

TECHNICAL INFORMATION REPORT

HEARTLAND MACHINE & ENGINEERING  
JOHNSON COUTY  
FRANKLIN, INDIANA  
HE PROJECT NO.: 113039

PREPARED FOR:  
TOM GOIN  
2848 N.GRAHAM RD.  
FRANKLIN, INDIANA 46131  
(317) 494-1415



A handwritten signature in black ink, appearing to read 'Ross O. Holloway', is written over a horizontal line.

DATED: May 16, 2013

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## **SECTION 1.0: INTRODUCTION**

The purpose of this project is to construct a new Office/Warehouse Building with an asphalt parking lot, concrete truck docks, and one entrance drive for Heartland Machine & Engineering located at 2848 N. Graham Rd. Franklin Indiana. The site is currently vacant and is covered in grass and a regional wet detention pond. This site is generally located on the northeast of Franklin just east of the U.S. 31 and west of I-65. More specifically, using the Indianapolis USGS 7.5 Minute Quadrangle Map in the Section 24 Township 15 North, Range 2 East, Marion County, Indiana. The scope of the work consists of analyzing existing site conditions, addressing specific problem areas identified during site inspections (if any), addressing known neighborhood concerns (if any), addressing zoning commitments related to storm water management, addressing downstream conditions/restrictions with a justification for the level of downstream analysis performed, and a brief description of the planned storm water management techniques which will be utilized to address these conditions.

### **Site History:**

The parcel has been a vacant lot ever since the development of Millers Flex Park

Flood zone designation figures have been included herein and a note has been placed upon the cover sheet of the construction documents.

The computer modeling for this project has been achieved with Pondpack Version 9 by Haestad Methods and Hydraflow Express by Intelisolve.

Estimation of storm water runoff for both existing and proposed drainage areas has been included herein. Within the runoff calculations the weighted curve numbers and runoff coefficient computations have been included herein. Time of concentration computation indication overland flow time, shallow concentrated flow time, and flow time in swale, gutter, pipe or channels have been included herein. All variables used within the stated calculations were taken from the City of Indianapolis, Stormwater Design and Construction Specifications Manual and for convenience some documentation is presented in within this report.

Erosion Control methods conform to the standards for the City of Franklin and the methods as stated in the Indiana Handbook of Erosion Control in Developing Areas. An erosion control plan has been produced to comply with Rule 5 (327 IAC 15-5) and is located within the construction documents. A copy of the NOI has been provided.

## **DESIGN CRITERIA**

### **Terrain and existing ground condition:**

The site is currently undeveloped.

The majority of the site slopes from the west to the east except the area adjacent to Canary Creek. Slopes average 0.50 – 3%.

### **Soil Types:**

See soils types on sheet C104.1

### **Overall Watershed:**

The site has three watersheds as labeled on the Existing Drainage Area Map Sheet EX-DA. The map shows EX-1 is 0.65 and is grass covered that sheet flows to Canary Creek EX-2 is 2.73 acres and consists of grass, asphalt drives, and a portion of Graham Rd. All of EX-2 drains to the existing detention pond. EX-3 is a grass berm along the south property line that drains to the south into a concrete paved side on the church property that conveys to the church's detention pond.

The masterplan drainage report for Millers Flex Space shows drainage area labeled Future West and is 1.35 acres and an area labeled Future East and is 5.75 acres. There was not a drainage basin map provided with the master plan drainage calculations. We have created a basin map showing the drainage areas used in the calculations and in Section 3 Masterplanned Hydrograph. Future west is the area that drains to Canary Creek and Future east is Lot 2 and Lot 3 and the Right-of-Way of Graham Rd. No construction will be done in the Future West drainage area. Franklin Engineering's calculations show a curve number of 88 for drainage area Future East. See Summary of Calculations for peak runoff rates.

The proposed drainage areas were calculated to show that the increase in impervious surface does not exceed the master planned curve number for the site. Drainage area PR-1 is the same as EX-1 and has no change. PR-2 and PR-3 both drain to the wet detention pond and have a curve number of 84. PR-2 drains to the proposed swale and was ran in a separate model to determine the time of concentration. The rational method was used to size the swale and calculations show the swale will handle the stormwater runoff. See Summary of calculations for peak runoff.

## **Summary of Calculations:**

### **Pre-Developed Runoff peak runoff rates:**

#### **EX-1:**

The peak storm for the 2-year was the 24 hr with 0.06 cfs.  
The peak storm for the 10-year was the 1 hr with 0.20 cfs.  
The peak storm for the 25-year was the 1 hr with 0.34 cfs.  
The peak storm for the 100-year was the 1 hr with 0.62 cfs.

#### **EX-2:**

The peak storm for the 2-year was the 2 hr with 0.49 cfs.  
The peak storm for the 10-year was the 1 hr with 1.81 cfs.  
The peak storm for the 25-year was the 1 hr with 2.71 cfs.  
The peak storm for the 100-year was the 1 hr with 4.41 cfs.

#### **EX-3:**

The peak storm for the 2-year was the 12 hr with 0.02 cfs.  
The peak storm for the 10-year was the 1 hr with 0.06 cfs.  
The peak storm for the 25-year was the 1 hr with 0.11 cfs.  
The peak storm for the 100-year was the 1 hr with 0.21 cfs.

### **Post-Developed peak runoff rates:**

#### **PR-1:**

The peak storm for the 2-year was the 24 hr with 0.06 cfs.  
The peak storm for the 10-year was the 1 hr with 0.20 cfs.  
The peak storm for the 25-year was the 1 hr with 0.34 cfs.  
The peak storm for the 100-year was the 1 hr with 0.62 cfs.

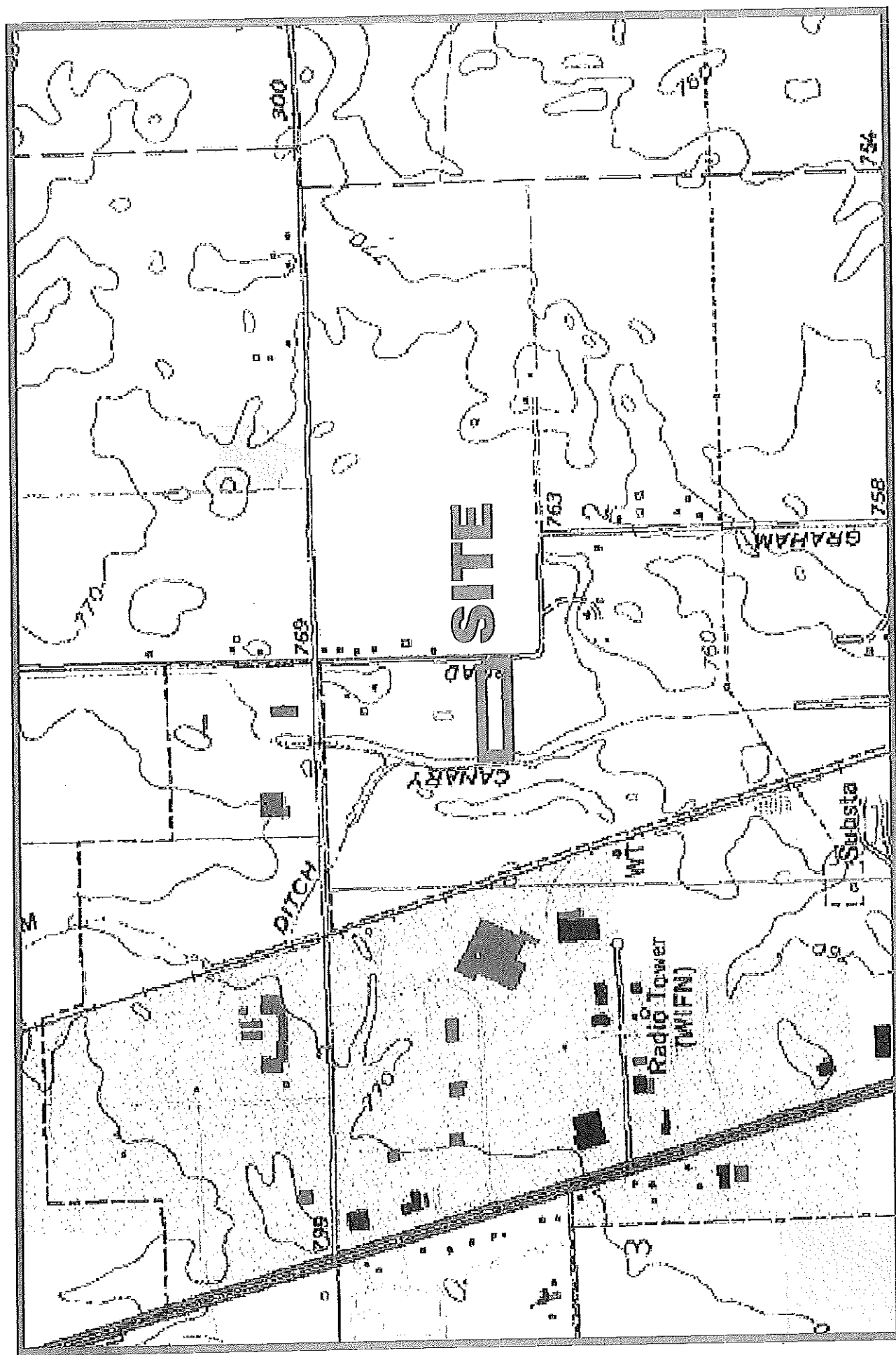
#### **PR-2 & 3:**

The peak storm for the 2-year was the 2 hr with 1.30 cfs.  
The peak storm for the 10-year was the 1 hr with 3.72 cfs.  
The peak storm for the 25-year was the 1 hr with 5.15 cfs.  
The peak storm for the 100-year was the 1 hr with 7.67 cfs.

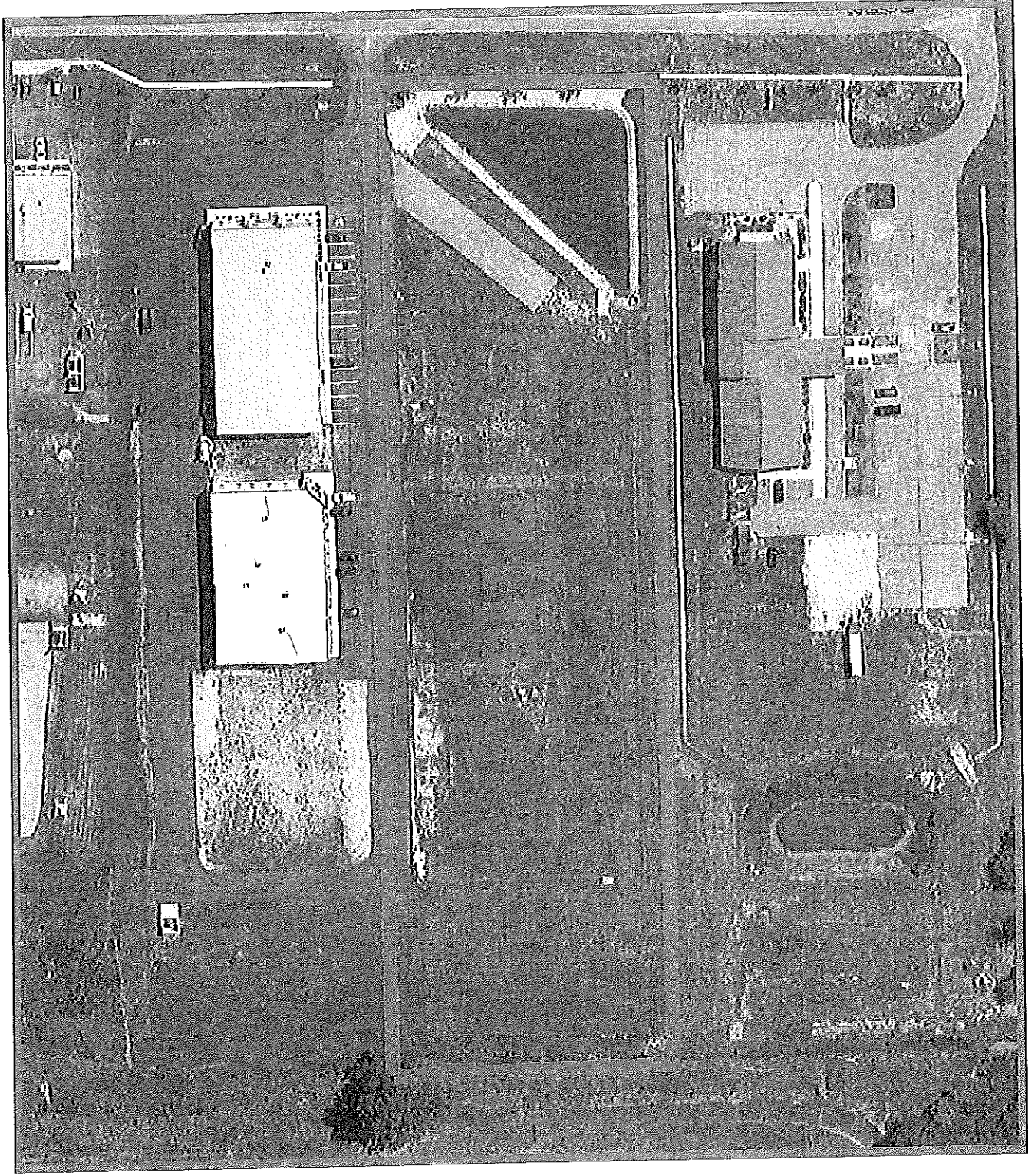
#### **PR-3:**

The peak storm for the 2-year was the 12 hr with 0.02 cfs.  
The peak storm for the 10-year was the 1 hr with 0.06 cfs.  
The peak storm for the 25-year was the 1 hr with 0.11 cfs.  
The peak storm for the 100-year was the 1 hr with 0.21 cfs.

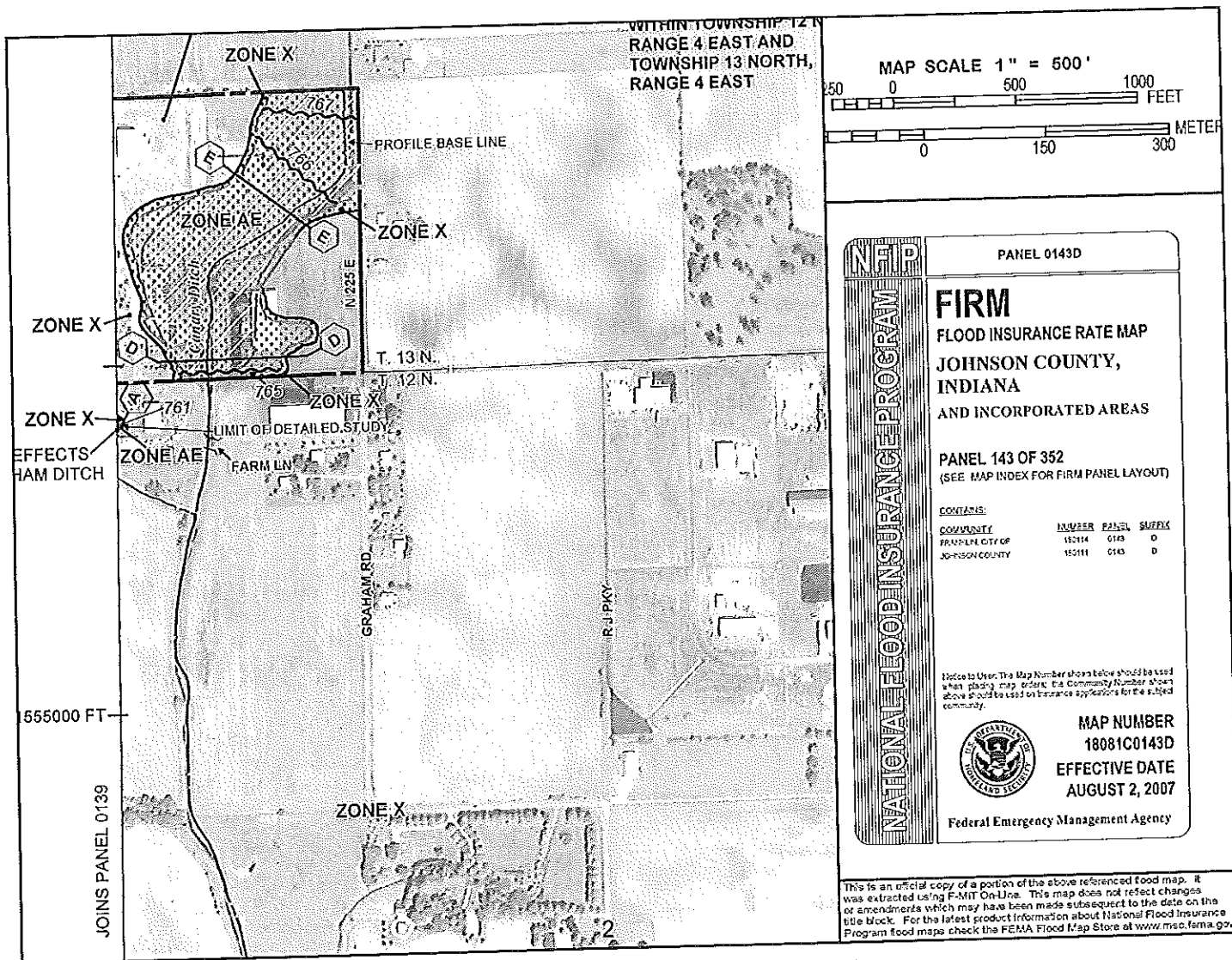
# **MAPS AND FLOOD INFORMATION**



QUAD MAP (NOT TO SCALE)



AERIAL MAP  
(NOT TO SCALE)



