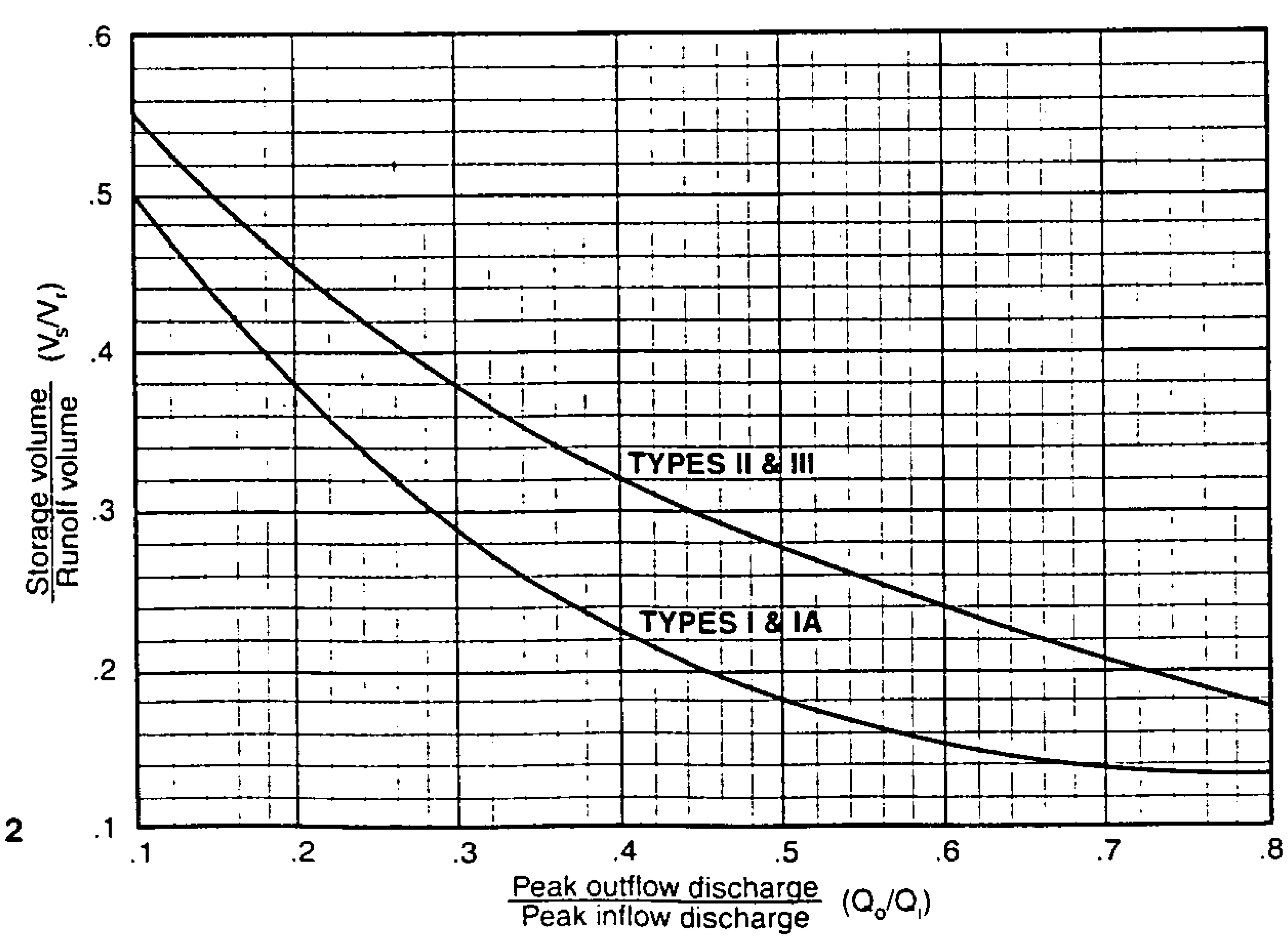


TABLE 2

Types I, IA, II, & III are defined in TR-55.

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10-YEAR-24-HOUR STORM (TYPE III STORM DISTRIBUTION):

Q_o = 12 cfs (present).

Q_i = 15 cfs (future).

V_r = 3.85" over 5 acres or 1.6 acre feet (3.85" of runoff from a 5" rainfall).

Q_o / Q_i = 0.80.

V_s / V_r = 0.18 (from Table 2 on page 10).

V_s = (0.18) (1.6) = 0.29 ac. ft. storage required for the 10-year storm.

From the above example, it is concluded that a total of 0.29 acre feet of storage is needed to accommodate the increase in runoff from a 10-year storm event. Next we must determine the size of the chamber bed needed for storage, and that it will fit within the site, taking into account all natural and artificial constraints. In this case we will assume that there is a square area, 200 feet by 200 feet, available for stormwater bed installation.

FINDING TOTAL AREA NEEDED FOR CHAMBER BED:

(0.29 ac. ft.) (43,560 sq. ft./ac.) = 12,633 cu. ft.

Calculate the approximate size of the Maximizer chamber bed by dividing the total volume by 2.15 cu. ft./1 sq. ft.

12,633 cu. ft./2.15 cu. ft./1 sq. ft. = 5,876 sq. ft.

A chamber bed of this approximate area will fit easily into the available 40,000 sq. ft. (200 ft. by 200 ft.).

Try using 30 rows wide. Each chamber is 34" wide and 87" long. Therefore, a bed with 30 rows will be about 85 feet wide. From Table 1 (on p. 9), the average storage volume per chamber is 46.5 cubic feet. The needed storage volume (12,633 cu. ft.) divided by 46.5 cu. ft./chamber indicates that 272 Maximizer chambers are needed. Use 270 chambers in a bed which is 30 rows wide and 9 chambers long. (Calculate the void in stone around the bed's perimeter and under the chambers to compensate for 270 chambers rather than 272.) Therefore, the length of the chamber bed will be about 63 feet. The actual square footage of the chamber bed will be 85 feet by 63 feet or 5,355 square feet, exclusive of any over excavation around the bed's perimeter.

The design engineer must now design the outlet so that only the prescribed rate of outflow is allowed from the system. The outlet must pass no more than the Q_o value for the design storm, which in this case is the 10-year storm, where **Q_o = 10 cfs.**

Note: Various types of outlets will require different flow equations and may involve pipe flow, weir flow or other types of flow at the discretion of the design engineer.

It is also possible to plan multi-stage outlets when considering detention for more than one design storm within the same system. The design procedure would be similar for that described above, except that incremental or stage storage within the detention structure would need to be quantified and the outlets from the system would need to be designed accordingly.

TWO-STAGE OUTLET.

In addition to the storage requirements for the 10-year storm discharge of 12 cfs (from the above example), a decision was made to limit the 2-year outflow discharge to 8 cfs because of potential damages to a roadside ditch located downstream from the project site. Using TR-55, it is determined that the 2-year peak discharge (future/developed condition) would be 10 cfs and the runoff will be 3.2".

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WORKSHEET #1: DETENTION BASIN PEAK OUTFLOW, STORAGE VOLUME (V_s) KNOWN.

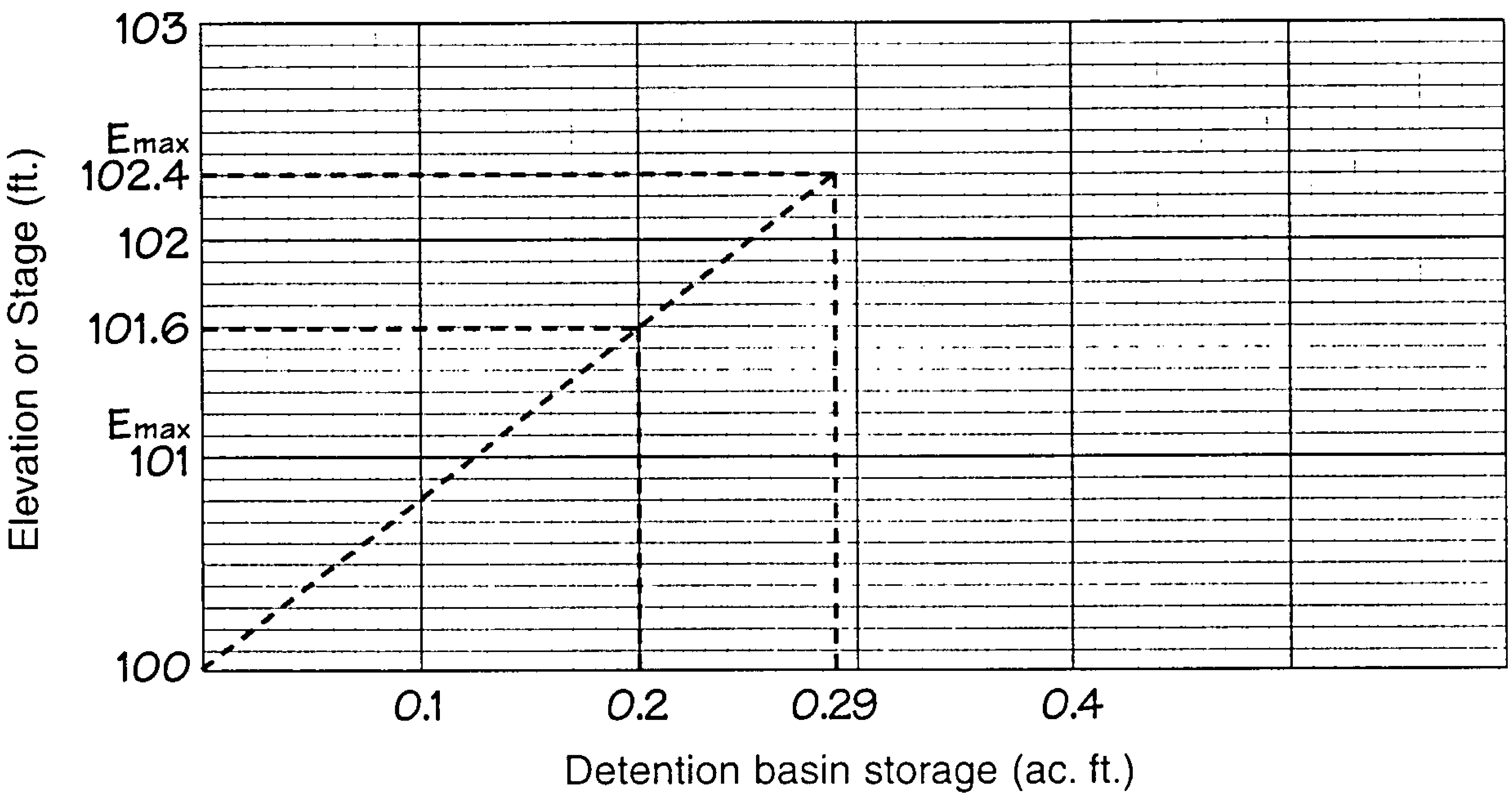
The following example shows how Worksheet #1 on page 14 is used to compute the V_s of 0.24 ac. ft. and E_{max}* of 101.6 ft. for the first stage. An E_{max} of 101.6 ft. is the crest elevation of the second stage outlet.

* E_{max} = The maximum elevation for a given stage.

Project: Shop 'Til You Drop
By: MS Date: 04/30/96
Location: Anywhere USA
Checked by: PL Date: 04/31/96

☐ Present ☑ Developed (Check One)

2-Stage Structure



1. Data:
   Drainage area .... A_m = 0.008 mi²
   Rainfall distribution type (I, IA, II, III) = III

	1st Stage	2nd Stage
2. Frequency .... yr	2	10
3. Storage volume, V_s .... ac-ft	0.20	0.29
4. Runoff, Q .... in	3.2	3.85
5. Runoff volume, V_r .... ac-ft ($V_r = QA_m$ 53.33)	1.33	1.6
6. Compute $\frac{V_s}{V_r}$	0.18	0.18
7. $\frac{q_o}{q_i}$ .... in (Use $\frac{V_s}{V_r}$ and Table 2)	0.8	0.80
8. Peak inflow discharge, q_i .... cfs	10	15
9. Peak outflow discharge, q_o .... cfs ($q_o = q_i (\frac{q_o}{q_i})$)	8	12 *
10. Maximum stage, E_{max} (From plot)	101.6	102.4

* 2nd stage q_o includes 1st stage q_o.

From TR-55.

Due to the system's low profile, the outlets at each stage will be rectangular weirs. The rectangular weir equation is:

$q_o = 3.2\, L_w\, H_w^{1.5}$.

where:

q_o = peak outflow discharge (cfs)

L_w = weir crest length (ft.)

H_w = head over weir crest (ft.)

For the first stage:

$H_w = E_{max}$ - weir crest elev.(assume elev. 100.00 ft. at bottom of bed), 101.6(ft.) - 100.0(ft.) = 1.6(ft.) and,

L_w = 8 cfs/(3.2 ft.)(1.6 ft.)$^{1.5}$ = 1.24 ft.

The width of the first stage weir outlet is 1.25 feet, the height is 1.6 feet.

The second stage is then sized to discharge at the correct rate using an E_{max} of 102.4 ft. which corresponds to the approximate top of the area available for water storage. First, it is necessary to compute the discharge through the lower outlet (first stage) with E_{max} of 102.4 ft.

L_w = 1.24 ft. (first stage) and,

H_w = 101.6 ft. - 100.0 ft. = 1.6 ft.

Using these values, determine the discharge (q_o) through the first stage:

q_o = (3.2 ft./sec.) (1.24 ft.) (1.6 ft.)$^{1.5}$ = 8.0 cfs.

Now, compute the required weir crest length (L_w) for the second stage. Since the second stage crest elevation is 102.4 ft:

H_w = 102.4 ft. - 101.6 ft. = 0.8 ft.

And, since q_o for the second stage equals the total q_o from the 10-year storm minus the q_o from the 2-year storm, then:

q_o = 12 cfs - 8 cfs = 4 cfs. Therefore,

L_w = 4 cfs/(3.2 ft.) (0.8 ft.)$^{1.5}$ = 1.75 ft.

The width of the weir opening between elevations 101.6 ft. (E_{max} first stage) and 102.4 ft. (E_{max} second stage) is 1.75 feet.

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WORKSHEET #1: DETENTION BASIN PEAK OUTFLOW, STORAGE VOLUME (V_s) KNOWN.

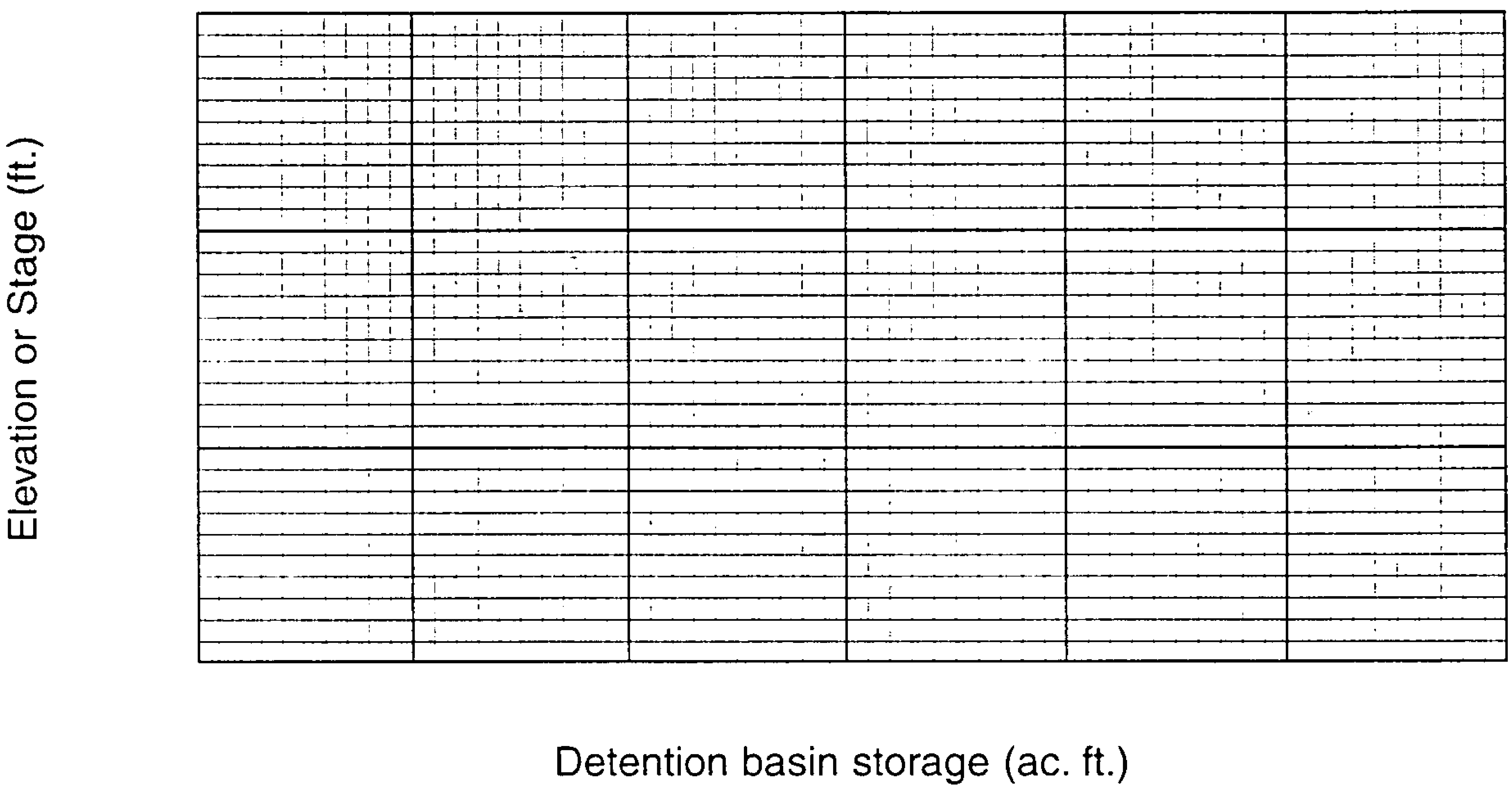
Project ______________________________

By ____________________ Date ____________

Location ______________________________

Checked by ______________ Date ____________

☐ Present ☐ Developed (Check One)



1. Data:
   Drainage area . . . . A_m = ________ mi^2
   Rainfall distribution type
   (I, IA, II, III) = ________

	1st Stage	2nd Stage
2. Frequency . . . . yr		
3. Storage volume, V_s . . . . ac-ft		
4. Runoff, Q . . . . .in		
5. Runoff volume, V_r . . . . ac-ft ($V_r = QA_m \times 53.33$)		
6. Compute $\frac{V_s}{V_r}$		
7. $\frac{q_o}{q_i}$ . . . . .in (Use $\frac{V_s}{V_r}$ and Table 2)		
8. Peak inflow discharge, q_i . . . . cfs		
9. Peak outflow discharge, q_o . . . . cfs ($q_o = q_i (\frac{q_o}{q_i})$)		*
10. Maximum stage, E_{max} (From plot)		

* 2nd stage q_o includes 1st stage q_o.

From TR-55.

WORKSHEET #2: DETENTION BASIN STORAGE, PEAK OUTFLOW DISCHARGE (q_o) KNOWN.

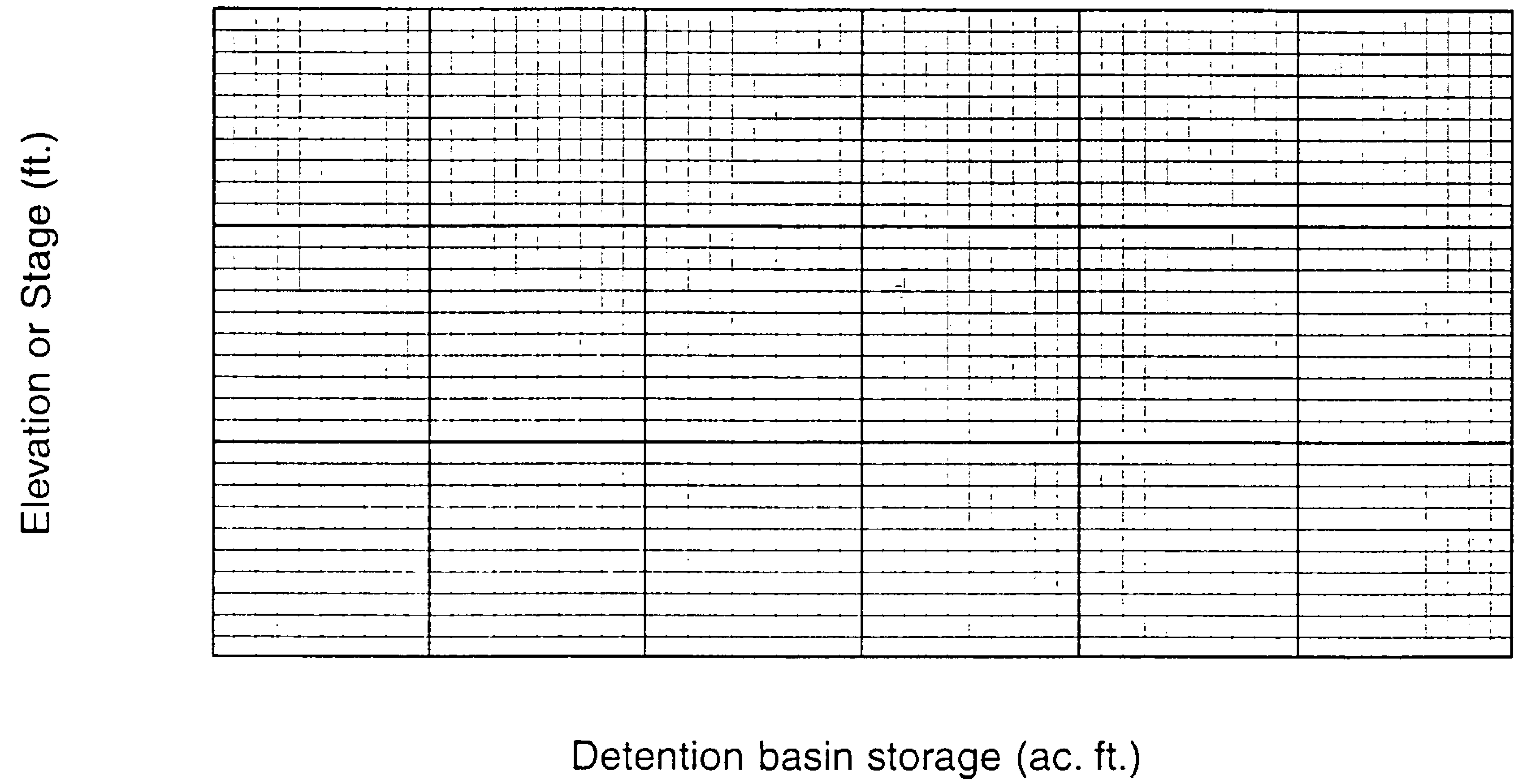
Project ____________________

By ____________________ Date ____________

Location ____________________

Checked by ____________________ Date ____________

☐ Present ☐ Developed (Check One)



1. Data:
   Drainage area . . . . A_m = ________ mi^2
   Rainfall distribution type (I, IA, II, III) = ________

	1st Stage	2nd Stage
2. Frequency . . . . yr		
3. Peak inflow discharge, q_i . . . . cfs		
4. Peak outflow discharge, q_o . . . . cfs		*
5. Compute $\frac{q_o}{q_i}$		
6. $\frac{V_s}{V_r}$ . . . . (Use $\frac{q_o}{q_i}$ and Table 2)		
7. Runoff, Q . . . . in		
8. Runoff volume, V_r . . . . ac-ft ($V_r = QA_m \times 53.33$)		
9. Storage volume, V_s . . . . ac-ft ($V_s = V_r (\frac{V_s}{V_r})$)		
10. Maximum stage, E_{max} (From plot)		

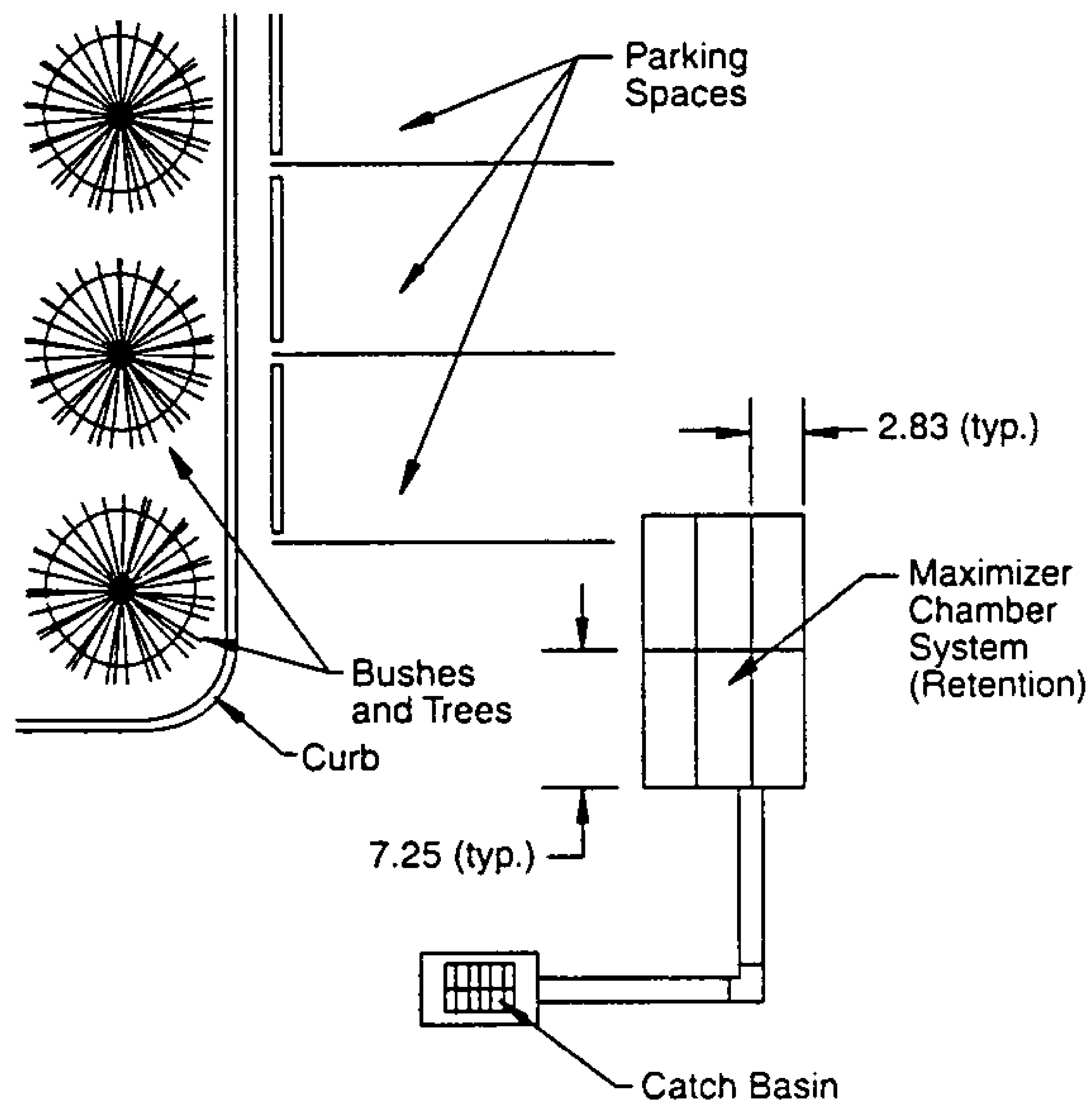
* 2nd stage q_o includes 1st stage q_o.

From TR-55.

INFILTRATOR SYSTEMS INC

EXAMPLE 3: FIRST FLUSH FACILITY.

Due to water quality concerns within the region, all new commercial developments are required to separate the "first flush" and prevent it from entering directly into surface water bodies or watercourses. In this example, it is required that the first inch of rainfall which falls onto the new pavement be stored in a first flush facility and allowed to exfiltrate into the soil. The parking area is two acres.



Therefore:

1" x 1 ft./12" x 2 ac. x 43,560 sq. ft./1 ac. = 7,260 cu. ft. of needed volume.

TO ESTIMATE THE SIZE OF THE CHAMBER BED:

7,260 cu. ft./(44.0 cu ft./chamber) ≅ 165 Maximizer chambers are needed.

Each chamber is 20.5 sq. ft. in area, therefore:

165 chambers x 20.5 sq. ft. ≅ 3,383 sq. ft.

Given the site constraints, such as bedrock and underground utilities, it is determined that a bed size of 60 ft. by 60 ft. will fit best. A width of 60 ft. will allow for 20 rows. To determine the average volume of each chamber in a 20 row bed configuration, refer to Table 1 on page 7. From this table, the average volume per chamber is 46.2 cu. ft.

TO FIND THE PRECISE NUMBER OF CHAMBERS NEEDED:

**7,260 cu. ft./(46.2 cu. ft./chamber) = 158 Maximizer chambers;
use 20 rows of 8 Maximizer chambers.**

Total number of chambers = 160 chambers.

This will provide 7,392 cu. ft. of storage which exceeds the needed 7,260 cu. ft.

The remainder of runoff from any given rainfall event will bypass the first flush storage facility and enter into a storm sewer, watercourse or otherwise be disposed of in a manner consistent with appropriate engineering practices.