**MASTERPLAN**

**DRAINAGE**

**CALCULATIONS**

**(BY FRANKLIN ENGINEERING)**

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intellsolve

**Hyd. No. 4**

**FUTURE WEST**

Hydrograph type = SCS Runoff  
Storm frequency = 100 yrs  
Drainage area = 1.35 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 6.00 in  
Storm duration = 24 hrs

Peak discharge = 2.86 cfs  
Time interval = 6 min  
Curve number = 66  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 25 min  
Distribution = Type II  
Shape factor = 484

Hydrograph Volume = 11,958 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(min      cfs)**

702      0.29  
762      0.60

...End

# Hydrograph Summary Report

Page 1

| Hyd. No.                | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min)   | Time to peak (min) | Volume (cuft) | Inflow hyd(s)        | Maximum elevation (ft) | Maximum storage (cuft) | Hydrograph description |
|-------------------------|--------------------------|-----------------|-----------------------|--------------------|---------------|----------------------|------------------------|------------------------|------------------------|
| 1                       | SCS Runoff               | 13.24           | 6                     | 732                | 56,093        | ---                  | ---                    | ---                    | EXIST                  |
| 2                       | SCS Runoff               | 23.45           | 6                     | 726                | 96,554        | ---                  | ---                    | ---                    | FUTURE EAST            |
| 3                       | Reservoir                | 3.64            | 6                     | 762                | 96,442        | 2                    | 758.56                 | 55,281                 | DETENTION              |
| 4                       | SCS Runoff               | 2.86            | 6                     | 732                | 11,958        | ---                  | ---                    | ---                    | FUTURE WEST            |
| Proj. file: JMILLER.gpw |                          |                 | Return Period: 100 yr |                    |               | Run date: 03-22-2007 |                        |                        |                        |

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intellisolve

Hyd. No. 4

FUTURE WEST

Hydrograph type = SCS Runoff  
Storm frequency = 10 yrs  
Drainage area = 1.35 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 4.08 in  
Storm duration = 24 hrs

Peak discharge = 1.24 cfs  
Time interval = 6 min  
Curve number = 66  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 25 min  
Distribution = Type II  
Shape factor = 484

Hydrograph Volume = 5,557 cuft

## Hydrograph Discharge Table

Time -- Outflow  
(min      cfs)

|     |      |
|-----|------|
| 708 | 0.14 |
| 768 | 0.26 |
| 828 | 0.14 |

...End

# Hydrograph Summary Report

Page 1

| Hyd. No.                | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Volume (cuft)        | Inflow hyd(s) | Maximum elevation (ft) | Maximum storage (cuft) | Hydrograph description |
|-------------------------|--------------------------|-----------------|---------------------|--------------------|----------------------|---------------|------------------------|------------------------|------------------------|
| 1                       | SCS Runoff               | 5.27            | 6                   | 732                | 24,783               | ---           | ---                    | ---                    | EXIST                  |
| 2                       | SCS Runoff               | 14.40           | 6                   | 726                | 58,511               | ---           | ---                    | ---                    | FUTURE EAST            |
| 3                       | Reservoir                | 0.57            | 6                   | 948                | 58,403               | 2             | 757.58                 | 40,953                 | DETENTION              |
| 4                       | SCS Runoff               | 1.24            | 6                   | 732                | 5,557                | ---           | ---                    | ---                    | FUTURE WEST            |
| Proj. file: JMILLER.gpw |                          |                 |                     |                    | Return Period: 10 yr |               |                        | Run date: 03-22-2007   |                        |

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intellsolve

Hyd. No. 4

FUTURE WEST

Hydrograph type = SCS Runoff  
Storm frequency = 2 yrs  
Drainage area = 1.35 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 2.64 in  
Storm duration = 24 hrs

Peak discharge = 0.31 cfs  
Time interval = 6 min  
Curve number = 66  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 25 min  
Distribution = Type II  
Shape factor = 484

Hydrograph Volume = 1,878 cuft

## Hydrograph Discharge Table

Time -- Outflow  
(min) cfs)

|     |      |
|-----|------|
| 714 | 0.05 |
| 774 | 0.09 |
| 834 | 0.05 |
| 894 | 0.04 |
| 954 | 0.03 |

...End

# Hydrograph Summary Report

| Hyd. No.                | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Volume (cuft)       | Inflow hyd(s) | Maximum elevation (ft) | Maximum storage (cuft) | Hydrograph description |
|-------------------------|--------------------------|-----------------|---------------------|--------------------|---------------------|---------------|------------------------|------------------------|------------------------|
| 1                       | SCS Runoff               | 1.01            | 6                   | 732                | 7,542               | ---           | ---                    | ---                    | EXIST                  |
| 2                       | SCS Runoff               | 7.71            | 6                   | 726                | 31,351              | ---           | ---                    | ---                    | FUTURE EAST            |
| 3                       | Reservoir                | 0.31            | 6                   | 966                | 31,274              | 2             | 756.01                 | 20,842                 | DETENTION              |
| 4                       | SCS Runoff               | 0.31            | 6                   | 732                | 1,878               | ---           | ---                    | ---                    | FUTURE WEST            |
| Proj. file: JMILLER.gpw |                          |                 |                     |                    | Return Period: 2 yr |               |                        | Run date: 03-22-2007   |                        |

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intellisolve

**Hyd. No. 4**

**FUTURE WEST**

Hydrograph type = SCS Runoff  
Storm frequency = 1 yrs  
Drainage area = 1.35 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 1.40 in  
Storm duration = 24 hrs

Peak discharge = 0.00 cfs  
Time interval = 6 min  
Curve number = 66  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 25 min  
Distribution = Type II  
Shape factor = 484

Hydrograph Volume = 121 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(min      cfs)**

|      |      |
|------|------|
| 768  | 0.00 |
| 828  | 0.00 |
| 888  | 0.00 |
| 948  | 0.00 |
| 1008 | 0.00 |
| 1068 | 0.00 |
| 1128 | 0.00 |
| 1188 | 0.00 |
| 1248 | 0.00 |
| 1308 | 0.00 |
| 1368 | 0.00 |
| 1428 | 0.00 |

...End

# Hydrograph Summary Report

| Hyd. No.                | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Volume (cuft)       | Inflow hyd(s) | Maximum elevation (ft) | Maximum storage (cuft) | Hydrograph description |
|-------------------------|--------------------------|-----------------|---------------------|--------------------|---------------------|---------------|------------------------|------------------------|------------------------|
| 1                       | SCS Runoff               | 0.00            | 6                   | 0                  | 0                   | ---           | ---                    | ---                    | EXIST                  |
| 2                       | SCS Runoff               | 2.52            | 6                   | 732                | 10,648              | ---           | ---                    | ---                    | FUTURE EAST            |
| 3                       | Reservoir                | 0.16            | 6                   | 918                | 10,596              | 2             | 754.63                 | 6,036                  | DETENTION              |
| 4                       | SCS Runoff               | 0.00            | 6                   | 924                | 121                 | ---           | ---                    | ---                    | FUTURE WEST            |
| Proj. file: JMILLER.gpw |                          |                 |                     |                    | Return Period: 1 yr |               |                        | Run date: 03-22-2007   |                        |

# Reservoir Report

Page 1

Hydraflow Hydrographs by Intellsolve

Reservoir No. 1 - POND

Pond Data

Bottom LxW = 135.0 x 67.5 ft Side slope = 3.0:1 Bottom elev. = 754.00 ft Depth = 5.00 ft

## Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|------------|----------------|---------------------|----------------------|----------------------|
| 0.00       | 754.00         | 9,113               | 0                    | 0                    |
| 0.25       | 754.25         | 9,419               | 2,316                | 2,316                |
| 0.50       | 754.50         | 9,729               | 2,393                | 4,710                |
| 0.75       | 754.75         | 10,044              | 2,472                | 7,181                |
| 1.00       | 755.00         | 10,364              | 2,551                | 9,732                |
| 1.25       | 755.25         | 10,688              | 2,631                | 12,363               |
| 1.50       | 755.50         | 11,016              | 2,713                | 15,076               |
| 1.75       | 755.75         | 11,349              | 2,796                | 17,872               |
| 2.00       | 756.00         | 11,687              | 2,879                | 20,751               |
| 2.25       | 756.25         | 12,029              | 2,964                | 23,715               |
| 2.50       | 756.50         | 12,375              | 3,050                | 26,766               |
| 2.75       | 756.75         | 12,726              | 3,138                | 29,903               |
| 3.00       | 757.00         | 13,082              | 3,226                | 33,129               |
| 3.25       | 757.25         | 13,442              | 3,315                | 36,444               |
| 3.50       | 757.50         | 13,806              | 3,406                | 39,850               |
| 3.75       | 757.75         | 14,176              | 3,498                | 43,348               |
| 4.00       | 758.00         | 14,549              | 3,590                | 46,938               |
| 4.25       | 758.25         | 14,927              | 3,684                | 50,622               |
| 4.50       | 758.50         | 15,309              | 3,779                | 54,402               |
| 4.75       | 758.75         | 15,696              | 3,876                | 58,277               |
| 5.00       | 759.00         | 16,088              | 3,973                | 62,250               |

## Culvert / Orifice Structures

|               | [A]      | [B]    | [C]  | [D]  |
|---------------|----------|--------|------|------|
| Rise in       | = 12.0   | 3.0    | 0.0  | 0.0  |
| Span in       | = 12.0   | 3.0    | 0.0  | 0.0  |
| No. Barrels   | = 1      | 1      | 0    | 0    |
| Invert El. ft | = 754.00 | 754.00 | 0.00 | 0.00 |
| Length ft     | = 550.0  | 0.5    | 0.0  | 0.0  |
| Slope %       | = 0.50   | 0.00   | 0.00 | 0.00 |
| N-Value       | = .013   | .013   | .000 | .000 |
| Orif. Coeff.  | = 0.60   | 0.60   | 0.00 | 0.00 |
| Multi-Stage   | = n/a    | Yes    | No   | No   |

## Weir Structures

|              | [A]    | [B]    | [C]  | [D]  |
|--------------|--------|--------|------|------|
| Crest Len ft | = 0.00 | 2.00   | 0.00 | 0.00 |
| Crest El. ft | = 0.00 | 757.58 | 0.00 | 0.00 |
| Weir Coeff.  | = 0.00 | 3.33   | 0.00 | 0.00 |
| Weir Type    | = --   | Rect   | --   | --   |
| Multi-Stage  | = No   | Yes    | No   | No   |

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

## Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Civ A cfs | Civ B cfs | Civ C cfs | Civ D cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | Total cfs |
|----------|--------------|--------------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|-----------|-----------|
| 0.00     | 0            | 754.00       | 0.00      | 0.00      | --        | --        | --       | 0.00     | --       | --       | --        | 0.00      |
| 0.25     | 2,316        | 754.25       | 0.09      | 0.08      | --        | --        | --       | 0.00     | --       | --       | --        | 0.08      |
| 0.50     | 4,710        | 754.50       | 0.15      | 0.13      | --        | --        | --       | 0.00     | --       | --       | --        | 0.13      |
| 0.75     | 7,181        | 754.75       | 0.18      | 0.18      | --        | --        | --       | 0.00     | --       | --       | --        | 0.18      |
| 1.00     | 9,732        | 755.00       | 0.21      | 0.21      | --        | --        | --       | 0.00     | --       | --       | --        | 0.21      |
| 1.25     | 12,363       | 755.25       | 0.24      | 0.24      | --        | --        | --       | 0.00     | --       | --       | --        | 0.24      |
| 1.50     | 15,076       | 755.50       | 0.27      | 0.27      | --        | --        | --       | 0.00     | --       | --       | --        | 0.27      |
| 1.75     | 17,872       | 755.75       | 0.30      | 0.29      | --        | --        | --       | 0.00     | --       | --       | --        | 0.29      |
| 2.00     | 20,751       | 756.00       | 0.34      | 0.31      | --        | --        | --       | 0.00     | --       | --       | --        | 0.31      |
| 2.25     | 23,715       | 756.25       | 0.34      | 0.33      | --        | --        | --       | 0.00     | --       | --       | --        | 0.33      |
| 2.50     | 26,766       | 756.50       | 0.38      | 0.35      | --        | --        | --       | 0.00     | --       | --       | --        | 0.35      |
| 2.75     | 29,903       | 756.75       | 0.38      | 0.37      | --        | --        | --       | 0.00     | --       | --       | --        | 0.37      |
| 3.00     | 33,129       | 757.00       | 0.39      | 0.39      | --        | --        | --       | 0.00     | --       | --       | --        | 0.39      |
| 3.25     | 36,444       | 757.25       | 0.42      | 0.41      | --        | --        | --       | 0.00     | --       | --       | --        | 0.41      |
| 3.50     | 39,850       | 757.50       | 0.42      | 0.42      | --        | --        | --       | 0.00     | --       | --       | --        | 0.42      |
| 3.75     | 43,348       | 757.75       | 0.93      | 0.43      | --        | --        | --       | 0.47     | --       | --       | --        | 0.89      |
| 4.00     | 46,938       | 758.00       | 2.23      | 0.42      | --        | --        | --       | 1.81     | --       | --       | --        | 2.23      |
| 4.25     | 50,622       | 758.25       | 3.46      | 0.15      | --        | --        | --       | 3.30     | --       | --       | --        | 3.46      |
| 4.50     | 54,402       | 758.50       | 3.61      | 0.10      | --        | --        | --       | 3.51     | --       | --       | --        | 3.61      |
| 4.75     | 58,277       | 758.75       | 3.71      | 0.07      | --        | --        | --       | 3.63     | --       | --       | --        | 3.70      |
| 5.00     | 62,250       | 759.00       | 3.79      | 0.05      | --        | --        | --       | 3.73     | --       | --       | --        | 3.79      |

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intellsolve

Hyd. No. 3

DETENTION

Hydrograph type = Reservoir  
Storm frequency = 100 yrs  
Inflow hyd. No. = 2  
Max. Elevation = 758.56 ft

Peak discharge = 3.64 cfs  
Time interval = 6 min  
Reservoir name = POND  
Max. Storage = 55,281 cuft

Storage Indication method used.

Outflow hydrograph volume = 96,442 cuft

## Hydrograph Discharge Table

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | Clv D<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 780           | 2.61          | 758.55          | 3.63         | 0.09         | -----        | -----        | -----       | 3.54        | -----       | -----       | -----        | 3.63           |
| 840           | 1.43          | 758.20          | 3.39         | 0.18         | -----        | -----        | -----       | 3.21        | -----       | -----       | -----        | 3.39           |
| 900           | 1.07          | 757.91          | 1.68         | 0.42         | -----        | -----        | -----       | 1.26        | -----       | -----       | -----        | 1.68           |
| 960           | 0.84          | 757.80          | 1.15         | 0.43         | -----        | -----        | -----       | 0.71        | -----       | -----       | -----        | 1.13           |
| 1020          | 0.71          | 757.74          | 0.90         | 0.43         | -----        | -----        | -----       | 0.45        | -----       | -----       | -----        | 0.87           |
| 1080          | 0.63          | 757.71          | 0.76         | 0.43         | -----        | -----        | -----       | 0.31        | -----       | -----       | -----        | 0.74           |
| 1140          | 0.54          | 757.68          | 0.65         | 0.43         | -----        | -----        | -----       | 0.22        | -----       | -----       | -----        | 0.65           |
| 1200          | 0.46          | 757.66          | 0.58         | 0.43         | -----        | -----        | -----       | 0.14        | -----       | -----       | -----        | 0.57           |
| 1260          | 0.42          | 757.63          | 0.53         | 0.43         | -----        | -----        | -----       | 0.07        | -----       | -----       | -----        | 0.50           |
| 1320          | 0.41          | 757.61          | 0.49         | 0.43         | -----        | -----        | -----       | 0.04        | -----       | -----       | -----        | 0.47           |
| 1380          | 0.39          | 757.60          | 0.46         | 0.43         | -----        | -----        | -----       | 0.02        | -----       | -----       | -----        | 0.44           |
| 1440          | 0.37          | 757.58          | 0.43         | 0.43         | -----        | -----        | -----       | 0.00        | -----       | -----       | -----        | 0.43           |
| 1500          | 0.00          | 757.43          | 0.42         | 0.42         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.42           |
| 1560          | 0.00          | 757.32          | 0.42         | 0.41         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.41           |
| 1620          | 0.00          | 757.21          | 0.42         | 0.40         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.40           |
| 1680          | 0.00          | 757.10          | 0.42         | 0.39         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.39           |
| 1740          | 0.00          | 756.99          | 0.39         | 0.39         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.39           |
| 1800          | 0.00          | 756.89          | 0.38         | 0.38         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.38           |
| 1860          | 0.00          | 756.78          | 0.38         | 0.37         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.37           |
| 1920          | 0.00          | 756.68          | 0.38         | 0.37         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.37           |

...End

# Reservoir Report

Page 1

Hydraflow Hydrographs by Intellsolve

Reservoir No. 1 - POND

## Pond Data

Bottom LxW = 135.0 x 67.5 ft Side slope = 3.0:1 Bottom elev. = 754.00 ft Depth = 5.00 ft

## Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|------------|----------------|---------------------|----------------------|----------------------|
| 0.00       | 754.00         | 9,113               | 0                    | 0                    |
| 0.25       | 754.25         | 9,419               | 2,316                | 2,316                |
| 0.50       | 754.50         | 9,729               | 2,393                | 4,710                |
| 0.75       | 754.75         | 10,044              | 2,472                | 7,181                |
| 1.00       | 755.00         | 10,364              | 2,551                | 9,732                |
| 1.25       | 755.25         | 10,688              | 2,631                | 12,363               |
| 1.50       | 755.50         | 11,016              | 2,713                | 15,076               |
| 1.75       | 755.75         | 11,349              | 2,796                | 17,872               |
| 2.00       | 756.00         | 11,687              | 2,879                | 20,751               |
| 2.25       | 756.25         | 12,029              | 2,964                | 23,715               |
| 2.50       | 756.50         | 12,375              | 3,050                | 26,766               |
| 2.75       | 756.75         | 12,726              | 3,138                | 29,903               |
| 3.00       | 757.00         | 13,082              | 3,226                | 33,129               |
| 3.25       | 757.25         | 13,442              | 3,315                | 36,444               |
| 3.50       | 757.50         | 13,808              | 3,406                | 39,850               |
| 3.75       | 757.75         | 14,175              | 3,498                | 43,348               |
| 4.00       | 758.00         | 14,549              | 3,590                | 46,938               |
| 4.25       | 758.25         | 14,927              | 3,684                | 50,622               |
| 4.50       | 758.50         | 15,309              | 3,779                | 54,402               |
| 4.75       | 758.75         | 15,696              | 3,876                | 58,277               |
| 5.00       | 759.00         | 16,088              | 3,973                | 62,250               |

## Culvert / Orifice Structures

|               | [A]      | [B]    | [C]  | [D]  |
|---------------|----------|--------|------|------|
| Rise In       | = 12.0   | 3.0    | 0.0  | 0.0  |
| Span In       | = 12.0   | 3.0    | 0.0  | 0.0  |
| No. Barrels   | = 1      | 1      | 0    | 0    |
| Invert El. ft | = 754.00 | 754.00 | 0.00 | 0.00 |
| Length ft     | = 550.0  | 0.5    | 0.0  | 0.0  |
| Slope %       | = 0.50   | 0.00   | 0.00 | 0.00 |
| N-Value       | = .013   | .013   | .000 | .000 |
| Orif. Coeff.  | = 0.60   | 0.60   | 0.00 | 0.00 |
| Multi-Stage   | = n/a    | Yes    | No   | No   |

## Weir Structures

|              | [A]    | [B]    | [C]  | [D]  |
|--------------|--------|--------|------|------|
| Crest Len ft | = 0.00 | 2.00   | 0.00 | 0.00 |
| Crest El. ft | = 0.00 | 757.58 | 0.00 | 0.00 |
| Weir Coeff.  | = 0.00 | 3.33   | 0.00 | 0.00 |
| Weir Type    | = ---  | Rect   | ---  | ---  |
| Multi-Stage  | = No   | Yes    | No   | No   |

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

## Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Civ A cfs | Civ B cfs | Civ C cfs | Civ D cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | Total cfs |
|----------|--------------|--------------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|-----------|-----------|
| 0.00     | 0            | 754.00       | 0.00      | 0.00      | ---       | ---       | ---      | 0.00     | ---      | ---      | ---       | 0.00      |
| 0.25     | 2,316        | 754.25       | 0.09      | 0.08      | ---       | ---       | ---      | 0.00     | ---      | ---      | ---       | 0.08      |
| 0.50     | 4,710        | 754.50       | 0.15      | 0.13      | ---       | ---       | ---      | 0.00     | ---      | ---      | ---       | 0.13      |
| 0.75     | 7,181        | 754.75       | 0.18      | 0.18      | ---       | ---       | ---      | 0.00     | ---      | ---      | ---       | 0.18      |
| 1.00     | 9,732        | 755.00       | 0.21      | 0.21      | ---       | ---       | ---      | 0.00     | ---      | ---      | ---       | 0.21      |
| 1.25     | 12,363       | 755.25       | 0.24      | 0.24      | ---       | ---       | ---      | 0.00     | ---      | ---      | ---       | 0.24      |
| 1.50     | 15,076       | 755.50       | 0.27      | 0.27      | ---       | ---       | ---      | 0.00     | ---      | ---      | ---       | 0.27      |
| 1.75     | 17,872       | 755.75       | 0.30      | 0.29      | ---       | ---       | ---      | 0.00     | ---      | ---      | ---       | 0.29      |
| 2.00     | 20,751       | 756.00       | 0.34      | 0.31      | ---       | ---       | ---      | 0.00     | ---      | ---      | ---       | 0.31      |
| 2.25     | 23,715       | 756.25       | 0.34      | 0.33      | ---       | ---       | ---      | 0.00     | ---      | ---      | ---       | 0.33      |
| 2.50     | 26,768       | 756.50       | 0.38      | 0.35      | ---       | ---       | ---      | 0.00     | ---      | ---      | ---       | 0.35      |
| 2.75     | 29,903       | 756.75       | 0.38      | 0.37      | ---       | ---       | ---      | 0.00     | ---      | ---      | ---       | 0.37      |
| 3.00     | 33,129       | 757.00       | 0.39      | 0.39      | ---       | ---       | ---      | 0.00     | ---      | ---      | ---       | 0.39      |
| 3.25     | 36,444       | 757.25       | 0.42      | 0.41      | ---       | ---       | ---      | 0.00     | ---      | ---      | ---       | 0.41      |
| 3.50     | 39,850       | 757.50       | 0.42      | 0.42      | ---       | ---       | ---      | 0.00     | ---      | ---      | ---       | 0.42      |
| 3.75     | 43,348       | 757.75       | 0.93      | 0.43      | ---       | ---       | ---      | 0.47     | ---      | ---      | ---       | 0.89      |
| 4.00     | 46,938       | 758.00       | 2.23      | 0.42      | ---       | ---       | ---      | 1.81     | ---      | ---      | ---       | 2.23      |
| 4.25     | 50,622       | 758.25       | 3.46      | 0.15      | ---       | ---       | ---      | 3.30     | ---      | ---      | ---       | 3.46      |
| 4.50     | 54,402       | 758.50       | 3.61      | 0.10      | ---       | ---       | ---      | 3.51     | ---      | ---      | ---       | 3.61      |
| 4.75     | 58,277       | 758.75       | 3.71      | 0.07      | ---       | ---       | ---      | 3.63     | ---      | ---      | ---       | 3.70      |
| 5.00     | 62,250       | 759.00       | 3.79      | 0.05      | ---       | ---       | ---      | 3.73     | ---      | ---      | ---       | 3.79      |

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intelsolve

Hyd. No. 3

DETENTION

Hydrograph type = Reservoir  
Storm frequency = 10 yrs  
Inflow hyd. No. = 2  
Max. Elevation = 757.58 ft

Peak discharge = 0.57 cfs  
Time interval = 6 min  
Reservoir name = POND  
Max. Storage = 40,953 cuft

Storage indication method used.

Outflow hydrograph volume = 58,403 cuft

## Hydrograph Discharge Table

| Time (min) | Inflow cfs | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | Clv D cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | Outflow cfs |
|------------|------------|--------------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|-----------|-------------|
| 600        | 0.34       | 754.20       | 0.06      | 0.06      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.06        |
| 660        | 0.73       | 754.36       | 0.11      | 0.11      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.11        |
| 720        | 11.69      | 755.26       | 0.25      | 0.24      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.24        |
| 780        | 1.68       | 757.27       | 0.42      | 0.41      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.41        |
| 840        | 0.93       | 757.48       | 0.42      | 0.42      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.42        |
| 900        | 0.69       | 757.64       | 0.55      | 0.43      | -----     | -----     | -----    | 0.10     | -----    | -----    | -----     | 0.53        |
| 960        | 0.55       | 757.66       | 0.58      | 0.43      | -----     | -----     | -----    | 0.14     | -----    | -----    | -----     | 0.57        |
| 1020       | 0.46       | 757.64       | 0.55      | 0.43      | -----     | -----     | -----    | 0.10     | -----    | -----    | -----     | 0.53        |
| 1080       | 0.41       | 757.62       | 0.51      | 0.43      | -----     | -----     | -----    | 0.06     | -----    | -----    | -----     | 0.49        |
| 1140       | 0.36       | 757.60       | 0.47      | 0.43      | -----     | -----     | -----    | 0.02     | -----    | -----    | -----     | 0.45        |
| 1200       | 0.30       | 757.50       | 0.42      | 0.42      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.42        |
| 1260       | 0.28       | 757.46       | 0.42      | 0.42      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.42        |
| 1320       | 0.27       | 757.42       | 0.42      | 0.42      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.42        |
| 1380       | 0.26       | 757.38       | 0.42      | 0.41      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.41        |
| 1440       | 0.25       | 757.34       | 0.42      | 0.41      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.41        |
| 1500       | 0.00       | 757.25       | 0.42      | 0.41      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.41        |
| 1560       | 0.00       | 757.14       | 0.42      | 0.40      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.40        |
| 1620       | 0.00       | 757.03       | 0.40      | 0.39      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.39        |
| 1680       | 0.00       | 756.93       | 0.38      | 0.38      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.38        |
| 1740       | 0.00       | 756.82       | 0.38      | 0.38      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.38        |
| 1800       | 0.00       | 756.72       | 0.38      | 0.37      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.37        |
| 1860       | 0.00       | 756.61       | 0.38      | 0.36      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.36        |
| 1920       | 0.00       | 756.51       | 0.38      | 0.35      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.35        |
| 1980       | 0.00       | 756.41       | 0.34      | 0.34      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.34        |
| 2040       | 0.00       | 756.31       | 0.34      | 0.34      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.34        |
| 2100       | 0.00       | 756.21       | 0.34      | 0.33      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.33        |
| 2160       | 0.00       | 756.11       | 0.34      | 0.32      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.32        |
| 2220       | 0.00       | 756.01       | 0.34      | 0.31      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.31        |
| 2280       | 0.00       | 755.92       | 0.30      | 0.30      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.30        |
| 2340       | 0.00       | 755.82       | 0.30      | 0.30      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.30        |
| 2400       | 0.00       | 755.73       | 0.30      | 0.29      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.29        |
| 2460       | 0.00       | 755.64       | 0.30      | 0.28      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.28        |
| 2520       | 0.00       | 755.55       | 0.27      | 0.27      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.27        |
| 2580       | 0.00       | 755.47       | 0.26      | 0.26      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.26        |
| 2640       | 0.00       | 755.38       | 0.26      | 0.25      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.25        |
| 2700       | 0.00       | 755.30       | 0.26      | 0.24      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.24        |
| 2760       | 0.00       | 755.22       | 0.23      | 0.23      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.23        |
| 2820       | 0.00       | 755.14       | 0.23      | 0.23      | -----     | -----     | -----    | -----    | -----    | -----    | -----     | 0.23        |

Continues on next page...

## DETENTION

## Hydrograph Discharge Table

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | Clv D<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 2880          | 0.00          | 755.06          | 0.23         | 0.22         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.22           |
| 2940          | 0.00          | 754.99          | 0.21         | 0.21         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.21           |
| 3000          | 0.00          | 754.92          | 0.20         | 0.20         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.20           |
| 3060          | 0.00          | 754.85          | 0.20         | 0.19         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.19           |
| 3120          | 0.00          | 754.79          | 0.19         | 0.18         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.18           |
| 3180          | 0.00          | 754.72          | 0.17         | 0.17         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.17           |
| 3240          | 0.00          | 754.66          | 0.17         | 0.16         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.16           |
| 3300          | 0.00          | 754.60          | 0.16         | 0.15         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.15           |
| 3360          | 0.00          | 754.55          | 0.15         | 0.14         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.14           |
| 3420          | 0.00          | 754.50          | 0.15         | 0.13         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.13           |
| 3480          | 0.00          | 754.45          | 0.13         | 0.13         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.13           |
| 3540          | 0.00          | 754.40          | 0.13         | 0.12         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.12           |
| 3600          | 0.00          | 754.36          | 0.11         | 0.11         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.11           |
| 3660          | 0.00          | 754.32          | 0.11         | 0.10         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.10           |
| 3720          | 0.00          | 754.29          | 0.09         | 0.09         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.09           |
| 3780          | 0.00          | 754.25          | 0.09         | 0.08         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.08           |
| 3840          | 0.00          | 754.22          | 0.07         | 0.07         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.07           |
| 3900          | 0.00          | 754.20          | 0.06         | 0.06         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.06           |

...End

# Reservoir Report

Page 1

Hydraflow Hydrographs by Intellisolve

## Reservoir No. 1 - POND

### Pond Data

Bottom LxW = 135.0 x 67.5 ft Side slope = 3.0:1 Bottom elev. = 754.00 ft Depth = 5.00 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|------------|----------------|---------------------|----------------------|----------------------|
| 0.00       | 754.00         | 9,113               | 0                    | 0                    |
| 0.25       | 754.25         | 9,419               | 2,316                | 2,316                |
| 0.50       | 754.50         | 9,729               | 2,393                | 4,710                |
| 0.75       | 754.75         | 10,044              | 2,472                | 7,181                |
| 1.00       | 755.00         | 10,364              | 2,551                | 9,732                |
| 1.25       | 755.25         | 10,688              | 2,631                | 12,363               |
| 1.50       | 755.50         | 11,018              | 2,713                | 15,076               |
| 1.75       | 755.75         | 11,349              | 2,796                | 17,872               |
| 2.00       | 756.00         | 11,687              | 2,879                | 20,751               |
| 2.25       | 756.25         | 12,029              | 2,964                | 23,715               |
| 2.50       | 756.50         | 12,375              | 3,050                | 26,766               |
| 2.75       | 756.75         | 12,726              | 3,138                | 29,903               |
| 3.00       | 757.00         | 13,082              | 3,226                | 33,129               |
| 3.25       | 757.25         | 13,442              | 3,315                | 36,444               |
| 3.50       | 757.50         | 13,806              | 3,406                | 39,850               |
| 3.75       | 757.75         | 14,175              | 3,498                | 43,348               |
| 4.00       | 758.00         | 14,549              | 3,590                | 46,938               |
| 4.25       | 758.25         | 14,927              | 3,684                | 50,622               |
| 4.50       | 758.50         | 15,309              | 3,779                | 54,402               |
| 4.75       | 758.75         | 15,698              | 3,876                | 58,277               |
| 5.00       | 759.00         | 16,088              | 3,973                | 62,250               |

### Culvert / Orifice Structures

|               | [A]      | [B]    | [C]  | [D]  |
|---------------|----------|--------|------|------|
| Rise In       | = 12.0   | 3.0    | 0.0  | 0.0  |
| Span In       | = 12.0   | 3.0    | 0.0  | 0.0  |
| No. Barrels   | = 1      | 1      | 0    | 0    |
| Invert El. ft | = 754.00 | 754.00 | 0.00 | 0.00 |
| Length ft     | = 550.0  | 0.5    | 0.0  | 0.0  |
| Slope %       | = 0.50   | 0.00   | 0.00 | 0.00 |
| N-Value       | = .013   | .013   | .000 | .000 |
| Orif. Coeff.  | = 0.60   | 0.60   | 0.00 | 0.00 |
| Multi-Stage   | = n/a    | Yes    | No   | No   |

### Weir Structures

|              | [A]    | [B]    | [C]  | [D]  |
|--------------|--------|--------|------|------|
| Crest Len ft | = 0.00 | 2.00   | 0.00 | 0.00 |
| Crest El. ft | = 0.00 | 757.58 | 0.00 | 0.00 |
| Weir Coeff.  | = 0.00 | 3.33   | 0.00 | 0.00 |
| Weir Type    | = —    | Rect   | —    | —    |
| Multi-Stage  | = No   | Yes    | No   | No   |

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

### Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Civ A cfs | Civ B cfs | Civ C cfs | Civ D cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | Total cfs |
|----------|--------------|--------------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|-----------|-----------|
| 0.00     | 0            | 754.00       | 0.00      | 0.00      | —         | —         | —        | 0.00     | —        | —        | —         | 0.00      |
| 0.25     | 2,316        | 754.25       | 0.09      | 0.08      | —         | —         | —        | 0.00     | —        | —        | —         | 0.08      |
| 0.50     | 4,710        | 754.50       | 0.15      | 0.13      | —         | —         | —        | 0.00     | —        | —        | —         | 0.13      |
| 0.75     | 7,181        | 754.75       | 0.18      | 0.18      | —         | —         | —        | 0.00     | —        | —        | —         | 0.18      |
| 1.00     | 9,732        | 755.00       | 0.21      | 0.21      | —         | —         | —        | 0.00     | —        | —        | —         | 0.21      |
| 1.25     | 12,363       | 755.25       | 0.24      | 0.24      | —         | —         | —        | 0.00     | —        | —        | —         | 0.24      |
| 1.50     | 15,076       | 755.50       | 0.27      | 0.27      | —         | —         | —        | 0.00     | —        | —        | —         | 0.27      |
| 1.75     | 17,872       | 755.75       | 0.30      | 0.29      | —         | —         | —        | 0.00     | —        | —        | —         | 0.29      |
| 2.00     | 20,751       | 756.00       | 0.34      | 0.31      | —         | —         | —        | 0.00     | —        | —        | —         | 0.31      |
| 2.25     | 23,715       | 756.25       | 0.34      | 0.33      | —         | —         | —        | 0.00     | —        | —        | —         | 0.33      |
| 2.50     | 26,766       | 756.50       | 0.38      | 0.35      | —         | —         | —        | 0.00     | —        | —        | —         | 0.35      |
| 2.75     | 29,903       | 756.75       | 0.38      | 0.37      | —         | —         | —        | 0.00     | —        | —        | —         | 0.37      |
| 3.00     | 33,129       | 757.00       | 0.39      | 0.39      | —         | —         | —        | 0.00     | —        | —        | —         | 0.39      |
| 3.25     | 36,444       | 757.25       | 0.42      | 0.41      | —         | —         | —        | 0.00     | —        | —        | —         | 0.41      |
| 3.50     | 39,850       | 757.50       | 0.42      | 0.42      | —         | —         | —        | 0.00     | —        | —        | —         | 0.42      |
| 3.75     | 43,348       | 757.75       | 0.93      | 0.43      | —         | —         | —        | 0.47     | —        | —        | —         | 0.89      |
| 4.00     | 46,938       | 758.00       | 2.23      | 0.42      | —         | —         | —        | 1.81     | —        | —        | —         | 2.23      |
| 4.25     | 50,622       | 758.25       | 3.46      | 0.15      | —         | —         | —        | 3.30     | —        | —        | —         | 3.46      |
| 4.50     | 54,402       | 758.50       | 3.61      | 0.10      | —         | —         | —        | 3.51     | —        | —        | —         | 3.61      |
| 4.75     | 58,277       | 758.75       | 3.71      | 0.07      | —         | —         | —        | 3.63     | —        | —        | —         | 3.70      |
| 5.00     | 62,250       | 759.00       | 3.79      | 0.05      | —         | —         | —        | 3.73     | —        | —        | —         | 3.79      |

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intellsolve

Hyd. No. 3

DETENTION

Hydrograph type = Reservoir  
Storm frequency = 2 yrs  
Inflow hyd. No. = 2  
Max. Elevation = 756.01 ft

Peak discharge = 0.31 cfs  
Time interval = 6 min  
Reservoir name = POND  
Max. Storage = 20,842 cuft

Storage Indication method used.