MAXIMIZER MATERIALS WORKSHEET

INFILTRATOR® SYSTEMS INC

Project ______________________

By ______________ Date __________

Location ______________________

Checked by ______________ Date __________

☐ Present ☐ Developed (Check One)

FIND THE FOLOWING:

1. Required storage volume (**V_s**) = ... [ ] cu. ft.

2. Approximate bed size for siting purposes: The capacity of each sq. ft. of bed is approximately 2.15 cu. ft.; **V_s**/2.15 = ... [ ] sq. ft. **(A)**

3. Approximate bed layout (length x width). Divide desired bed width by 2.83 ft. (width of chamber) to calculate actual number of chamber rows = ... [ ] rows **(R)**

4. The average volume per chamber (**V_{avg}**)(Using "**R**" and Table 1) = ... [ ] cu. ft.

5. The actual number of chambers **(C)** needed: (**V_s**) ________ /(**V_{avg}**) ________ = ... [ ] chambers **(C)**

6. The number of PowerArch bridges needed **(P)**: 2((**C**) ________ /(**R**)) x ((**R**) -1) = ... [ ] bridges **(P)**

7. The actual size of the bed **(S)**: **(C)** ________ x 20.5 sq. ft./chamber = ... [ ] sq. ft. **(S)**

8. Quantity of excavation **(E)**: **(S)** ________ x 4.5 ft. (depth) x 1 cu. yd./27 cu. ft. = ... [ ] cu. yd. **(E)**

9. Area of filter fabric **(F)**:**(C)** ________ /**(R)** ________ x 7.25 ft. (unit length) x 4 ft. (fabric width) x 2 sides x 1 sq. yd./ 9 sq. ft. = ... [ ] sq. yd. **(F)**

10. Quantity of stone (**V_{st}**): [**(S)** ________ x 0.25 ft. x 1 cu. yd./27 cu. ft. = cu. yd. (**V_{st}**) (**V_{st}**) ________ x 1.5 tons/cu. yd.] + [(R x 6) + 2C/R] (4 sq. ft.) = ... [ ] tons of stone

11. End plates needed:

    Maximizer "A" end plates (**M_A**): **(R)** ________ rows = ... [ ] end plates (**M_A**)

    Maximizer "B" end plates (**M_B**): **(R)** ________ rows = ... [ ] end plates (**M_B**)

    PowerArch "A" end plates (**PA_A**):[**(R)** ________ rows - 1] = ... [ ] end plates (**PA_A**)

    PowerArch "B" end plates (**PA_B**):[**(R)** ________ rows - 1] = ... [ ] end plates (**PA_B**)

MAXIMIZER COST ESTIMATE WORKSHEET

INFILTRATOR SYSTEMS INC

Project ________________________________

By ____________________ Date ____________

Location ______________________________

Checked by ______________ Date ____________

☐ Present ☐ Developed (Check One)

____

FIND THE COST OF THE SYSTEM:

	Quantity	Cost		
Chambers	________	x $________	/chamber = ...	$ [ ]
Bridges	________	x $________	/bridge = ...	$ [ ]
End Plates (chambers)	________	x $________	/end plate = ...	$ [ ]
End Plates (bridges)	________	x $________	/end plate = ...	$ [ ]
Filter Fabric (sq. yd.)	________	x $________	/sq. yd. = ...	$ [ ]
Stone (tons)	________	x $________	/ton = ...	$ [ ]
Excavating cost (cu. yd.)	________	x $________	/cu. yd. = ...	$ [ ]

Total Material Cost Plus Excavation = ... $ [ ]

The above does not include labor costs, except for excavating. The total installed cost, including labor, should be between \$2.50 – \$2.95 per cubic foot of storage volume provided, depending on regional costs. This does not include catch basins, piping, or other peripheral drainage structures.

Note: Cost can vary considerably depending on local conditions. This worksheet is provided as a guide only.

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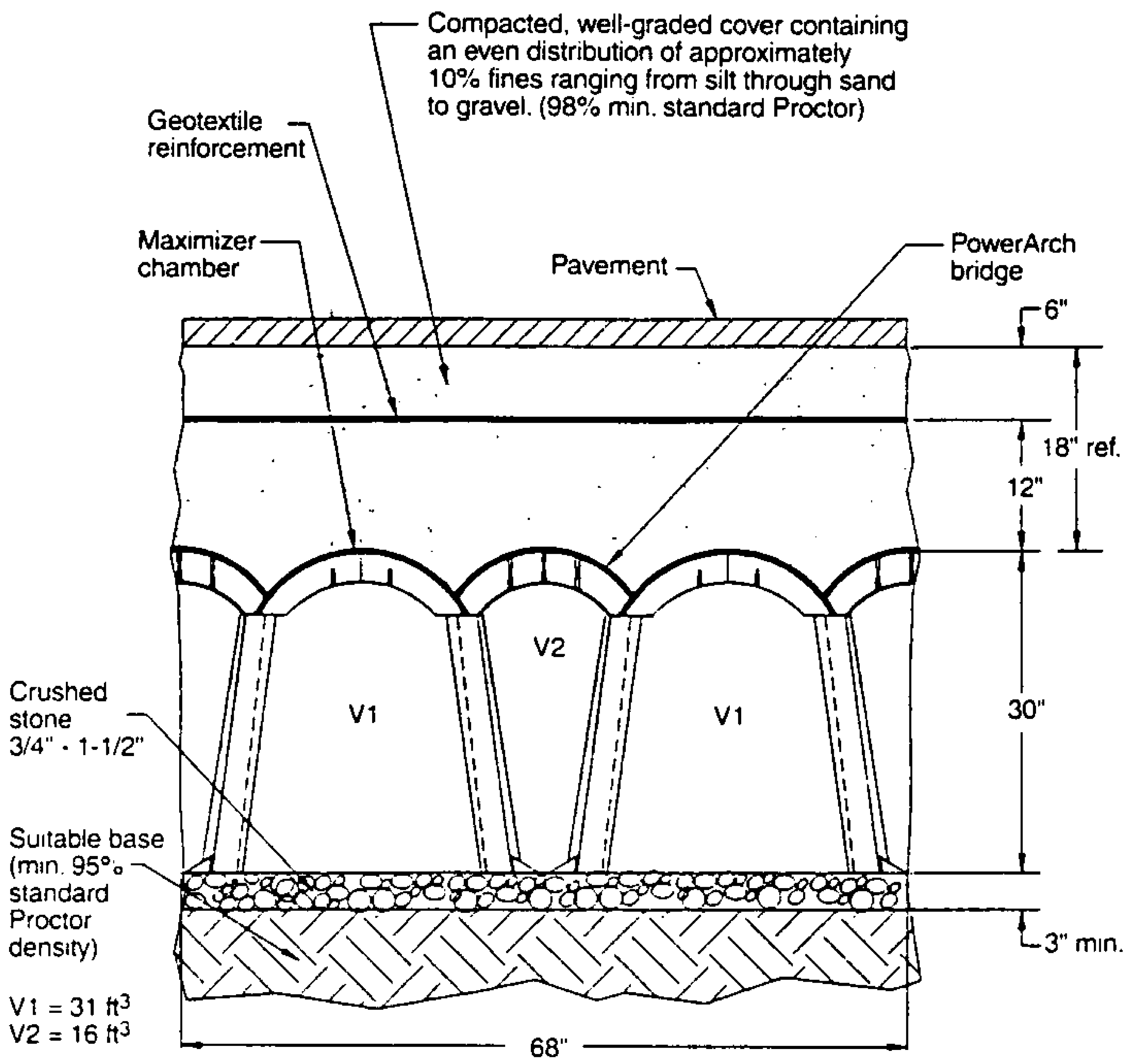
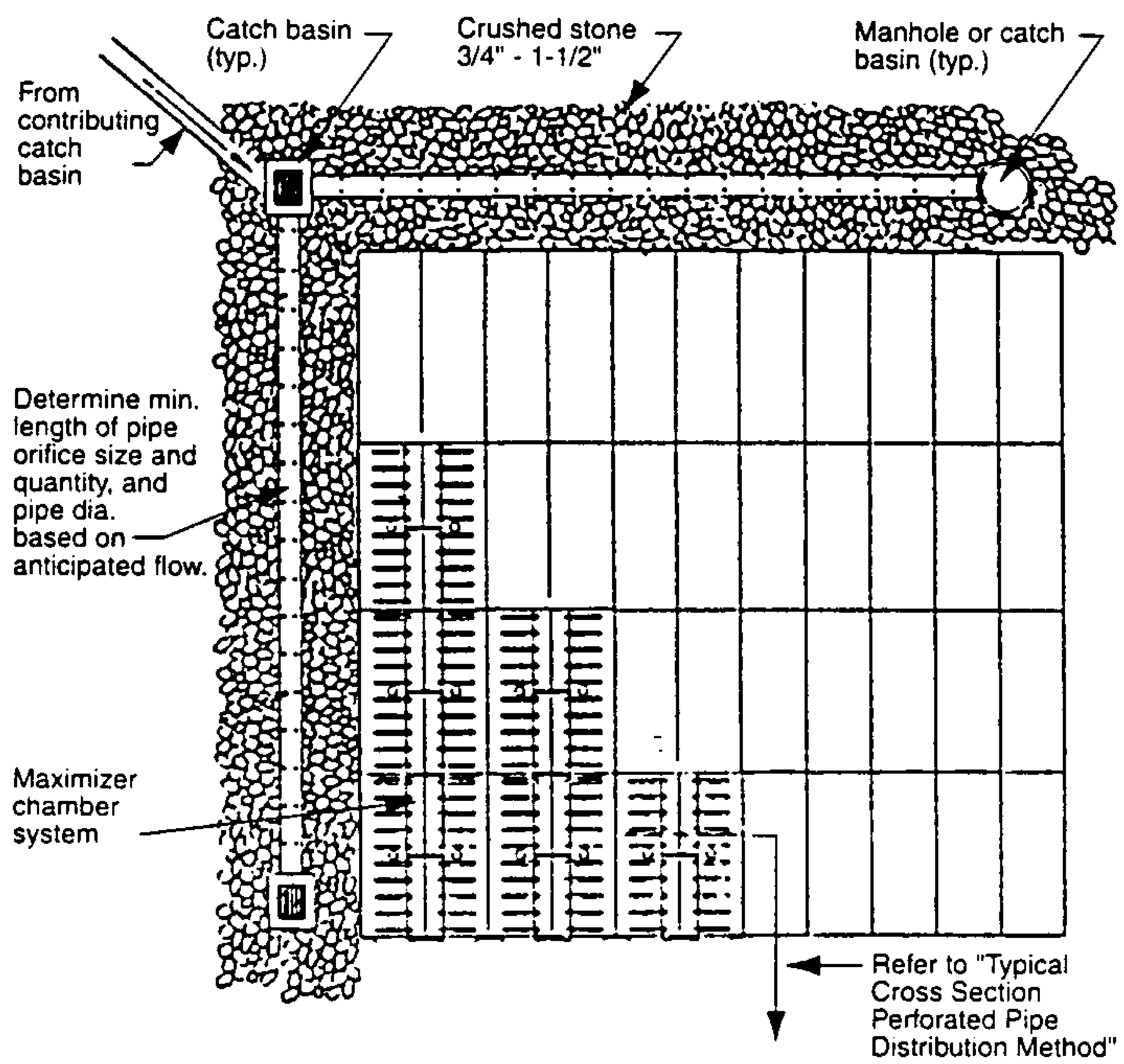
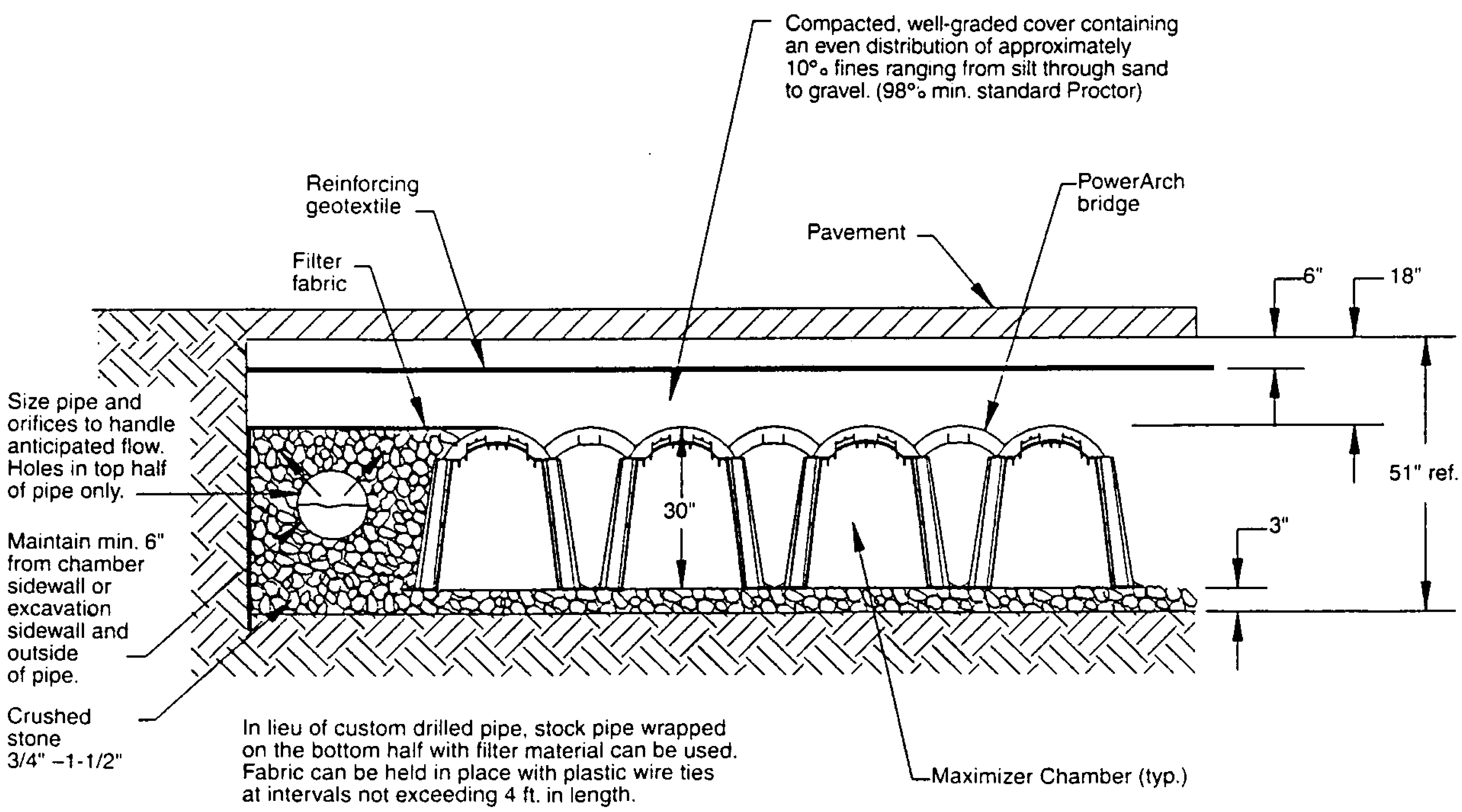
MAXIMIZER SYSTEM
Not to Scale



PERFORATED PIPE DISTRIBUTION METHOD
Not to Scale



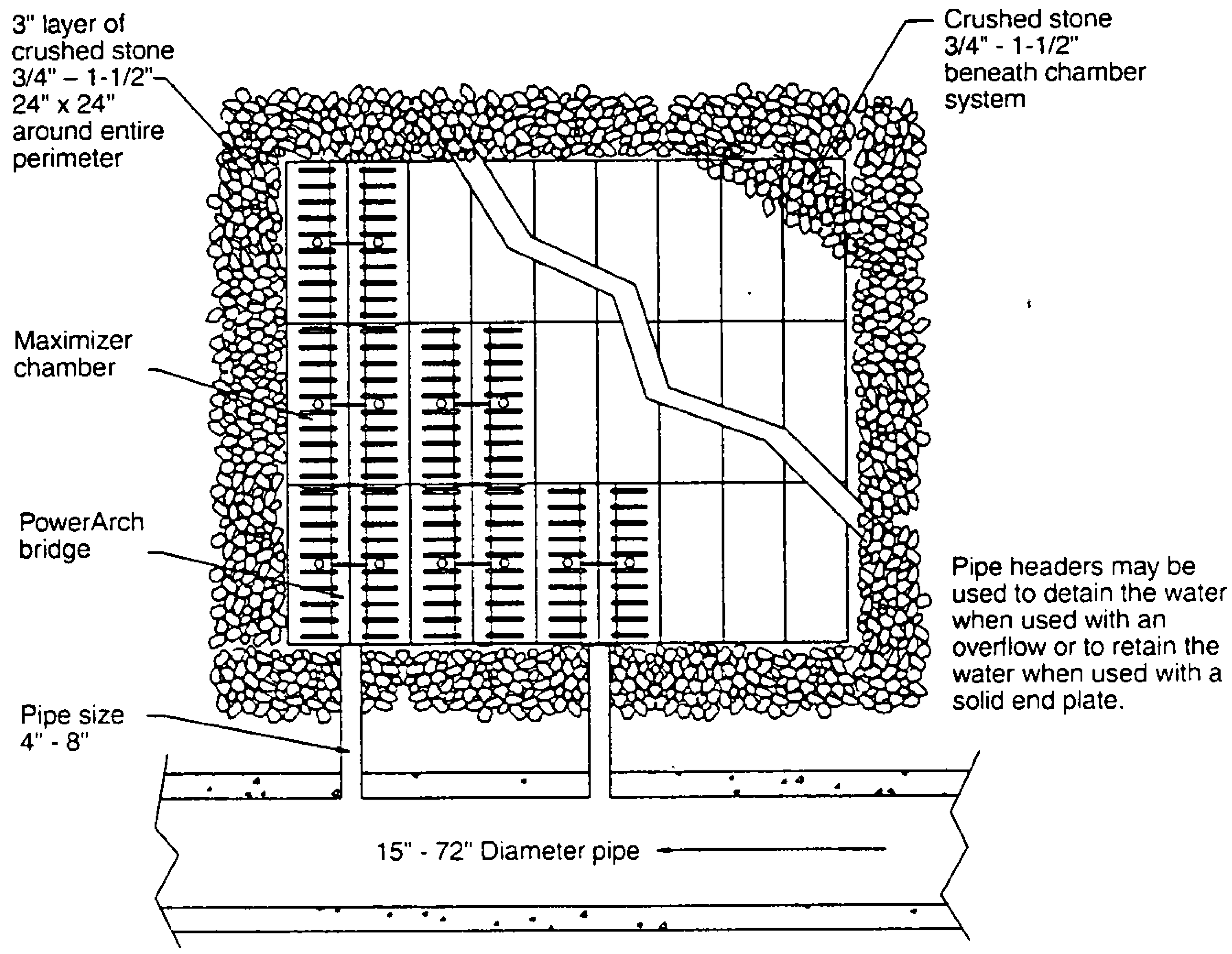
PERFORATED PIPE DISTRIBUTION METHOD
Not to Scale



INFILTRATOR SYSTEMS INC

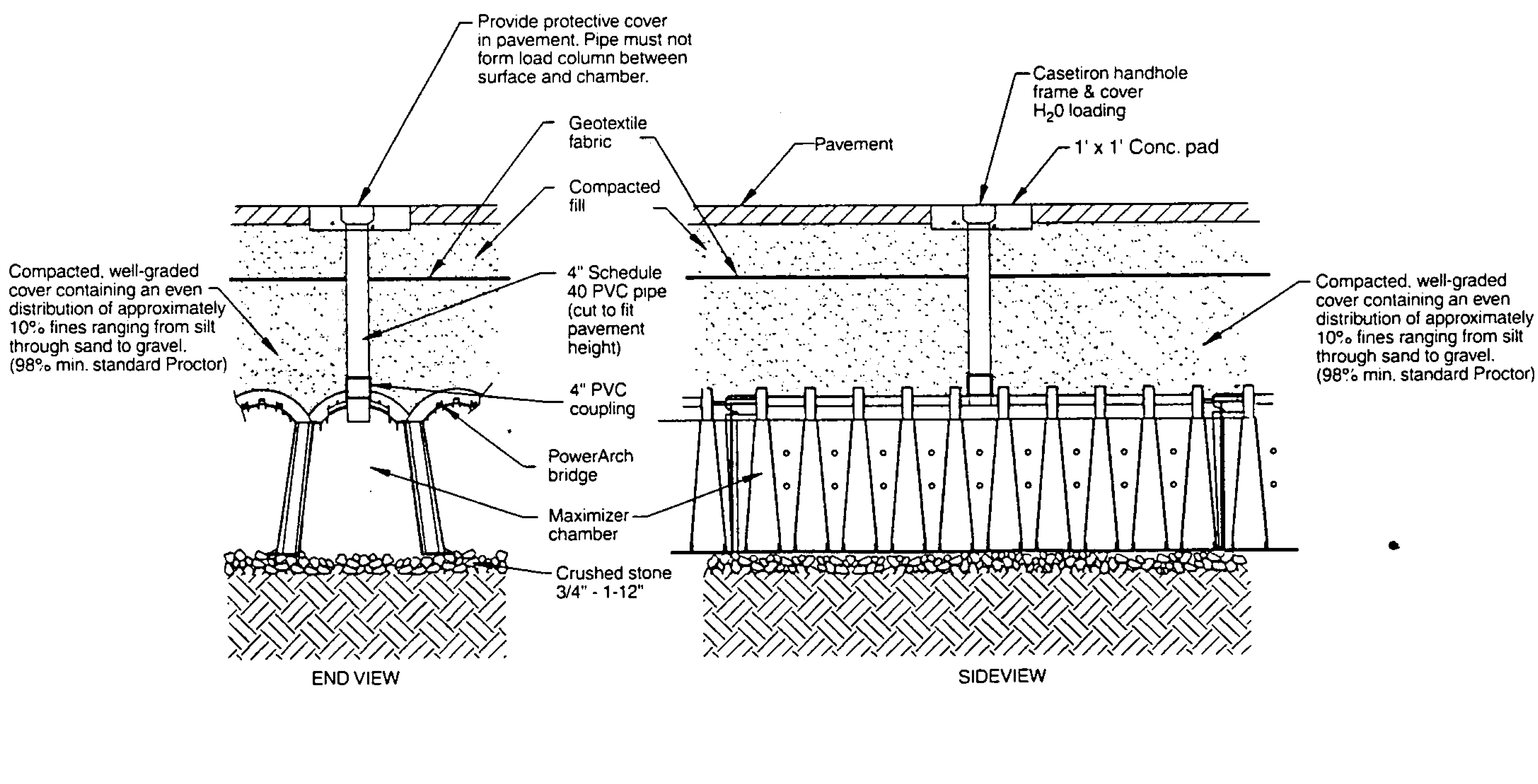
PLAN VIEW OF THE MAXIMIZER CHAMBER SYSTEM

Not to Scale



INSPECTION PORT DETAIL

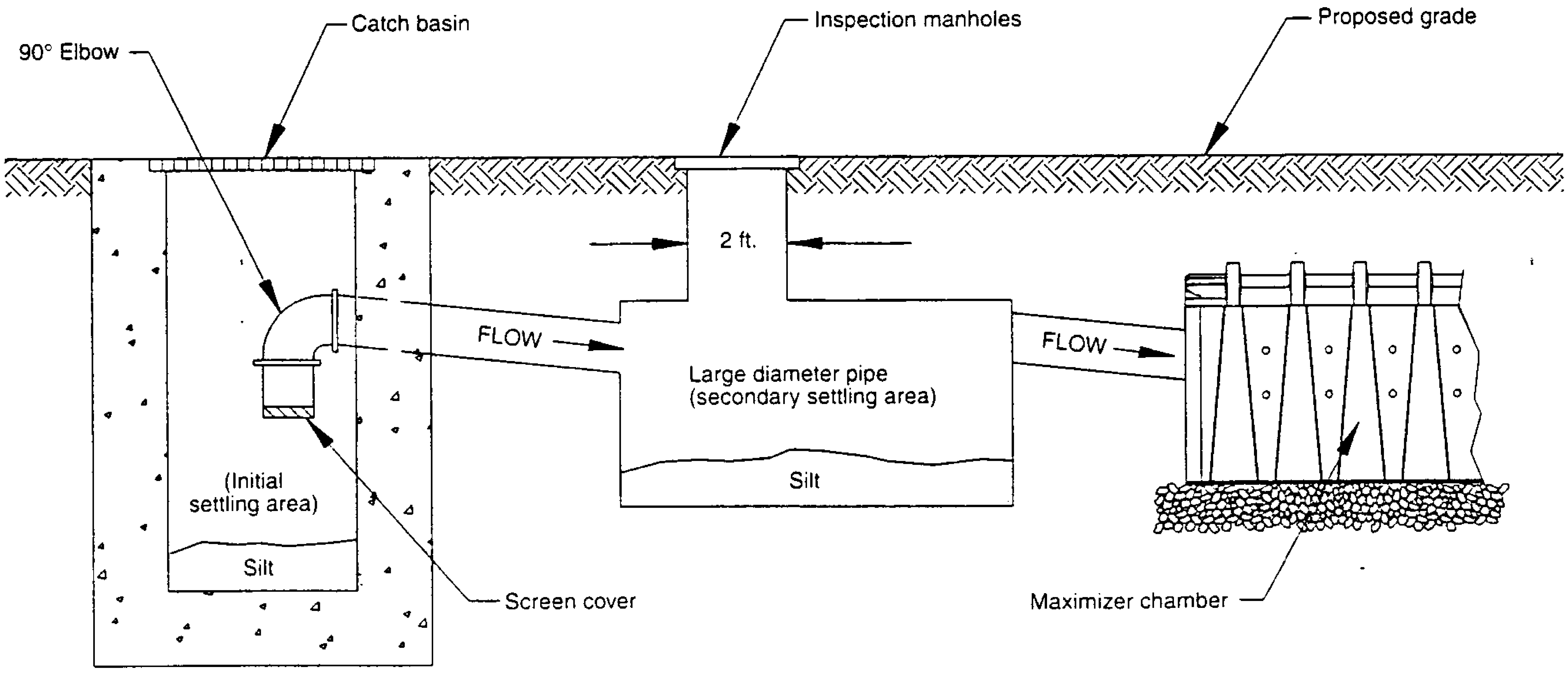
Not to Scale



INFILTRATOR SYSTEMS INC

WATER QUALITY INLET SYSTEM

Not to Scale



WATER QUALITY INLET

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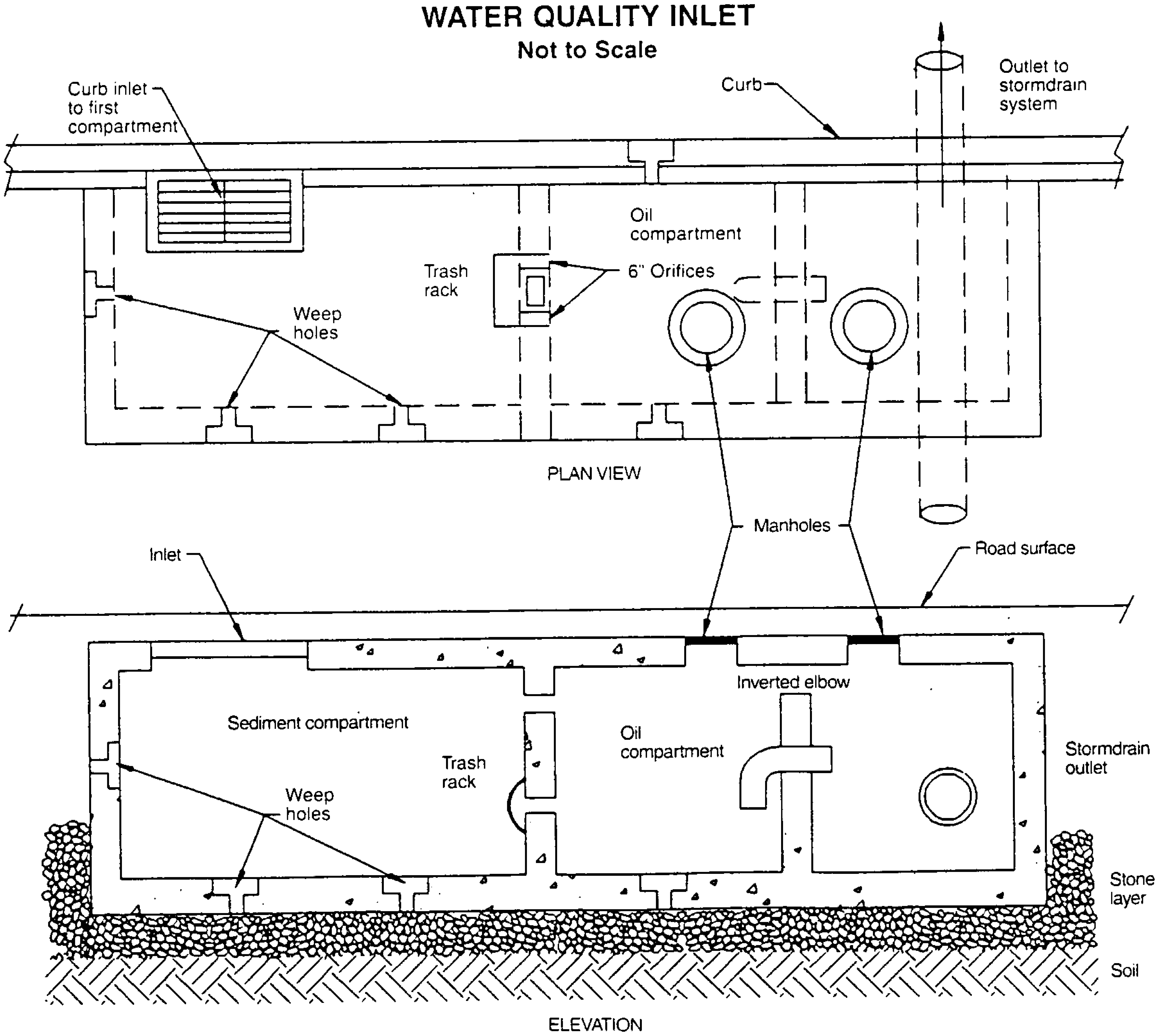
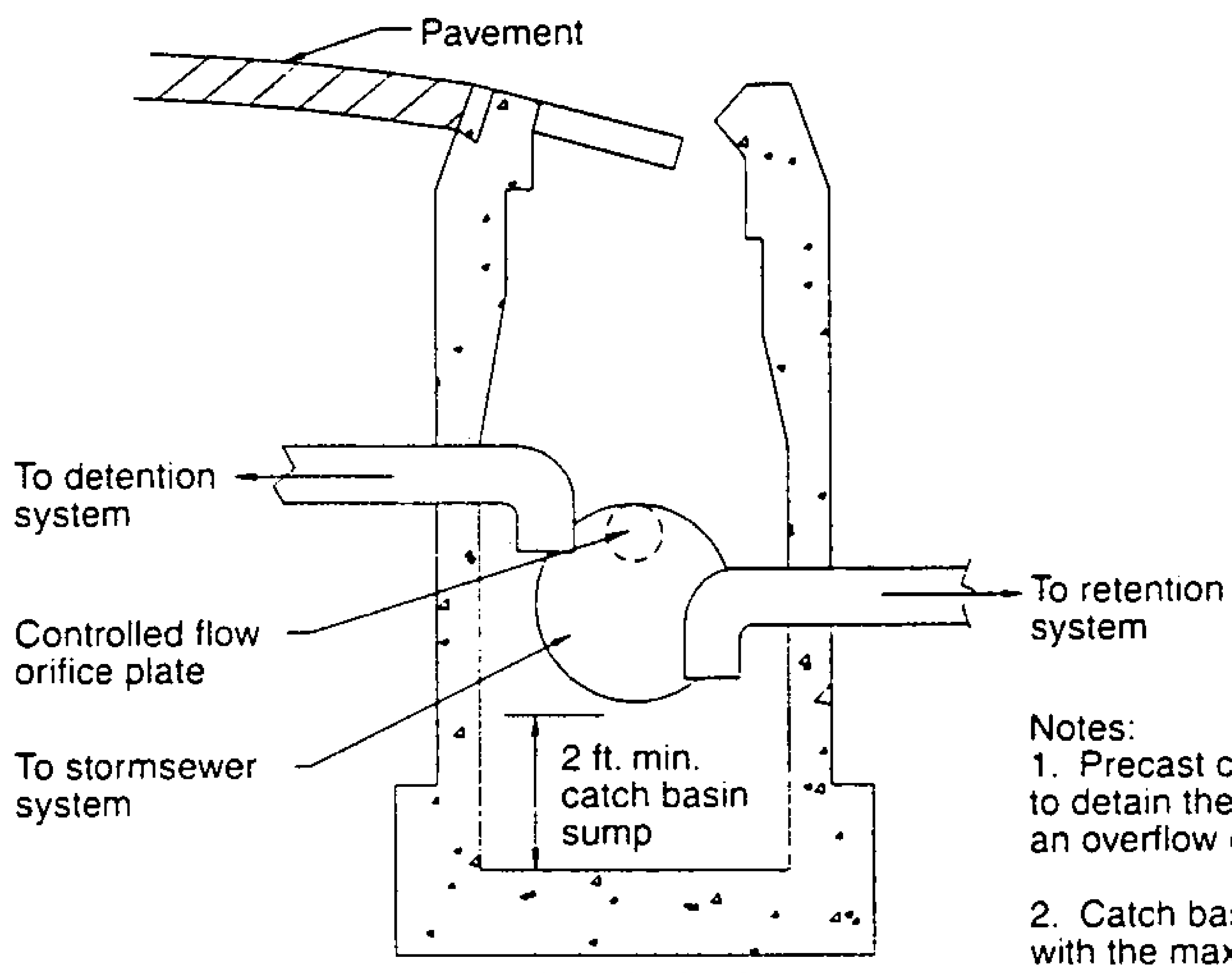