Outflow hydrograph volume = 31,274 cuft

## Hydrograph Discharge Table

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | Clv D<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 720           | 6.13          | 754.58          | 0.15         | 0.15         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.15           |
| 780           | 0.98          | 755.81          | 0.30         | 0.29         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.29           |
| 840           | 0.55          | 755.94          | 0.31         | 0.31         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.31           |
| 900           | 0.41          | 755.99          | 0.33         | 0.31         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.31           |
| 960           | 0.32          | 756.01          | 0.34         | 0.31         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.31           |
| 1020          | 0.28          | 756.00          | 0.34         | 0.31         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.31           |
| 1080          | 0.24          | 755.99          | 0.32         | 0.31         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.31           |
| 1140          | 0.21          | 755.96          | 0.31         | 0.31         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.31           |
| 1200          | 0.18          | 755.93          | 0.30         | 0.30         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.30           |
| 1260          | 0.17          | 755.89          | 0.30         | 0.30         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.30           |
| 1320          | 0.16          | 755.84          | 0.30         | 0.30         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.30           |
| 1380          | 0.15          | 755.80          | 0.30         | 0.29         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.29           |
| 1440          | 0.15          | 755.76          | 0.30         | 0.29         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.29           |
| 1500          | 0.00          | 755.68          | 0.30         | 0.28         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.28           |
| 1560          | 0.00          | 755.59          | 0.29         | 0.27         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.27           |
| 1620          | 0.00          | 755.50          | 0.27         | 0.27         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.27           |
| 1680          | 0.00          | 755.42          | 0.26         | 0.26         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.26           |
| 1740          | 0.00          | 755.33          | 0.26         | 0.25         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.25           |
| 1800          | 0.00          | 755.25          | 0.24         | 0.24         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.24           |
| 1860          | 0.00          | 755.17          | 0.23         | 0.23         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.23           |
| 1920          | 0.00          | 755.10          | 0.23         | 0.22         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.22           |
| 1980          | 0.00          | 755.02          | 0.23         | 0.21         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.21           |
| 2040          | 0.00          | 754.95          | 0.20         | 0.20         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.20           |
| 2100          | 0.00          | 754.88          | 0.20         | 0.19         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.19           |
| 2160          | 0.00          | 754.81          | 0.20         | 0.18         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.18           |
| 2220          | 0.00          | 754.75          | 0.18         | 0.18         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.18           |
| 2280          | 0.00          | 754.69          | 0.17         | 0.17         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.17           |
| 2340          | 0.00          | 754.63          | 0.17         | 0.16         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.16           |
| 2400          | 0.00          | 754.57          | 0.15         | 0.15         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.15           |
| 2460          | 0.00          | 754.52          | 0.15         | 0.14         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.14           |
| 2520          | 0.00          | 754.47          | 0.13         | 0.13         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.13           |
| 2580          | 0.00          | 754.42          | 0.13         | 0.12         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.12           |
| 2640          | 0.00          | 754.38          | 0.11         | 0.11         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.11           |
| 2700          | 0.00          | 754.34          | 0.11         | 0.10         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.10           |
| 2760          | 0.00          | 754.30          | 0.09         | 0.09         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.09           |
| 2820          | 0.00          | 754.27          | 0.09         | 0.09         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.09           |
| 2880          | 0.00          | 754.24          | 0.08         | 0.08         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.08           |
| 2940          | 0.00          | 754.21          | 0.07         | 0.07         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.07           |

Continues on next page...

## DETENTION

## Hydrograph Discharge Table

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Civ A<br>cfs | Civ B<br>cfs | Civ C<br>cfs | Civ D<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 3000          | 0.00          | 754.19          | 0.05         | 0.05         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.05           |
| 3060          | 0.00          | 754.17          | 0.05         | 0.05         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.05           |
| 3120          | 0.00          | 754.15          | 0.04         | 0.04         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.04           |
| 3180          | 0.00          | 754.14          | 0.03         | 0.03         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.03           |

...End

# Reservoir Report

Page 1

Reservoir No. 1 - POND

Hydraflow Hydrographs by Intellisolve

## Pond Data

Bottom LxW = 135.0 x 67.5 ft Side slope = 3.0:1 Bottom elev. = 754.00 ft Depth = 5.00 ft

## Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|------------|----------------|---------------------|----------------------|----------------------|
| 0.00       | 754.00         | 9,113               | 0                    | 0                    |
| 0.25       | 754.25         | 9,419               | 2,316                | 2,316                |
| 0.50       | 754.50         | 9,729               | 2,393                | 4,710                |
| 0.75       | 754.75         | 10,044              | 2,472                | 7,181                |
| 1.00       | 755.00         | 10,364              | 2,551                | 9,732                |
| 1.25       | 755.25         | 10,688              | 2,631                | 12,363               |
| 1.50       | 755.50         | 11,016              | 2,713                | 15,076               |
| 1.75       | 755.75         | 11,349              | 2,796                | 17,872               |
| 2.00       | 756.00         | 11,687              | 2,879                | 20,751               |
| 2.25       | 756.25         | 12,029              | 2,964                | 23,715               |
| 2.50       | 756.50         | 12,375              | 3,050                | 26,766               |
| 2.75       | 756.75         | 12,728              | 3,138                | 29,903               |
| 3.00       | 757.00         | 13,082              | 3,226                | 33,129               |
| 3.25       | 757.25         | 13,442              | 3,315                | 36,444               |
| 3.50       | 757.50         | 13,806              | 3,406                | 39,850               |
| 3.75       | 757.75         | 14,175              | 3,498                | 43,348               |
| 4.00       | 758.00         | 14,549              | 3,590                | 46,938               |
| 4.25       | 758.25         | 14,927              | 3,684                | 50,622               |
| 4.50       | 758.50         | 15,309              | 3,779                | 54,402               |
| 4.75       | 758.75         | 15,688              | 3,876                | 58,277               |
| 5.00       | 759.00         | 16,088              | 3,973                | 62,250               |

## Culvert / Orifice Structures

|               | [A]      | [B]    | [C]  | [D]  |
|---------------|----------|--------|------|------|
| Rise In       | = 12.0   | 3.0    | 0.0  | 0.0  |
| Span In       | = 12.0   | 3.0    | 0.0  | 0.0  |
| No. Barrels   | = 1      | 1      | 0    | 0    |
| Invert El. ft | = 754.00 | 754.00 | 0.00 | 0.00 |
| Length ft     | = 550.0  | 0.5    | 0.0  | 0.0  |
| Slope %       | = 0.50   | 0.00   | 0.00 | 0.00 |
| N-Value       | = .013   | .013   | .000 | .000 |
| Orif. Coeff.  | = 0.60   | 0.60   | 0.00 | 0.00 |
| Multi-Stage   | = n/a    | Yes    | No   | No   |

## Weir Structures

|              | [A]    | [B]    | [C]  | [D]  |
|--------------|--------|--------|------|------|
| Crest Len ft | = 0.00 | 2.00   | 0.00 | 0.00 |
| Crest El. ft | = 0.00 | 757.58 | 0.00 | 0.00 |
| Weir Coeff.  | = 0.00 | 3.33   | 0.00 | 0.00 |
| Weir Type    | = --   | Rect   | --   | --   |
| Multi-Stage  | = No   | Yes    | No   | No   |

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

## Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Civ A cfs | Civ B cfs | Civ C cfs | Civ D cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | Total cfs |
|----------|--------------|--------------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|-----------|-----------|
| 0.00     | 0            | 754.00       | 0.00      | 0.00      | --        | --        | --       | 0.00     | --       | --       | --        | 0.00      |
| 0.25     | 2,316        | 754.25       | 0.09      | 0.08      | --        | --        | --       | 0.00     | --       | --       | --        | 0.08      |
| 0.50     | 4,710        | 754.50       | 0.15      | 0.13      | --        | --        | --       | 0.00     | --       | --       | --        | 0.13      |
| 0.75     | 7,181        | 754.75       | 0.18      | 0.18      | --        | --        | --       | 0.00     | --       | --       | --        | 0.18      |
| 1.00     | 9,732        | 755.00       | 0.21      | 0.21      | --        | --        | --       | 0.00     | --       | --       | --        | 0.21      |
| 1.25     | 12,363       | 755.25       | 0.24      | 0.24      | --        | --        | --       | 0.00     | --       | --       | --        | 0.24      |
| 1.50     | 15,076       | 755.50       | 0.27      | 0.27      | --        | --        | --       | 0.00     | --       | --       | --        | 0.27      |
| 1.75     | 17,872       | 755.75       | 0.30      | 0.29      | --        | --        | --       | 0.00     | --       | --       | --        | 0.29      |
| 2.00     | 20,751       | 756.00       | 0.34      | 0.31      | --        | --        | --       | 0.00     | --       | --       | --        | 0.31      |
| 2.25     | 23,715       | 756.25       | 0.34      | 0.33      | --        | --        | --       | 0.00     | --       | --       | --        | 0.33      |
| 2.50     | 26,766       | 756.50       | 0.38      | 0.35      | --        | --        | --       | 0.00     | --       | --       | --        | 0.35      |
| 2.75     | 29,903       | 756.75       | 0.38      | 0.37      | --        | --        | --       | 0.00     | --       | --       | --        | 0.37      |
| 3.00     | 33,129       | 757.00       | 0.39      | 0.39      | --        | --        | --       | 0.00     | --       | --       | --        | 0.39      |
| 3.25     | 36,444       | 757.25       | 0.42      | 0.41      | --        | --        | --       | 0.00     | --       | --       | --        | 0.41      |
| 3.50     | 39,850       | 757.50       | 0.42      | 0.42      | --        | --        | --       | 0.00     | --       | --       | --        | 0.42      |
| 3.75     | 43,348       | 757.75       | 0.93      | 0.43      | --        | --        | --       | 0.47     | --       | --       | --        | 0.89      |
| 4.00     | 46,938       | 758.00       | 2.23      | 0.42      | --        | --        | --       | 1.81     | --       | --       | --        | 2.23      |
| 4.25     | 50,622       | 758.25       | 3.46      | 0.15      | --        | --        | --       | 3.30     | --       | --       | --        | 3.46      |
| 4.50     | 54,402       | 758.50       | 3.61      | 0.10      | --        | --        | --       | 3.51     | --       | --       | --        | 3.61      |
| 4.75     | 58,277       | 758.75       | 3.71      | 0.07      | --        | --        | --       | 3.63     | --       | --       | --        | 3.70      |
| 5.00     | 62,250       | 759.00       | 3.79      | 0.05      | --        | --        | --       | 3.73     | --       | --       | --        | 3.79      |

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intellsolve

Hyd. No. 3

DETENTION

Hydrograph type = Reservoir  
Storm frequency = 1 yrs  
Inflow hyd. No. = 2  
Max. Elevation = 754.63 ft

Peak discharge = 0.16 cfs  
Time interval = 6 min  
Reservoir name = POND  
Max. Storage = 6,036 cuft

Storage Indication method used.

Outflow hydrograph volume = 10,596 cuft

## Hydrograph Discharge Table

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | Clv D<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 720           | 1.83          | 754.12          | 0.03         | 0.02         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.02           |
| 780           | 0.38          | 754.57          | 0.15         | 0.15         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.15           |
| 840           | 0.22          | 754.62          | 0.17         | 0.16         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.16           |
| 900           | 0.17          | 754.63          | 0.17         | 0.16         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.16           |
| 960           | 0.13          | 754.63          | 0.17         | 0.16         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.16           |
| 1020          | 0.11          | 754.62          | 0.17         | 0.15         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.15           |
| 1080          | 0.10          | 754.60          | 0.15         | 0.15         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.15           |
| 1140          | 0.09          | 754.58          | 0.15         | 0.15         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.15           |
| 1200          | 0.08          | 754.56          | 0.15         | 0.15         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.15           |
| 1260          | 0.07          | 754.53          | 0.15         | 0.14         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.14           |
| 1320          | 0.07          | 754.51          | 0.15         | 0.14         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.14           |
| 1380          | 0.07          | 754.48          | 0.14         | 0.13         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.13           |
| 1440          | 0.06          | 754.46          | 0.13         | 0.13         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.13           |
| 1500          | 0.00          | 754.42          | 0.13         | 0.12         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.12           |
| 1560          | 0.00          | 754.38          | 0.11         | 0.11         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.11           |
| 1620          | 0.00          | 754.33          | 0.11         | 0.10         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.10           |
| 1680          | 0.00          | 754.30          | 0.09         | 0.09         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.09           |
| 1740          | 0.00          | 754.26          | 0.09         | 0.09         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.09           |
| 1800          | 0.00          | 754.23          | 0.08         | 0.08         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.08           |
| 1860          | 0.00          | 754.21          | 0.06         | 0.06         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.06           |
| 1920          | 0.00          | 754.18          | 0.05         | 0.05         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.05           |
| 1980          | 0.00          | 754.17          | 0.04         | 0.04         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.04           |
| 2040          | 0.00          | 754.15          | 0.04         | 0.04         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.04           |
| 2100          | 0.00          | 754.14          | 0.03         | 0.03         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.03           |
| 2160          | 0.00          | 754.12          | 0.03         | 0.03         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.03           |
| 2220          | 0.00          | 754.11          | 0.02         | 0.02         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.02           |
| 2280          | 0.00          | 754.11          | 0.02         | 0.02         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.02           |
| 2340          | 0.00          | 754.10          | 0.02         | 0.02         | -----        | -----        | -----       | -----       | -----       | -----       | -----        | 0.02           |
|               |               | 754.10          |              |              |              |              |             |             |             |             |              |                |

...End

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intellsolve

## Hyd. No. 2

### FUTURE EAST

Hydrograph type = SCS Runoff  
Storm frequency = 1 yrs  
Drainage area = 5.75 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 1.40 in  
Storm duration = 24 hrs

Peak discharge = 2.52 cfs  
Time interval = 6 min  
Curve number = 88  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 25 min  
Distribution = Type II  
Shape factor = 484

Hydrograph Volume = 10,648 cuft

### Hydrograph Discharge Table

Time -- Outflow  
(hrs      cfs)

|       |      |
|-------|------|
| 11.10 | 0.03 |
| 12.10 | 2.45 |
| 13.10 | 0.35 |
| 14.10 | 0.21 |
| 15.10 | 0.16 |
| 16.10 | 0.13 |
| 17.10 | 0.11 |
| 18.10 | 0.10 |
| 19.10 | 0.09 |
| 20.10 | 0.08 |
| 21.10 | 0.07 |
| 22.10 | 0.07 |
| 23.10 | 0.07 |
| 24.10 | 0.06 |

...End

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intellsolve

## Hyd. No. 2

### FUTURE EAST

Hydrograph type = SCS Runoff  
Storm frequency = 2 yrs  
Drainage area = 5.75 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 2.64 in  
Storm duration = 24 hrs

Peak discharge = 7.71 cfs  
Time interval = 6 min  
Curve number = 88  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 25 min  
Distribution = Type II  
Shape factor = 484

Hydrograph Volume = 31,351 cuft

### Hydrograph Discharge Table

Time -- Outflow  
(hrs cfs)

|       |      |
|-------|------|
| 9.50  | 0.08 |
| 10.50 | 0.18 |
| 11.50 | 0.54 |
| 12.50 | 3.31 |
| 13.50 | 0.70 |
| 14.50 | 0.45 |
| 15.50 | 0.37 |
| 16.50 | 0.29 |
| 17.50 | 0.26 |
| 18.50 | 0.23 |
| 19.50 | 0.20 |
| 20.50 | 0.17 |
| 21.50 | 0.16 |
| 22.50 | 0.16 |
| 23.50 | 0.15 |

...End

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intellsolve

## Hyd. No. 1

EXIST

Hydrograph type = SCS Runoff  
Storm frequency = 2 yrs  
Drainage area = 7.10 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 2.64 in  
Storm duration = 24 hrs

Peak discharge = 1.01 cfs  
Time interval = 6 min  
Curve number = 63  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 25 min  
Distribution = Type II  
Shape factor = 484

Hydrograph Volume = 7,542 cuft

## Hydrograph Discharge Table

Time -- Outflow  
(hrs) cfs)

|       |      |
|-------|------|
| 11.90 | 0.10 |
| 12.90 | 0.37 |
| 13.90 | 0.22 |
| 14.90 | 0.17 |
| 15.90 | 0.14 |
| 16.90 | 0.13 |
| 17.90 | 0.11 |
| 18.90 | 0.10 |
| 19.90 | 0.09 |
| 20.90 | 0.08 |
| 21.90 | 0.08 |
| 22.90 | 0.08 |
| 23.90 | 0.08 |

...End

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intellisolve

## Hyd. No. 2

### FUTURE EAST

Hydrograph type = SCS Runoff  
Storm frequency = 10 yrs  
Drainage area = 5.75 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 4.08 in  
Storm duration = 24 hrs