TYPICAL CATCH BASIN SUMP

Not to Scale

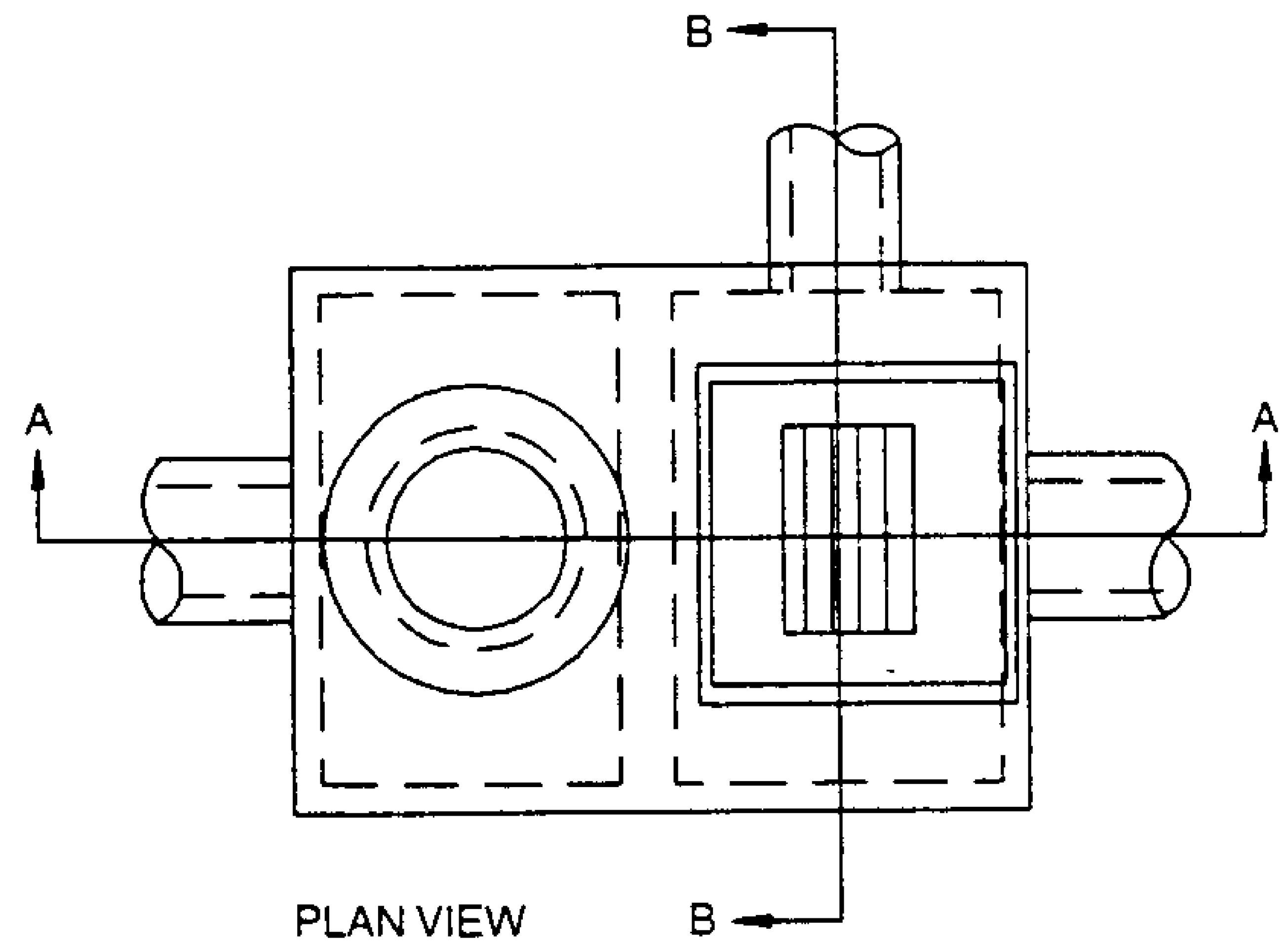


CROSS SECTION

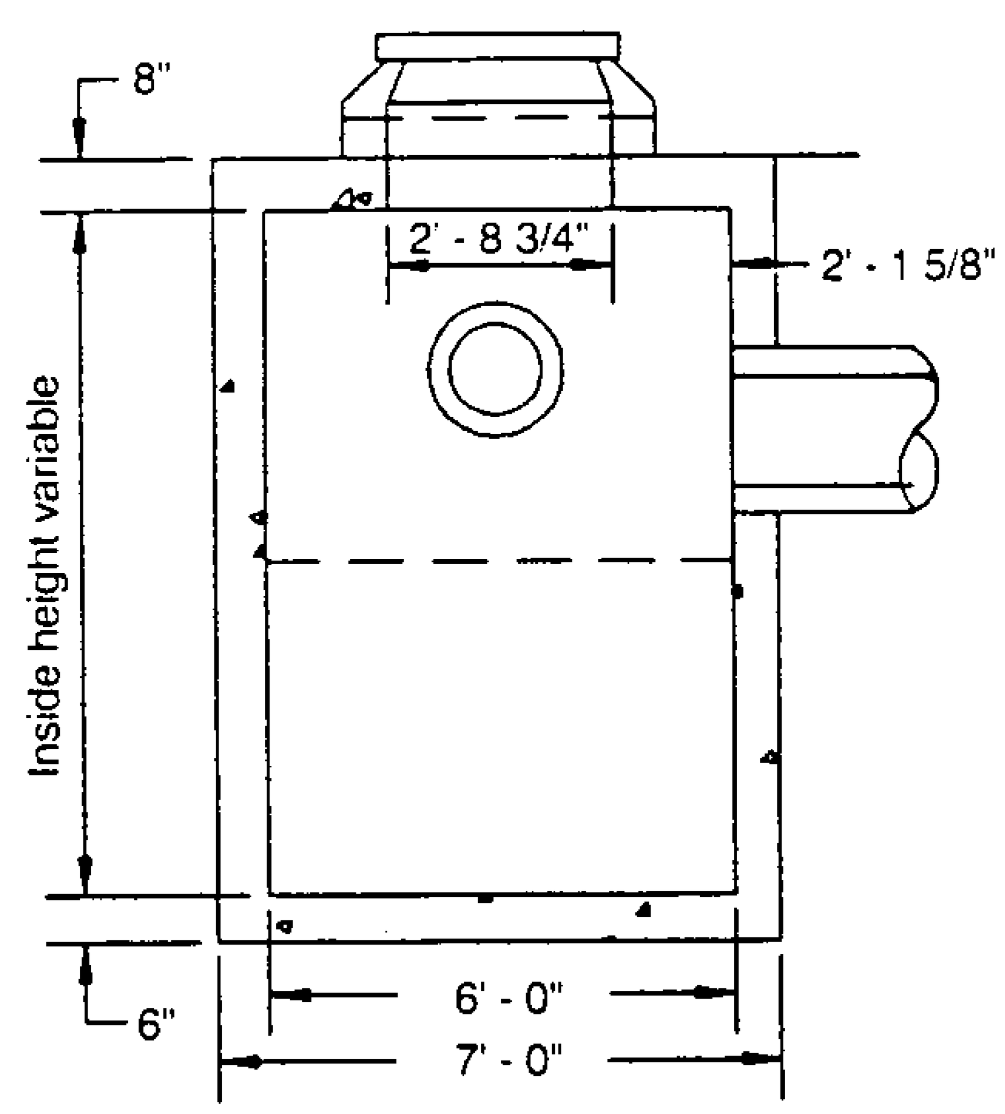
Notes:
1. Precast catch basins may be used to detain the water when provided with an overflow outfall.
2. Catch basins should be provided with the maximum sump depth possible. A minimum 2 ft. sump is recommended.

SEDIMENTATION STRUCTURE

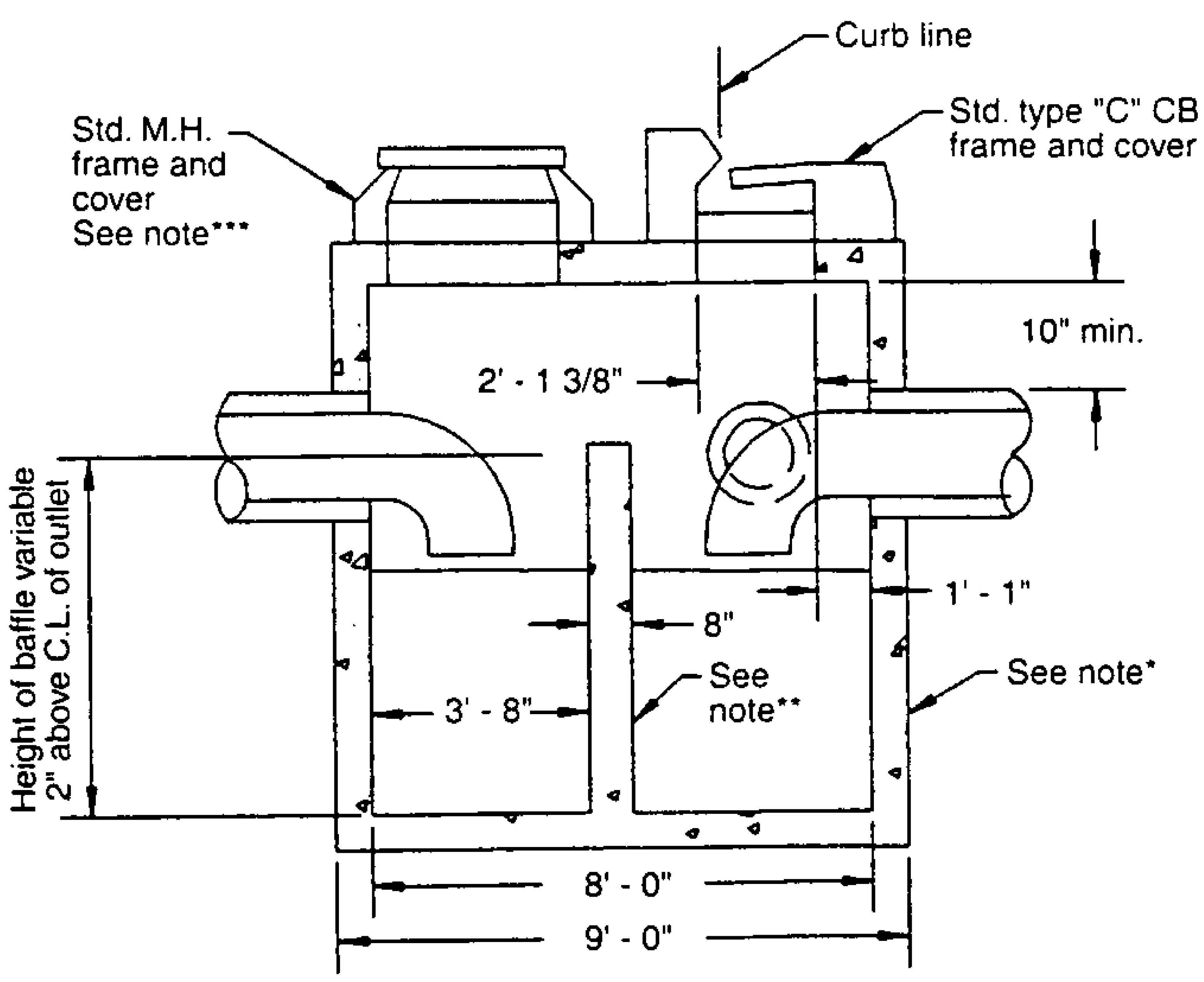
Not to Scale



PLAN VIEW



SECTION B-B



SECTION A-A

Design Loading:
Standard units: AASHTO H10-44
Optional units: AASHTO HS20-44

Steel Reinforcement – ASTM A-615-75
Grade 60 1" min. cover

Concrete Minimum Strength – 5000 p.s.i. @ 28 days

Maximum Inside Height for 2 Piece Chamber – 8"

Roof and Sidewall Openings as Specified

* Construction joint sealed with 1" dia. butyl rubber or equivalent.

** Baffle construction to be of cast material with thru holes above outlet flow line or mortared cement blocks with weep holes above outlet flow line.

***Adjust M.H. frame to suit required field height.

Land that has been disturbed is often void of vegetation and slopes to some degree. Construction sites are conducive to concentrated flows and almost any irregularity in the landscape has the potential to become a watercourse. The combination of bare ground, concentrated flow, and slope make construction sites prime candidates for accelerated, gully erosion. If left unchecked, erosion and sedimentation may require significant on-site and off-site cleanup efforts, often at a high cost.

The following principles of erosion & sediment control should be considered during the planning and construction phases of any site developments.*

1. Keep land disturbance to a minimum — Plan the phases of development so that only the areas actively being developed are exposed. All other areas should have natural vegetation preserved, have a good cover of temporary or permanent vegetation established, or be heavily mulched.

2. Stabilize disturbed areas — Permanent structures, temporary or permanent vegetation, and mulch (or a combination of these measures) should be employed as quickly as possible after the land is disturbed.

3. Keep runoff velocities low — The removal of existing vegetative cover and the resulting increase in impervious surface area during development will increase both the volume and velocity of runoff. These increases must be taken into account when providing for erosion control. Slope lengths should be kept short, gradients low, and vegetation preserved where possible to minimize velocities of stormwater runoff, hence reducing erosion hazards.

4. Protect disturbed areas from stormwater runoff — Install erosion control or stormwater management measures to prevent water from entering and running over disturbed areas, and to prevent erosion damage to downstream facilities.

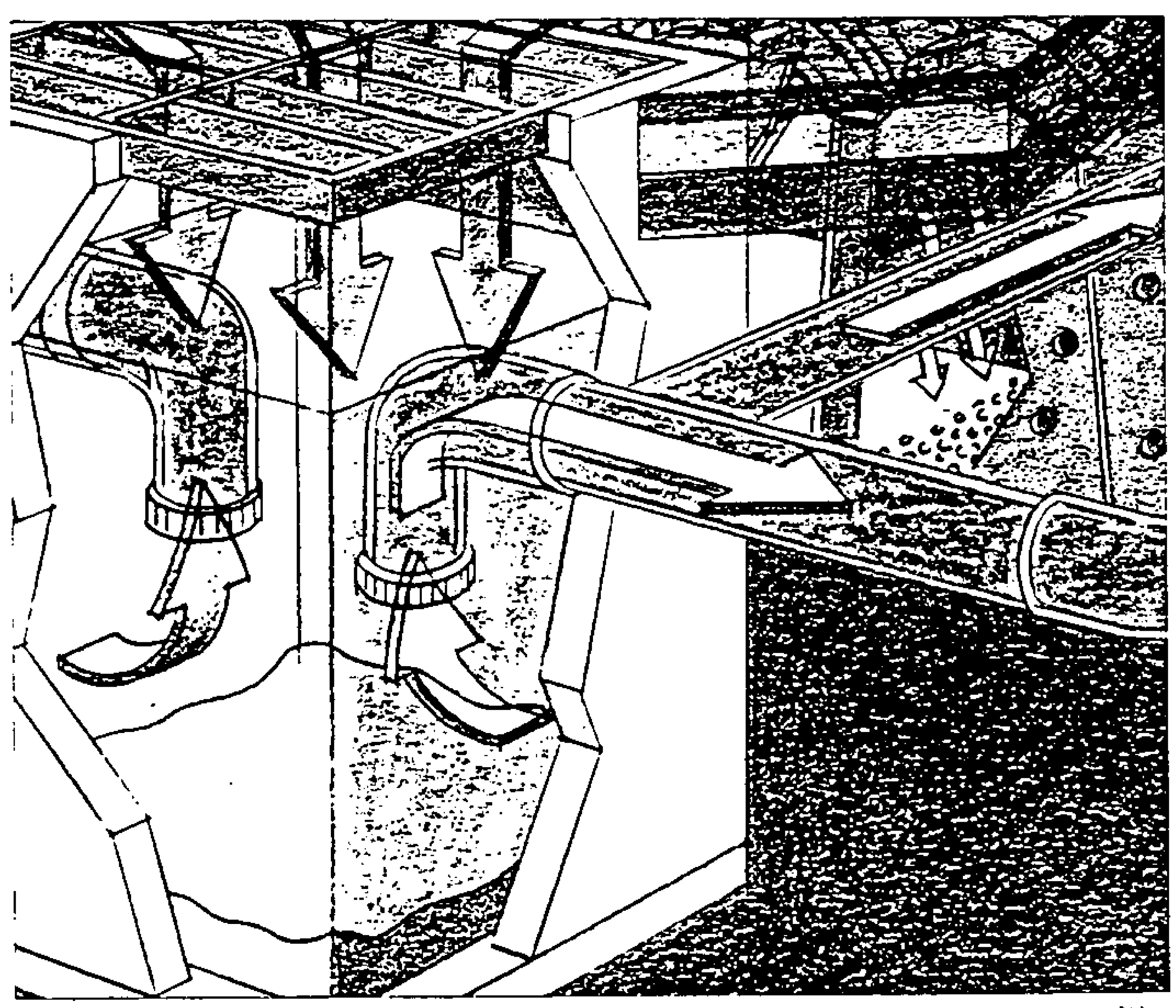
5. Install perimeter control practices — Use practices that isolate the development site from surrounding areas. This can be done through filtration of runoff (silt fence or haybale check dams) or storage/settlement basins.

6. Implement a thorough maintenance and followup program — Measures which are taken to minimize erosion and sedimentation will have been installed in vain if maintenance is not performed on a periodic basis.

7. Assign responsibility for the maintenance program — Responsibility for the installation and maintenance of erosion and sediment control measures should be assigned to one person who is at the construction site, on a full-time basis, throughout the construction process.

Infiltrator Systems Inc. encourages comprehensive erosion and sediment control planning, recognizing that sediment is a symptom of the erosion process and that prevention of erosion should be the primary objective of a good erosion and sediment control plan. Containing sediment is a secondary objective which must also be addressed on most sites to prevent off-site impacts.

This philosophy should also be applied to underground stormwater storage facilities; that is, intercept sediment before it gets to the storage facility. The most effective and economical long-term sediment control within such systems is through pretreatment with catch basin sumps, 90° elbows at catch basin outlet pipes, and grit chambers. These measures can be used in combination for best results. Periodic maintenance of these features is essential.



This illustration shows a water collection and inlet system with downward facing 90° elbows.

As a minimum, Infiltrator Systems Inc. recommends the use of a catch basin with a minimum of 2 feet of sump below the outlet pipe invert, and an upside down 90° elbow on the pipe which leads from the basin to the chamber bed.

Temporary erosion and sediment control measures include the use of mulch, temporary vegetation, haybale check dams, fabric-wrapped catch basin grates, sediment basins and diversions.

** From the Connecticut Guidelines for Soil Erosion and Sediment Control, Connecticut Council on Soil and Water Conservation, revised, 1988.*

SYSTEM MAINTENANCE.

When using the header/manifold pipe inletting method, it may be necessary to clean the Maximizer chamber bed from time to time. The frequency of needed cleanings will depend on the efficiency of runoff pretreatment and the management practices within the contributing watershed. Infiltrator Systems Inc. encourages designs which are conducive to adequate pretreatment of runoff.

MONITORING.

In order to monitor conditions within the chamber bed, it is recommended that observation stations be placed in access ports in the rows that receive water from the header/manifold system. These observation stations can also be used to remove the sediment-water slurry formed during system cleanout, and for system ventilation.

CLEANOUT.

Header & Manifold Inleting System.

1 Inspect the stormwater system to determine the need for cleanout. Systems should be checked at least once a year. If sediment within the catch basin sump is within 6" of the bottom of the 90° elbow, or within 6" of the bottom row of orifices under the PowerArch sections, the sediment should be removed.

2 Remove covers from the access port(s). (See illustration below).

3 Insert a 2"or 3" hose from a high-pressure pump source into the cleanout port which leads into the 4" perforated pipe under the PowerArch sections. Maneuver the hose back and forth, forcing sediment to go into suspension. Do not allow murky water to flow into orifices in the Maximizer chamber sidewall. It may be necessary to stop pumping, allow the water level to drop, and then repeat this procedure in order to prevent water from entering the orifices.

4 Remove sediment-laden water from the receiving catch basin or manhole using a pump, such as a "mud-sucker." Care should be taken to remove this water from the site and dispose of it in a manner consistent with good environmental practices. In lieu of backflushing to a catch basin or manhole, slurry can be pumped from an access port located in the same row of bridge sections that receives water from the high-pressure pump source.

PERFORATED PIPE DISTRIBUTION.

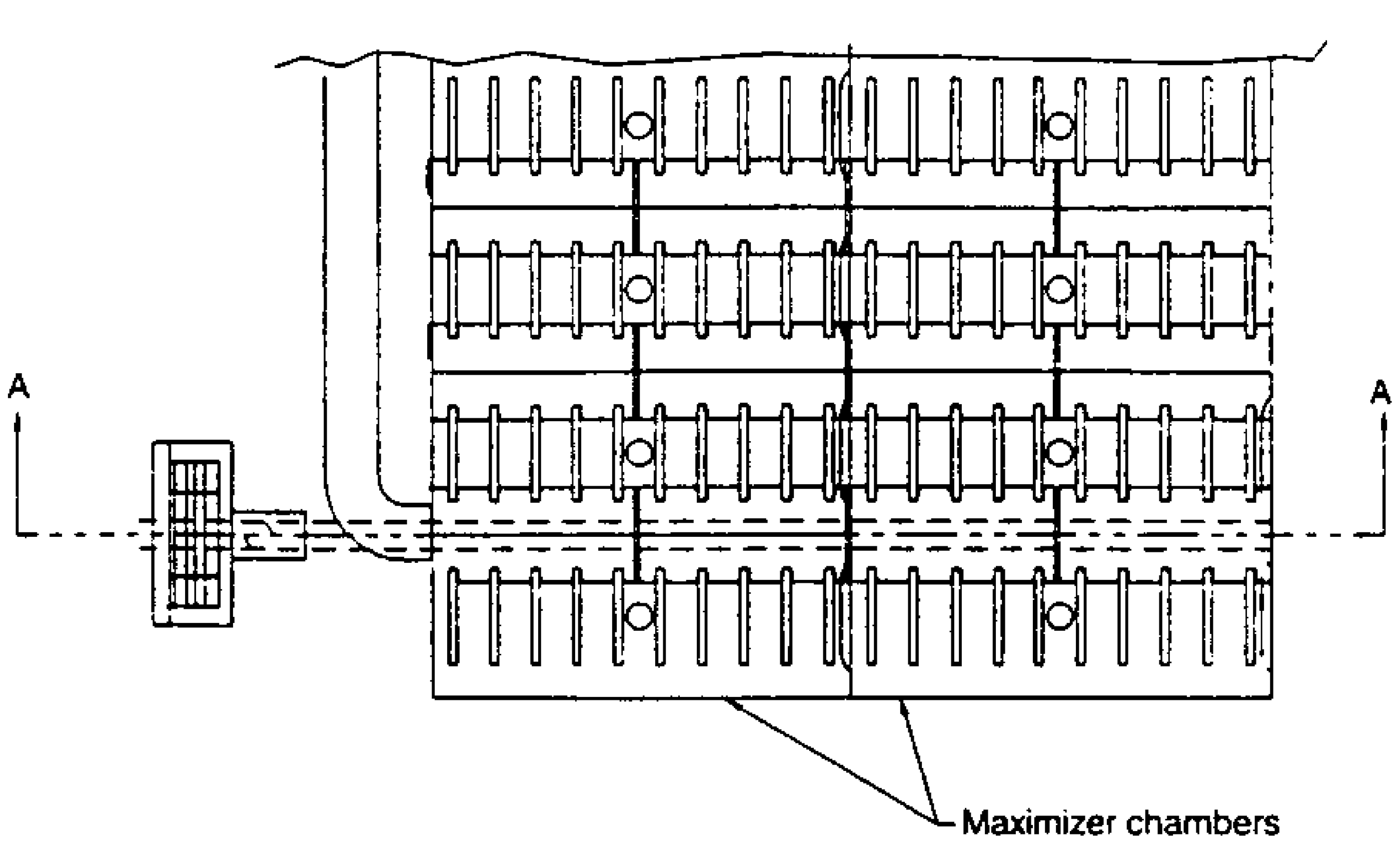
1 Same as above.

2 Insert a 2" or 3" hose from a high-pressure pump source into the perforated conduit which runs between structures along the perimeter (or within the interior) of the chamber bed. Proceed towards next structure along the bed's perimeter, forcing accumulated sediment to move in the direction of the pressurized water flow.

3 Same as #4 above.

PLAN VIEW TYPICAL MAXIMIZER BED

Not to Scale



INSPECTION AND MAINTENANCE

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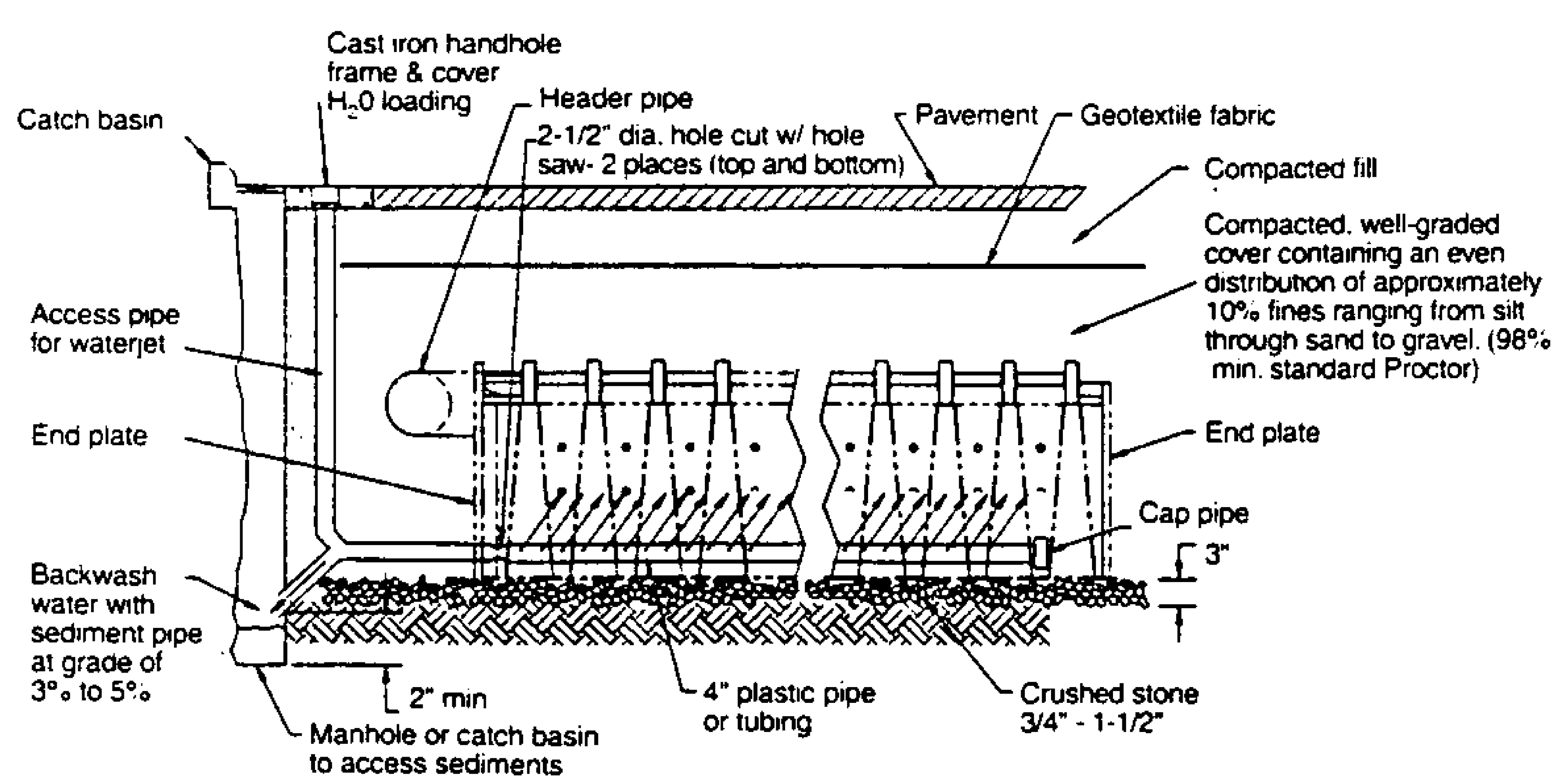


MAINTENANCE AND INSPECTION SCHEDULE.

Infiltrator Systems Inc. recommends that the land owner use this schedule for periodic system maintenance to ensure its proper function.

SEDIMENT CONTROL	LEVEL*	INSPECTION**	MAINTENANCE***
Sediment Basin	Primary	Quarterly or after large storm event	Excavate sediment
Swale with Sediment Dams	Primary	Quarterly or after large storm event	Excavate sediment
Swale with Drains	Primary/Secondary	Quarterly or after large storm event	Excavate sediment from swale; pump, vacuum or excavate sediment from yard drains
Swale/Median Strip Design	Primary/Final	Quarterly or after large storm event	Replace fabric & stone inject water into the chamber, suspend silt, and pump chamber
Parking Lot Perimeter Design	Primary/Secondary	Biannually	Inject water, suspend silt and pump chamber
Catch Basin Sump	Primary	Quarterly	Excavate, pump or vacuum
Sedimentation Structure	Primary	Quarterly	Excavate, pump or vacuum
Catch Basin	Primary/Secondary	After all storm events	Clean and replace filter bag
Backflow Design	Primary/Secondary	Quarterly	Excavate, pump or vacuum
Sedimentation Control and Irrigation Structure	Primary/Secondary	Quarterly	Excavate, pump or vacuum
Porous Pavement	Primary	Quarterly	Sweep pavement
Pipe Header Design	Primary	Biannually	Excavate, pump or vacuum
Serial Distribution	Primary/Secondary	Biannually	Excavate, vacuum or inject water; suspend silt and pump chamber
Water Quality Inlet	Primary/Secondary	Quarterly	Excavate, pump or vacuum
Sand Filters	Primary	Quarterly or after large storm event	Remove and replace sand filter
Maximizer Settling Chambers	Primary/Secondary	Biannually	Vacuum or inject water, suspend silt and pump chamber
Chamber	Final	Annually	Vacuum or inject water, suspend silt and pump chamber

* LEVEL – If multiple methods are used within a design, each will be delineated according to the direction of flow as primary, secondary and final.
** INSPECTION – Minimum standard to be used on a one-year period.
*** MAINTENANCE – After system has been inspected and sediment needs to be removed, the methods stated are minimum guidelines for removal and cleaning of system.

INFILTRATOR SYSTEMS INC

WARRANTY NOTES: These points must be followed on all Maximizer installations in order for the system to be properly constructed and to validate the warranty.

1. Installation requirements have been sent to the general contractor and installer via registered mail, return-receipt requested.
2. All plans must be reviewed and signed off by an Infiltrator representative prior to procurement.
3. An Infiltrator representative must be on site at all times during the actual installation of the system.
4. Read all instructions before beginning installation.
5. Certification that the backfill and base material has been properly compacted must be available to Infiltrator personnel for inspection, upon request.
6. The system cannot be excavated and installed at the same time. The entire bed should be excavated, the units installed, and stone in place around the entire perimeter before covering.
7. The entire perimeter of the system must be filled with stone and compacted to the chamber's shoulder prior to backfill.
8. Stone size must be within the range specified (3/4" to 1 1/2"). No rounded stones are acceptable.
9. No stone is allowed directly on top of the system.
10. Fabric CAN NOT be used directly on top of the chambers.
11. Geotextiles used must meet the minimum qualities of those exemplified in this document.
12. All end plates and PowerArch bridge sections must be screwed into the Maximizer chambers as illustrated in the Maximizer Chamber System Installation Requirements.
13. When backfilling, it's desirable to run the dozer down the length of the chambers and NOT across their width.
14. A Caterpillar D-3, D-4, or equivalent dozer is recommended for covering the system.
15. All heavy wheeled vehicles, such as loaded dump trucks, concrete trucks, and front-end loaders, must stay off the bed until it has been paved. The bed must be surrounded by warning tape and appropriately located signs during times when construction is halted prior to the completion of the chamber bed.
16. An installation video is available to supplement these instructions.
17. Failure to follow these requirements voids the Maximizer product warranty.

MATERIALS AND EQUIPMENT LIST

- ☐ Maximizer Chamber System components:
  - Maximizer chambers
  - PowerArch bridges
  - Chamber "A" end plates
  - Chamber "B" end plates
  - Bridge "A" end plates
  - Bridge "B" end plates
- ☐ Vibratory plate compactor
- ☐ Vibratory roller with dynamic force not exceeding 24,000 lb.
- ☐ Non-woven filter fabric, minimum 4 oz. per sq. yd. (Mirafi 140N or equivalent)
- ☐ Drywall screws (2") – approximately 6 screws are needed for each chamber and 5 for each end plate. Be sure to have extras on hand.
- ☐ Crushed stone (3/4" to 1 1/2")
- ☐ Pavement base material (per design)
- ☐ String line and wooden stakes
- ☐ Transit or laser
- ☐ Stone bucket
- ☐ Tracked excavator
- ☐ Tracked bulldozer with ground pressure not exceeding 1,100 lb./sq. ft. (Caterpillar D-3, D-4, or equivalent)
- ☐ Cordless drill
- ☐ Reciprocating saw or router bit (for custom cutting end plate holes)
- ☐ Woven geotextile soil stabilizing fabric (Amoco 2006 or equivalent)
- ☐ Signs and caution tape, for posting around bed until it is finished, to divert traffic

Pre-Construction Meeting.

Meet prior to construction with the installer, general contractor, and Infiltrator representative to go over the specifications of the installation.

Excavating and Preparing the Site.

1 Excavate the chamber bed to desired dimensions, extending about two feet beyond the bed's perimeter to allow for machinery operation and to leave room for hand work. Each Maximizer chamber is 87" long and 34" wide, so be sure the planned number of chambers will fit into the excavated space provided. Also, remember to include an access ramp into the excavated hole to allow for movement of machinery and materials into and out of the work area.

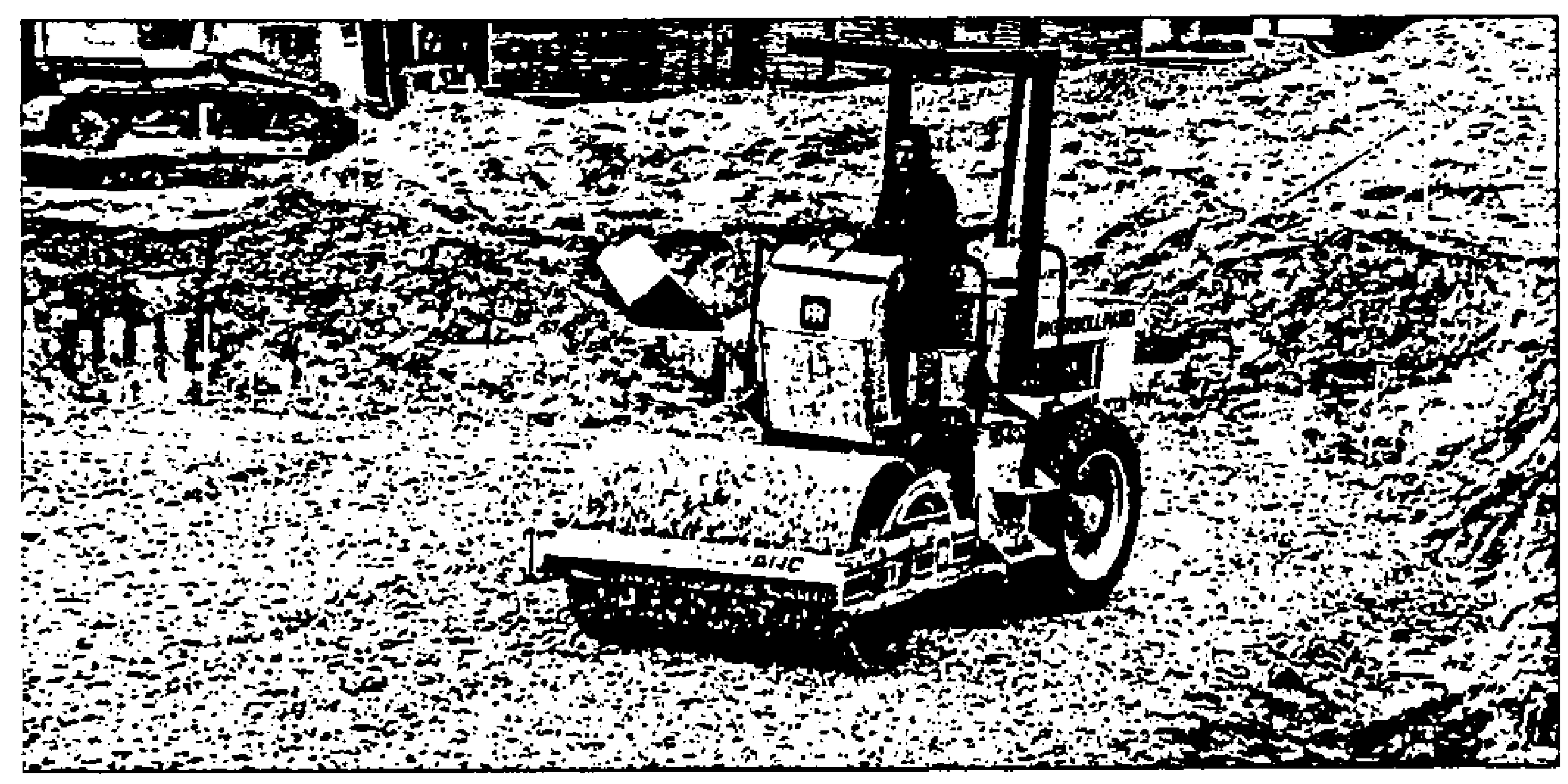
2 Compact the base of the bed using a vibratory roller. The base material must be compacted to a minimum 95% standard Proctor.

Note: Compaction tests must be performed to certify that the base has been properly prepared. Failure to provide certification of compaction will void the product warranty.

3 Drape the nonwoven filter fabric along the sidewalls only of the excavation so that it reaches the bottom of the excavated bed. The fabric must be a minimum of four ounces per square yard, such as Mirafi 140N or equivalent. Make sure the dimensions of the fabric agree with the plan.

4 Place a layer of crushed rock with a minimum 3" thickness over the entire bottom surface of the bed. The size of the rock must be between 3/4" and 1 1/2" in diameter. Limestone may be used in systems planned for detention, but can not be used in retention systems where exfiltration is the primary means of dispersing water stored within the chamber system. The bottom of the filter fabric along the perimeter should be anchored in place by the rock.

5 Compact the crushed rock using at least two passes of the vibratory roller with full dynamic force applied. Do not proceed to the next step until the surface of the crushed rock is uniformly flat and level. If the depth of the bottom layer of rock is greater than 6", compact it in 6" lifts.



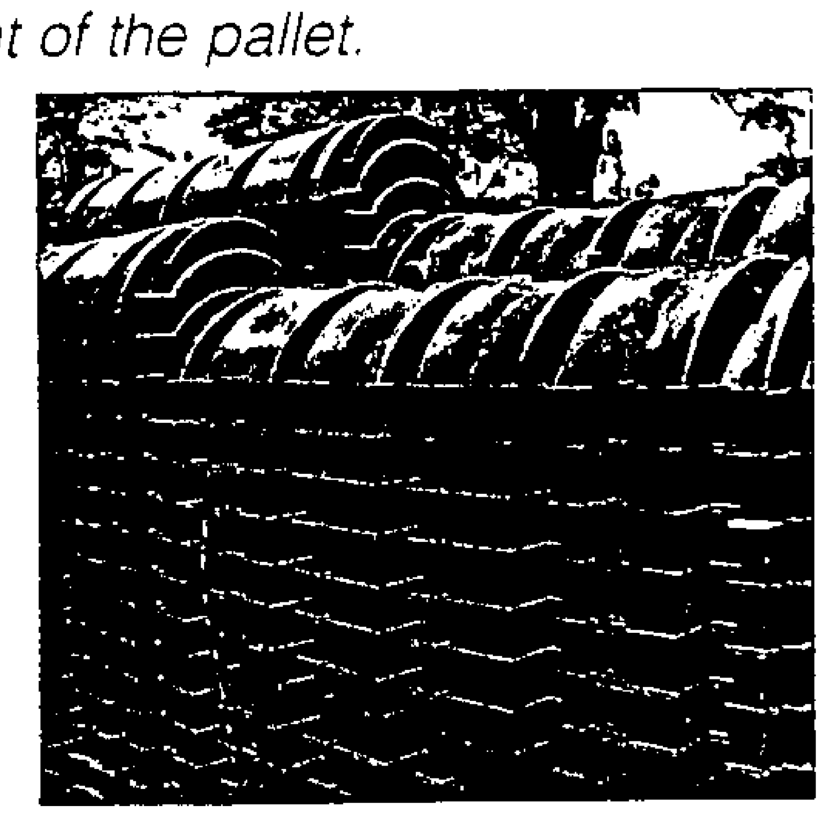
Compact the crushed rock.

6 Make sure the Infiltrator representative is present and that he/she checks the rock layer to confirm it's flat and level.

7 Transport the pallets of Maximizer chambers and PowerArch bridges into the excavated area. Be sure to locate each pallet where it will not be in the way as work progresses, but keep it close enough to the area of activity to be convenient. The Maximizer chambers and PowerArch bridges can be removed from the pallet by hand.

Note: Do not overturn the pallets to access the parts. The chambers and bridges should be removed one at a time, by hand, with care being taken so parts aren't dropped to the ground from the full height of the pallet.

Transport the pallets of Maximizer chambers and PowerArch bridges into the excavated area.



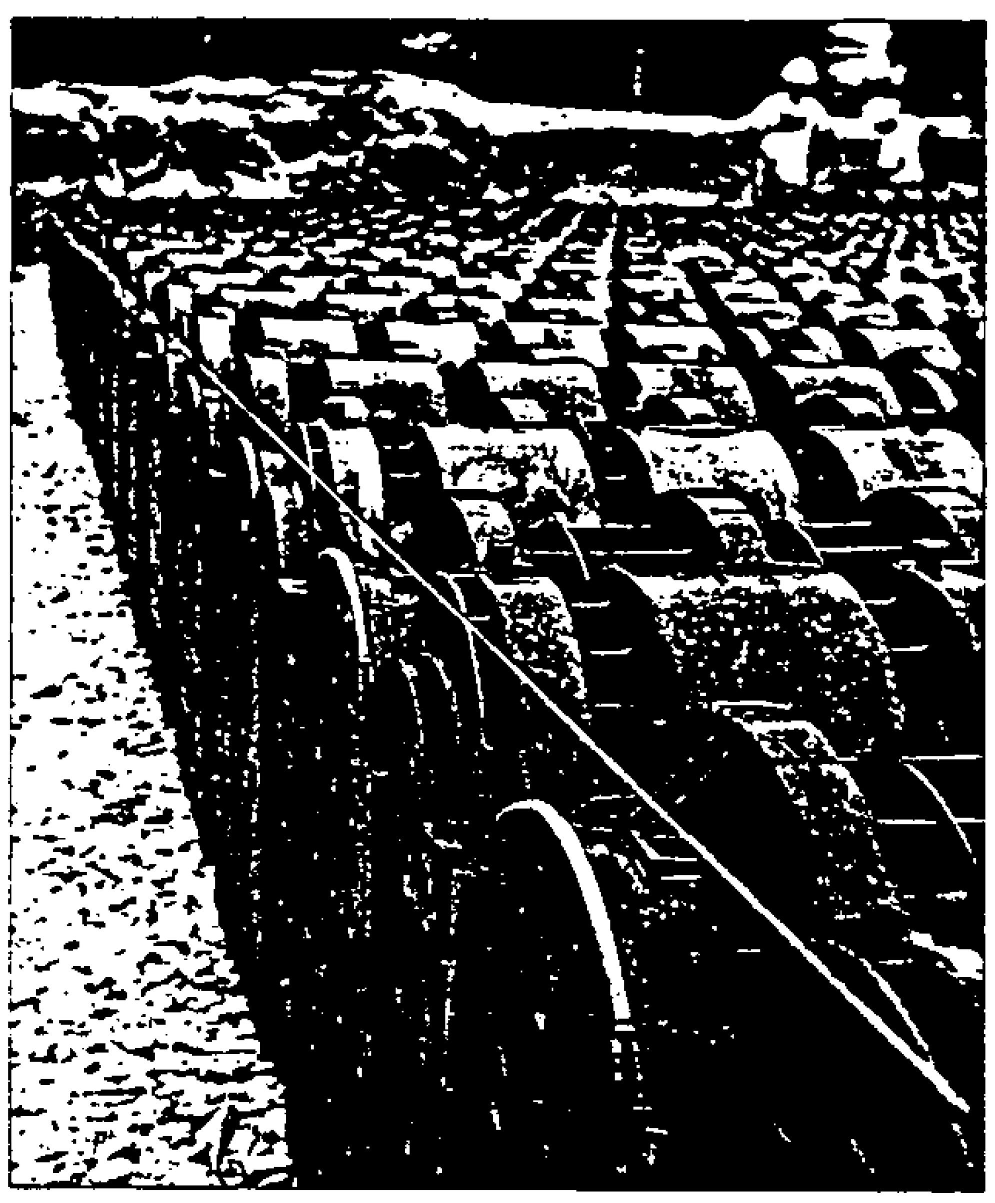
The Maximizer chambers and PowerArch bridges can be removed from the pallet by hand.

Installing the System.

1 Confirm that the Infiltrator representative is present on the site.

2 Place four stakes at each corner of the chamber-bed footprint. Measure the diagonals to confirm that the bed is square. This system can only be built square. *Failure to do so will require disassembly and reassembly of the entire system.* Verify that the inner dimensions of the bed match the planned length.

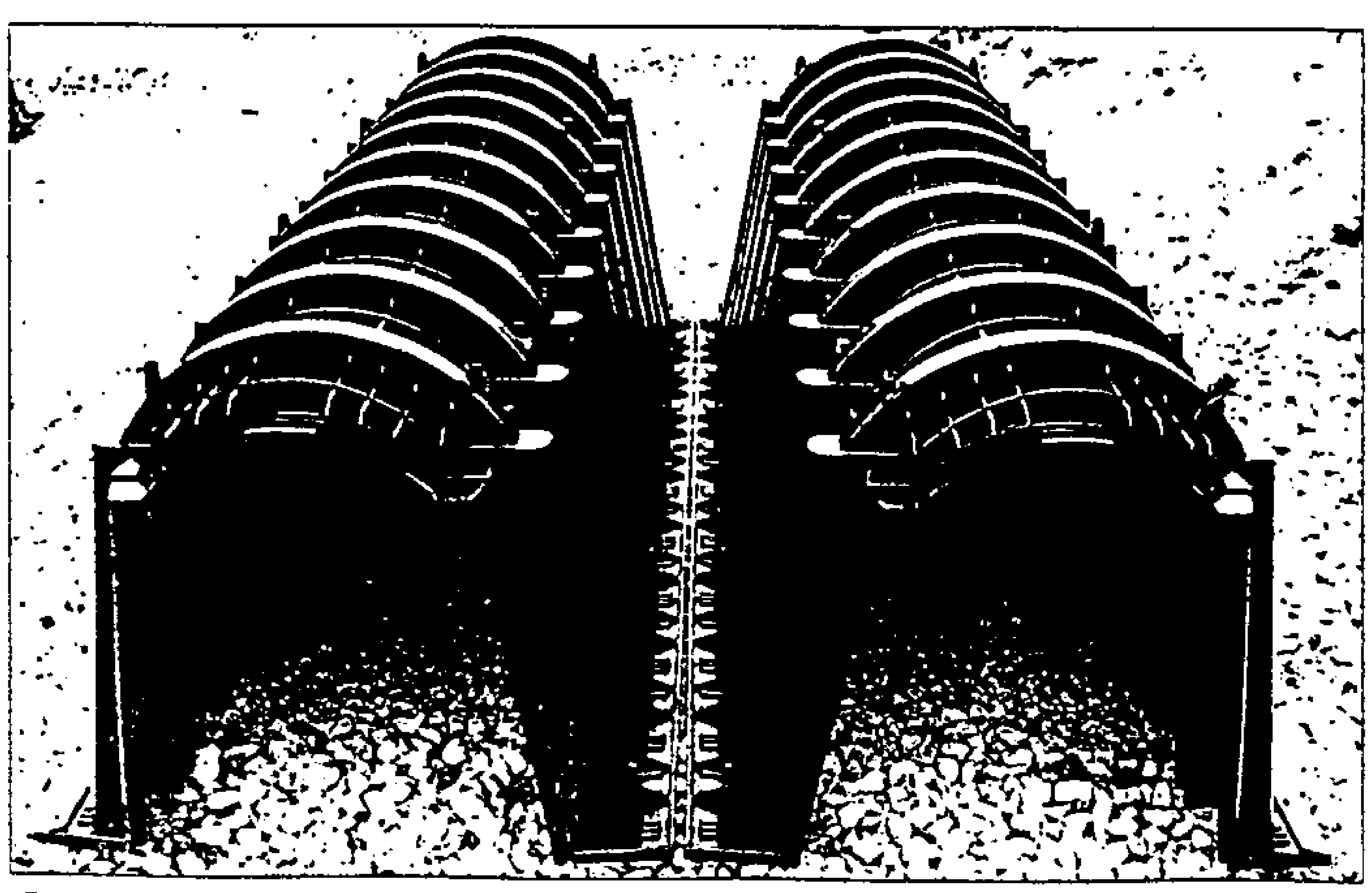
3 Choose a corner of the excavated bed as the starting point. Run a string line parallel to two adjacent walls of the bed to form an "L". The string line must be offset from the wall in the exact location of the chambers. The system plans will designate the direction in which the chambers will lay. Use the string line as a reference for setting the first chamber.



Run a string line parallel to two adjacent walls of the bed to form an "L".

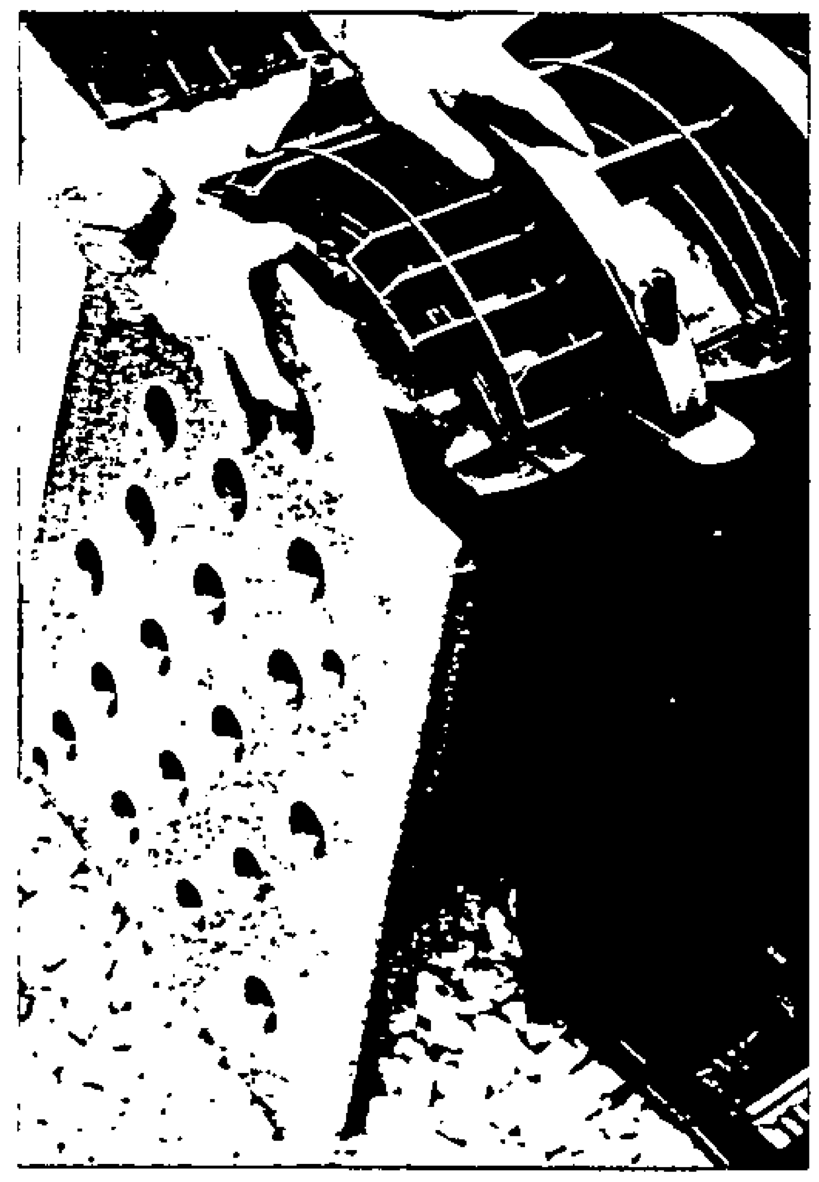
4 Place the first chamber, "A" end, adjacent to the end of the string line. Make sure the "A" end and outside length of the chamber are square to the line. This step is critical to the proper alignment and construction of the bed.

5 Set the second chamber side-by-side with the first, making sure that the two "A" ends are adjacent to the string line.

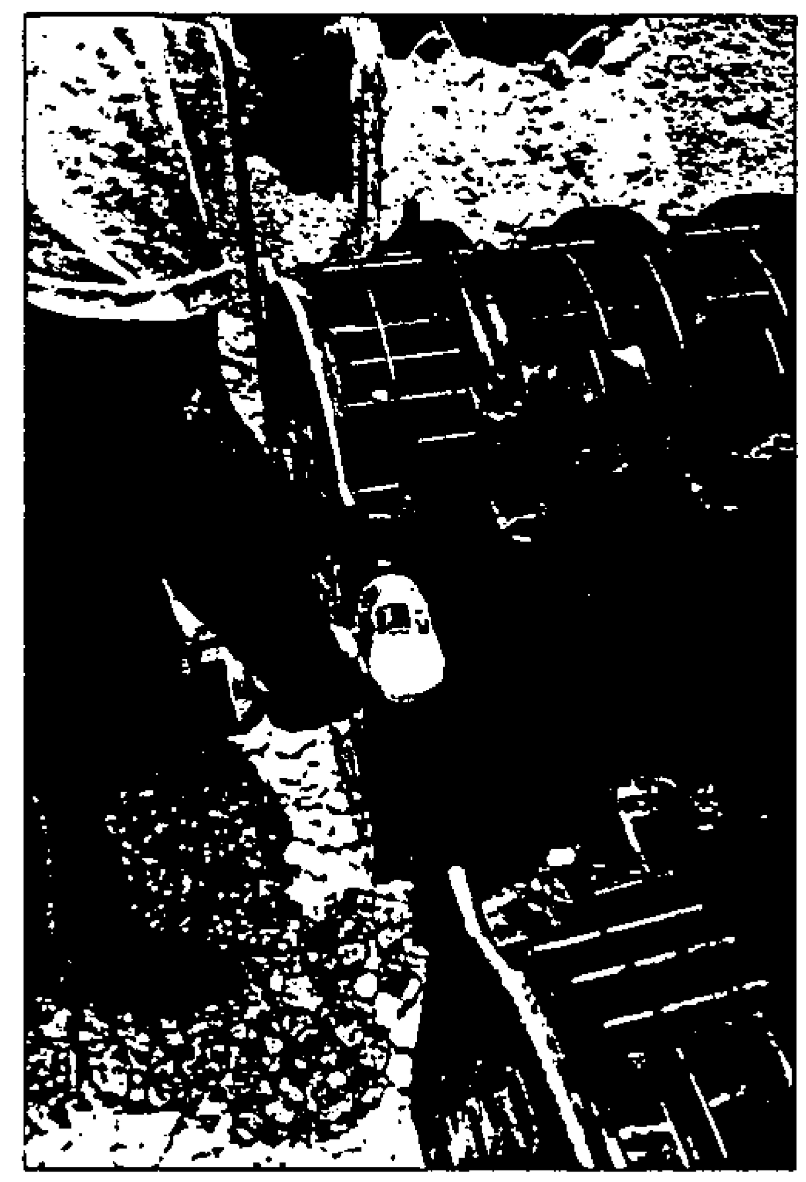


Set the second chamber side-by-side with the first.

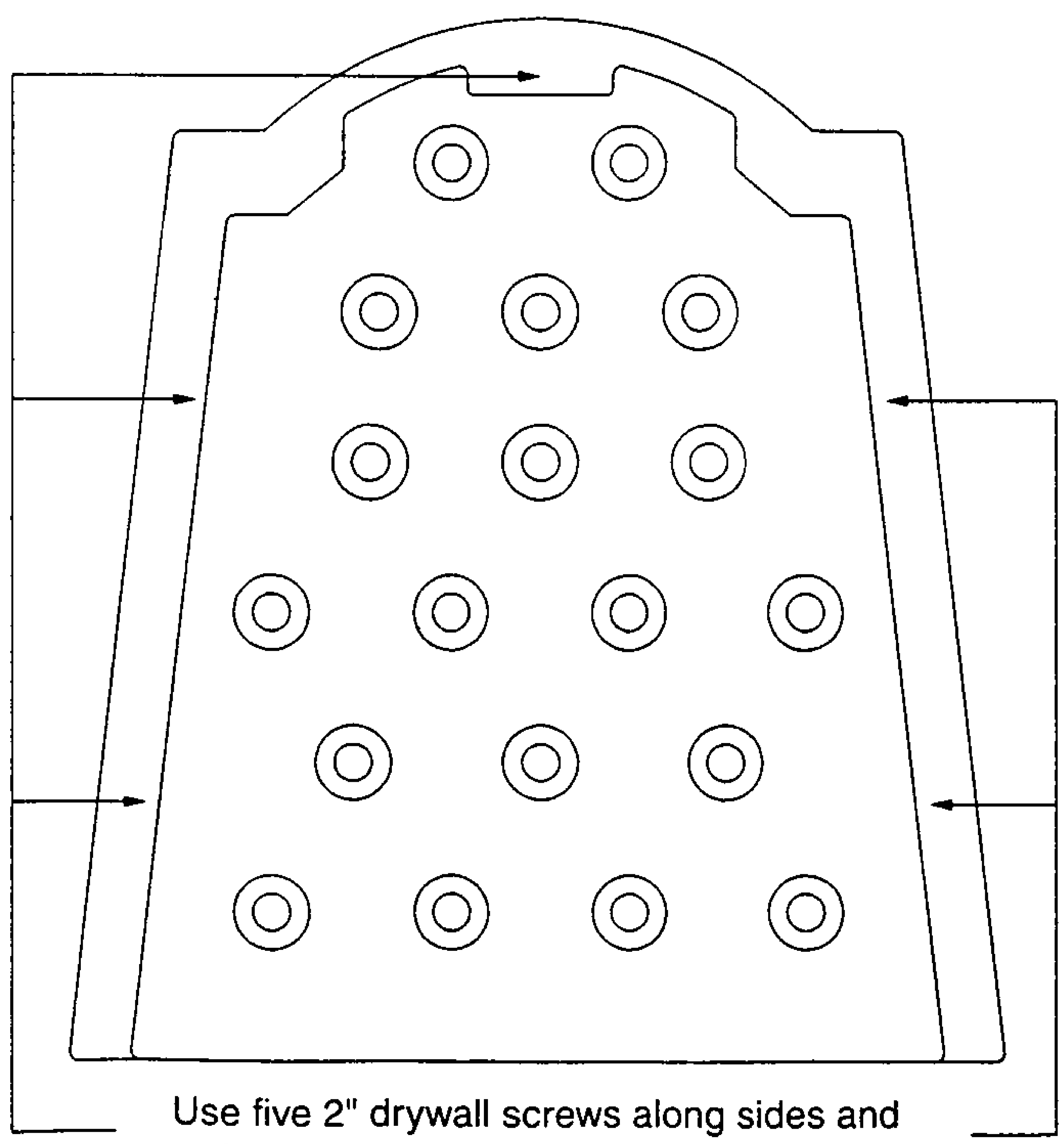
6 Install the "A" chamber end plates in each of the two "A" ends of the chambers in place. Secure the end plate to the top of the chamber with a single 2" drywall screw. Using four more screws, fasten two on each side of the chamber, one-third and two-thirds of the way up each side. (See diagram.)