Peak discharge = 14.40 cfs  
Time interval = 6 min  
Curve number = 88  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 25 min  
Distribution = Type II  
Shape factor = 484

Hydrograph Volume = 58,511 cuft

### Hydrograph Discharge Table

Time -- Outflow  
(hrs cfs)

|       |      |
|-------|------|
| 8.40  | 0.14 |
| 9.40  | 0.27 |
| 10.40 | 0.45 |
| 11.40 | 1.08 |
| 12.40 | 8.55 |
| 13.40 | 1.26 |
| 14.40 | 0.79 |
| 15.40 | 0.63 |
| 16.40 | 0.50 |
| 17.40 | 0.44 |
| 18.40 | 0.39 |
| 19.40 | 0.33 |
| 20.40 | 0.29 |
| 21.40 | 0.27 |
| 22.40 | 0.26 |
| 23.40 | 0.25 |

...End

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intellisolve

## Hyd. No. 1

### EXIST :

Hydrograph type = SCS Runoff  
Storm frequency = 10 yrs  
Drainage area = 7.10 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 4.08 in  
Storm duration = 24 hrs

Peak discharge = 5.27 cfs  
Time interval = 6 min  
Curve number = 63  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 25 min  
Distribution = Type II  
Shape factor = 484

Hydrograph Volume = 24,783 cuft

## Hydrograph Discharge Table

### Time -- Outflow (hrs      cfs)

|       |      |
|-------|------|
| 11.70 | 0.08 |
| 12.70 | 1.39 |
| 13.70 | 0.67 |
| 14.70 | 0.48 |
| 15.70 | 0.39 |
| 16.70 | 0.32 |
| 17.70 | 0.29 |
| 18.70 | 0.26 |
| 19.70 | 0.22 |
| 20.70 | 0.20 |
| 21.70 | 0.19 |
| 22.70 | 0.19 |
| 23.70 | 0.18 |

...End

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intellisolve

Hyd. No. 2

FUTURE EAST

Hydrograph type = SCS Runoff  
Storm frequency = 100 yrs  
Drainage area = 5.75 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 6.00 in  
Storm duration = 24 hrs

Peak discharge = 23.45 cfs  
Time interval = 6 min  
Curve number = 88  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 25 min  
Distribution = Type II  
Shape factor = 484

Hydrograph Volume = 96,554 cuft

## Hydrograph Discharge Table

Time -- Outflow  
(hrs) (cfs)

|       |       |
|-------|-------|
| 7.30  | 0.24  |
| 8.30  | 0.34  |
| 9.30  | 0.57  |
| 10.30 | 0.85  |
| 11.30 | 1.76  |
| 12.30 | 18.16 |
| 13.30 | 2.08  |
| 14.30 | 1.26  |
| 15.30 | 1.00  |
| 16.30 | 0.78  |
| 17.30 | 0.68  |
| 18.30 | 0.60  |
| 19.30 | 0.52  |
| 20.30 | 0.44  |
| 21.30 | 0.42  |
| 22.30 | 0.40  |
| 23.30 | 0.39  |

...End

# Hydrograph Report

Page 1

Hydraflow Hydrographs by Intellsolve

## Hyd. No. 1

### EXIST

Hydrograph type = SCS Runoff  
Storm frequency = 100 yrs  
Drainage area = 7.10 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 6.00 in  
Storm duration = 24 hrs

Peak discharge = 13.24 cfs  
Time interval = 6 min  
Curve number = 63  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 25 min  
Distribution = Type II  
Shape factor = 484

Hydrograph Volume = 56,093 cuft

## Hydrograph Discharge Table

### Time -- Outflow (hrs cfs)

|       |       |
|-------|-------|
| 11.10 | 0.14  |
| 12.10 | 12.89 |
| 13.10 | 1.86  |
| 14.10 | 1.11  |
| 15.10 | 0.87  |
| 16.10 | 0.69  |
| 17.10 | 0.60  |
| 18.10 | 0.53  |
| 19.10 | 0.47  |
| 20.10 | 0.40  |
| 21.10 | 0.37  |
| 22.10 | 0.36  |
| 23.10 | 0.35  |
| 24.10 | 0.31  |

...End

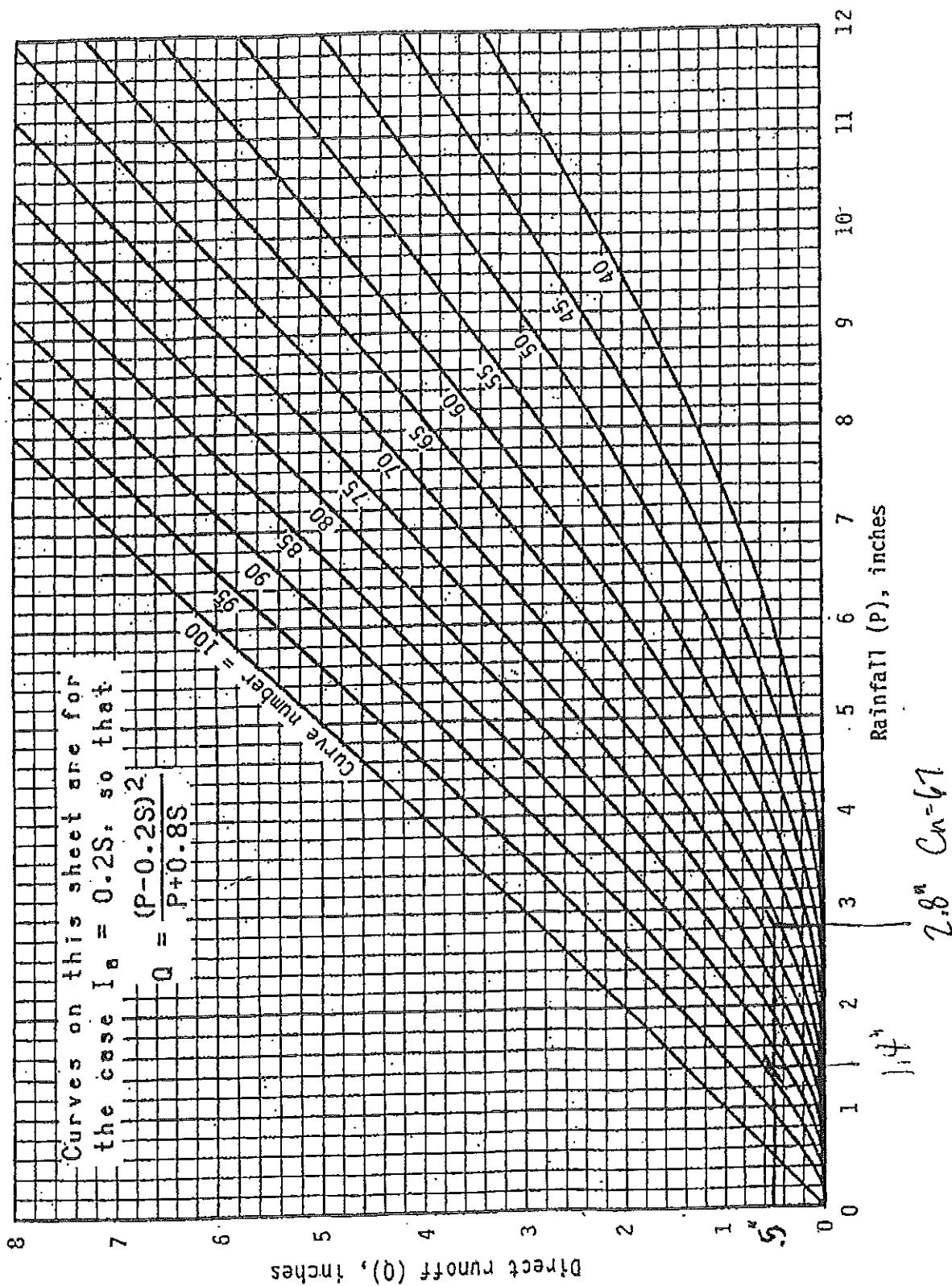


Figure 2-1.—Solution of runoff equation.

Table 3.9 Curve Numbers for Various Cover and Soil Types [AMC=II] (NEH-4)

| LAND USE DESCRIPTION                                      | HYDROLOGIC SOIL GROUP             |       |       |    |
|-----------------------------------------------------------|-----------------------------------|-------|-------|----|
|                                                           | A                                 | B     | C     | D  |
| Cultivated land: without conservation treatment           | 72                                | 81    | 88    | 91 |
| : with conservation treatment                             | 62                                | 71    | 78    | 81 |
| Pasture or range land: poor condition                     | 68                                | 79    | 86    | 89 |
| : good condition                                          | 39                                | 61    | 74    | 80 |
| Meadow: good condition                                    | 30                                | 58    | 71    | 78 |
| Wood or Forest land: thin stand, poor cover,<br>no mulch  | 45                                | 66    | 77    | 83 |
| : good cover                                              | 25                                | 55    | 70    | 77 |
| Open spaces: lawns, parks, golf courses, cemeteries, etc. |                                   |       |       |    |
| good condition: grass cover on 75% or more<br>of the area | 39                                | 61    | 74    | 80 |
| fair condition: grass cover on 50% to 75%<br>of the area  | 49                                | 69    | 79    | 84 |
| Commercial and business areas (85% impervious)            | 89                                | 92    | 94    | 95 |
| Industrial districts (72% impervious)                     | 81                                | 88    | 91    | 93 |
| Residential: <sup>1</sup>                                 | Average % Impervious <sup>2</sup> |       |       |    |
| Average lot size                                          |                                   |       |       |    |
| 1/8 acre or less                                          | 65                                | 77    | 85    | 90 |
| 1/4 acre                                                  | 38                                | 61    | 75    | 83 |
| 1/3 acre                                                  | 30                                | 57    | 72    | 81 |
| 1/2 acre                                                  | 25                                | 54    | 70    | 80 |
| 1 acre                                                    | 20                                | 51    | 68    | 79 |
| Paved parking lots, roofs, driveways, etc. <sup>3</sup>   | 96                                | 98    | 98    | 98 |
| Streets and roads:                                        |                                   |       |       |    |
| paved with curbs and storm sewers <sup>3</sup>            | 98                                | 98    | 98    | 98 |
| gravel                                                    | 76                                | 85    | 89    | 91 |
| dirt                                                      | 72                                | 82    | 87    | 89 |
| Urban areas:                                              |                                   |       |       |    |
| Low density (15-18% impervious surfaces)                  | 69-71                             | 75-78 | 82-84 | 86 |
| Medium density (21-27% impervious surfaces)               | 71-73                             | 77-80 | 84-86 | 88 |
| High density (50-75% impervious surfaces)                 | 73-75                             | 79-82 | 86-88 | 90 |

<sup>1</sup>Curve numbers are computed assuming the runoff from the house and driveway is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur.

<sup>2</sup>The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

<sup>3</sup>In some warmer climates of the country a curve number of 95 may be used.

5.25 AC. EST. FUTURE: 4 @ 98 = 392

1.75 @ 66 = 115.5

507.5 = Cn = 88

R. 4 E.

607.0" 40" C"

(cont sheet 16)

Mo 01

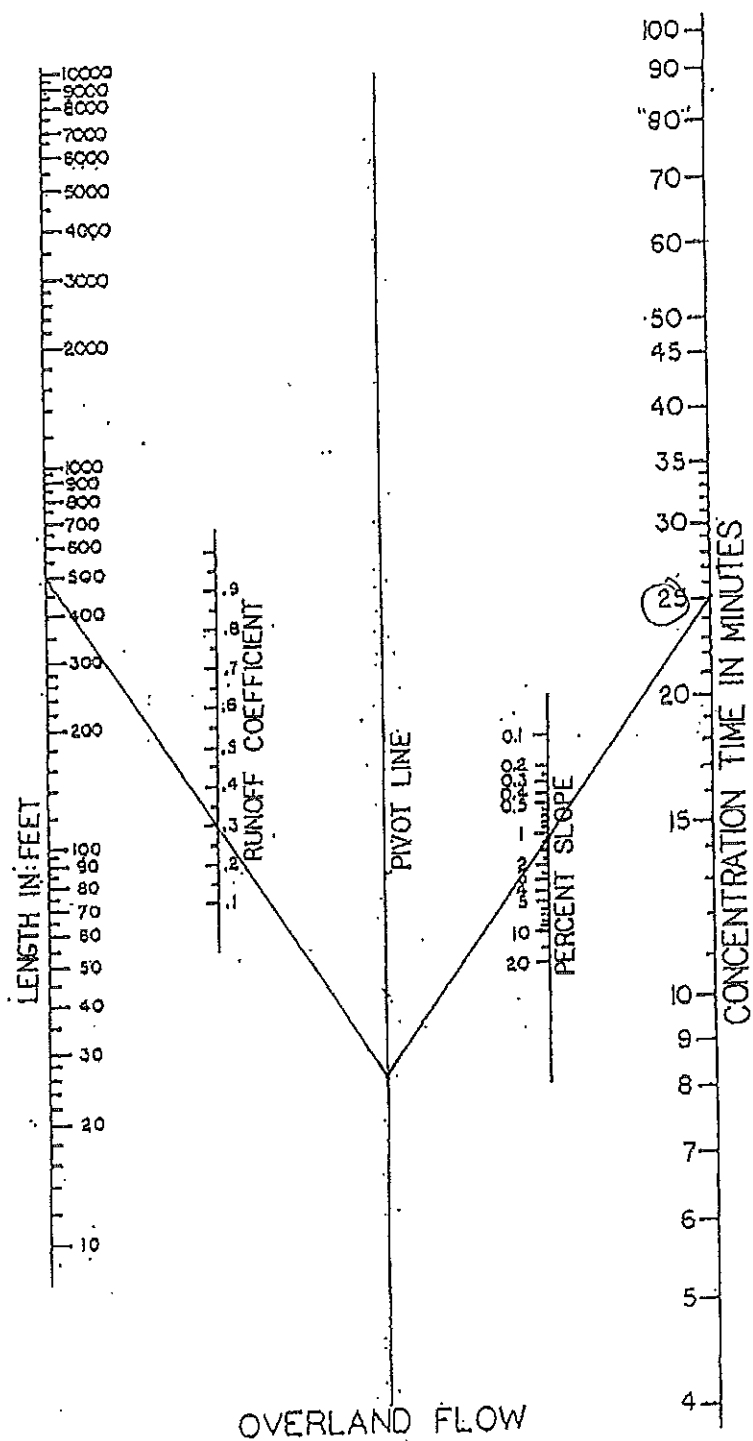


30007111

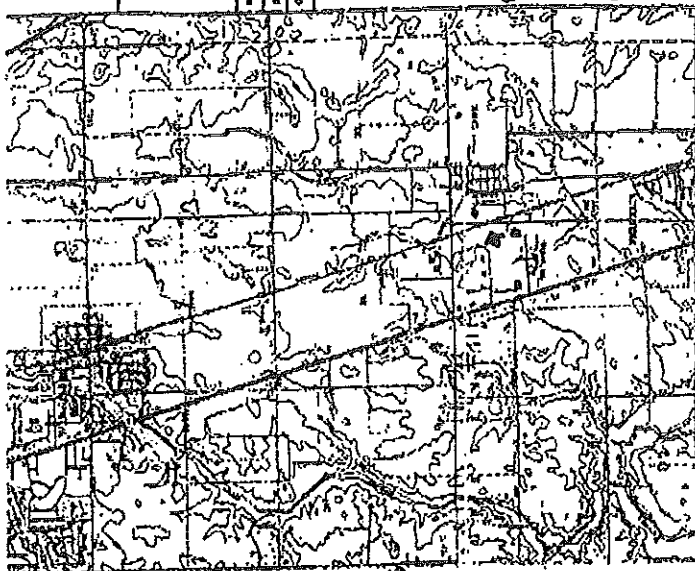
(cont sheet 23)