Install the "A" chamber end plates.



Secure the end plate to the chamber.



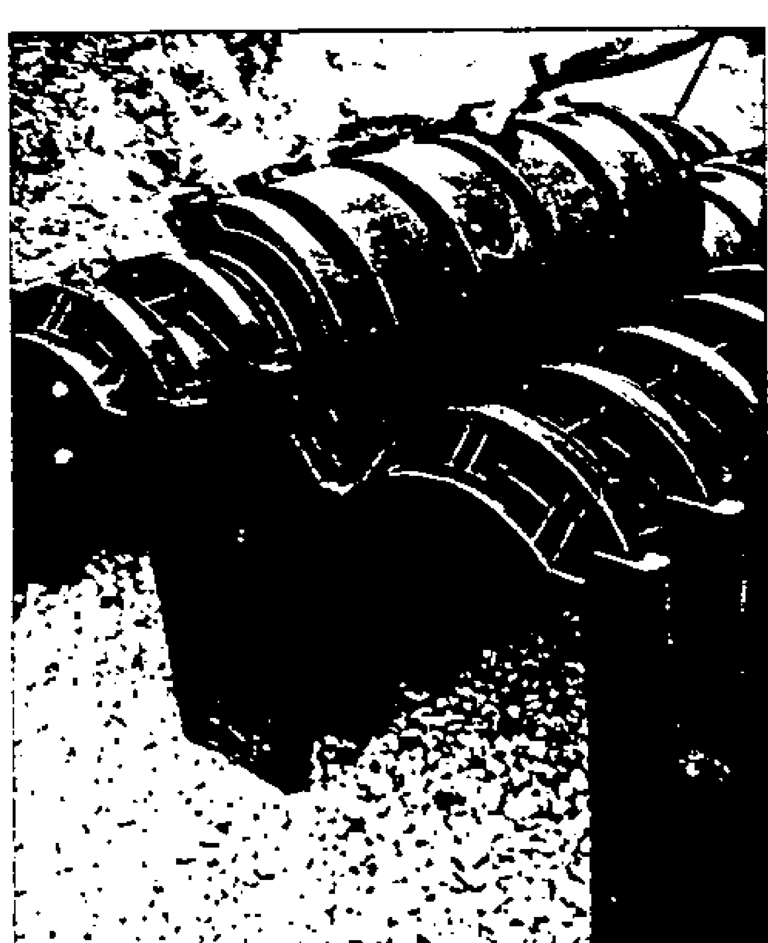
Use five 2" drywall screws along sides and top of the end plate to secure it to the chamber.

Installing the System.

7 Slide an "A" PowerArch end plate between the two chambers. The "A" PowerArch end plate only fits in the "A" end of the system. The end plate will seat properly when the top shoulder lines up with the top shoulders of the Maximizer chambers.

Slide an "A" PowerArch end plate between the two chambers.

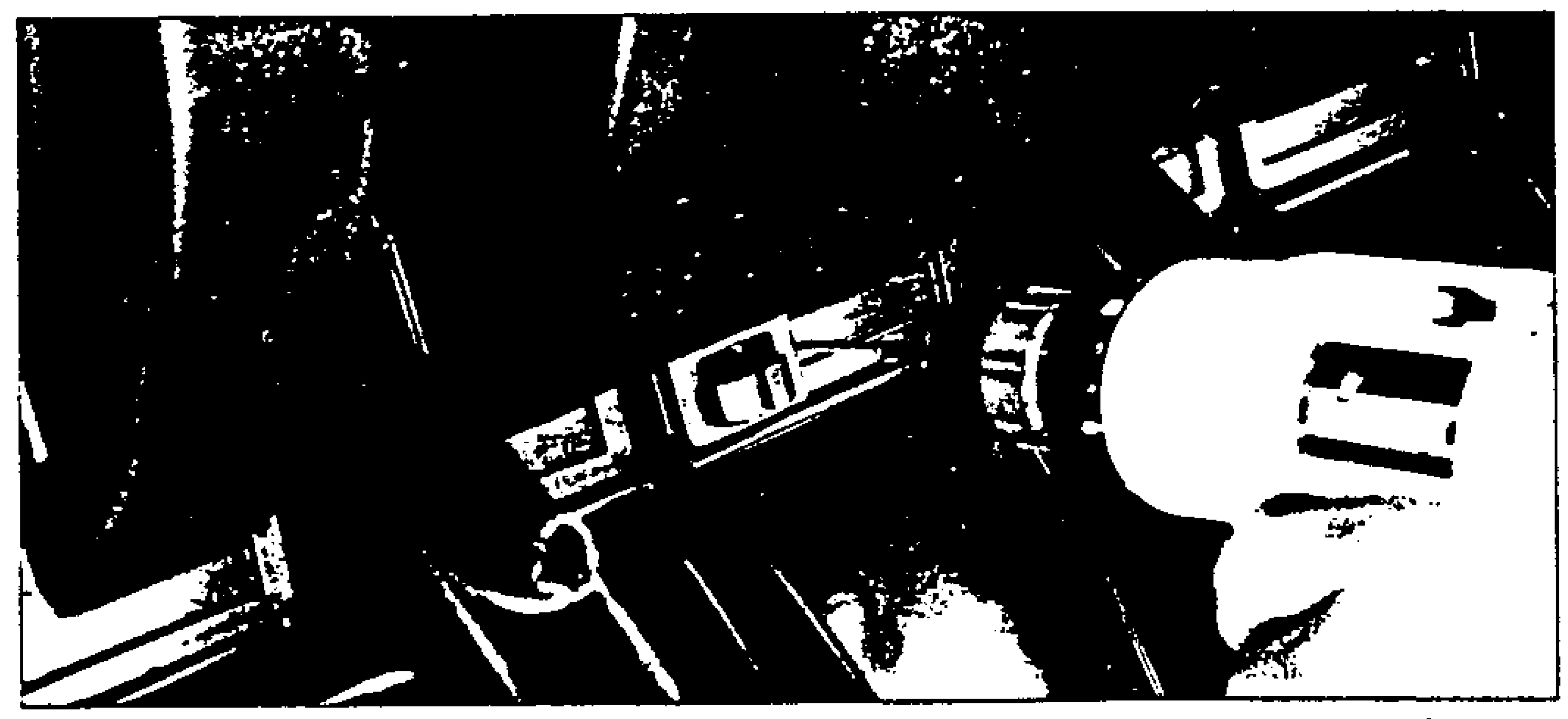
8 Position the first PowerArch bridge so that the "A" end is facing in the same direction as the "A" end of the Maximizer chambers. With the bridge at an angle, line up the square openings on the bridge with the chamber tabs closest to you. Lower the opposite side of the bridge to fit the tabs on the adjacent chamber. You may have to adjust the position of the chambers slightly to allow the tabs to line up with the holes.



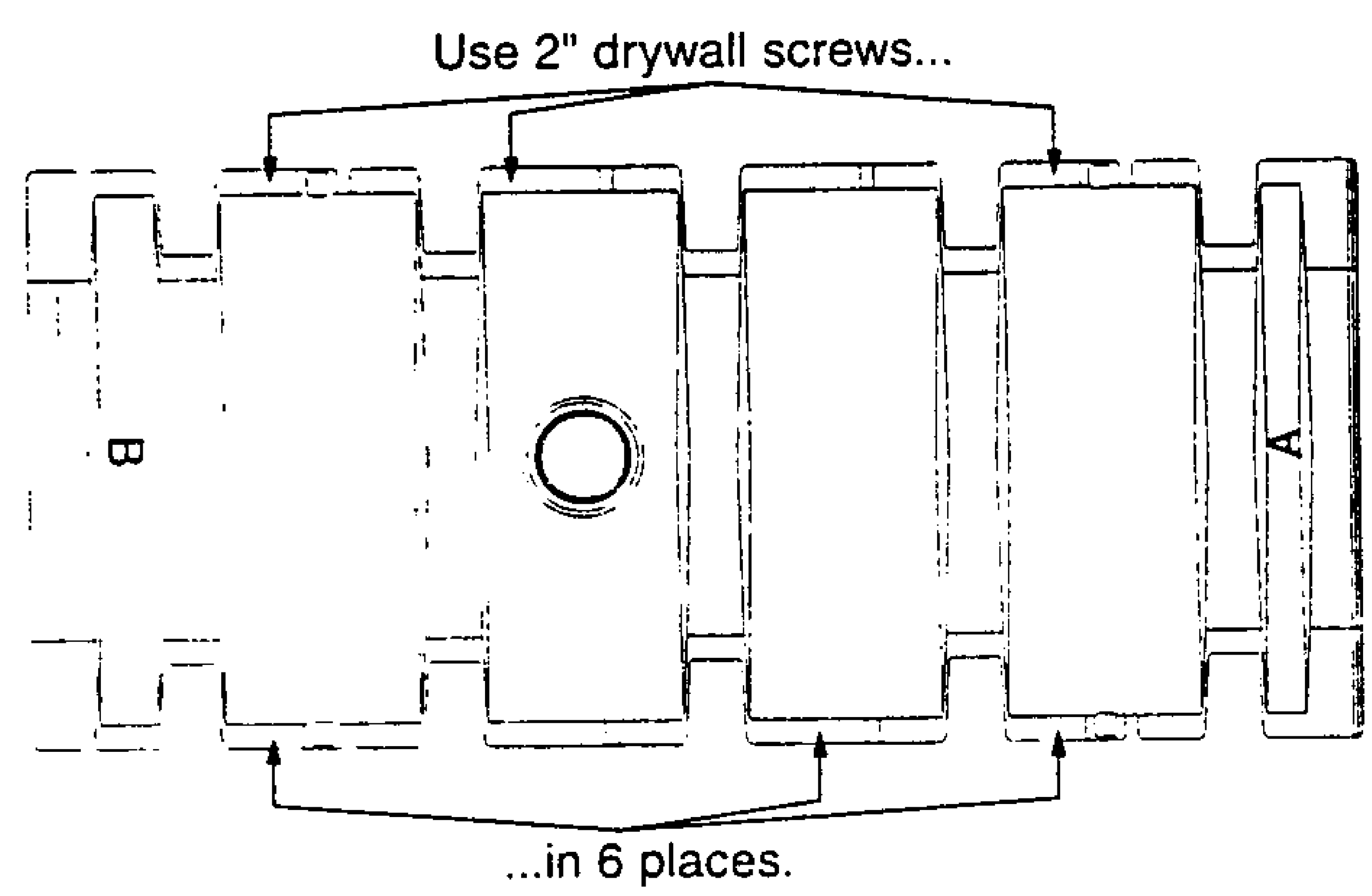
Position the first PowerArch bridge.

Lower the opposite side of the bridge to fit into the tabs.

9 Using a total of six 2" drywall screws, attach the PowerArch bridge to the chamber at each of the four tab locations on the bridge and in the middle of each side. Note the offset location of the two middle screws. (See illustration.)



Attach the PowerArch bridge to the chamber.



10 Install the second bridge as the first, making sure that the "B" end lines up with the "B" chamber ends.

11 Each time you place a Maximizer chamber, the connecting two PowerArch bridges must be installed. The bridges will not fit properly if additional chambers are placed prior to connecting the bridges with them.

Each time you place a Maximizer chamber, the connecting two PowerArch bridges must be installed.

Installing the System.

12 To connect Maximizer chambers end-to-end, position the new chamber so that the "A" end is aligned with the "B" end of the already-installed chamber. Lift the "B" end of the new chamber approximately 18" and push the chambers together until they interlock. Lower the chamber to the ground. Visually inspect the chambers to confirm that the two ends are completely interlocked.

Position new chambers so that the "A" end is aligned with the "B" end.

Visually inspect the chambers to confirm that the two ends are completely interlocked.

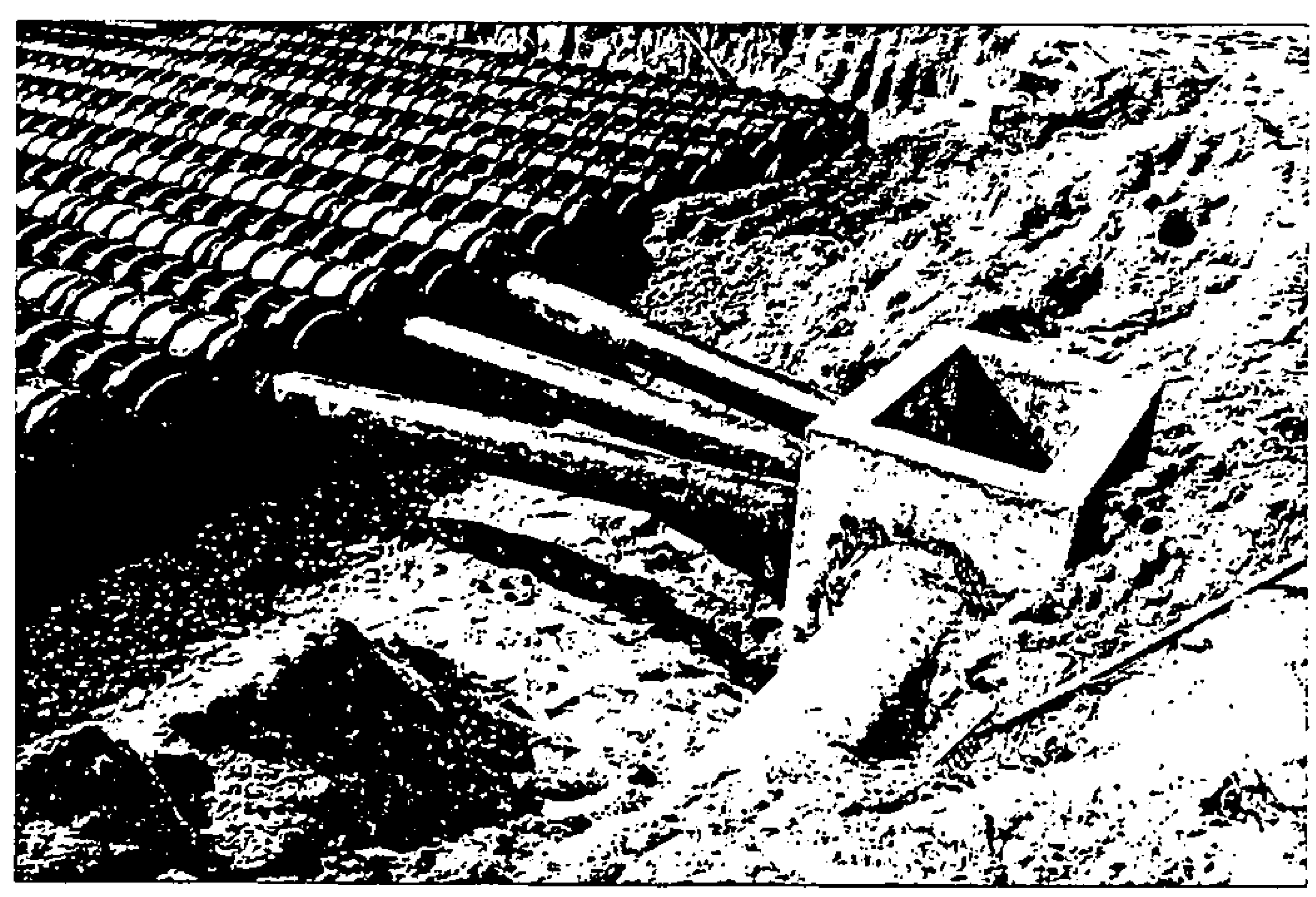
13 When you reach the planned bed length, place the "B" end plates into the ends of each chamber. The end plates for the adjacent chambers must be inserted before inserting the PowerArch bridge end plates. (This is important because the Maximizer end plate screws can not be placed once the PowerArch end plates are installed.) Using five 2" drywall screws, secure each end plate to the chamber as described in #6 of "Installing the System".

14 Continue with these instructions until all the chambers have been installed.

15 Refer to the engineering plans for the inlet detail from the catch basin at this time. Cut holes in the end plates that will receive inlet pipes if a header and manifold inleting system is to be used. The holes can be custom cut using a reciprocating saw, portable drill with a router bit, or other suitable cutting tool. The end plates under the PowerArch bridge sections are capable of receiving up to an 8" pipe. Larger pipes (up to 12" in diameter) must be installed through the Maximizer chamber end plates.

Cut holes in the end plates that will receive inlet pipes if a header and manifold inleting system is to be used.

16 Run the distribution pipe to the chamber rows from the catch basin or other sedimentation structure per design requirements. Make sure the pipe runs through the inlet opening in the end plate. Cut the pipe so that it extends approximately 2" beyond the plate into the system. It will **NOT** run the length of the system.

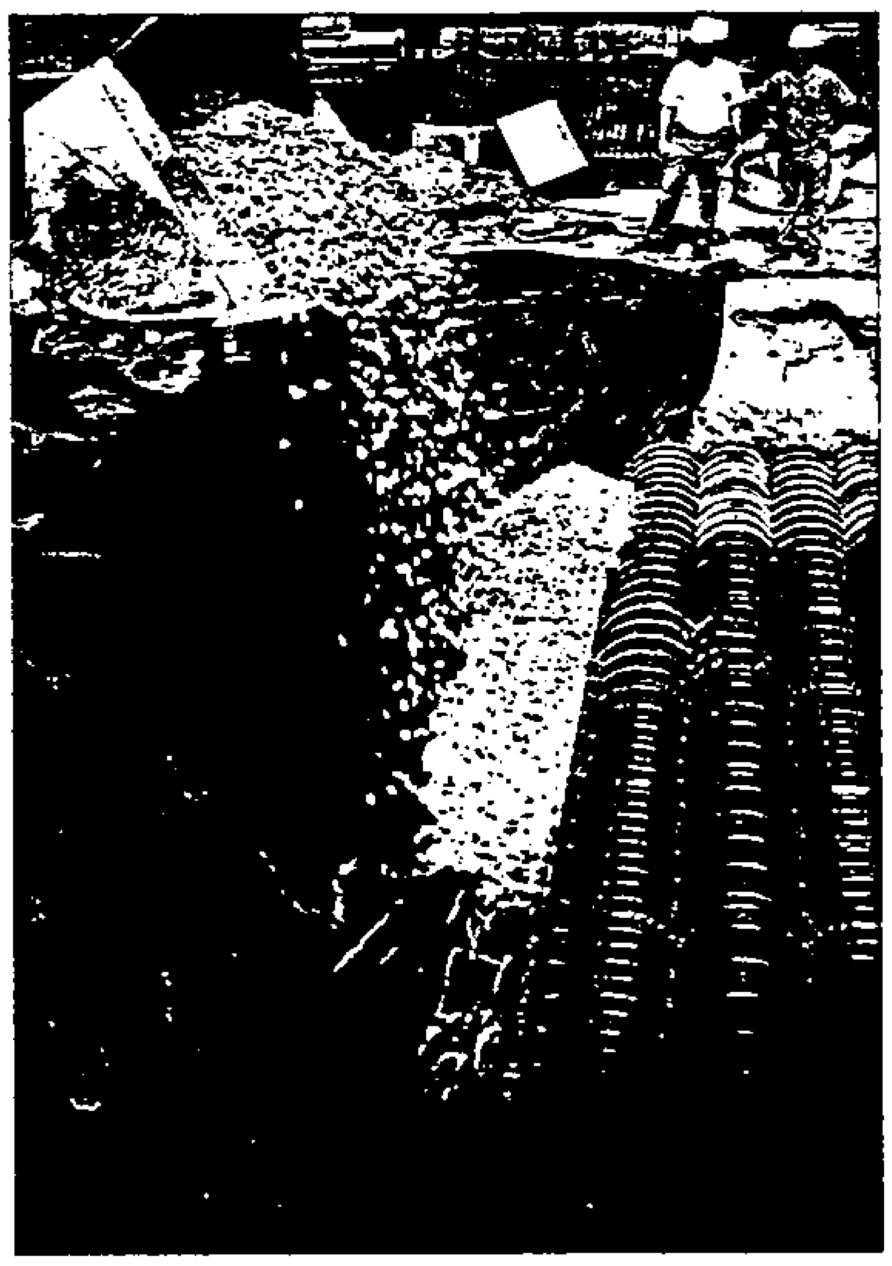


Run the distribution pipe to the chamber rows from the catch basin or other sedimentation structure.

Covering the System.

1 Confirm that the Infiltrator representative is present on the site.

2 Gently place crushed stone (3/4" - 1 1/2" in diameter) around the entire perimeter of the bed, between the chambers and the excavated sidewall, to prevent chamber movement. The stone must reach to the top of the chamber's sidewall (24" high). An excavator is preferred for the stone placement. Do not use dozers or front-end loaders.



Note: If the inleting system uses perforated pipe at the perimeter of the bed, rather than a header and manifold configuration, crushed stone must be placed in lifts with the top of the first lift at the planned elevation of the bottom of the feeder pipe.

Gently place crushed stone to prevent chamber movement.

3 Compact the perimeter stone layer(s) with two passes of a vibratory plate compactor.

Note: This must be done on all four sides before backfilling over the system.

Compact the stone layer.

4 Fold the previously-placed filter fabric over the stone, making sure it doesn't overlap onto the chamber tops.

5 Cut holes in the end plates according to the plan to allow for vent pipes. In traffic areas, the vent ports must not be load bearing and must be specially designed to ensure structural stability. Position vent pipes according to design.

Note: Avoid running vent lines across the top of the bed.

6 Carefully place the suitable backfill material per engineer's design in strategic locations along the outside perimeter of the chamber bed. Make sure the backfill doesn't contain stones over 6" in diameter, organic matter, or shrink-swell clays. Infiltrator Systems Inc. recommends a well-graded backfill material. Stone is not a suitable backfill for the first 6" above the chamber tops.

Note: Do not drop the backfill material directly onto chambers and don't use wheeled vehicles on the chamber bed

7 Push the backfill material with a small bulldozer, such as a Caterpillar D-3, D-4, John Deere JD-450, or equivalent. The first lift above the chambers should be approximately one foot in depth. This will allow sufficient cover for the backfill machinery. The backfill should be spread lengthwise, not widthwise, along the chambers.

8 Compact the 12" lift using a vibratory roller, not exceeding 24,000 lb. of dynamic force, to a minimum 98% standard Proctor.

9 Lay a woven geotextile, Amoco 2006 or equivalent, over the 12" of compacted backfill. Be sure to install the fabric according to manufacturer's specifications.

10 Finish backfilling to the pavement subgrade with lifts not exceeding 12". Each lift must be compacted with a vibratory roller to 98% standard Proctor.

Note: Compaction tests must be performed to certify that the backfill has been properly prepared. Failure to provide certification of compaction will void product warranty.

11 Wheeled vehicles necessary for the preparation of the pavement base and pavement may be allowed onto the bed only after a minimum of 18" of compacted cover is in place. Sudden stops, starts, and changes of direction should be avoided while heavy machinery is located over the chamber bed. Throughout construction, the bed must be surrounded by warning tape and appropriately located signs to prevent construction traffic.

12 Finish the site as per the plan design.

Note: Call Infiltrator Systems' engineering department at 1-800-221-4436 with any installation questions.

Maximizer chambers can be used to store and exfiltrate runoff from residential rooftops. By providing the mechanism for roofwater to enter into the soil, Maximizer chamber systems help to reduce the quantity and rate of overland flow generated by impervious roof surfaces. This runoff, left unchecked, might otherwise leave the site and cause adverse environmental effects on downstream properties. As an added benefit, the system helps to prevent soggy lawn conditions.

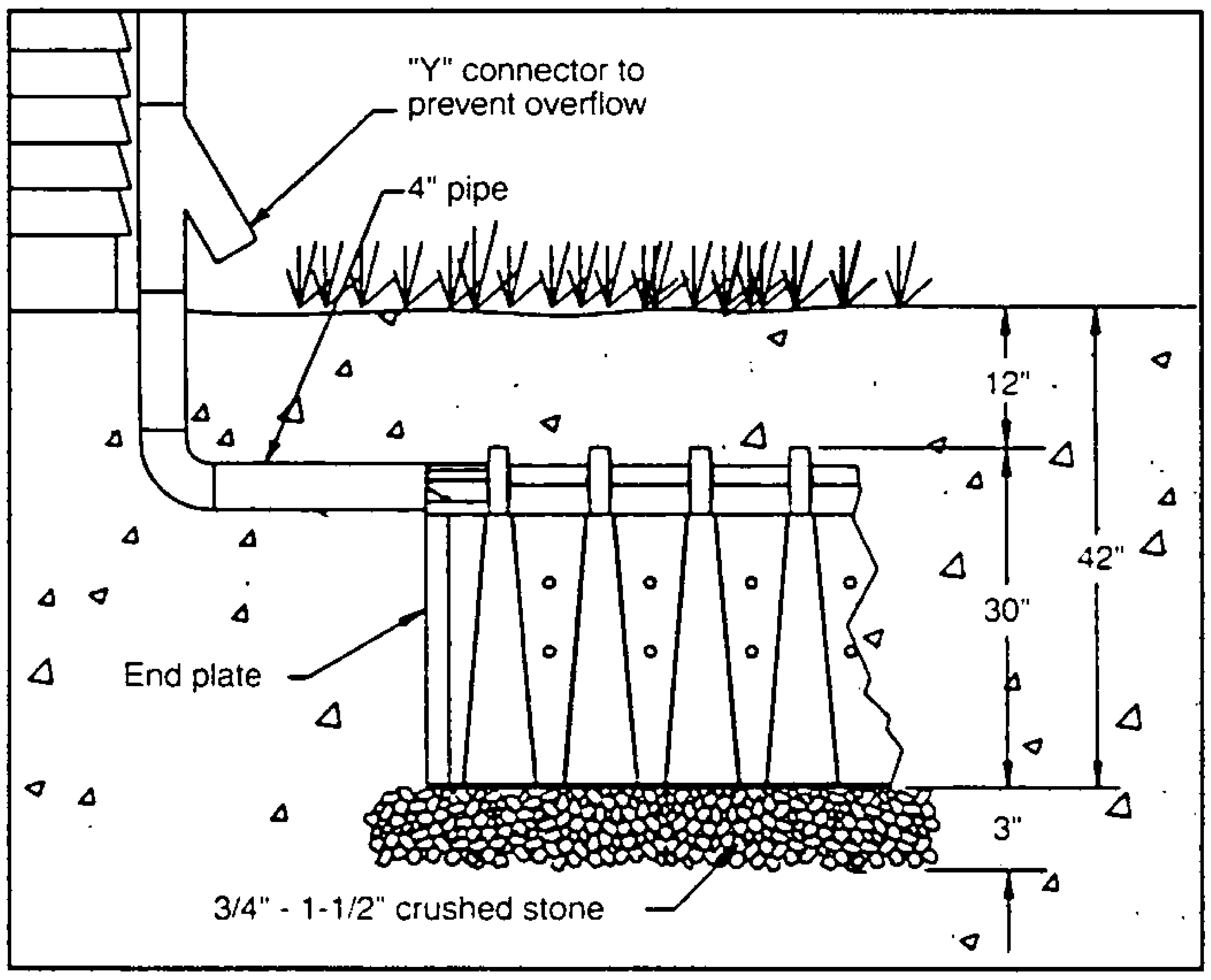
Maximizer chambers should be installed at a minimum bottom depth of 45". To avoid scouring, the bottom of the excavated area should be lined with crushed stone. The stone layer should be a minimum of 3" thick, and the stone must range between ¾" - 1½" in size.

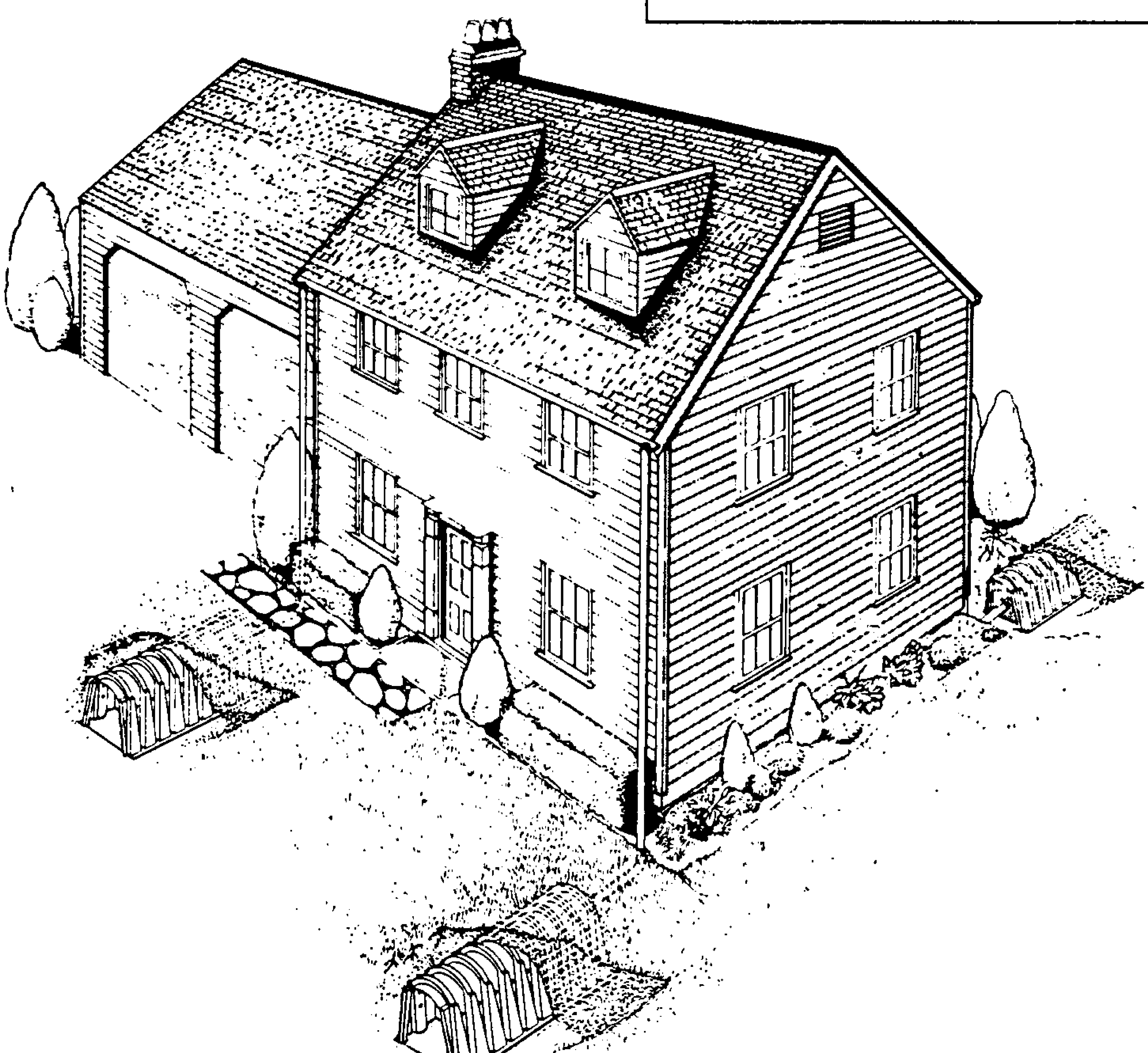
The size of the roofwater runoff system should conform to all applicable local and state codes and regulations. Where no such regulations or codes apply, Infiltrator Systems Inc. recommends sizing the system to hold at least one inch of rainfall from over the entire contributing area. This will handle runoff from the vast majority of storm events while occupying a limited area. To determine the number of chambers needed per downspout, refer to Table 3.