# OVERLAND FLOW AND RUN-OFF COEFFICIENT

FIGURE 5.3

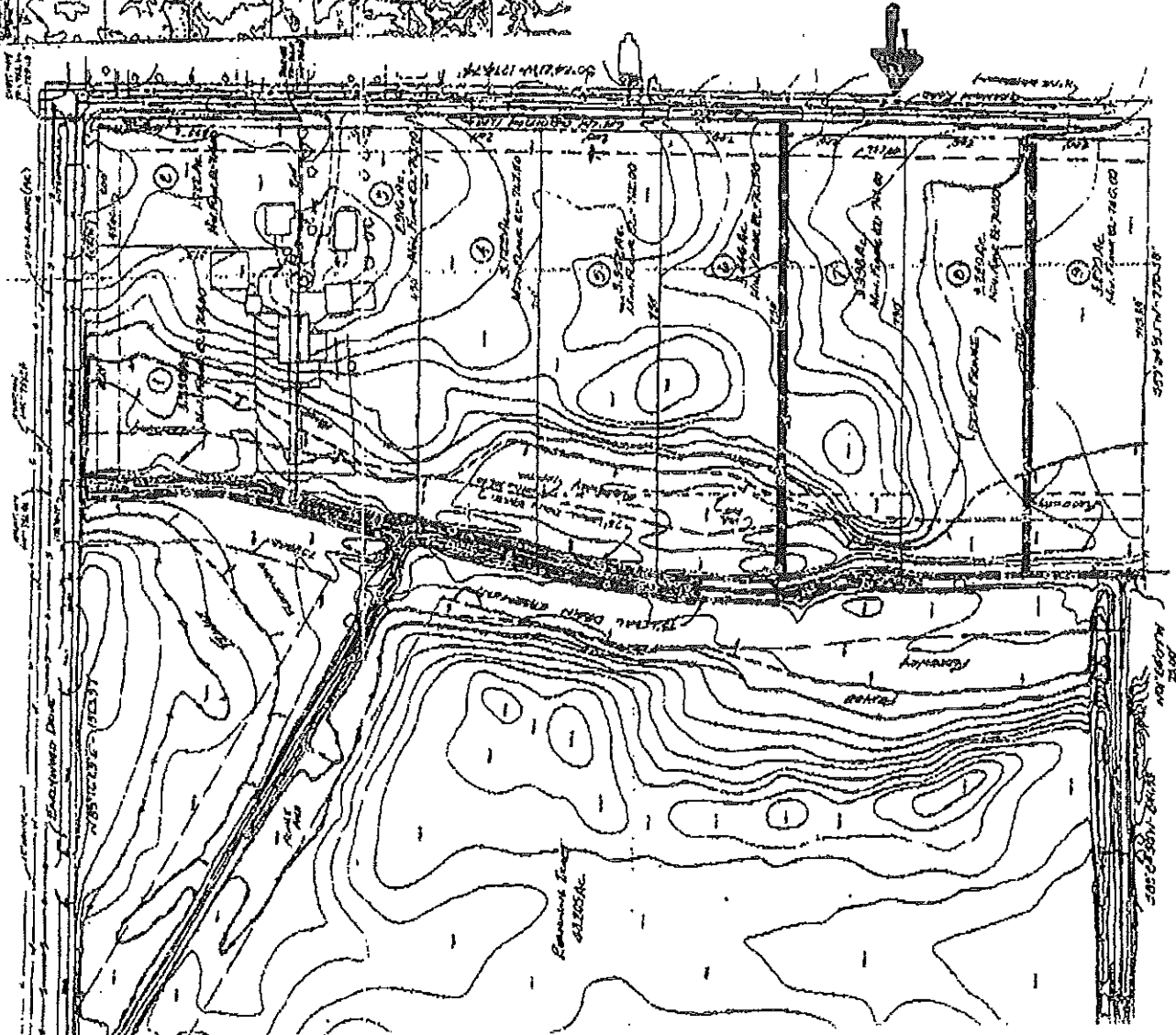


|                                                                                                                                            |                  |                                                                                                           |                   |
|--------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------------------------------------------------|-------------------|
| <b>Franklin Engineering Company</b><br>Engineers and Land Surveyors<br>111 West Jefferson Road<br>Honolulu, Hawaii 96813<br>(813) 722-2222 |                  | <b>SKETCH PLAN</b><br><b>LIWHILE PROPERTY</b><br><b>CITY OF HONOLULU</b><br><b>JOHNSON COUNTY, HAWAII</b> |                   |
| DATE                                                                                                                                       | 10/1/77          | BY                                                                                                        | W. J. [Signature] |
| PROJECT                                                                                                                                    | LIWHILE PROPERTY | SCALE                                                                                                     | AS SHOWN          |



THIS SKETCH PLAN was prepared by the undersigned, a duly Licensed Professional Engineer and Land Surveyor, on the basis of a field survey conducted on or about the 1st day of October, 1977, and is subject to the provisions of the Professional Engineers and Land Surveyors Act, Chapter 911, Hawaii Revised Statutes, and the rules and regulations of the Board of Professional Engineers and Land Surveyors, Chapter 911-1, Hawaii Administrative Rules. The undersigned hereby certifies that the information furnished to him by the owner of the property is true and correct, and that the sketch plan is a true and correct representation of the property as surveyed and shown on the map.

*W. J. [Signature]*  
 W. J. [Signature]  
 Professional Engineer and Land Surveyor  
 License No. 12345  
 State of Hawaii



**DRAINAGE REPORT**  
**MILLER FLEX SPACE**  
**7.1 ACRES**  
**MARCH 22, 2007**

The 7.1 acre site drains southeasterly overland and then southwesterly to Canary Ditch. Sites north and south have self-contained drainage systems with detention yielding no offsite flows. The site is 60% Type "B" soils and 40% Type "C" soils, yielding a net Cn for the meadow condition of 63. Existing predevelopment flows are as follows:

$$Q_2 \approx 1.01 \text{ cfs}$$

$$Q_{10} \approx 5.27 \text{ cfs}$$

We will construct a 1/4 acre detention pond at the southeast corner of the site with a restrictive outlet structure and pipe west above the south property line to Canary Ditch. We will use 550 LF of 12" RCP as the 100 year outlet with a 3" orifice in the front of the box for a 10 year outlet reducing flows as follows:

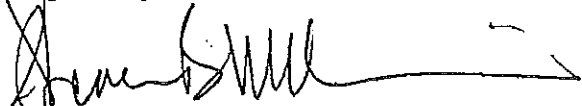
$$Q_{100} = 3.64 \text{ cfs}$$

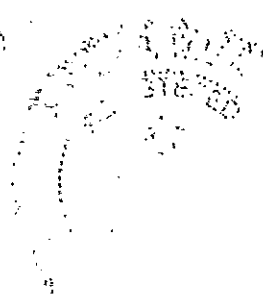
$$Q_{10} = 0.57 \text{ cfs}$$

The pond will reach an elevation of 758.56 in a 100 year storm storing 55,281 cft. Top of bank will be 759.00 with a 758.56 overflow. Mean W.L. is 754.00. In a 1/2" direct runoff, the peak occurs at 918 minutes with 6036 cft stored and 24 hours later 926 cft or 15% is retained.

I do not recommend a low flow outlet less than 3" in diameter.

Prepared by:

  
Steven B. Williams

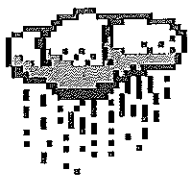


**EXISTING**

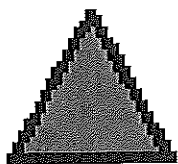
**DRAINAGE AREA**

**HYDROGRAPH**

EX-1



Addlink 10

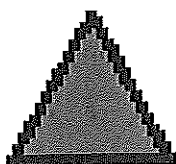


Out 10

EX-2



Addlink 20

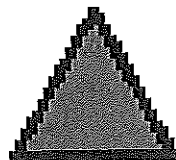


Out 20

EX-3



Addlink 30



Out 30

Type.... Runoff CN-Area

Name.... EX-1

File.... L:\HE DATA FILE\HE113\113039\D113039\PRE.ppw

RUNOFF CURVE NUMBER DATA

.....

| Soil/Surface Description          | CN | Area<br>acres | Impervious<br>Adjustment |     | Adjusted<br>CN |
|-----------------------------------|----|---------------|--------------------------|-----|----------------|
|                                   |    |               | %C                       | %UC |                |
| Grass-B-Soil                      | 69 | .650          |                          |     | 69.00          |
| COMPOSITE AREA & WEIGHTED CN ---> |    | .650          |                          |     | 69.00 (69)     |

.....

Type.... Tc Calcs

Page 1.01

Name.... EX-1

File.... L:\HE DATA FILE\HE113\113039\D113039\PRE.ppw

.....  
TIME OF CONCENTRATION CALCULATOR  
.....

-----  
Segment #1: Tc: TR-55 Sheet

Mannings n           .2400  
Hydraulic Length   147.50 ft  
2yr, 24hr P        2.6400 in  
Slope               .078300 ft/ft

Avg.Velocity        .20 ft/sec

Segment #1 Time:    12.42 min  
-----

=====  
Total Tc:           12.42 min  
=====

Type.... Tc Calcs

Page 1.02

Name.... EX-1

File.... L:\HE DATA FILE\HE113\113039\D113039\PRE.ppw

---

-----  
Tc Equations used...  
-----

==== SCS TR-55 Sheet Flow =====

$$Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))$$

Where: Tc = Time of concentration, hrs  
n = Mannings n  
Lf = Flow length, ft  
P = 2yr, 24hr Rain depth, inches  
Sf = Slope, %

Type.... Runoff CN-Area

Page 2.02

Name.... EX-2

File.... L:\HE DATA FILE\HE113\113039\D113039\PRE.ppw

RUNOFF CURVE NUMBER DATA

.....

| Soil/Surface Description | CN | Area<br>acres | Impervious<br>Adjustment |     | Adjusted<br>CN |
|--------------------------|----|---------------|--------------------------|-----|----------------|
|                          |    |               | %C                       | %UC |                |
| Ex .Pond                 | 98 | .270          |                          |     | 98.00          |
| Impervious               | 98 | .350          |                          |     | 98.00          |
| Grass-B-Soils            | 69 | 1.830         |                          |     | 69.00          |
| Grass-C-Soils            | 79 | .280          |                          |     | 79.00          |

COMPOSITE AREA & WEIGHTED CN --->                      2.730                      76.61 (77)  
.....

Type.... Tc Calcs  
Name.... EX-2

Page 1.03

File.... L:\HE DATA FILE\HE113\113039\D113039\PRE.ppw

::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::  
TIME OF CONCENTRATION CALCULATOR  
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

-----  
Segment #1: Tc: TR-55 Sheet

Mannings n           .2400  
Hydraulic Length    58.50 ft  
2yr, 24hr P        2.6400 in  
Slope               .035900 ft/ft

Avg.Velocity        .12 ft/sec

Segment #1 Time:     8.10 min  
-----

Segment #2: Tc: TR-55 Sheet

Mannings n           .0110  
Hydraulic Length    313.00 ft  
2yr, 24hr P        2.6400 in  
Slope               .006200 ft/ft

Avg.Velocity        .98 ft/sec

Segment #2 Time:     5.31 min  
-----

=====  
Total Tc:            13.41 min  
=====

Type.... Tc Calcs

Page 1.04

Name.... EX-2

File.... L:\HE DATA FILE\HE113\113039\D113039\PRE.ppw

---

-----  
Tc Equations used...  
-----

==== SCS TR-55 Sheet Flow =====

$$Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))$$

Where: Tc = Time of concentration, hrs  
n = Mannings n  
Lf = Flow length, ft  
P = 2yr, 24hr Rain depth, inches  
Sf = Slope, %

Type.... Runoff CN-Area  
Name.... EX-3

RUNOFF CURVE NUMBER DATA

.....

| Soil/Surface Description | CN | Area<br>acres | Impervious<br>Adjustment |     | Adjusted<br>CN |
|--------------------------|----|---------------|--------------------------|-----|----------------|
|                          |    |               | %C                       | %UC |                |
| Grass                    | 69 | .190          |                          |     | 69.00          |

COMPOSITE AREA & WEIGHTED CN ---> .190 69.00 (69)  
.....

Type.... Tc Calcs

Page 1.05

Name.... EX-3

File.... L:\HE DATA FILE\HE113\113039\D113039\PRE.ppw

---

.....  
TIME OF CONCENTRATION CALCULATOR  
.....

-----  
Segment #1: Tc: User Defined

Segment #1 Time: 5.00 min

-----  
Total Tc: 5.00 min  
=====

Type.... Tc Calcs

Page 1.06

Name.... EX-3

File.... L:\HE DATA FILE\HE113\113039\D113039\PRE.ppw

---

-----  
Tc Equations used...  
-----

==== User Defined =====

Tc = Value entered by user

Where: Tc = Time of concentration

## MASTER DESIGN STORM SUMMARY

Network Storm Collection: 0.5 HR

| Return Event | Total<br>Depth<br>in | Rainfall<br>Type | RNF ID        |
|--------------|----------------------|------------------|---------------|
| 2            | .9900                | Synthetic Curve  | 0-10 1stQ 50% |
| 10           | 1.5500               | Synthetic Curve  | 0-10 1stQ 50% |
| 25           | 1.8300               | Synthetic Curve  | 0-10 1stQ 50% |
| 100          | 2.2500               | Synthetic Curve  | 0-10 1stQ 50% |

MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| EX-1    | AREA | 2               | .000             |      | 33.00        | .01          |                |                              |
| EX-1    | AREA | 10              | .004             |      | 27.00        | .14          |                |                              |
| EX-1    | AREA | 25              | .009             |      | 21.00        | .25          |                |                              |
| EX-1    | AREA | 100             | .017             |      | 20.00        | .51          |                |                              |
| EX-2    | AREA | 2               | .010             |      | 29.00        | .33          |                |                              |
| EX-2    | AREA | 10              | .052             |      | 20.00        | 1.52         |                |                              |
| EX-2    | AREA | 25              | .082             |      | 19.00        | 2.42         |                |                              |
| EX-2    | AREA | 100             | .134             |      | 18.00        | 4.06         |                |                              |
| EX-3    | AREA | 2               | .000             |      | 27.00        | .00          |                |                              |
| EX-3    | AREA | 10              | .001             |      | 16.00        | .05          |                |                              |
| EX-3    | AREA | 25              | .003             |      | 15.00        | .09          |                |                              |
| EX-3    | AREA | 100             | .005             |      | 13.00        | .18          |                |                              |

MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversiion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| *OUT 10 | JCT  | 2               | .000             |      | 33.00        | .01          |                |                              |
| *OUT 10 | JCT  | 10              | .004             |      | 27.00        | .14          |                |                              |
| *OUT 10 | JCT  | 25              | .009             |      | 21.00        | .25          |                |                              |
| *OUT 10 | JCT  | 100             | .017             |      | 20.00        | .51          |                |                              |
| *OUT 20 | JCT  | 2               | .010             |      | 29.00        | .33          |                |                              |
| *OUT 20 | JCT  | 10              | .052             |      | 20.00        | 1.52         |                |                              |
| *OUT 20 | JCT  | 25              | .082             |      | 19.00        | 2.42         |                |                              |
| *OUT 20 | JCT  | 100             | .134             |      | 18.00        | 4.06         |                |                              |
| *OUT 30 | JCT  | 2               | .000             |      | 27.00        | .00          |                |                              |
| *OUT 30 | JCT  | 10              | .001             |      | 16.00        | .05          |                |                              |
| *OUT 30 | JCT  | 25              | .003             |      | 15.00        | .09          |                |                              |
| *OUT 30 | JCT  | 100             | .005             |      | 13.00        | .18          |                |                              |

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# MASTER DESIGN STORM SUMMARY

Network Storm Collection: 1.0 HR

| Return Event | Total<br>Depth<br>in | Rainfall<br>Type | RNF ID        |
|--------------|----------------------|------------------|---------------|
| 2            | 1.2500               | Synthetic Curve  | 0-10 1stQ 50% |
| 10           | 1.9600               | Synthetic Curve  | 0-10 1stQ 50% |
| 25           | 2.3100               | Synthetic Curve  | 0-10 1stQ 50% |
| 100          | 2.8800               | Synthetic Curve  | 0-10 1stQ 50% |

## MASTER NETWORK SUMMARY SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| EX-1    | AREA | 2               | .001             |      | 53.00        | .03          |                |                              |
| EX-1    | AREA | 10              | .011             |      | 32.00        | .20          |                |                              |
| EX-1    | AREA | 25              | .018             |      | 30.00        | .34          |                |                              |
| EX-1    | AREA | 100             | .033             |      | 25.00        | .62          |                |                              |
| EX-2    | AREA | 2               | .027             |      | 32.00        | .47          |                |                              |
| EX-2    | AREA | 10              | .097             |      | 27.00        | 1.81         |                |                              |
| EX-2    | AREA | 25              | .142             |      | 25.00        | 2.71         |                |                              |
| EX-2    | AREA | 100             | .225             |      | 24.00        | 4.41         |                |                              |
| EX-3    | AREA | 2               | .000             |      | 42.00        | .01          |                |                              |
| EX-3    | AREA | 10              | .003             |      | 28.00        | .06          |                |                              |
| EX-3    | AREA | 25              | .005             |      | 19.00        | .11          |                |                              |
| EX-3    | AREA | 100             | .010             |      | 18.00        | .21          |                |                              |

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 MASTER NETWORK SUMMARY  
 SCS Unit Hydrograph Method

 (\*Node=Outfall; +Node=Diversion;)  
 (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| *OUT 10 | JCT  | 2               | .001             |      | 53.00        | .03          |                |                              |
| *OUT 10 | JCT  | 10              | .011             |      | 32.00        | .20          |                |                              |
| *OUT 10 | JCT  | 25              | .018             |      | 30.00        | .34          |                |                              |
| *OUT 10 | JCT  | 100             | .033             |      | 25.00        | .62          |                |                              |
| *OUT 20 | JCT  | 2               | .027             |      | 32.00        | .47          |                |                              |
| *OUT 20 | JCT  | 10              | .097             |      | 27.00        | 1.81         |                |                              |
| *OUT 20 | JCT  | 25              | .142             |      | 25.00        | 2.71         |                |                              |
| *OUT 20 | JCT  | 100             | .225             |      | 24.00        | 4.41         |                |                              |
| *OUT 30 | JCT  | 2               | .000             |      | 42.00        | .01          |                |                              |
| *OUT 30 | JCT  | 10              | .003             |      | 28.00        | .06          |                |                              |
| *OUT 30 | JCT  | 25              | .005             |      | 19.00        | .11          |                |                              |
| *OUT 30 | JCT  | 100             | .010             |      | 18.00        | .21          |                |                              |

## MASTER DESIGN STORM SUMMARY

Network Storm Collection: 2.0 HR

| Return Event | Total<br>Depth<br>in | Rainfall<br>Type | RNF ID        |
|--------------|----------------------|------------------|---------------|
| 2            | 1.5200               | Synthetic Curve  | 0-10 1stQ 50% |
| 10           | 2.4000               | Synthetic Curve  | 0-10 1stQ 50% |
| 25           | 2.8000               | Synthetic Curve  | 0-10 1stQ 50% |
| 100          | 3.5000               | Synthetic Curve  | 0-10 1stQ 50% |

MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| EX-1    | AREA | 2               | .004             |      | 58.00        | .04          |                |                              |
| EX-1    | AREA | 10              | .020             |      | 41.00        | .20          |                |                              |
| EX-1    | AREA | 25              | .031             |      | 39.00        | .32          |                |                              |
| EX-1    | AREA | 100             | .052             |      | 35.00        | .57          |                |                              |
| EX-2    | AREA | 2               | .050             |      | 46.00        | .49          |                |                              |
| EX-2    | AREA | 10              | .154             |      | 37.00        | 1.71         |                |                              |
| EX-2    | AREA | 25              | .213             |      | 36.00        | 2.42         |                |                              |
| EX-2    | AREA | 100             | .325             |      | 34.00        | 3.81         |                |                              |
| EX-3    | AREA | 2               | .001             |      | 53.00        | .01          |                |                              |
| EX-3    | AREA | 10              | .006             |      | 31.00        | .06          |                |                              |
| EX-3    | AREA | 25              | .009             |      | 31.00        | .10          |                |                              |
| EX-3    | AREA | 100             | .015             |      | 30.00        | .18          |                |                              |

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MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation; Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| *OUT 10 | JCT  | 2               | .004             |      | 58.00        | .04          |                |                              |
| *OUT 10 | JCT  | 10              | .020             |      | 41.00        | .20          |                |                              |
| *OUT 10 | JCT  | 25              | .031             |      | 39.00        | .32          |                |                              |
| *OUT 10 | JCT  | 100             | .052             |      | 35.00        | .57          |                |                              |
| *OUT 20 | JCT  | 2               | .050             |      | 46.00        | .49          |                |                              |
| *OUT 20 | JCT  | 10              | .154             |      | 37.00        | 1.71         |                |                              |
| *OUT 20 | JCT  | 25              | .213             |      | 36.00        | 2.42         |                |                              |
| *OUT 20 | JCT  | 100             | .325             |      | 34.00        | 3.81         |                |                              |
| *OUT 30 | JCT  | 2               | .001             |      | 53.00        | .01          |                |                              |
| *OUT 30 | JCT  | 10              | .006             |      | 31.00        | .06          |                |                              |
| *OUT 30 | JCT  | 25              | .009             |      | 31.00        | .10          |                |                              |
| *OUT 30 | JCT  | 100             | .015             |      | 30.00        | .18          |                |                              |

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# MASTER DESIGN STORM SUMMARY

Network Storm Collection: 3.0 HR

| Return Event | Total<br>Depth<br>in | Rainfall<br>Type | RNF ID        |
|--------------|----------------------|------------------|---------------|
| 2            | 1.6800               | Synthetic Curve  | 0-10 1stQ 50% |
| 10           | 2.6400               | Synthetic Curve  | 0-10 1stQ 50% |
| 25           | 3.0900               | Synthetic Curve  | 0-10 1stQ 50% |
| 100          | 3.8700               | Synthetic Curve  | 0-10 1stQ 50% |

# MASTER NETWORK SUMMARY SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| EX-1    | AREA | 2               | .006             |      | 84.00        | .04          |                |                              |
| EX-1    | AREA | 10              | .026             |      | 50.00        | .19          |                |                              |
| EX-1    | AREA | 25              | .039             |      | 50.00        | .30          |                |                              |
| EX-1    | AREA | 100             | .064             |      | 48.00        | .51          |                |                              |
| EX-2    | AREA | 2               | .066             |      | 57.00        | .46          |                |                              |
| EX-2    | AREA | 10              | .189             |      | 48.00        | 1.49         |                |                              |
| EX-2    | AREA | 25              | .258             |      | 48.00        | 2.08         |                |                              |
| EX-2    | AREA | 100             | .389             |      | 46.00        | 3.19         |                |                              |
| EX-3    | AREA | 2               | .002             |      | 62.00        | .01          |                |                              |
| EX-3    | AREA | 10              | .008             |      | 46.00        | .06          |                |                              |
| EX-3    | AREA | 25              | .011             |      | 46.00        | .09          |                |                              |
| EX-3    | AREA | 100             | .019             |      | 46.00        | .16          |                |                              |

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MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| *OUT 10 | JCT  | 2               | .006             |      | 84.00        | .04          |                |                              |
| *OUT 10 | JCT  | 10              | .026             |      | 50.00        | .19          |                |                              |
| *OUT 10 | JCT  | 25              | .039             |      | 50.00        | .30          |                |                              |
| *OUT 10 | JCT  | 100             | .064             |      | 48.00        | .51          |                |                              |
| *OUT 20 | JCT  | 2               | .066             |      | 57.00        | .46          |                |                              |
| *OUT 20 | JCT  | 10              | .189             |      | 48.00        | 1.49         |                |                              |
| *OUT 20 | JCT  | 25              | .258             |      | 48.00        | 2.08         |                |                              |
| *OUT 20 | JCT  | 100             | .389             |      | 46.00        | 3.19         |                |                              |
| *OUT 30 | JCT  | 2               | .002             |      | 62.00        | .01          |                |                              |
| *OUT 30 | JCT  | 10              | .008             |      | 46.00        | .06          |                |                              |
| *OUT 30 | JCT  | 25              | .011             |      | 46.00        | .09          |                |                              |
| *OUT 30 | JCT  | 100             | .019             |      | 46.00        | .16          |                |                              |

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# MASTER DESIGN STORM SUMMARY

Network Storm Collection: 6.0 HR

| Return Event | Total<br>Depth<br>in | Rainfall<br>Type | RNF ID        |
|--------------|----------------------|------------------|---------------|
| 2            | 1.9800               | Synthetic Curve  | 0-10 1stQ 50% |
| 10           | 3.1200               | Synthetic Curve  | 0-10 1stQ 50% |
| 25           | 3.6000               | Synthetic Curve  | 0-10 1stQ 50% |
| 100          | 4.5000               | Synthetic Curve  | 0-10 1stQ 50% |

## MASTER NETWORK SUMMARY SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| EX-1    | AREA | 2               | .011             |      | 163.00       | .04          |                |                              |
| EX-1    | AREA | 10              | .040             |      | 90.00        | .16          |                |                              |
| EX-1    | AREA | 25              | .055             |      | 91.00        | .23          |                |                              |
| EX-1    | AREA | 100             | .087             |      | 90.00        | .36          |                |                              |
| EX-2    | AREA | 2               | .100             |      | 93.00        | .40          |                |                              |
| EX-2    | AREA | 10              | .263             |      | 91.00        | 1.10         |                |                              |
| EX-2    | AREA | 25              | .342             |      | 91.00        | 1.43         |                |                              |
| EX-2    | AREA | 100             | .503             |      | 75.00        | 2.12         |                |                              |
| EX-3    | AREA | 2               | .003             |      | 105.00       | .01          |                |                              |
| EX-3    | AREA | 10              | .012             |      | 86.00        | .05          |                |                              |
| EX-3    | AREA | 25              | .016             |      | 88.00        | .07          |                |                              |
| EX-3    | AREA | 100             | .025             |      | 90.00        | .11          |                |                              |

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MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| *OUT 10 | JCT  | 2               | .011             |      | 163.00       | .04          |                |                              |
| *OUT 10 | JCT  | 10              | .040             |      | 90.00        | .16          |                |                              |
| *OUT 10 | JCT  | 25              | .055             |      | 91.00        | .23          |                |                              |
| *OUT 10 | JCT  | 100             | .087             |      | 90.00        | .36          |                |                              |
|         |      |                 |                  |      |              |              |                |                              |
| *OUT 20 | JCT  | 2               | .100             |      | 93.00        | .40          |                |                              |
| *OUT 20 | JCT  | 10              | .263             |      | 91.00        | 1.10         |                |                              |
| *OUT 20 | JCT  | 25              | .342             |      | 91.00        | 1.43         |                |                              |
| *OUT 20 | JCT  | 100             | .503             |      | 75.00        | 2.12         |                |                              |
|         |      |                 |                  |      |              |              |                |                              |
| *OUT 30 | JCT  | 2               | .003             |      | 105.00       | .01          |                |                              |
| *OUT 30 | JCT  | 10              | .012             |      | 86.00        | .05          |                |                              |
| *OUT 30 | JCT  | 25              | .016             |      | 88.00        | .07          |                |                              |
| *OUT 30 | JCT  | 100             | .025             |      | 90.00        | .11          |                |                              |

## MASTER DESIGN STORM SUMMARY

Network Storm Collection: 12.0 HR

| Return Event | Total<br>Depth<br>in | Rainfall<br>Type | RNF ID        |
|--------------|----------------------|------------------|---------------|
| 2            | 2.4000               | Synthetic Curve  | 0-10 2ndQ 50% |
| 10           | 3.6000               | Synthetic Curve  | 0-10 2ndQ 50% |
| 25           | 4.2000               | Synthetic Curve  | 0-10 2ndQ 50% |
| 100          | 5.1600               | Synthetic Curve  | 0-10 2ndQ 50% |

MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| EX-1    | AREA | 2               | .020             |      | 324.00       | .06          |                |                              |
| EX-1    | AREA | 10              | .055             |      | 322.00       | .16          |                |                              |
| EX-1    | AREA | 25              | .076             |      | 322.00       | .23          |                |                              |
| EX-1    | AREA | 100             | .112             |      | 323.00       | .33          |                |                              |
| EX-2    | AREA | 2               | .154             |      | 324.00       | .46          |                |                              |
| EX-2    | AREA | 10              | .342             |      | 324.00       | 1.02         |                |                              |
| EX-2    | AREA | 25              | .448             |      | 324.00       | 1.32         |                |                              |
| EX-2    | AREA | 100             | .627             |      | 324.00       | 1.81         |                |                              |
| EX-3    | AREA | 2               | .006             |      | 320.00       | .02          |                |                              |
| EX-3    | AREA | 10              | .016             |      | 316.00       | .05          |                |                              |
| EX-3    | AREA | 25              | .022             |      | 320.00       | .07          |                |                              |
| EX-3    | AREA | 100             | .033             |      | 324.00       | .10          |                |                              |

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MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| *OUT 10 | JCT  | 2               | .020             |      | 324.00       | .06          |                |                              |
| *OUT 10 | JCT  | 10              | .055             |      | 322.00       | .16          |                |                              |
| *OUT 10 | JCT  | 25              | .076             |      | 322.00       | .23          |                |                              |
| *OUT 10 | JCT  | 100             | .112             |      | 323.00       | .33          |                |                              |
| *OUT 20 | JCT  | 2               | .154             |      | 324.00       | .46          |                |                              |
| *OUT 20 | JCT  | 10              | .342             |      | 324.00       | 1.02         |                |                              |
| *OUT 20 | JCT  | 25              | .448             |      | 324.00       | 1.32         |                |                              |
| *OUT 20 | JCT  | 100             | .627             |      | 324.00       | 1.81         |                |                              |
| *OUT 30 | JCT  | 2               | .006             |      | 320.00       | .02          |                |                              |
| *OUT 30 | JCT  | 10              | .016             |      | 316.00       | .05          |                |                              |
| *OUT 30 | JCT  | 25              | .022             |      | 320.00       | .07          |                |                              |
| *OUT 30 | JCT  | 100             | .033             |      | 324.00       | .10          |                |                              |

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# MASTER DESIGN STORM SUMMARY

Network Storm Collection: 24.0 HR

| Return Event | Total<br>Depth<br>in | Rainfall<br>Type | RNF ID        |
|--------------|----------------------|------------------|---------------|
| 2            | 2.6400               | Synthetic Curve  | 0-10 3rdQ 50% |
| 10           | 4.0800               | Synthetic Curve  | 0-10 3rdQ 50% |
| 25           | 4.8000               | Synthetic Curve  | 0-10 3rdQ 50% |
| 100          | 6.0000               | Synthetic Curve  | 0-10 3rdQ 50% |

## MASTER NETWORK SUMMARY SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| EX-1    | AREA | 2               | .026             |      | 927.00       | .06          |                |                              |
| EX-1    | AREA | 10              | .071             |      | 928.00       | .14          |                |                              |
| EX-1    | AREA | 25              | .098             |      | 930.00       | .19          |                |                              |
| EX-1    | AREA | 100             | .147             |      | 931.00       | .28          |                |                              |
| EX-2    | AREA | 2               | .189             |      | 935.00       | .39          |                |                              |
| EX-2    | AREA | 10              | .426             |      | 933.00       | .81          |                |                              |
| EX-2    | AREA | 25              | .559             |      | 933.00       | 1.03         |                |                              |
| EX-2    | AREA | 100             | .791             |      | 934.00       | 1.41         |                |                              |
| EX-3    | AREA | 2               | .008             |      | 926.00       | .02          |                |                              |
| EX-3    | AREA | 10              | .021             |      | 912.00       | .04          |                |                              |
| EX-3    | AREA | 25              | .029             |      | 922.00       | .06          |                |                              |
| EX-3    | AREA | 100             | .043             |      | 917.00       | .08          |                |                              |

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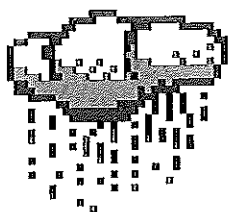
MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

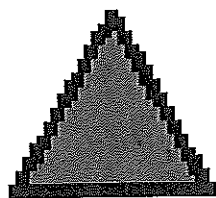
| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| *OUT 10 | JCT  | 2               | .026             |      | 927.00       | .06          |                |                              |
| *OUT 10 | JCT  | 10              | .071             |      | 928.00       | .14          |                |                              |
| *OUT 10 | JCT  | 25              | .098             |      | 930.00       | .19          |                |                              |
| *OUT 10 | JCT  | 100             | .147             |      | 931.00       | .28          |                |                              |
| *OUT 20 | JCT  | 2               | .189             |      | 935.00       | .39          |                |                              |
| *OUT 20 | JCT  | 10              | .426             |      | 933.00       | .81          |                |                              |
| *OUT 20 | JCT  | 25              | .559             |      | 933.00       | 1.03         |                |                              |
| *OUT 20 | JCT  | 100             | .791             |      | 934.00       | 1.41         |                |                              |
| *OUT 30 | JCT  | 2               | .008             |      | 926.00       | .02          |                |                              |
| *OUT 30 | JCT  | 10              | .021             |      | 912.00       | .04          |                |                              |
| *OUT 30 | JCT  | 25              | .029             |      | 922.00       | .06          |                |                              |
| *OUT 30 | JCT  | 100             | .043             |      | 917.00       | .08          |                |                              |

**PROPOSED  
DRAINAGE AREA  
HYDROGRAPHS**

PR-1

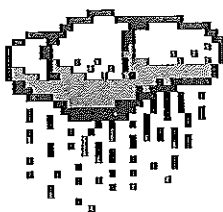


Addlink 10

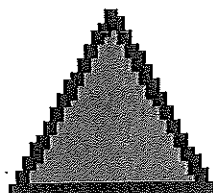


Out 1

PR-2 AND PR-3

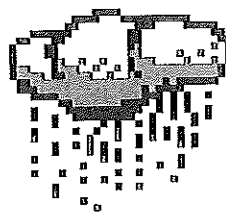


Addlink 30

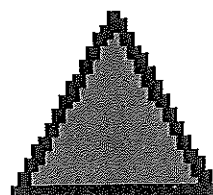


Out 2

PR-4



Addlink 20



Out 3

File.... L:\HE DATA FILE\HE113\113039\D113039\POST.ppw

### RUNOFF CURVE NUMBER DATA

RUNOFF CURVE NUMBER DATA

| Soil/Surface Description          | CN | Area<br>acres | Impervious<br>Adjustment |     | Adjusted<br>CN |
|-----------------------------------|----|---------------|--------------------------|-----|----------------|
|                                   |    |               | %C                       | %UC |                |
| GRASS-B-SOILS                     | 69 | .650          |                          |     | 69.00          |
| COMPOSITE AREA & WEIGHTED CN ---> |    | .650          |                          |     | 69.00 (69)     |

Type.... Tc Calcs

Page 3.01

Name.... PR-1

File.... L:\HE DATA FILE\HE113\113039\D113039\POST.ppw

::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::  
TIME OF CONCENTRATION CALCULATOR  
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

-----  
Segment #1: Tc: TR-55 Sheet

Mannings n           .2400  
Hydraulic Length    147.50 ft  
2yr, 24hr P         2.6400 in  
Slope                .078300 ft/ft

Avg.Velocity         .20 ft/sec

Segment #1 Time:     12.42 min  
-----

=====  
Total Tc:            12.42 min  
=====

Type.... Tc Calcs

Page 3.02

Name.... PR-1

File.... L:\HE DATA FILE\HE113\113039\D113039\POST.ppw

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-----  
Tc Equations used...  
-----

==== SCS TR-55 Sheet Flow =====

$$Tc = (.007 * ((n * Lf)^{.8})) / ((P^{.5}) * (Sf^{.4}))$$

Where: Tc = Time of concentration, hrs  
n = Mannings n  
Lf = Flow length, ft  
P = 2yr, 24hr Rain depth, inches  
Sf = Slope, %

Type.... Runoff CN-Area  
Name.... PR-2 AND PR-3

File.... L:\HE DATA FILE\HE113\113039\D113039\POST.ppw

RUNOFF CURVE NUMBER DATA

.....

| Soil/Surface Description          | CN | Area<br>acres | Impervious<br>Adjustment |     | Adjusted<br>CN |
|-----------------------------------|----|---------------|--------------------------|-----|----------------|
|                                   |    |               | %C                       | %UC |                |
| IMPERVIOUS                        | 98 | 1.110         |                          |     | 98.00          |
| EX. POND                          | 98 | .290          |                          |     | 98.00          |
| GRASS-C-SOIL                      | 79 | .020          |                          |     | 79.00          |
| GRASS-B-SOIL                      | 69 | 1.290         |                          |     | 69.00          |
| COMPOSITE AREA & WEIGHTED CN ---> |    | 2.710         |                          |     | 84.06 (84)     |

.....