TABLE 3: NUMBER OF MAXIMIZER CHAMBERS NEEDED FOR A GIVEN RAINFALL DEPTH AND ROOF AREA.

Contributing Rooftop (sq. ft.)	1"	2"	3"	4"	6"	10"
200	1	2	2	3	4	6
300	1	2	3	4	5	8
400	2	3	4	5	7	11
500	2	3	5	6	8	14
750	2	4	7	8	12	21

MAXIMIZER DOWNSPOUT DETAIL.





4' X 4' X 8' CONCRETE GALLERY.

Where each unit is able to store 96.35 cubic feet and one foot of stone is used around the sides and bottom of the structure. Void within the stone is estimated at 35% of total stone volume.

Stone volume:14 cubic feet (cu. ft.) per linear foot (l.f.). The 14 cu. ft. includes the crushed stone needed on each side of the gallery, and underneath the gallery, per linear foot of the gallery system.

Void within the stone:
14 cu. ft. x 0.35 = 4.9 cu. ft. of void/l.f.

Total average storage per linear foot of system is 16.94 cu. ft.

Galleries needed: 15,000 cu. ft/16.94 cu. ft/l.f. = 886 l.f.
886 l.f./8 l.f./ gallery unit = 111 galleries

Cost of galleries: 111 galleries x $215 each = **$23,865**

Stone needed: 14 cu.ft. of stone/l.f. x 886 l.f. x
1 cu. yd./27 cu.ft. x 1.5 tons/cu.yd. = 691 tons

Cost of stone: 691 tons x $20.00/ton (in place) = **$13,820**

Excavation: 6 ft. (depth) x 6 ft. (width) x 886 l.f. x
1 cu.yd./27 cu.ft. = 1,181 cu. yd. of excavation

Cost of excavation: 1,181 cu.yd. x $4/cu.yd. = **$4,724**

Backfill = $1,500

Labor/setting cost: @ $50.00 per galley unit (laborers and machine) = **$5,550**

Total system cost = $49,459

Cost per cu. ft. of storage = $3.30

4' X 4' X 4' CONCRETE GALLERY.

Where each unit is able to store 42.9 cubic feet and one foot of stone is used around the sides and bottom of the structure. Void within the stone is estimated at 35% of total stone volume.

Stone volume: 14 cubic feet (cu. ft.) per linear foot (l. f.). The 14 cu. ft. includes the crushed stone needed on each side of the gallery, and underneath the gallery, per linear foot of the gallery system.

Void within the stone: 14 cu. ft. x 0.35 = 4.9 cu. ft. of void/l.f.

Total average storage per linear foot of system is 15.63 cubic feet.

Galleries needed: 15,000 cu.ft./15.63 cu.ft./l.f. = 960 l.f.
960 l. f./4 l. f./gallery unit = 240 galleries

Cost of galleries: 240 galleries x $126 each = **$30,240**

Stone needed: 14 cu. ft. of stone/l. f. x 960 l. f. x
1 cu. yd./27 cu. ft. x 1.5 tons/cu. yd. = 750 tons

Cost of stone: 750 tons x $20.00/ton (in place) = **$15,000**

Excavation: 6 ft.(depth) x 6 ft. (width) x 960 l.f. x
1 cu.yd./27 cu.ft. = 1,280 cu. yd. of excavation

Cost of excavation: 1,280 cu. yd. x $4/cu. yd. = **$5,120**

Backfill = $1,700

Labor/setting cost: @ $30.00 per galley unit (laborers and machine) = **$7,200**

Total system cost = $59,260

Cost per cu. ft. of storage = $3.95

INFILTRATOR SYSTEMS INC

PERFORATED CORRUGATED METAL PIPE (CMP).

48 INCH DIAMETER.

Where the cross-sectional area of the pipe is 12.57 sq. ft., and 1 foot of stone will be placed below the pipe and around the sides to the top of pipe. Void within the stone is estimated at 35% of the total stone volume.

Stone volume: 17.43 cubic feet (cu. ft.) per linear foot (l. f.)

Void within the stone: 17.43 cu. ft. x 0.35 = 6.1 cu. ft. of void/l. f.

Total average storage per linear foot of system is 18.7 cu. ft.

Required pipe length: 15,000 cu. ft./18.7 cu. ft./l. f. = 802 l. f.

Cost of pipe: 802 l. f. @ $26.00 per l. f.= **$20,852**

Stone needed: 17.43 cu.ft. of stone/l.f. x 802 l.f. x 1 cu.yd./27cu.ft. x 1.5 tons/cu. yd. = 777 tons

Cost of stone: 777 tons x $20.00/ton (in place) = **$15,540**

Excavation: 6.5 ft. (depth) x 6 ft. (width) x 802 l.f. x 1 cu.yd./27 cu.ft. = 1,159 cu. yd. of excavation

Cost of excavation: 1,159 cu. yd. x $3.00/cu. yd. = **$3,477**

Backfill & compaction @ $1.40/cu. yd.: $1.40/cu. yd. x 492 cu. yd. = **$689**

Labor/setting cost: Using a crew of three, @ $25.00 each per hour, assuming 100 feet of pipe set per day – ($75/hour x 8 hours/day)/100 ft./day = $6.00 per ft. $6.00/ft. x 802 = **$4,812**

Total system cost = $45,370

Cost per cu. ft. of storage = $3.02

72 INCH DIAMETER.

Where the cross-sectional area of the pipe is 28.27 sq. ft., and 1 foot of stone will be placed below the pipe and around the sides to the top of pipe. Void within the stone is estimated at 35% of the total stone volume.

Stone volume: 27.73 cubic feet (cu. ft.) per linear foot (l. f.)

Void within the stone: 27.73 cu. ft. x 0.35 = 9.7 cu. ft. of void/l. f.

Total average storage per linear foot of system is 37.97 cu. ft.

Required pipe length: 15,000 cu.ft./37.97 cu.ft./l. f. = 395 l. f.

Cost of pipe: 395 l.f. @ $62.00/l.f. = **$24,490**

Stone needed: 27.73 cu. ft. of stone/l. f. x 395 l. f. x 1 cu. yd./27 cu. ft. x 1.5 tons/cu. yd. = 608 tons

Cost of stone: 608 tons x $20.00/ton (in place) = **$12,160**

Excavation: 9 ft. (depth) x 8 ft. (width) x 395 l.f. x 1 cu. yd./27 cu.ft. = 1,053 cu. yd. of excavation

Cost of excavation (varies with the need for shoring or extensive sloping of sidewalls): 1,053 cu. yd. x $6/cu. yd. = **$6,318**

Backfill & compaction (varies with system depth) = $1,500

Labor/setting cost: Using a crew of four, @ $25.00 each per hour, assuming 60 feet of pipe set per day – ($100/hour x 8 hours/day)/60 ft./day = $13.33 per ft. $13.33/ft. x 395 ft. = **$5,265**

Total system cost = $49,733

Cost per cu. ft. of storage = $3.32

INFILTRATOR® SYSTEMS INC

EXFILTRATION TRENCHES.

Void within stone is estimated at 35% of total stone volume. Therefore:

Stone volume: 15,000 cu. ft. of storage needed x 1 cu. ft. stone/0.35 cu. ft. void = 42,857 cu. ft. of stone needed. 42,857 cu.ft. x 1 cu.yd./27 cu.ft. = 1,590 cu.yds. stone

Stone needed: 1,590 cu. yds. x 1.5 tons/1 cu.yd. = 2,385 tons

Cost of stone: Use: $20.00/ton in place. Therefore $20.00 x 2,385 tons = **$47,700**

Excavation: 42,857 cu. ft. x 4 ft.(assumed depth) = 10,715 sq. ft.; 42,857 cu.ft. x 1 cu.yd./27 cu. ft. = 1,590 cu. yds.

Cost of excavation: 1,590 cu. yds. x $2.50/cu. yd. = **$3,975**

Cost of hauling one half of excavated material off site (assuming one half can be used on site): 795 cu. yds. x $2.43/cu. yd. = **$1,932**

Total system cost = $53,607

Cost per cu. ft. of storage = $3.57

SURFACE DETENTION POND.

Pond will be sized to store 15,000 cu. ft. Total pond volume and area will include that necessary to facilitate one foot of flow depth over an emergency spillway and one foot of freeboard. With 3:1 slopes, lthe top dimensions of a detention pond with the required storage capacity will have top dimensions of 99 ft. (length) by 74 ft. (width). The planned storage depth is 4 ft. and the total depth is 6 ft. In order to construct this facility, approximately 0.25 acre of land will be needed. For safety reasons, the pond must be fenced.

Cost of excavation: 1,100 cu. yd. @ $4.00/cu. yd. = **$6,660**

Removal of spoils (assume 2 mile round trip): $3.01/1 cu. yd. x 1,100 cu. yd. = **$3,311.**

Cost of grading (@ $1.48/1 sq. yd.): $1.48/1 sq. yd. x 605 sq. yd. = **$895**

Lime, seed, fertilizer and mulch (@ $3,000/1 ac.): 0.25 acre x $3,000/1 ac. = **$750**

Cost of outlet structure = $3,000

Cost of chain-link fencing (@ $13.00/l. ft.): 400 l. ft. x $13.00/l. ft. = **$5,200**

Present land value: (@ $85,000/1 ac.): 0.25 ac. x $85,000/1 ac. = **$21,250**

Total system cost = $38,806*

Cost per cu. ft. of storage = $2.59

* Does not include yearly costs associated with lawn mowing and landscaping. Nor does it include lost revenue resulting from the loss of usable land.

INFILTRATOR SYSTEMS INC

MAXIMIZER CHAMBER SYSTEM.

Use a configuration which is 20 rows wide where the average volume per chamber, including the apportioned volume available under the PowerArch bridge sections, is 46.2 cubic feet. Therefore:

Chambers needed: 15,000 cu. ft. of storage needed/46.2 cu. ft./chamber = 325 chambers. Use 320 chambers and credit the void space in the stone which will be placed around the bed perimeter. 35% is commonly used for the available void in crushed granite. In a bed which is 20 chambers wide, the rows must be 16 chambers long in order to provide for 320 total chambers. **Cost of chambers @ $63.50/ea. = $20,320**

Power Arch bridges needed: There will be 19 rows of bridges, and since each bridge section is half the length of the chamber, each row will have 32 bridges. Therefore, the total number of bridge sections needed is 608. **Cost of bridges @ $12.00/ea. = $7,296**

End Plates needed: There will be two end plates for each chamber row and two end plates for each bridge row. 40 chamber end plates and 38 bridge end plates will be needed. **Cost of chamber end plates @ $12.00/ea. = $480. Cost of bridge end plates @ $10.00/ea. = $380**

Subtotal – Maximizer system components = $28,476

Bed size: Each chamber is 20.5 square feet in area. Therefore, 320 chambers will cover about 6,560 square feet. In this bed of 20 wide and 16 long, the length will be 116 ft. and the width will be 57 ft. The total bed size, including 2 feet of overexcavation on all sides of the chambers will be 120 ft. x 61 ft.

Excavation: Total excavation equals the length x width x depth of the bed. In this case: 120 ft. x 61 ft. x 4.5 ft. x 1 cu. yd./27 cu. ft. = 1,220 cu. yd. **Cost of excavation @ $2.50/cu. yd. = $3,050**

Stone required: A 3" thick layer of ¾ - 1½" crushed rock is required underneath the chambers and a 2 foot wide x 2 foot deep crushed stone backfill is required around the chambers. Therefore:

Stone around chambers @ 362 feet of bed perimeter: 362 ft. x 2 ft. x 2 ft. x 1 cu. yd./27 cu. ft. = 54 cu. yd.; 54 cu. yd. x 1.5 ton/cu. yd. = 81 tons.

Stone under chambers @ 6,560 sq. ft. chamber: 6,560 sq. ft. x 0.25 ft. x 1 cu. yd./27 cu. ft. = 61 cu. yd.; 61 cu yd. x 1.5 ton/cu. yd. = 92 tons

Total stone needed: 173 tons

Cost of crushed stone (in place @ $20.00/ton): 173 tons x $20.00/ton = **$3,460**

Backfill & compaction @ $1.40 cu. yd. : 1.5 ft. (above chambers) x 7,320 sq. ft. x 1 cu. yd./27 cu. ft. = 407 cu. yd. **Cost of backfill & compaction:** $1.40/cu. yd. x 407 cu. yd. = **$570**

Cost of labor @ $25.00/hr. (30 chambers/hr.): 320 chambers/30 chambers/hr = 10.7 hr. x $25.00/hr. x 4 people = **$1,070**

Filter fabric: Fabric will be draped around the sidewall of the excavation. Width of fabric must cover height and width of stone with a 1 foot overlap onto the chambers. Therefore, the fabric will be 5.25 feet x the length of the perimeter – 5.25 feet x 362 feet x 1 sq. yd./9 sq. ft. = 212 sq. yd. **Cost of fabric:** 212 sq. yd. x $0.40/sq. yd. = **$85.00**

Reinforcement fabric: 7,320 sq. ft. x 1 sq. yd./9 sq. ft. = 814 sq. yd. **Cost of reinforcement fabric:** 814 sq. yd. x 0.90/sq. yd. = **$733**

Total installed cost = $37,444

Cost per cu. ft. of storage = $2.50

The Maximizer Chamber System is the most cost effective alternative for stormwater storage, when maintenance and land cost is factored into surface detention ponds. This is illustrated in the chart below.

Detailed cost comparisons follow. Each is based on a hypothetical situation where 15,000 cubic feet of stormwater runoff needs to be stored. Some numbers have been rounded for convenience.

STORMWATER STORAGE SYSTEM COST COMPARISON

Type of System	Cost Per Cubic Foot of Storage
Concrete Galleries	
4' x 4' x 8' Gallery	$3.30
4' x 4' x 4' Gallery	$3.95
Corrugated Metal Pipe (CMP)	
48" diameter	$3.10
72" diameter	$3.23
Exfiltration Trenches	$3.57
Surface Detention Pond	$2.59
MAXIMIZER CHAMBER SYSTEM	$2.50

The Connecticut Council on Soil and Water Conservation. *Connecticut Guidelines for Soil Erosion and Sediment Control.* Second Printing: January, 1988.

Schueler, T.R., Department of Environmental Programs Metropolitan Washington Council of Governments. *Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMP's.* Washington, D.C., July, 1987.

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United States Department of Agriculture, Soil Conservation Service, Engineering Division. *Technical Release 55, Urban Hydrology for Small Watersheds.* Washington, D.C., June, 1986.

Urbonas, Ben and Stahre, Peter. *Stormwater, Best Management Practices and Detention for Water Quality, Drainage, and CSO Management.* Prentiss Hall, Englewood Cliffs, NJ. 1993.

INFILTRATOR®
SYSTEMS INC

Leading the way in septic and stormwater chamber systems℠

4 Business Park Road, P.O. Box 768
Old Saybrook, CT 06475
800-221-4436 860-388-6639 FAX 860-388-6810

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Montgomery Storage Units ZONE ATLAS/DRNG,FILE#: F-21/D53

DRB #: 96-223 EPC #: ______ WORK ORDER #: ______

LEGAL DESCRIPTION: Lots A, B, D, E, G & H of Montgomery Partners

CITY ADDRESS: ______

ENGINEERING FIRM: Mark Goodwin & Associates, PA CONTACT: Gregory J. Krenik PE

ADDRESS: PO Box 90606 PHONE: 345-2010

OWNER: Web Wallace CONTACT: Jeff Newman

ADDRESS: 121 Tijeras NE, Suite 2000 PHONE: 242-1552

ARCHITECT: Ernest Ulibarri & Associates CONTACT: Jeff Newman

ADDRESS: 121 Tijeras NE, Suite 2000 PHONE: 242-1552

SURVEYOR: N/A CONTACT: ______

ADDRESS: ______ PHONE: ______

CONTRACTOR: N/A CONTACT: ______

ADDRESS: ______ PHONE: ______

TYPE OF SUBMITTAL:

- ___ DRAINAGE REPORT
- X DRAINAGE PLAN
- ___ CONCEPTUAL GRADING & DRAINAGE PLAN
- X GRADING PLAN
- ___ EROSION CONTROL PLAN
- ___ ENGINEER'S CERTIFICATION
- ___ OTHER

PRE-DESIGN MEETING:

- X YES
- ___ NO
- ___ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

- ___ SKETCH PLAT APPROVAL
- ___ PRELIMINARY PLAT APPROVAL
- ___ S. DEV. PLAN FOR SUB'D APPROVAL
- ___ S. DEV. PLAN FOR BLDG PERMIT APPROVAL
- ___ SECTOR PLAN APPROVAL
- ___ FINAL PLAT APPROVAL
- ___ FOUNDATION PERMIT APPROVAL
- X BUILDING PERMIT APPROVAL
- ___ CERTIFICATION OF OCCUPANCY APPROVAL
- ___ GRADING PERMIT APPROVAL
- ___ PAVING PERMIT APPROVAL
- ___ S.A.D. DRAINAGE REPORT
- ___ DRAINAGE REQUIREMENTS
- ___ OTHER ______ (Specify)

10/22

DATE SUBMITTED: 10-23-96

BY: [signature]

Gregory J. Krenik PE

Lisa - The arch
changed BLDGS
A, B, C & D Floor
Plan. So I
changed the Finish
Floors to adjust.

Greg
Hydrolog Bridgewater

City of Albuquerque
P. O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103
PUBLIC WORKS DEPARTMENT

September 23, 1997

CERTIFICATE OF WORK ORDER COMPLETION

Pacheco Park Ltd. CO.
Webb Wallace
428 Sandoval
Santa Fe, NM 87501

RE: MONTGOMERY STORAGE UNITS- PROJECT NO.: 5483.81 (MAP NO. F-21)

Dear Sir:

This is to certify that the City of Albuquerque accepts Project No. 5483.81 as being completed according to approved plans and construction specifications. Please be advised this certificate of completion shall only become effective upon final plat approval and filling in the office of the Bernalillo County Clerk's Office.

The project is described as follows:

- The project consisted of westbound right turn bay and an eastbound left turn bay on Montgomery Blvd. As part of the right turn bay new sidewalk was required.

- Water and sewer lines were placed within the site as well as along and across Montgomery Blvd.

- A storm drain outfall was also installed from the on-site pond to the existing inlet in Montgomery Blvd.

- Widening of the 4' sidewalk to a 6' sidewalk on north side of Montgomery Blvd.

The contractor's correction period began the date of this letter and is effective for a period of one (1) year.

Sincerely,

Russell B. Givler, P.E.

cc:

Mark Goodwin & Associates
Sundance Mechanical
Fred Aguirre, Hydrology, PWD
Tina Pohl, Engineering Group, PWD
Terri Martin, Engineering Group, PWD
Martin Barker, Materials Testing Lab
Linda Adamsko, Special Assessments, DFM
Sam Hall, Water Systems, PWD
Jim Fink, Liquid Waste, PWD
Dean Wall, Street Maintenance, PWD
Jack McDonough, Water/Wastewater Group, PWD
Ray Chavez, Traffic Engineering, PWD
Josie Jaramillo, New Meter Sales, Finance Group, PWD
Richard Zamora, Maps and Records, PWD
John Ewing, Risk Management
f/Project No. 5483.81
f/Readers
f/Warranty:Contract

CITY OF
Albuquerque

November 26, 1996

Martin J. Chávez, Mayor

Greg Krenik, PE
Mark Goodwin & Assoc.
P.O. Box 90606
Albuquerque, NM 87199

RE: MONTGOMERY STORAGE UNITS (F21-D53). UPDATED GRADING AND DRAINAGE PLAN FOR BUILDING PERMIT APPROVAL. ENGINEER'S STAMP DATED 11-18-96.

Dear Mr. Krenik:

Based on the information provided on your November 19, 1996 submittal, City Hydrology has the following comments:

1. Please provide a copy of calculations used to determine the volume of the chamber system (see the Specifications, Worksheet #1 for Detention Basins). Also, provide orifice calculations.

2. Give invert elevations on all storm drain pipe, including the pipe connecting the detention chambers.

3. The specifications that you provided for the detention chamber system call for a 4-inch vent pipe for every 1000 square feet of bed area. It appears that you need more vents.

I am interested in the installation of the underground detention system you have chosen. Would you please let me know when installation of the chambers is to take place? I'd like to watch.

An Engineer's Certification will be required prior to Certificate of Occupancy.

If I can be of further assistance, please feel free to contact me at 768-3622.

Sincerely,

Lisa Ann Manwill
Engineering Assoc./Hyd.

c: Andrew Garcia
File

CITY OF
Albuquerque

May 24, 1996

Martin J. Chávez, Mayor

Greg Krenik, PE
Mark Goodwin & Assoc.
P.O. Box 90606
Albuquerque, NM 87199

RE: MONTGOMERY STORAGE UNITS (F21-D53) CONCEPTUAL GRADING AND DRAINAGE PLAN FOR SITE DEVELOPMENT PLAN FOR BUILDING PERMIT APPROVAL. ENGINEER'S STAMP DATED 5-22-96.

Dear Mr. Krenik:

Based on the updated information provided on your May 22, 1996 submittal, the above referenced plan is approved for Site Development Plan for Building Permit.

Please note, ponds more than 18 inches in depth require safety fencing.

If I can be of further assistance, please feel free to contact me at 768-3622.

Sincerely,

Lisa Ann Manwill
Engineering Assoc./Hyd.

c: Andrew Garcia
File

CITY OF
Albuquerque
Public Works Department

June 18, 1997

Martin J. Chávez, Mayor

Robert E. Gurulé, Director

Greg Krenik, PE
Mark Goodwin & Assoc.
P.O. Box 90606
Albuquerque, NM 87199

RE: MONTGOMERY STORAGE UNITS (F21-D53). ENGINEER'S CERTIFICATION FOR CERTIFICATE OF OCCUPANCY. ENGINEER'S CERTIFICATION DATED MAY 27, 1997.

Dear Mr. Krenik:

Based on the updated information provided on your June 16, 1997 submittal, the above referenced project is not acceptable for Certificate of Occupancy. The project is not complete.

I have added the storm drain as-builts for this entire development project to the Valvoline file. When you submit the gas station and storage units for Certificate of Occupancy, be certain to make reference to the storm drain as-builts now on file.

If I can be of further assistance, please feel free to contact me at 768-3622.

Sincerely,

Lisa Ann Manwill, P.E.
Engineering Assoc./Hyd.

c: Andrew Garcia
File

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Montgomery Storage Units ZONE ATLAS/DRNG,FILE#: F-21 / 1053

DRB #: 96-223 EPC #: ______ WORK ORDER #: ______

LEGAL DESCRIPTION: Lots A1-A, A1-B, A2 & A3 of Montgomery Partners

CITY ADDRESS: ______

ENGINEERING FIRM: Mark Goodwin & Associates, PA CONTACT: Gregory J. Krenik PE

ADDRESS: PO Box 90606 PHONE: 345-2010

OWNER: Web Wallace CONTACT: Jeff Newman

ADDRESS: 121 Tijeras NE, Suite 2000 PHONE: 242-1552

ARCHITECT: Ernest Ulibarri & Associates CONTACT: Jeff Newman

ADDRESS: 121 Tijeras NE, Suite 2000 PHONE: 242-1552

SURVEYOR: N/A CONTACT: ______

ADDRESS: ______ PHONE: ______

CONTRACTOR: N/A CONTACT: ______

ADDRESS: ______ PHONE: ______

TYPE OF SUBMITTAL:

- ___ DRAINAGE REPORT
- X DRAINAGE PLAN
- ___ CONCEPTUAL GRADING & DRAINAGE PLAN
- X GRADING PLAN
- ___ EROSION CONTROL PLAN
- ___ ENGINEER'S CERTIFICATION
- ___ OTHER

PRE-DESIGN MEETING:

- X YES
- ___ NO
- ___ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

- ___ SKETCH PLAT APPROVAL
- ___ PRELIMINARY PLAT APPROVAL
- ___ S. DEV. PLAN FOR SUB'D APPROVAL
- ___ S. DEV. PLAN FOR BLDG PERMIT APPROVAL
- ___ SECTOR PLAN APPROVAL
- ___ FINAL PLAT APPROVAL
- ___ FOUNDATION PERMIT APPROVAL
- X BUILDING PERMIT APPROVAL
- ___ CERTIFICATION OF OCCUPANCY APPROVAL
- ___ GRADING PERMIT APPROVAL
- ___ PAVING PERMIT APPROVAL
- ___ S.A.D. DRAINAGE REPORT
- ___ DRAINAGE REQUIREMENTS
- ___ OTHER ______ (Specify)

DATE SUBMITTED: 11-18-96

BY: [signature]
Gregory J. Krenik PE

RECEIVED NOV 19 1996 HYDROLOGY DIVISION

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Montgomery Storage Units ZONE ATLAS/DRNG,FILE#: F-21 /1453

DRB #: 96-223 EPC #: ______ WORK ORDER #: ______

LEGAL DESCRIPTION: Lots A1-A, A1-B, A2 & A3 of Montgomery Partners

CITY ADDRESS: ______

ENGINEERING FIRM: Mark Goodwin & Associates, PA CONTACT: Gregory J. Krenik PE

ADDRESS: PO Box 90606 PHONE: 345-2010

OWNER: Web Wallace CONTACT: Jeff Newman

ADDRESS: 121 Tijeras NE, Suite 2000 PHONE: 242-1552

ARCHITECT: Ernest Ulibarri & Associates CONTACT: Jeff Newman

ADDRESS: 121 Tijeras NE, Suite 2000 PHONE: 242-1552

SURVEYOR: N/A CONTACT: ______

ADDRESS: ______ PHONE: ______

CONTRACTOR: N/A CONTACT: ______

ADDRESS: ______ PHONE: ______

TYPE OF SUBMITTAL:

- ___ DRAINAGE REPORT
- X DRAINAGE PLAN
- ___ CONCEPTUAL GRADING & DRAINAGE PLAN
- X GRADING PLAN
- ___ EROSION CONTROL PLAN
- ___ ENGINEER'S CERTIFICATION
- ___ OTHER

PRE-DESIGN MEETING:

- X YES
- ___ NO
- ___ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

- ___ SKETCH PLAT APPROVAL
- ___ PRELIMINARY PLAT APPROVAL
- ___ S. DEV. PLAN FOR SUB'D APPROVAL
- ___ S. DEV. PLAN FOR BLDG PERMIT APPROVAL
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- ___ CERTIFICATION OF OCCUPANCY APPROVAL
- ___ GRADING PERMIT APPROVAL
- ___ PAVING PERMIT APPROVAL
- ___ S.A.D. DRAINAGE REPORT
- ___ DRAINAGE REQUIREMENTS
- ___ OTHER ______ (Specify)

DATE SUBMITTED: 12-9-96

BY: [signature]
Gregory J. Krenik PE

RECEIVED
DEC 10
HYDROLOGY DIVISION

D. Mark Goodwin & Associates, P.A.
Consulting Engineers and Surveyors
P.O. BOX 90606, ALBUQUERQUE, NM 87199
(505) 345-2010

December 9, 1996

Ms. Lisa Manwill
Hydrology Division
City of Albuquerque
PO Box 1293
Albuquerque, NM 87103

Re: ***Montgomery Storage Units (F21-D53)***

Dear Ms. Manwill:

This letter is an itemized response to your letter of November 26, 1996, and a part of the resubmittal.

1) *I've included the calculation sheets of the chamber system. The orifice calculations are shown on sheet 2 of the calculations.*

2) *Invert elevations are shown on all storm drain pipe.*

3) *I've added and relocated the 4" vent pipes to accommodate the required areas.*

Please contact our office if you have any questions.

Very Truly Yours,

MARK GOODWIN & ASSOCIATES, P.A.

Gregory J. Krenik, P.E.

GJK/sb

b:\montg.str\comments.1

D. Mark Goodwin & Associates, P.A.
Consulting Engineers and Surveyors

PROJECT Montgomery Storage Units
SUBJECT Drainage Calcs
BY GJK DATE 2-13-96
CHECKED ______ DATE ______
SHEET 2 OF ____
Revised 5-21-96 11-18-96

- A portion of IV & V will discharge directly offsite to the Montgomery Roadway. This is because this area can not drain to the ponds. The low point of these areas are below the bottom of the ponds.

AREA IV = 0.0793 AC
GREEN AREA = 0
TYPE "D" = 100%

AREA V = 0.7644 AC
GREEN AREA = 11.46%
TYPE "D" = 88.54%

FROM: HYMO OUTPUT SHEETS 4-9
Q = 0.41 CFS Q = 3.70 CFS

THIS FLOW WILL BE SUBTRACTED FROM ALLOWABLE DISCHARGE
6.5619 - 0.41 - 3.70 = 2.4519 CFS
USE THIS TO ROUTE POND

- SIZE UNDERGROUND STORAGE AREAS AND POND.

UGS - D USE A 7" ORIFICE A=0.267 $Q = 0.6A\sqrt{2gh}$

ELEV	STORAGE	OUTFLOW
88.60	0.0	0.0
89.60	0.126	1.08
90.60	0.252	1.68
91.10	0.314	1.91

UGS - C USE A 5" ORIFICE A = 0.136

ELEV	STORAGE	OUTFLOW
92.00	0.0	0.0
93.00	0.068	0.58
94.00	0.136	0.88
94.50	0.170	0.99

UGS - B USE A 5" ORIFICE A = 0.136

ELEV	STORAGE	OUTFLOW
87.00	0.0	0.0
88.00	0.081	0.58
89.00	0.162	0.88
89.50	0.203	0.99

POND A USE AN 8" ORIFICE A = 0.349

ELEV	STORAGE	OUTFLOW
86.00	0.0	0.0
87.00	0.051	1.38
88.00	0.102	2.17
89.00	0.155	2.75
89.50	0.208	2.99

MAXIMIZER MATERIALS WORKSHEET

INFILTRATOR SYSTEMS INC

Project Montgomery Storage Units

By GSK Date 12-6-96

Location UGS-D

Checked by ______ Date ______

☐ Present ☐ Developed (Check One)

FIND THE FOLOWING:

1. Required storage volume (V_s) = ... 13,169 cu. ft.

2. Approximate bed size for siting purposes: The capacity of each sq. ft. of bed is approximately 2.15 cu. ft.; V_s/2.15 = ... 6125 sq. ft. **(A)**

3. Approximate bed layout (length x width). Divide desired bed width by 2.83 ft. (width of chamber) to calculate actual number of chamber rows = ... 5/15 rows **(R)**

4. The average volume per chamber (V_{avg})(Using "R" and Table 1) = ... 43.72/46.06 cu. ft.

5. The actual number of chambers **(C)** needed: (V_s) 13,169 /(V_{avg}) 3934.8 + 9672.6 = 13,607.4 OK .... 90/210 chambers **(C)**

6. The number of PowerArch bridges needed **(P)**: 2((C) ______ /(R)) x ((R) -1) = ... 72/196 bridges **(P)**

7. The actual size of the bed **(S)**: (C) ______ x 20.5 sq. ft./chamber = ... 1845/4305 sq. ft. **(S)**

8. Quantity of excavation **(E)**: **(S)** ______ x 4.5 ft. (depth) x 1 cu. yd./27 cu. ft. = ... 308/718 cu. yd. **(E)**

9. Area of filter fabric **(F)**:**(C)** ______ /**(R)** ______ x 7.25 ft. (unit length) x 4 ft. (fabric width) x 2 sides x 1 sq. yd./ 9 sq. ft. = ... 116/90.2 sq. yd. **(F)**

10. Quantity of stone (V_{st}): [**(S)** ______ x 0.25 ft. x 1 cu. yd./27 cu. ft. = cu. yd. (V_{st}) (V_{st}) 17.08/39.86 x 1.5 tons/cu. yd.] + [(R x 6) + 2C/R] (4 sq. ft.) = ... 213.6/531.8 tons of stone

11. End plates needed:

    Maximizer "A" end plates (M_A): (R) 15 + 5 rows = ... 20 end plates (M_A)

    Maximizer "B" end plates (M_B): (R) 15 + 5 rows = ... 20 end plates (M_B)

    PowerArch "A" end plates (PA_A):[(R) 14 + 4 rows - 1] = ... 18 end plates (PA_A)

    PowerArch "B" end plates (PA_B):[(R) 14+4 rows - 1] = ... 18 end plates (PA_B)

MAXIMIZER MATERIALS WORKSHEET

INFILTRATOR SYSTEMS INC

Project Montgomery Storage Units

By GSK Date 12-6-96

Location UGS-B

Checked by ________ Date ________

☐ Present ☐ Developed (Check One)

FIND THE FOLOWING:

1. Required storage volume (V_s) = ... 7915 cu. ft.

2. Approximate bed size for siting purposes: The capacity of each sq. ft. of bed is approximately 2.15 cu. ft.; V_s/2.15 = ... 3681 sq. ft. **(A)**

3. Approximate bed layout (length x width). Divide desired bed width by 2.83 ft. (width of chamber) to calculate actual number of chamber rows = ... 7 rows **(R)**

4. The average volume per chamber (V_{avg})(Using "**R**" and Table 1) = ... 44.6 cu. ft.

5. The actual number of chambers **(C)** needed: (V_s) 7915 /(V_{avg}) 44.8 = ... 177 chambers **(C)** 179 actual

6. The number of PowerArch bridges needed **(P)**: 2((C) ________ /(R)) x ((R) -1) = ... 147 bridges **(P)**

7. The actual size of the bed **(S)**: **(C)** ________ x 20.5 sq. ft./chamber = ... 3669.5 sq. ft. **(S)**

8. Quantity of excavation **(E)**: **(S)** ________ x 4.5 ft. (depth) x 1 cu. yd./27 cu. ft. = ... 611.6 cu. yd. **(E)**

9. Area of filter fabric **(F)**:**(C)** ________ /(R) ________ x 7.25 ft. (unit length) x 4 ft. (fabric width) x 2 sides x 1 sq. yd./ 9 sq. ft. = ... 165 sq. yd. **(F)**

10. Quantity of stone (V_{st}): [(S) ________ x 0.25 ft. x 1 cu. yd./27 cu. ft. = cu. yd. (V_{st}) (V_{st}) ________ x 1.5 tons/cu. yd.] + [(R x 6) + 2C/R] (4 sq. ft.) = ... ______ tons of stone

11. End plates needed:

Maximizer "A" end plates (M_A): **(R)** 7 rows = ... 7 end plates (M_A)

Maximizer "B" end plates (M_B): **(R)** 7 rows = ... 7 end plates (M_B)

PowerArch "A" end plates (PA_A):[(R) ________ rows - 1] = ... 6 end plates (PA_A)

PowerArch "B" end plates (PA_B):[(R) ________ rows - 1] = ... 6 end plates (PA_B)

MAXIMIZER MATERIALS WORKSHEET

INFILTRATOR® SYSTEMS INC

Project Montgomery Storage Units

By GJK Date 12-6-96

Location UGS-C

Checked by ______ Date ______

☐ Present ☐ Developed (Check One)

FIND THE FOLOWING:

1. Required storage volume (**V_s**) = ... [6334] cu. ft.

2. Approximate bed size for siting purposes: The capacity of each sq. ft. of bed is approximately 2.15 cu. ft.; V_s/2.15 = ... [2946] sq. ft. **(A)**

3. Approximate bed layout (length x width). Divide desired bed width by 2.83 ft. (width of chamber) to calculate actual number of chamber rows = ... [18] rows **(R)**

4. The average volume per chamber (**V_{avg}**)(Using "**R**" and Table 1) = ... [46.21] cu. ft.

5. The actual number of chambers (**C**) needed: (**V_s**) 6334 /(**V_{avg}**) 46.21 = ... [137] chambers **(C)** 144 Provided

6. The number of PowerArch bridges needed (**P**): 2((**C**) 144 /(**R**)) x ((**R**) -1) = ... [136] bridges **(P)**

7. The actual size of the bed (**S**): (**C**) 144 x 20.5 sq. ft./chamber = ... [2952] sq. ft. **(S)**

8. Quantity of excavation (**E**): (**S**) 2952 x 4.5 ft. (depth) x 1 cu. yd./27 cu. ft. = ... [492] cu. yd. **(E)**

9. Area of filter fabric (**F**):(**C**) 144 /(**R**) 18 x 7.25 ft. (unit length) x 4 ft. (fabric width) x 2 sides x 1 sq. yd./ 9 sq. ft. = ... [51.56] sq. yd. **(F)**

10. Quantity of stone (**V_{st}**): [(**S**) ______ x 0.25 ft. x 1 cu. yd./27 cu. ft. = cu. yd. (**V_{st}**) (**V_{st}**) ______ x 1.5 tons/cu. yd.] + [(R x 6) + 2C/R] (4 sq. ft.) = ... [ ] tons of stone

11. End plates needed:

    Maximizer "A" end plates (**M_A**): (**R**) 18 rows = ... [18] end plates (**M_A**)

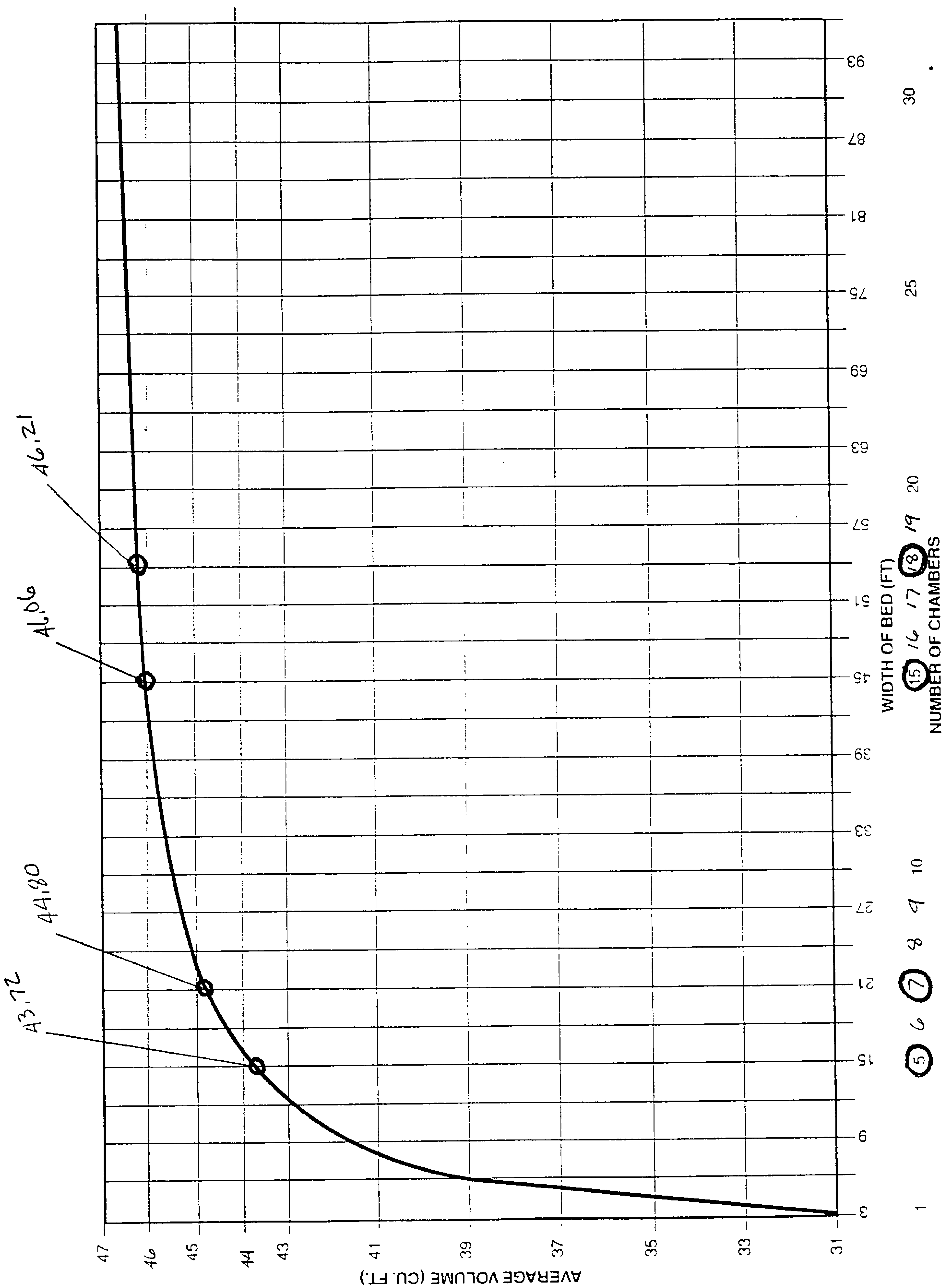
    Maximizer "B" end plates (**M_B**): (**R**) 18 rows = ... [18] end plates (**M_B**)

    PowerArch "A" end plates (**PA_A**):[(**R**) 18 rows - 1] = ... [17] end plates (**PA_A**)

    PowerArch "B" end plates (**PA_B**):[(**R**) 18 rows - 1] = ... [17] end plates (**PA_B**)

INFILTRATOR
SYSTEMS INC

TABLE 1: AVERAGE MAXIMIZER CHAMBER VOLUME



CITY OF
Albuquerque

September 9, 1997

Martin J. Chávez, Mayor

Greg Krenik, P.E.
Mark Goodwin & Assoc.
P.O. Box 90606
Albuquerque, NM 87199

RE: MONTGOMERY STORAGE UNITS (F21-D53). ENGINEER'S CERTIFICATION FOR CERTIFICATE OF OCCUPANCY. ENGINEER'S CERTIFICATION DATED AUGUST 26, 1997.

Dear Mr. Krenik:

Based on the information provided on your August 26, 1997 submittal, the above referenced project is approved for Certificate of Occupancy.

If I can be of further assistance, please feel free to contact me at 924-3984.

Sincerely,

Lisa Ann Manwill, P.E.
Hydrology

c: Andrew Garcia
File

JEWEL OSCO PLANS
MARY S. BLA

~~PUBLIC WORKS TINA~~

WAITING FOR TINAS CALL

P/U FOR KEVIN PATTON W/BHI
@ CITY PLAZA DEL SOL
ASK FOR ANDREW GARCIA

JOB - MONTGOMERY STORAGE UNITS
CITY FILE # F21-053
HE NEEDS BY TODAY.

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Montgomery Storage Units ZONE ATLAS/DRNG,FILE#: F-21/D53

DRB #: 96-223 EPC #: ______ WORK ORDER #: ______

LEGAL DESCRIPTION: Lots A1-A, A1-B, A2 & A3 of Montgomery Partners

CITY ADDRESS: 9831 MONTGOMERY BLVD NE

ENGINEERING FIRM: Mark Goodwin & Associates, PA CONTACT: Gregory J. Krenik PE

ADDRESS: PO Box 90606 PHONE: 345-2010

OWNER: Web Wallace CONTACT: Jeff Newman

ADDRESS: 121 Tijeras NE, Suite 2000 PHONE: 242-1552

ARCHITECT: Ernest Ulibarri & Associates CONTACT: Jeff Newman

ADDRESS: 121 Tijeras NE, Suite 2000 PHONE: 242-1552

SURVEYOR: N/A CONTACT: ______

ADDRESS: ______ PHONE: ______

CONTRACTOR: N/A CONTACT: ______

ADDRESS: ______ PHONE: ______

TYPE OF SUBMITTAL:

- ___ DRAINAGE REPORT
- ___ DRAINAGE PLAN
- ___ CONCEPTUAL GRADING & DRAINAGE PLAN
- ___ GRADING PLAN
- ___ EROSION CONTROL PLAN
- _X_ ENGINEER'S CERTIFICATION
- ___ OTHER

PRE-DESIGN MEETING:

- ___ YES
- ___ NO
- ___ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

- ___ SKETCH PLAT APPROVAL
- ___ PRELIMINARY PLAT APPROVAL
- ___ S. DEV. PLAN FOR SUB'D APPROVAL
- ___ S. DEV. PLAN FOR BLDG PERMIT APPROVAL
- ___ SECTOR PLAN APPROVAL
- ___ FINAL PLAT APPROVAL
- ___ FOUNDATION PERMIT APPROVAL
- ___ BUILDING PERMIT APPROVAL
- _X_ CERTIFICATION OF OCCUPANCY APPROVAL
- ___ GRADING PERMIT APPROVAL
- ___ PAVING PERMIT APPROVAL
- ___ S.A.D. DRAINAGE REPORT
- ___ DRAINAGE REQUIREMENTS
- _X_ OTHER ______ (Specify)

CO REQUEST IS ONLY FOR THE ENTIRE STORM DRAIN SYSTEM. THE PAVING IS NOT COMPLETE IN THE STORAGE AREA. WITH THE STORMDRAIN CERT VALVOLINE AND PHILLIPS CAN OBTAIN FINAL CO'S.

MAY 27 1997

DATE SUBMITTED: 5-27-97

BY: [signature]

Gregory J. Krenik PE

Your AS (Bnd) dated on 5-27-97

between CB4 and pind show different alignments.

The which one is right?

CITY OF
Albuquerque

September 27, 1996

Martin J. Chávez, Mayor

Greg Krenik, PE
Mark Goodwin & Assoc.
P.O. Box 90606
Albuquerque, NM 87199

RE: MONTGOMERY STORAGE UNITS (F21-D53). GRADING AND DRAINAGE PLAN FOR BUILDING PERMIT APPROVAL. ENGINEER'S STAMP DATED 9-5-96.

Dear Mr. Krenik:

Based on the updated information provided on your September 6, 1996 submittal, the above referenced plan is approved for Building Permit.

Prior to the Hydrology Division signing, you will need to show cross lot drainage easements on the plat. Also, when you resubmit the Quick Lube facility, be certain to request an SO #19 Permit approval for the sidewalk culverts.

An Engineer's Certification will be required prior to Certificate of Occupancy.

If I can be of further assistance, please feel free to contact me at 768-3622.

Sincerely,

Lisa Ann Manwill
Engineering Assoc./Hyd.

c: Andrew Garcia
File

CITY OF
Albuquerque
Public Works Department
June 11, 1997

Martin J. Chávez, Mayor

Robert E. Gurulé, Director

Greg Krenik
Mark Goodwin and Associates
P.O. Box 90606
Albuquerque, New Mexico 87199

RE: Engineer's Certification for Montgomery Storage Units (F21-D53) Received May 27, 1997

Dear Mr Krenik:

I have reviewed the referenced Certification dated May 27, 1997 and forward the following comments.

1. The approval sought is Certification of Occupancy Approval on the Drainage Information Sheet. However, what you have submitted is a record drawing of the storm drain system for the site.

2. I can agree that the record drawing would be required for C.O. approval. If you are asking for C.O. approval for Valvoline and Phillips as-built grades of the parking lot and buildings need to be submitted. Please follow the DPM check.

If you have any questions please call me at 924-3984.

Sincerely,

Carlos A. Montoya
Project Manager

c: Andrew Garcia
File

CITY OF
Albuquerque

August 2, 1996

Martin J. Chávez, Mayor

Greg Krenik, PE
Mark Goodwin & Assoc.
P.O. Box 90606
Albuquerque, NM 87199

RE: MONTGOMERY STORAGE UNITS (F21-D53). GRADING PLAN FOR BUILDING PERMIT APPROVAL. ENGINEER'S STAMP DATED 7-29-96.

Dear Mr. Krenik:

Based on the updated information provided on your July 30, 1996 submittal, the above referenced plan is approved for Building Permit.

If I can be of further assistance, please feel free to contact me at 768-3622.

Sincerely,

Lisa Ann Manwill
Engineering Assoc./Hyd.

c: Andrew Garcia
File

CITY OF
Albuquerque

October 7, 1996

Martin J. Chávez, Mayor

Greg Krenik, PE
Mark Goodwin & Assoc.
P.O. Box 90606
Albuquerque, NM 87199

RE: MONTGOMERY STORAGE UNITS (F21-D53). GRADING AND DRAINAGE PLAN FOR BUILDING PERMIT APPROVAL. ENGINEER'S STAMP DATED 10-1-96.

Dear Mr. Krenik:

Based on the updated information provided on your October 2, 1996 submittal, the above referenced plan is approved for Building Permit.

An Engineer's Certification will be required prior to Certificate of Occupancy.

If I can be of further assistance, please feel free to contact me at 768-3622.

Sincerely,

Lisa Ann Manwill
Engineering Assoc./Hyd.

c: Andrew Garcia
File

CITY OF
Albuquerque

October 30, 1996

Martin J. Chávez, Mayor

Greg Krenik, PE
Mark Goodwin & Assoc.
P.O. Box 90606
Albuquerque, NM 87199

RE: MONTGOMERY STORAGE UNITS (F21-D53). UPDATED GRADING AND DRAINAGE PLAN FOR BUILDING PERMIT APPROVAL. ENGINEER'S STAMP DATED 10-22-96.

Dear Mr. Krenik:

Based on the updated information provided on your October 23, 1996 submittal, the above referenced plan is approved for Building Permit. As you are aware, this project has been revised numerous times. If for some reason you have to resubmit again, an updated drainage report and narritive will be required.

An Engineer's Certification will be required prior to Certificate of Occupancy.

If I can be of further assistance, please feel free to contact me at 768-3622.

Sincerely,

Lisa Ann Manwill
Engineering Assoc./Hyd.

c: Andrew Garcia
File

CITY OF
Albuquerque

December 12, 1996

Martin J. Chávez, Mayor

Greg Krenik, PE
Mark Goodwin & Assoc.
P.O. Box 90606
Albuquerque, NM 87199

RE: MONTGOMERY STORAGE UNITS (F21-D53). UPDATED GRADING AND DRAINAGE PLAN FOR BUILDING PERMIT APPROVAL. ENGINEER'S STAMP DATED 12-9-96.

Dear Mr. Krenik:

Based on the updated information provided on your December 10, 1996 submittal, the above referenced project is approved for Building Permit.

An Engineer's Certification will be required prior to Certificate of Occupancy approval.

If I can be of further assistance, please feel free to contact me at 768-3622.

Sincerely,

Lisa Ann Manwill
Engineering Assoc./Hyd.

c: Andrew Garcia
File

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Montgomery Storage Units ZONE ATLAS/DRNG,FILE#: F-21/D53

DRB #: 96-223 EPC #: ______ WORK ORDER #: ______

LEGAL DESCRIPTION: Lots A, B, D, E, G & H of Montgomery Partners

CITY ADDRESS: ______

ENGINEERING FIRM: Mark Goodwin & Associates, PA CONTACT: Gregory J. Krenik PE

ADDRESS: PO Box 90606 PHONE: 345-2010

OWNER: Web Wallace CONTACT: Jeff Newman

ADDRESS: 121 Tijeras NE, Suite 2000 PHONE: 242-1552

ARCHITECT: Ernest Ulibarri & Associates CONTACT: Jeff Newman

ADDRESS: 121 Tijeras NE, Suite 2000 PHONE: 242-1552

SURVEYOR: N/A CONTACT: ______

ADDRESS: ______ PHONE: ______

CONTRACTOR: N/A CONTACT: ______

ADDRESS: ______ PHONE: ______

TYPE OF SUBMITTAL:

- ___ DRAINAGE REPORT
- X DRAINAGE PLAN
- ___ CONCEPTUAL GRADING & DRAINAGE PLAN
- X GRADING PLAN
- ___ EROSION CONTROL PLAN
- ___ ENGINEER'S CERTIFICATION
- ___ OTHER – Drainage Calculations

PRE-DESIGN MEETING:

- X YES
- ___ NO
- ___ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

- ___ SKETCH PLAT APPROVAL
- ___ PRELIMINARY PLAT APPROVAL
- ___ S. DEV. PLAN FOR SUB'D APPROVAL
- ___ S. DEV. PLAN FOR BLDG PERMIT APPROVAL
- ___ SECTOR PLAN APPROVAL
- ___ FINAL PLAT APPROVAL
- ___ FOUNDATION PERMIT APPROVAL
- X BUILDING PERMIT APPROVAL
- ___ CERTIFICATION OF OCCUPANCY APPROVAL
- ___ GRADING PERMIT APPROVAL
- ___ PAVING PERMIT APPROVAL
- ___ S.A.D. DRAINAGE REPORT
- ___ DRAINAGE REQUIREMENTS
- ___ OTHER ______ (Specify)

DATE SUBMITTED: 9-5-96

BY: Gregory J. Krenik PE

RECEIVED SEP - 6 1996 HYDROLOGY DIV.

Lisa:

We had to alter some buildings (A, B, D, E & F) to avoid the waterline easements.

Everything else remained the same.

Greg

1

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
UTILITY DEVELOPMENT DIVISION/HYDROLOGY SECTION

PRE-DESIGN CONFERENCE

DRAINAGE FILE/ZONE ATLAS PAGE NO.: F21 DATE: 9-23-88

EPC NO.: ______ DRB NO.: ______ ZONE: ______

SUBJECT: OFFICE

STREET ADDRESS: Montgomery & Eubank

LEGAL DESCRIPTION: Lts 82, 83, 84, 98, 99, 100, 114, 115 & 116

APPROVAL REQUESTED:
- ___ PRELIMINARY PLAT
- X SITE DEVELOPMENT PLAN
- ___ GRADING/PAVING PERMIT
- X FINAL PLAT
- X BUILDING PERMIT
- X OTHER ZONE change

WHO	REPRESENTING
ATTENDANCE: Chris Weiss	
Fred Aguirre	
Carlos Montoya	

FINDINGS:

① Vacation Action & Dedication of private rd. & Replat
Ⓐ No drainage plan required if EPC requires master plan for Lots ~~84~~, 82, ~~83~~, 98, 99, 115, 114

② No drainage requirements for zone change ✓

③ Site plan for 100 & 116 and possible 84 we will need conceptual drainage plan & drainage plan for Building Permit

④ Dedication of Public Rd may will require a drainage plan & may require financial guarantees at DRB. Recommend that roadway design be incorporated with development of lot 100 & 116.

The undersigned agrees that the above findings are summarized accurately and are only subject to change if further investigation reveals that they are not reasonable or that they are based on inaccurate information.

SIGNED: Carlos A Montoya SIGNED: Chris Weiss

TITLE: ______ TITLE: ______

DATE: 9-23-88 DATE: ______

NOTE PLEASE PROVIDE A COPY OF THIS PRE-DESIGN FORM WITH THE DRAINAGE SUBMITTAL.

CITY OF ALBUQUERQUE
MUNICIPAL DEVELOPMENT DEPARTMENT
ENGINEERING DIVISION/DESIGN HYDROLOGY SECTION

CONFERENCE RECAP

DRAINAGE FILE/ZONE ATLAS PAGE NO.: F-21 DATE: 2/21/86

PLANNING DIVISION NOS: EPC: ______ DRB: ______

SUBJECT: CONTINENTAL SQUARE

STREET ADDRESS (IF KNOWN): MONTGOMERY

SUBDIVISION NAME: ______

APPROVAL REQUESTED:

___ PRELIMINARY PLAT ___ FINAL PLAT

X SITE DEVELOPMENT PLAN ___ BUILDING PERMIT

___ OTHER ___ ROUGH GRADING

	WHO	REPRESENTING
ATTENDANCE:	Jesse May	Easterling & Assoc.
	Roger Green	City

FINDINGS:

(1) Conceptual Grading & Drainage Plan required for Site Development Approval from EPC.
(2) MONTGOMERY HAS FLOOD ZONE DOWNSTREAM AT WYOMING. CONSTRUCTION OF S.A.D 204 MAY CHANGE THIS STATUS. Downstream capacity will affect allowable discharge rates.

The undersigned agrees that the above findings are summarized accurately and are only subject to change if further investigation reveals that they are not reasonable or that they are based on inaccurate information.

SIGNED: Roger L Green SIGNED: Jesse L May III
TITLE: Civil Engineer TITLE: Eng Mgr
DATE: 2/21/86 DATE: 2/21/86

NOTE PLEASE PROVIDE A COPY OF THIS RECAP WITH THE DRAINAGE SUBMITTAL

CITY OF ALBUQUERQUE
MUNICIPAL DEVELOPMENT DEPARTMENT
ENGINEERING DIVISION/DESIGN HYDROLOGY SECTION

CONFERENCE RECAP

DRAINAGE FILE/ZONE ATLAS PAGE NO.: F-21 DATE: 3/23/88 @ 2:00 pm

PLANNING DIVISION NOS: EPC: ________ DRB: ________

SUBJECT: ________

STREET ADDRESS (IF KNOWN): ________

SUBDIVISION NAME: [illegible] Unit 1

APPROVAL REQUESTED:

___ PRELIMINARY PLAT
___ SITE DEVELOPMENT PLAN
___ OTHER
___ FINAL PLAT
X BUILDING PERMIT
___ ROUGH GRADING

	WHO	REPRESENTING
ATTENDANCE:	Steve Clark	[illegible]
	Roger Green	Hydrology Section

FINDINGS:

BUILDING PERMIT & FINAL PLAT REQUIRE AN APPROVED GRADING & DRAINAGE REPORT. THE REPORT SHOULD FOLLOW THE MASTER PLAN "CONTINENTAL SQUARE", EASTERLING & ASSOC. FILE # F21/D53. FREE DISCHARGE WILL BE LIMITED WITHOUT A DOWNSTREAM ANALYSIS — WYOMING & MONTGOMERY INTERSECTION.

CHECK w/ PHIL CLARK OF BURNS PETERS

The undersigned agrees that the above findings are summarized accurately and are only subject to change if further investigation reveals that they are not reasonable or that they are based on inaccurate information.

SIGNED: GS Reeder SIGNED: [illegible]
TITLE: CE/HYDROLOGY TITLE: [illegible]
DATE: 23 MAR 88 DATE: [illegible]

NOTE PLEASE PROVIDE A COPY OF THIS RECAP WITH THE DRAINAGE SUBMITTAL

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Montgomery Storage Units ZONE ATLAS/DRNG,FILE#: F-21/1053

DRB #: 96-223 EPC #: ______ WORK ORDER #: ______

LEGAL DESCRIPTION: Lots A, B, D, E, G & H of Montgomery Partners

CITY ADDRESS: ______

ENGINEERING FIRM: Mark Goodwin & Associates, PA CONTACT: Gregory J. Krenik PE

ADDRESS: PO Box 90606 PHONE: 345-2010

OWNER: Web Wallace CONTACT: Jeff Newman

ADDRESS: 121 Tijeras NE, Suite 2000 PHONE: 242-1552

ARCHITECT: Ernest Ulibarri & Associates CONTACT: Jeff Newman

ADDRESS: 121 Tijeras NE, Suite 2000 PHONE: 242-1552

SURVEYOR: N/A CONTACT: ______

ADDRESS: ______ PHONE: ______

CONTRACTOR: N/A CONTACT: ______

ADDRESS: ______ PHONE: ______

TYPE OF SUBMITTAL:

- ___ DRAINAGE REPORT
- X DRAINAGE PLAN
- ___ CONCEPTUAL GRADING & DRAINAGE PLAN
- X GRADING PLAN
- ___ EROSION CONTROL PLAN
- ___ ENGINEER'S CERTIFICATION
- ___ OTHER – Drainage Calculations

PRE-DESIGN MEETING:

- X YES
- ___ NO
- ___ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

- ___ SKETCH PLAT APPROVAL
- ___ PRELIMINARY PLAT APPROVAL
- ___ S. DEV. PLAN FOR SUB'D APPROVAL
- ___ S. DEV. PLAN FOR BLDG PERMIT APPROVAL
- ___ SECTOR PLAN APPROVAL
- ___ FINAL PLAT APPROVAL
- ___ FOUNDATION PERMIT APPROVAL
- X BUILDING PERMIT APPROVAL
- ___ CERTIFICATION OF OCCUPANCY APPROVAL
- ___ GRADING PERMIT APPROVAL
- ___ PAVING PERMIT APPROVAL
- ___ S.A.D. DRAINAGE REPORT
- ___ DRAINAGE REQUIREMENTS
- ___ OTHER ______ (Specify)

DATE SUBMITTED: 10-1-96

BY: [signature]
Gregory J. Krenik PE

RECEIVED OCT - 2 1996

2-2

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
UTILITY DEVELOPMENT DIVISION/HYDROLOGY SECTION

PRE-DESIGN CONFERENCE

DRAINAGE FILE/ZONE ATLAS PAGE NO.: ____________ DATE: ____________

EPC NO.: ____________ DRB NO.: ____________ ZONE: ____________

SUBJECT: ____________

STREET ADDRESS: ____________

LEGAL DESCRIPTION: ____________

APPROVAL REQUESTED:
- ____ PRELIMINARY PLAT
- ____ SITE DEVELOPMENT PLAN
- ____ GRADING/PAVING PERMIT
- ____ FINAL PLAT
- ____ BUILDING PERMIT
- ____ OTHER ____________

	WHO	REPRESENTING
ATTENDANCE:		

FINDINGS:

(5) Need address downstream capacity.
(A) as it relates to flows to the Sierra Vista shopping ctr.

The undersigned agrees that the above findings are summarized accurately and are only subject to change if further investigation reveals that they are not reasonable or that they are based on inaccurate information.

SIGNED: Carlos Montoya SIGNED: Chris Weiss

TITLE: ____________ TITLE: ____________

DATE: 9-23-88 DATE: ____________

NOTE PLEASE PROVIDE A COPY OF THIS PRE-DESIGN FORM WITH THE DRAINAGE SUBMITTAL.

CITY OF
Albuquerque

May 17, 1996

Martin J. Chávez, Mayor

Greg Krenik, PE
Mark Goodwin & Assoc.
P.O. Box 90606
Albuquerque, NM 87199

RE: MONTGOMERY STORAGE UNITS (F21-D53) CONCEPTUAL GRADING AND DRAINAGE PLAN FOR SITE DEVELOPMENT PLAN FOR BUILDING PERMIT APPROVAL. ENGINEER'S STAMP DATED 4-23-96.

Dear Mr. Krenik:

Based on the updated information provided on your April 24, 1996 submittal, the above referenced plan is approved for Site Development Plan for Building Permit approval.

If I can be of further assistance, please feel free to contact me at 768-3622.

Sincerely,

Lisa Ann Manwill
Engineering Assoc./Hyd.

c: Andrew Garcia
File

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Montgomery Storage Units ZONE ATLAS/DRNG,FILE#: F-21/1153

DRB #: ______ EPC #: ______ WORK ORDER #: ______

LEGAL DESCRIPTION: Lots A, B, D, E, G & H of Montgomery Partners

CITY ADDRESS: ______

ENGINEERING FIRM: Mark Goodwin & Associates, PA CONTACT: Gregory J. Krenik PE

ADDRESS: PO Box 90606 PHONE: 345-2010

OWNER: Web Wallace CONTACT: Jeff Newman

ADDRESS: 121 Tijeras NE, Suite 2000 PHONE: 242-1552

ARCHITECT: Ernest Ulibarri & Associates CONTACT: Jeff Newman

ADDRESS: 121 Tijeras NE, Suite 2000 PHONE: 242-1552

SURVEYOR: N/A CONTACT: ______

ADDRESS: ______ PHONE: ______

CONTRACTOR: N/A CONTACT: ______

ADDRESS: ______ PHONE: ______

TYPE OF SUBMITTAL:

- ___ DRAINAGE REPORT
- ___ DRAINAGE PLAN
- X CONCEPTUAL GRADING & DRAINAGE PLAN
- ___ GRADING PLAN
- ___ EROSION CONTROL PLAN
- ___ ENGINEER'S CERTIFICATION
- X OTHER – Drainage Calculations

PRE-DESIGN MEETING:

- X YES
- ___ NO
- X COPY PROVIDED

Stamped 4-23-96

CHECK TYPE OF APPROVAL SOUGHT:

- ___ SKETCH PLAT APPROVAL
- ___ PRELIMINARY PLAT APPROVAL
- ___ S. DEV. PLAN FOR SUB'D APPROVAL
- X S. DEV. PLAN FOR BLDG PERMIT APPROVAL
- ___ SECTOR PLAN APPROVAL
- ___ FINAL PLAT APPROVAL
- ___ FOUNDATION PERMIT APPROVAL
- ___ BUILDING PERMIT APPROVAL
- ___ CERTIFICATION OF OCCUPANCY APPROVAL
- ___ GRADING PERMIT APPROVAL
- ___ PAVING PERMIT APPROVAL
- ___ S.A.D. DRAINAGE REPORT
- ___ DRAINAGE REQUIREMENTS
- ___ OTHER ______ (Specify)

DATE SUBMITTED: 4-24-96

BY: [signature]

Gregory J. Krenik PE

[redacted]

MARK GOODWIN & ASSOCIATES
CONSULTING ENGINEERS

DRAINAGE CALCULATIONS

for

MONTGOMERY STORAGE UNITS

APR 24 1996

February 1996

GREGORY JAMES KRENIK
NEW MEXICO
11929
REGISTERED PROFESSIONAL ENGINEER
2-14-96

D. MARK GOODWIN & ASSOCIATES 4-24-96

D. Mark Goodwin & Associates, P.A.
Consulting Engineers and Surveyors

PROJECT Montgomery Storage Units
SUBJECT Drainage Calcs
BY GJK DATE 2-13-96
CHECKED ______ DATE ______
SHEET 1 OF ____

- THE TOTAL SITE CONSISTS OF 6.7042 ACRES.
- PER THE PREDESIGN CONFERENCE THIS SITE WILL BE ALLOWED 1 CFS./AC DISCHARGE = 6.704 CFS
- THE SITE IS DIVIDED INTO 5 BASINS.
- OFFSITE FLOWS FROM THE RESIDENTIAL BACK YARDS WILL BE ROUTED ALONG THE BACK OF THE NORTH ROW OF BUILDINGS TO THE WEST.
- THIS SITE DOES NOT LIE WITHIN A FLOOD PLAIN.
- RUNOFF OF THE SITE WILL BE HANDLED BY A SERIES OF PONDS WITH FINAL DISCHARGE TO THE STORMDRAIN IN MONTGOMERY.

* AREA I DRAINS THE WESTERN PORTION OF THE STORAGE UNIT PARCEL INTO A TRANSVERSE DRAIN THEN INTO THE POND B WHICH IS TIED TO POND A AND DISCHARGES TO POND C.

* AREA II DRAINS THE EASTERN PORTION OF THE STORAGE UNIT PARCEL TO AREA III

* AREA III DRAINS THE OFFICE AREA OF THE STORAGE UNIT PARCEL AND AREA II INTO POND A

* AREA IV DRAINS THE EASTERN OUT PARCEL INTO POND B

* AREA V DRAINS THE WESTERN TWO OUTPARCELS INTO POND C.

AREA II & III DRAIN TO POND A

AREA I & IV DRAIN TO POND B

AREA V DRAINS TO POND C

POND A DRAINS TO POND B (POND A & B ARE TIED TOGETHER)

POND B DRAINS TO POND C

POND C DISCHARGES TO MONTGOMERY STORM DRAIN

- FIND AREA THAT DRAIN TO EACH POND

	POND A	POND B	POND C
TOTAL AREA	1.5046 AC	2.9306 AC	2.2690 AC
GREEN AREA	13.92 %	5.17 %	16.25 %
TYPE "D"	86.08 %	94.83 %	83.75 %

- A PORTION OF AREA V will discharge directly OFFSITE TO THE MONTGOMERY ROADWAY. THIS IS BECAUSE THIS AREA CAN NOT DRAIN TO THE PONDS. THE LOW POINT OF THIS AREA IS BELOW THE BOTTOM OF THE POND C.

AREA = 0.4577 AC
GREEN AREA = 5,144 ft² = 25.80%
TYPE "D" = 14,793 ft² = 74.20%

THIS AREA WILL BE SUBTRACTED BASIN V

POND C

TOTAL AREA = 2.2690 − 0.4577 = 1.8113 AC
GREEN AREA = 16,060 − 5,144 = 10,916 ft² = 0.2506 AC = 13.84 %
TYPE "D" = 82,778 − 14,793 = 67,985 ft² = 1.5607 AC = 86.16 %

- POND A & B

TOTAL AREA = 4.4352 AC
GREEN AREA = 8.14 %
TYPE "D" = 91.86 %

P_1 = 2.17 in
P_6 = 2.65 in
P_{24} = 3.20 in } FOR ALL PONDS
DT = 0.03333 HR
TP = 0.1333 HR

- CONNECT POND A & B WITH 24" RCP

- SIZE OUTFALL FROM POND B TO POND C

ORIFICE FLOW

$Q = 0.6 A \sqrt{2gh}$ USE 4" PVC PIPE

ELEV	OUTFLOW
89	0
90	0.30
91	0.52
92	0.66
93	0.79
94	0.89

D. Mark Goodwin & Associates, P.A.
Consulting Engineers and Surveyors

PROJECT Montgomery Storage Units
SUBJECT Drainage Calcs
BY GK DATE 2-13-96
CHECKED ______ DATE ______
SHEET 3 OF ____

Revised 4-24-96

• SIZE PONDS

POND A & B

ELEV	AREA (SF)	STORAGE (AC-FT)
89	~~8210~~ 6694	0
90	~~8210~~ 6694	~~0.189~~ 0.154
91	~~8210~~ 6694	~~0.377~~ 0.307
92	~~8210~~ 6694	~~0.565~~ 0.461
93	~~8210~~ 6694	~~0.754~~ 0.615
94	~~8210~~ 6694	~~0.942~~ 0.768

POND C

ELEV	AREA (SF)	STORAGE (AC-FT)
86	~~2531~~ 2424	0
87	~~2531~~ 2424	~~0.058~~ 0.056
88	~~2531~~ 2424	~~0.116~~ 0.111
89	~~2531~~ 2424	~~0.174~~ 0.167
89.26	~~2531~~ 2424	~~0.232~~ 0.223

• SITE OUTFALL TO MONTGOMERY STORMDRAIN

USE 12" ORIFICE

$$Q = 0.6 A \sqrt{2gh}$$

ELEV	OUTFLOW
86	0
87	2.67
88	4.63
89	5.98
89.26	5.99

FROM HYMO OUTPUT SHEETS 4-9

	POND A+B	POND C
Peak Discharge	~~0.761 CFS~~ 0.849 CFS	~~4.552~~ CFS 4.668 CFS
Max Water ELEV	~~92.779~~ 93.586	~~87.960~~ 88.029

• FIND DIRECT DISCHARGE Q

USE INFO on sheet 2 FOR THE PORTION OF AREA V
FROM HYMO SHEETS 10-12
Q = 2.06 CFS

• TOTAL Q = 4.668 + 2.06 = 6.728 CFS ≈ 6.704 CFS OK

```
S ART                 TIME=0.0

*****
* ***   HYDROGRAPH FOR DISCHARGE FROM MONTGOMERY STORAGE PONDS
* ***   INTO STORM DRAIN IN MONTGOMERY BLVD. THIS HYDROGRAPH WILL
*****   COMBINE ALL THREE PONDS.
* ***

RAINFALL               TYPE=1 RAIN QUARTER=0.0 IN
                       RAIN ONE=2.17 IN RAIN SIX=2.65 IN
                       RAIN DAY=3.20 IN DT=0.03333 HR

COMPUTE NM HYD         ID=1 HYD NO=101 AREA=0.006930 SQ MI
                       PER A=0 PER B=8.14 PER C=0 PER D=91.86
                       TP=0.1333 HR MASS RAINFALL=-1
PRINT HYD              ID=1 CODE=1
*
*       ROUTE FLOW TO POND A & B
*
***** HYDROGRAPH FOR POND A & B
* *** RESERVOIR ROUTE THE DEVELOPED STORM
R JTE RESERVOIR       ID=2 HYD NO=102 INFLOW ID=1 CODE=24
                      OUTFLOW (CFS)      STORAGE(AC-FT)    ELEVATION(FT)
                         0.0                0.0                89.0
                         0.30               0.154              90.0
                         0.52               0.307              91.0
                         0.66               0.461              92.0
                         0.79               0.615              93.0
                         0.89               0.768              94.0


P INT HYD              ID=2 CODE=1
*
* ***WESTERN 2 OUTPARCELS
*
COMPUTE NM HYD         ID=3  HYD NO=103  AREA=0.002830 SQ MI
                       PER A=0 B=13.84 C=0 D=86.16
                       TP=0.1333 HR MASS RAINFALL=-1
P INT HYD              ID=3 CODE=1
*
A ) HYD                ID=4  HYD NO=104  ID=2  ID=3
P INT HYD              ID=4  CODE=1
*
* ROUTING THROUGH POND B FROM POND A
*
ROUTE RESERVOIR        ID=5  HYD NO=105  INFLOW ID=4  CODE=24
                       OUTFLOW(CFS)        STORAGE(AC-FT)      ELEVATION(FT)
                          0.0                 0.0                  86.0
                          2.67                0.056                87.0
                          4.63                0.111                88.0
                          5.98                0.167                89.0
                          5.99                0.223                89.26
PRINT HYD              ID=5  CODE=1
FINISH
```

AHYMO PROGRAM (AHYMO194) - AMAFCA Hydrologic Model - January, 1994
RUN DATE (MON/DAY/YR) = 04/24/1996
START TIME (HR:MIN:SEC) = 08:05:46   USER NO.= M_GOODWN.I01
INPUT FILE = MSU.DAT

START   TIME=0.0

*****

*****   HYDROGRAPH FOR DISCHARGE FROM MONTGOMERY STORAGE PONDS

*****   INTO STORM DRAIN IN MONTGOMERY BLVD. THIS HYDROGRAPH WILL

*****   COMBINE ALL THREE PONDS.

*****

RAINFALL   TYPE=1 RAIN QUARTER=0.0 IN

RAIN ONE=2.17 IN RAIN SIX=2.65 IN

RAIN DAY=3.20 IN DT=0.03333 HR

COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2
- PEAK AT 1.40 HR.

DT =   .033330 HOURS   END TIME =   5.999400 HOURS

.0000	.0029	.0059	.0090	.0121	.0153	.0186
.0219	.0253	.0288	.0324	.0361	.0398	.0437
.0477	.0518	.0560	.0604	.0649	.0696	.0744
.0794	.0845	.0899	.0955	.1013	.1075	.1138
.1206	.1277	.1351	.1411	.1476	.1544	.1691
.2020	.2527	.3255	.4248	.5554	.7219	.9292
1.1822	1.4170	1.5151	1.5979	1.6715	1.7385	1.8002
1.8575	1.9110	1.9611	2.0083	2.0529	2.0949	2.1347
2.1725	2.2082	2.2422	2.2744	2.3050	2.3127	2.3200
2.3268	2.3334	2.3398	2.3458	2.3517	2.3574	2.3628
2.3681	2.3733	2.3783	2.3831	2.3879	2.3925	2.3970
2.4014	2.4057	2.4099	2.4140	2.4180	2.4219	2.4258
2.4296	2.4333	2.4370	2.4406	2.4441	2.4476	2.4510
2.4544	2.4577	2.4610	2.4642	2.4674	2.4705	2.4736
2.4766	2.4796	2.4826	2.4855	2.4884	2.4913	2.4941
2.4969	2.4996	2.5023	2.5050	2.5077	2.5103	2.5129
2.5155	2.5181	2.5206	2.5231	2.5256	2.5280	2.5305
2.5329	2.5352	2.5376	2.5399	2.5423	2.5446	2.5468
2.5491	2.5513	2.5536	2.5558	2.5579	2.5601	2.5623

2.5644 2.5665 2.5686 2.5707 2.5727 2.5748 2.5768
2.5789 2.5809 2.5829 2.5848 2.5868 2.5888 2.5907
2.5926 2.5945 2.5964 2.5983 2.6002 2.6021 2.6039 6
2.6057 2.6076 2.6094 2.6112 2.6130 2.6148 2.6165
2.6183 2.6201 2.6218 2.6235 2.6252 2.6270 2.6287
2.6304 2.6320 2.6337 2.6354 2.6370 2.6387 2.6403
2.6419 2.6436 2.6452 2.6468 2.6484 2.6500

COMPUTE NM HYD ID=1 HYD NO=101 AREA=0.006930 SQ MI

PER A=0 PER B=8.14 PER C=0 PER D=91.86

TP=0.1333 HR MASS RAINFALL=-1

K = .072649HR TP = .133300HR K/TP RATIO = .545000 SHAPE
ONSTANT, N = 7.106420
UNIT PEAK = 25.133 CFS UNIT VOLUME = .9989 B = 526.28
P60 = 2.1700
AREA = .006366 SQ MI IA = .10000 INCHES INF = .04000 I
NCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT
= .033330

K = .134018HR TP = .133300HR K/TP RATIO = 1.005385 SHAPE
ONSTANT, N = 3.511218
UNIT PEAK = 1.3590 CFS UNIT VOLUME = .9902 B = 321.15
P60 = 2.1700
AREA = .000564 SQ MI IA = .50000 INCHES INF = 1.25000 I
NCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT
= .033330

PRINT HYD ID=1 CODE=1

PARTIAL HYDROGRAPH 101.00

RUNOFF VOLUME = 2.28557 INCHES = .8447 ACRE-FEET
PEAK DISCHARGE RATE = 21.71 CFS AT 1.500 HOURS BASIN AREA =
069 SQ. MI.

*

* ROUTE FLOW TO POND A & B

*

***** HYDROGRAPH FOR POND A & B

***** RESERVOIR ROUTE THE DEVELOPED STORM

ROUTE RESERVOIR ID=2 HYD NO=102 INFLOW ID=1 CODE=24

OUTFLOW (CFS)	STORAGE(AC-FT)	ELEVATION(FT)
0.0	0.0	89.0
0.30	0.154	90.0
0.52	0.307	91.0

0.66	0.461	92.0	
0.79	0.615	93.0	7
0.89	0.768	94.0	

* * * * * * * * * * * * * * * * *

TIME (HRS)	INFLOW (CFS)	ELEV (FEET)	VOLUME (AC-FT)	OUTFLOW (CFS)
.00	.00	89.00	.000	.00
.80	.00	89.00	.000	.00
1.60	14.97	91.57	.394	.60
2.40	1.00	93.58	.704	.85
3.20	.27	93.43	.681	.83
4.00	.19	93.17	.642	.81
4.80	.18	92.91	.601	.78
5.60	.18	92.66	.563	.75
6.40	.02	92.40	.523	.71
7.20	.00	92.11	.478	.67
8.00	.00	91.83	.434	.64
8.80	.00	91.56	.394	.60
9.60	.00	91.31	.355	.56
10.40	.00	91.08	.319	.53
11.20	.00	90.86	.285	.49
12.00	.00	90.66	.254	.44
12.80	.00	90.47	.226	.40
13.60	.00	90.31	.201	.37
14.40	.00	90.15	.178	.33
15.20	.00	90.02	.157	.30
16.00	.00	89.89	.138	.27
16.80	.00	89.79	.121	.24
17.60	.00	89.69	.106	.21
18.40	.00	89.61	.094	.18
19.20	.00	89.53	.082	.16

PEAK DISCHARGE = .849 CFS - PEAK OCCURS AT HOUR 2.47
MAXIMUM WATER SURFACE ELEVATION = 93.586
MAXIMUM STORAGE = .7046 AC-FT INCREMENTAL TIME= .033330HR
S

PRINT HYD ID=2 CODE=1

PARTIAL HYDROGRAPH 102.00

RUNOFF VOLUME = 2.08932 INCHES = .7722 ACRE-FEET
PEAK DISCHARGE RATE = .85 CFS AT 2.466 HOURS BASIN AREA =
.0069 SQ. MI.

*

*****WESTERN 2 OUTPARCELS

*

COMPUTE NM HYD ID=3 HYD NO=103 AREA=0.002830 SQ MI

PER A=0 B=13.84 C=0 D=86.16

TP=0.1333 HR MASS RAINFALL=-1

K = .072649HR TP = .133300HR K/TP RATIO = .545000 SHAPE
ONSTANT, N = 7.106420
UNIT PEAK = 9.6266 CFS UNIT VOLUME = .9982 B = 526.28
P60 = 2.1700
AREA = .002438 SQ MI IA = .10000 INCHES INF = .04000 I
CHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT
.033330

K = .134018HR TP = .133300HR K/TP RATIO = 1.005385 SHAPE
ONSTANT, N = 3.511218
UNIT PEAK = .94362 CFS UNIT VOLUME = .9851 B = 321.15
P60 = 2.1700
AREA = .000392 SQ MI IA = .50000 INCHES INF = 1.25000 I
CHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT
.033330

PRINT HYD ID=3 CODE=1

PARTIAL HYDROGRAPH 103.00

RUNOFF VOLUME = 2.20284 INCHES = .3325 ACRE-FEET
PEAK DISCHARGE RATE = 8.63 CFS AT 1.500 HOURS BASIN AREA =
0028 SQ. MI.

*

ADD HYD ID=4 HYD NO=104 ID=2 ID=3

PRINT HYD ID=4 CODE=1

PARTIAL HYDROGRAPH 104.00

RUNOFF VOLUME = 2.12221 INCHES = 1.1047 ACRE-FEET
PEAK DISCHARGE RATE = 9.05 CFS AT 1.500 HOURS BASIN AREA =
.0098 SQ. MI.

*

* ROUTING THROUGH POND B FROM POND A

*

ROUTE RESERVOIR ID=5 HYD NO=105 INFLOW ID=4 CODE=24

OUTFLOW(CFS)	STORAGE(AC-FT)	ELEVATION(FT)
0.0	0.0	86.0
2.67	0.056	87.0

4.63	0.111	88.0
5.98	0.167	89.0
5.99	0.223	89.26

9

* * * * * * * * * * * * * * * * *

TIME (HRS)	INFLOW (CFS)	ELEV (FEET)	VOLUME (AC-FT)	OUTFLOW (CFS)
.00	.00	86.00	.000	.00
.80	.00	86.00	.000	.00
1.60	6.58	87.90	.106	4.44
2.40	1.24	86.86	.048	2.30
3.20	.93	86.39	.022	1.03
4.00	.88	86.34	.019	.90
4.80	.85	86.32	.018	.86
5.60	.82	86.31	.017	.83
6.40	.72	86.28	.016	.76
7.20	.67	86.26	.014	.69
8.00	.64	86.24	.014	.65
8.80	.60	86.23	.013	.61
9.60	.56	86.22	.012	.57
10.40	.53	86.20	.011	.54
11.20	.49	86.19	.011	.50
12.00	.44	86.17	.010	.46
12.80	.40	86.16	.009	.42
13.60	.37	86.14	.008	.38
14.40	.33	86.13	.007	.34
15.20	.30	86.12	.007	.31
16.00	.27	86.10	.006	.28
16.80	.24	86.09	.005	.25
17.60	.21	86.08	.005	.22
18.40	.18	86.07	.004	.19
19.20	.16	86.06	.004	.17

PEAK DISCHARGE = 4.668 CFS - PEAK OCCURS AT HOUR 1.70
MAXIMUM WATER SURFACE ELEVATION = 88.029
MAXIMUM STORAGE = .1126 AC-FT INCREMENTAL TIME= .033330HR
S

PRINT HYD ID=5 CODE=1

PARTIAL HYDROGRAPH 105.00

RUNOFF VOLUME = 2.11628 INCHES = 1.1016 ACRE-FEET
PEAK DISCHARGE RATE = 4.67 CFS AT 1.700 HOURS BASIN AREA =
.0098 SQ. MI.

FINISH

NORMAL PROGRAM FINISH END TIME (HR:MIN:SEC) = 08:05:53

```
S  RT                   TIME=0.0
*  ** HYDROGRAPH FOR MONTGOMERY STORAGE - DIRECT DISCHARGE
RA NFALL                TYPE=1 RAIN QUARTER=0.0 IN
                        RAIN ONE=2.17 IN RAIN SIX=2.65 IN
                        RAIN DAY=3.20 IN DT=0.03333 HR
CO PUTE NM HYD          ID=1 HYD NO=101.1 AREA=0.000715 SQ MI
                        PER A=00.00 B=25.8 C=00 D=74.2
                        TP=0.1333 HR MASS RAINFALL=-1
PR NT HYD                ID=1 CODE=1
FINISH
```

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     AHYMO PROGRAM (AHYMO194) - AMAFCA Hydrologic Model - January, 1994
          RUN DATE (MON/DAY/YR) = 02/13/1996
          START TIME (HR:MIN:SEC) = 18:35:23     USER NO.= M_GOODWN.I01
          INPUT FILE = MSUOFF.DAT


 START                  TIME=0.0

 ***** HYDROGRAPH FOR MONTGOMERY STORAGE - DIRECT DISCHARGE

 RAINFALL               TYPE=1 RAIN QUARTER=0.0 IN

                        RAIN ONE=2.17 IN RAIN SIX=2.65 IN

                        RAIN DAY=3.20 IN DT=0.03333 HR


                    COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2
- PEAK AT 1.40 HR.
                    DT =     .033330 HOURS       END TIME =     5.999400 HOURS
                       .0000    .0029    .0059    .0090    .0121    .0153    .0186
                       .0219    .0253    .0288    .0324    .0361    .0398    .0437
                       .0477    .0518    .0560    .0604    .0649    .0696    .0744
                       .0794    .0845    .0899    .0955    .1013    .1075    .1138
                       .1206    .1277    .1351    .1411    .1476    .1544    .1691
                       .2020    .2527    .3255    .4248    .5554    .7219    .9292
                      1.1822   1.4170   1.5151   1.5979   1.6715   1.7385   1.8002
                      1.8575   1.9110   1.9611   2.0083   2.0529   2.0949   2.1347
                      2.1725   2.2082   2.2422   2.2744   2.3050   2.3127   2.3200
                      2.3268   2.3334   2.3398   2.3458   2.3517   2.3574   2.3628
                      2.3681   2.3733   2.3783   2.3831   2.3879   2.3925   2.3970
                      2.4014   2.4057   2.4099   2.4140   2.4180   2.4219   2.4258
                      2.4296   2.4333   2.4370   2.4406   2.4441   2.4476   2.4510
                      2.4544   2.4577   2.4610   2.4642   2.4674   2.4705   2.4736
                      2.4766   2.4796   2.4826   2.4855   2.4884   2.4913   2.4941
                      2.4969   2.4996   2.5023   2.5050   2.5077   2.5103   2.5129
                      2.5155   2.5181   2.5206   2.5231   2.5256   2.5280   2.5305
                      2.5329   2.5352   2.5376   2.5399   2.5423   2.5446   2.5468
                      2.5491   2.5513   2.5536   2.5558   2.5579   2.5601   2.5623
                      2.5644   2.5665   2.5686   2.5707   2.5727   2.5748   2.5768
                      2.5789   2.5809   2.5829   2.5848   2.5868   2.5888   2.5907
                      2.5926   2.5945   2.5964   2.5983   2.6002   2.6021   2.6039
                      2.6057   2.6076   2.6094   2.6112   2.6130   2.6148   2.6165
                      2.6183   2.6201   2.6218   2.6235   2.6252   2.6270   2.6287
                      2.6304   2.6320   2.6337   2.6354   2.6370   2.6387   2.6403
                      2.6419   2.6436   2.6452   2.6468   2.6484   2.6500

 COMPUTE NM HYD         ID=1 HYD NO=101.1 AREA=0.000715 SQ MI

                        PER A=00.00 B=25.8 C=00 D=74.2

                        TP=0.1333 HR MASS RAINFALL=-1


     K =    .072649HR     TP =    .133300HR     K/TP RATIO =    .545000     SHAPE
CONSTANT, N =   7.106420
     UNIT PEAK =    2.0946     CFS    UNIT VOLUME =    .9941        B =    526.28
```

P60 = 2.1700
AREA = .000531 SQ MI IA = .10000 INCHES INF = .04000 I
N HES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT
= .033330

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K = .134018HR TP = .133300HR K/TP RATIO = 1.005385 SHAPE
CONSTANT, N = 3.511218
UNIT PEAK = .44443 CFS UNIT VOLUME = .9682 B = 321.15
P60 = 2.1700
AREA = .000184 SQ MI IA = .50000 INCHES INF = 1.25000 I
N HES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT
= .033330

PRINT HYD ID=1 CODE=1

PARTIAL HYDROGRAPH 101.10

RUNOFF VOLUME = 2.02925 INCHES = .0774 ACRE-FEET
PEAK DISCHARGE RATE = 2.06 CFS AT 1.500 HOURS BASIN AREA =
.0007 SQ. MI.

FINISH

NORMAL PROGRAM FINISH END TIME (HR:MIN:SEC) = 18:35:30

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

DESIGN HYDROLOGY SECTION
123 Central NW, Albuquerque, NM 87102
(505) 766-7644

March 20, 1986

Ted Green
Easterling & Associates, Inc.
5643 Paradise Boulevard NW
Albuquerque, NM 87114

RE: CONCEPTUAL GRADING AND DRAINAGE PLAN SUBMITTAL OF CONTINENTAL SQUARE, RECEIVED 2/28/86 FOR SITE DEVELOPMENT PLAN APPROVAL (F21/D53)

Dear Ted:

The above referenced submittal dated 2/28/86, is approved for Site Development Plan.

I believe that the existing parcel contains 33' wide easements that will need to be incorporated or vacated when platting is done. A detailed Drainage Report will be required prior to platting actions and Building Permit release. Approved street grades for Pitt Street will also be required. If subject property was included within S.A.D. 204 boundary, then the S.A.D. 204 assessment must be paid within the 30 day cash pay period or liens paid, as a condition of Final Plat approval.

If the Rational Formula is to be used to calculate the peak flow rates, then the detailed Drainage Report will be evaluated using composite "C" values according to the DPM, which no longer recognizes "C" values determined as shown in your Conceptual Drainage Plan.

If you have any questions call me at 766-7644.

Sincerely,

Roger A Green, PE

Roger A. Green
Civil Engineer/Design Hydrology

RAG:mrk

cc: Ken Watkins, Continental West Development, 505 Marquette, Suite 1819, Albuquerque, NM

DRAINAGE INFORMATION SHEET

DD53

PROJECT TITLE: Montgomery Storage Units ZONE ATLAS/DRNG,FILE#: F-21

DRB #: 96-223 EPC #: ______ WORK ORDER #: ______

LEGAL DESCRIPTION: Lot A3-A of Montgomery Partners

CITY ADDRESS: 9831 Montgomery Blvd NE

ENGINEERING FIRM: Mark Goodwin & Associates, PA CONTACT: Gregory J. Krenik PE

ADDRESS: PO Box 90606 PHONE: 345-2010

OWNER: Web Wallace CONTACT: Jeff Newman

ADDRESS: 121 Tijeras NE, Suite 2000 PHONE: 242-1552

ARCHITECT: Ernest Ulibarri & Associates CONTACT: Jeff Newman

ADDRESS: 121 Tijeras NE, Suite 2000 PHONE: 242-1552

SURVEYOR: N/A CONTACT: ______

ADDRESS: ______ PHONE: ______

CONTRACTOR: N/A CONTACT: ______

ADDRESS: ______ PHONE: ______

TYPE OF SUBMITTAL:

- ___ DRAINAGE REPORT
- ___ DRAINAGE PLAN
- ___ CONCEPTUAL GRADING & DRAINAGE PLAN
- ___ GRADING PLAN
- ___ EROSION CONTROL PLAN
- X ENGINEER'S CERTIFICATION
- ___ OTHER

PRE-DESIGN MEETING:

- ___ YES
- ___ NO
- ___ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

- ___ SKETCH PLAT APPROVAL
- ___ PRELIMINARY PLAT APPROVAL
- ___ S. DEV. PLAN FOR SUB'D APPROVAL
- ___ S. DEV. PLAN FOR BLDG PERMIT APPROVAL
- ___ SECTOR PLAN APPROVAL
- ___ FINAL PLAT APPROVAL
- ___ FOUNDATION PERMIT APPROVAL
- ___ BUILDING PERMIT APPROVAL
- X CERTIFICATION OF OCCUPANCY APPROVAL
- ___ GRADING PERMIT APPROVAL
- ___ PAVING PERMIT APPROVAL
- ___ S.A.D. DRAINAGE REPORT
- ___ DRAINAGE REQUIREMENTS
- X OTHER Immediate Temp (Specify)

This request is only for the storage area since Phillips 66 & [illegible] already have their C.O's

30 day issued on 8-26-97 AB.

DATE SUBMITTED: 8-26-97

BY: [signature]

Gregory J. Krenik PE