Type.... Tc Calcs  
Name.... PR-2 AND PR-3

Page 3.03

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::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::  
TIME OF CONCENTRATION CALCULATOR  
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

-----  
Segment #1: Tc: TR-55 Sheet

Mannings n           .2400  
Hydraulic Length    25.00 ft  
2yr, 24hr P        2.6400 in  
Slope                .017600 ft/ft

Avg.Velocity        .08 ft/sec

Segment #1 Time:     5.45 min  
-----

Segment #2: Tc: TR-55 Shallow

Hydraulic Length    337.00 ft  
Slope                .047100 ft/ft  
Paved

Avg.Velocity        4.41 ft/sec

Segment #2 Time:     1.27 min  
-----

=====  
Total Tc:            6.73 min  
=====

Type.... Tc Calcs  
Name.... PR-2 AND PR-3

Page 3.04

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-----  
Tc Equations used...  
-----

==== SCS TR-55 Sheet Flow =====

$$Tc = (.007 * ((n * Lf)^{.8})) / ((P^{.5}) * (Sf^{.4}))$$

Where: Tc = Time of concentration, hrs  
n = Mannings n  
Lf = Flow length, ft  
P = 2yr, 24hr Rain depth, inches  
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow =====

Unpaved surface:  
 $V = 16.1345 * (Sf^{.5})$

Paved surface:  
 $V = 20.3282 * (Sf^{.5})$

$$Tc = (Lf / V) / (3600\text{sec/hr})$$

Where: V = Velocity, ft/sec  
Sf = Slope, ft/ft  
Tc = Time of concentration, hrs  
Lf = Flow length, ft

Type.... Runoff CN-Area  
Name.... PR-4

RUNOFF CURVE NUMBER DATA

.....

| Soil/Surface Description          | CN | Area<br>acres | Impervious<br>Adjustment |     | Adjusted<br>CN |
|-----------------------------------|----|---------------|--------------------------|-----|----------------|
|                                   |    |               | %C                       | %UC |                |
| GRASS                             | 69 | .190          |                          |     | 69.00          |
| COMPOSITE AREA & WEIGHTED CN ---> |    | .190          |                          |     | 69.00 (69)     |

.....

Type.... Tc Calcs  
Name.... PR-4

Page 3.05

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.....  
TIME OF CONCENTRATION CALCULATOR  
.....

-----  
Segment #1: Tc: User Defined

Segment #1 Time: 5.00 min  
-----

=====  
Total Tc: 5.00 min  
=====

Type.... Tc Calcs  
Name.... PR-4

Page 3.06

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-----  
Tc Equations used...  
-----

==== User Defined =====

Tc = Value entered by user

Where: Tc = Time of concentration

Type.... Master Network Summary

Page 1.02

Name.... Watershed

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MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID       | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| PR-1          | AREA | 2               | .001             |      | 53.00        | .03          |                |                              |
| PR-1          | AREA | 10              | .011             |      | 32.00        | .20          |                |                              |
| PR-1          | AREA | 25              | .018             |      | 30.00        | .34          |                |                              |
| PR-1          | AREA | 100             | .033             |      | 25.00        | .62          |                |                              |
| PR-2 AND PR-3 | AREA | 2               | .061             |      | 20.00        | 1.30         |                |                              |
| PR-2 AND PR-3 | AREA | 10              | .162             |      | 18.00        | 3.72         |                |                              |
| PR-2 AND PR-3 | AREA | 25              | .219             |      | 17.00        | 5.15         |                |                              |
| PR-2 AND PR-3 | AREA | 100             | .320             |      | 16.00        | 7.67         |                |                              |
| PR-4          | AREA | 2               | .000             |      | 42.00        | .01          |                |                              |
| PR-4          | AREA | 10              | .003             |      | 28.00        | .06          |                |                              |
| PR-4          | AREA | 25              | .005             |      | 19.00        | .11          |                |                              |
| PR-4          | AREA | 100             | .010             |      | 18.00        | .21          |                |                              |

## MASTER DESIGN STORM SUMMARY

Network Storm Collection: 2.0 HR

| Return Event | Total<br>Depth<br>in | Rainfall<br>Type | RNF ID        |
|--------------|----------------------|------------------|---------------|
| 2            | 1.5200               | Synthetic Curve  | 0-10 1stQ 50% |
| 10           | 2.4000               | Synthetic Curve  | 0-10 1stQ 50% |
| 25           | 2.8000               | Synthetic Curve  | 0-10 1stQ 50% |
| 100          | 3.5000               | Synthetic Curve  | 0-10 1stQ 50% |

MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| *OUT 1  | JCT  | 2               | .004             |      | 58.00        | .04          |                |                              |
| *OUT 1  | JCT  | 10              | .020             |      | 41.00        | .20          |                |                              |
| *OUT 1  | JCT  | 25              | .031             |      | 39.00        | .32          |                |                              |
| *OUT 1  | JCT  | 100             | .052             |      | 35.00        | .57          |                |                              |
| *OUT 2  | JCT  | 2               | .096             |      | 32.00        | 1.16         |                |                              |
| *OUT 2  | JCT  | 10              | .235             |      | 30.00        | 2.91         |                |                              |
| *OUT 2  | JCT  | 25              | .306             |      | 27.00        | 3.81         |                |                              |
| *OUT 2  | JCT  | 100             | .437             |      | 26.00        | 5.53         |                |                              |
| *OUT 3  | JCT  | 2               | .001             |      | 53.00        | .01          |                |                              |
| *OUT 3  | JCT  | 10              | .006             |      | 31.00        | .06          |                |                              |
| *OUT 3  | JCT  | 25              | .009             |      | 31.00        | .10          |                |                              |
| *OUT 3  | JCT  | 100             | .015             |      | 30.00        | .18          |                |                              |

Type.... Master Network Summary

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Name.... Watershed

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MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID       | Type | Return Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------------|------|--------------|------------------|------|--------------|--------------|----------------|------------------------------|
| PR-1          | AREA | 2            | .004             |      | 58.00        | .04          |                |                              |
| PR-1          | AREA | 10           | .020             |      | 41.00        | .20          |                |                              |
| PR-1          | AREA | 25           | .031             |      | 39.00        | .32          |                |                              |
| PR-1          | AREA | 100          | .052             |      | 35.00        | .57          |                |                              |
| PR-2 AND PR-3 | AREA | 2            | .096             |      | 32.00        | 1.16         |                |                              |
| PR-2 AND PR-3 | AREA | 10           | .235             |      | 30.00        | 2.91         |                |                              |
| PR-2 AND PR-3 | AREA | 25           | .306             |      | 27.00        | 3.81         |                |                              |
| PR-2 AND PR-3 | AREA | 100          | .437             |      | 26.00        | 5.53         |                |                              |
| PR-4          | AREA | 2            | .001             |      | 53.00        | .01          |                |                              |
| PR-4          | AREA | 10           | .006             |      | 31.00        | .06          |                |                              |
| PR-4          | AREA | 25           | .009             |      | 31.00        | .10          |                |                              |
| PR-4          | AREA | 100          | .015             |      | 30.00        | .18          |                |                              |

## MASTER DESIGN STORM SUMMARY

Network Storm Collection: 3.0 HR

| Return Event | Total<br>Depth<br>in | Rainfall<br>Type | RNF ID        |
|--------------|----------------------|------------------|---------------|
| 2            | 1.6800               | Synthetic Curve  | 0-10 1stQ 50% |
| 10           | 2.6400               | Synthetic Curve  | 0-10 1stQ 50% |
| 25           | 3.0900               | Synthetic Curve  | 0-10 1stQ 50% |
| 100          | 3.8700               | Synthetic Curve  | 0-10 1stQ 50% |

MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| *OUT 1  | JCT  | 2               | .006             |      | 84.00        | .04          |                |                              |
| *OUT 1  | JCT  | 10              | .026             |      | 50.00        | .19          |                |                              |
| *OUT 1  | JCT  | 25              | .039             |      | 50.00        | .30          |                |                              |
| *OUT 1  | JCT  | 100             | .064             |      | 48.00        | .51          |                |                              |
| *OUT 2  | JCT  | 2               | .119             |      | 46.00        | .99          |                |                              |
| *OUT 2  | JCT  | 10              | .277             |      | 38.00        | 2.32         |                |                              |
| *OUT 2  | JCT  | 25              | .359             |      | 21.00        | 3.09         |                |                              |
| *OUT 2  | JCT  | 100             | .510             |      | 21.00        | 4.96         |                |                              |
| *OUT 3  | JCT  | 2               | .002             |      | 62.00        | .01          |                |                              |
| *OUT 3  | JCT  | 10              | .008             |      | 46.00        | .06          |                |                              |
| *OUT 3  | JCT  | 25              | .011             |      | 46.00        | .09          |                |                              |
| *OUT 3  | JCT  | 100             | .019             |      | 46.00        | .16          |                |                              |

Type.... Master Network Summary

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MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID       | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| PR-1          | AREA | 2               | .006             |      | 84.00        | .04          |                |                              |
| PR-1          | AREA | 10              | .026             |      | 50.00        | .19          |                |                              |
| PR-1          | AREA | 25              | .039             |      | 50.00        | .30          |                |                              |
| PR-1          | AREA | 100             | .064             |      | 48.00        | .51          |                |                              |
| PR-2 AND PR-3 | AREA | 2               | .119             |      | 46.00        | .99          |                |                              |
| PR-2 AND PR-3 | AREA | 10              | .277             |      | 38.00        | 2.32         |                |                              |
| PR-2 AND PR-3 | AREA | 25              | .359             |      | 21.00        | 3.09         |                |                              |
| PR-2 AND PR-3 | AREA | 100             | .510             |      | 21.00        | 4.96         |                |                              |
| PR-4          | AREA | 2               | .002             |      | 62.00        | .01          |                |                              |
| PR-4          | AREA | 10              | .008             |      | 46.00        | .06          |                |                              |
| PR-4          | AREA | 25              | .011             |      | 46.00        | .09          |                |                              |
| PR-4          | AREA | 100             | .019             |      | 46.00        | .16          |                |                              |

## MASTER DESIGN STORM SUMMARY

Network Storm Collection: 6.0 HR

| Return Event | Total<br>Depth<br>in | Rainfall<br>Type | RNF ID        |
|--------------|----------------------|------------------|---------------|
| 2            | 1.9800               | Synthetic Curve  | 0-10 1stQ 50% |
| 10           | 3.1200               | Synthetic Curve  | 0-10 1stQ 50% |
| 25           | 3.6000               | Synthetic Curve  | 0-10 1stQ 50% |
| 100          | 4.5000               | Synthetic Curve  | 0-10 1stQ 50% |

MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| *OUT 1  | JCT  | 2               | .011             |      | 163.00       | .04          |                |                              |
| *OUT 1  | JCT  | 10              | .040             |      | 90.00        | .16          |                |                              |
| *OUT 1  | JCT  | 25              | .055             |      | 91.00        | .23          |                |                              |
| *OUT 1  | JCT  | 100             | .087             |      | 90.00        | .36          |                |                              |
| *OUT 2  | JCT  | 2               | .165             |      | 90.00        | .71          |                |                              |
| *OUT 2  | JCT  | 10              | .365             |      | 38.00        | 1.83         |                |                              |
| *OUT 2  | JCT  | 25              | .457             |      | 37.00        | 2.45         |                |                              |
| *OUT 2  | JCT  | 100             | .636             |      | 37.00        | 3.74         |                |                              |
| *OUT 3  | JCT  | 2               | .003             |      | 105.00       | .01          |                |                              |
| *OUT 3  | JCT  | 10              | .012             |      | 86.00        | .05          |                |                              |
| *OUT 3  | JCT  | 25              | .016             |      | 88.00        | .07          |                |                              |
| *OUT 3  | JCT  | 100             | .025             |      | 90.00        | .11          |                |                              |

Name.... Watershed

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MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID       | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| PR-1          | AREA | 2               | .011             |      | 163.00       | .04          |                |                              |
| PR-1          | AREA | 10              | .040             |      | 90.00        | .16          |                |                              |
| PR-1          | AREA | 25              | .055             |      | 91.00        | .23          |                |                              |
| PR-1          | AREA | 100             | .087             |      | 90.00        | .36          |                |                              |
| PR-2 AND PR-3 | AREA | 2               | .165             |      | 90.00        | .71          |                |                              |
| PR-2 AND PR-3 | AREA | 10              | .365             |      | 38.00        | 1.83         |                |                              |
| PR-2 AND PR-3 | AREA | 25              | .457             |      | 37.00        | 2.45         |                |                              |
| PR-2 AND PR-3 | AREA | 100             | .636             |      | 37.00        | 3.74         |                |                              |
| PR-4          | AREA | 2               | .003             |      | 105.00       | .01          |                |                              |
| PR-4          | AREA | 10              | .012             |      | 86.00        | .05          |                |                              |
| PR-4          | AREA | 25              | .016             |      | 88.00        | .07          |                |                              |
| PR-4          | AREA | 100             | .025             |      | 90.00        | .11          |                |                              |

## MASTER DESIGN STORM SUMMARY

Network Storm Collection: 12.0 HR

| Return Event | Total<br>Depth<br>in | Rainfall<br>Type | RNF ID        |
|--------------|----------------------|------------------|---------------|
| 2            | 2.4000               | Synthetic Curve  | 0-10 2ndQ 50% |
| 10           | 3.6000               | Synthetic Curve  | 0-10 2ndQ 50% |
| 25           | 4.2000               | Synthetic Curve  | 0-10 2ndQ 50% |
| 100          | 5.1600               | Synthetic Curve  | 0-10 2ndQ 50% |

MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| *OUT 1  | JCT  | 2               | .020             |      | 324.00       | .06          |                |                              |
| *OUT 1  | JCT  | 10              | .055             |      | 322.00       | .16          |                |                              |
| *OUT 1  | JCT  | 25              | .076             |      | 322.00       | .23          |                |                              |
| *OUT 1  | JCT  | 100             | .112             |      | 323.00       | .33          |                |                              |
| *OUT 2  | JCT  | 2               | .235             |      | 323.00       | .71          |                |                              |
| *OUT 2  | JCT  | 10              | .457             |      | 324.00       | 1.32         |                |                              |
| *OUT 2  | JCT  | 25              | .575             |      | 288.00       | 1.65         |                |                              |
| *OUT 2  | JCT  | 100             | .772             |      | 288.00       | 2.20         |                |                              |
| *OUT 3  | JCT  | 2               | .006             |      | 320.00       | .02          |                |                              |
| *OUT 3  | JCT  | 10              | .016             |      | 316.00       | .05          |                |                              |
| *OUT 3  | JCT  | 25              | .022             |      | 320.00       | .07          |                |                              |
| *OUT 3  | JCT  | 100             | .033             |      | 324.00       | .10          |                |                              |

Type.... Master Network Summary

Name.... Watershed

File.... L:\HE DATA FILE\HE113\113039\D113039\POST.PPW

MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID       | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| PR-1          | AREA | 2               | .020             |      | 324.00       | .06          |                |                              |
| PR-1          | AREA | 10              | .055             |      | 322.00       | .16          |                |                              |
| PR-1          | AREA | 25              | .076             |      | 322.00       | .23          |                |                              |
| PR-1          | AREA | 100             | .112             |      | 323.00       | .33          |                |                              |
| PR-2 AND PR-3 | AREA | 2               | .235             |      | 323.00       | .71          |                |                              |
| PR-2 AND PR-3 | AREA | 10              | .457             |      | 324.00       | 1.32         |                |                              |
| PR-2 AND PR-3 | AREA | 25              | .575             |      | 288.00       | 1.65         |                |                              |
| PR-2 AND PR-3 | AREA | 100             | .772             |      | 288.00       | 2.20         |                |                              |
| PR-4          | AREA | 2               | .006             |      | 320.00       | .02          |                |                              |
| PR-4          | AREA | 10              | .016             |      | 316.00       | .05          |                |                              |
| PR-4          | AREA | 25              | .022             |      | 320.00       | .07          |                |                              |
| PR-4          | AREA | 100             | .033             |      | 324.00       | .10          |                |                              |

Type.... Master Network Summary

Page 1.01

Name.... Watershed

File.... L:\HE DATA FILE\HE113\113039\D113039\POST.ppw

# MASTER DESIGN STORM SUMMARY

Network Storm Collection: 24.0 HR

| Return Event | Total<br>Depth<br>in | Rainfall<br>Type | RNF ID        |
|--------------|----------------------|------------------|---------------|
| 2            | 2.6400               | Synthetic Curve  | 0-10 3rdQ 50% |
| 10           | 4.0800               | Synthetic Curve  | 0-10 3rdQ 50% |
| 25           | 4.8000               | Synthetic Curve  | 0-10 3rdQ 50% |
| 100          | 6.0000               | Synthetic Curve  | 0-10 3rdQ 50% |

## MASTER NETWORK SUMMARY SCS Unit Hydrograph Method

(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| *OUT 1  | JCT  | 2               | .026             |      | 927.00       | .06          |                |                              |
| *OUT 1  | JCT  | 10              | .071             |      | 928.00       | .14          |                |                              |
| *OUT 1  | JCT  | 25              | .098             |      | 930.00       | .19          |                |                              |
| *OUT 1  | JCT  | 100             | .147             |      | 931.00       | .28          |                |                              |
| *OUT 2  | JCT  | 2               | .277             |      | 936.00       | .53          |                |                              |
| *OUT 2  | JCT  | 10              | .551             |      | 934.00       | .97          |                |                              |
| *OUT 2  | JCT  | 25              | .697             |      | 934.00       | 1.20         |                |                              |
| *OUT 2  | JCT  | 100             | .948             |      | 932.00       | 1.57         |                |                              |
| *OUT 3  | JCT  | 2               | .008             |      | 926.00       | .02          |                |                              |
| *OUT 3  | JCT  | 10              | .021             |      | 912.00       | .04          |                |                              |
| *OUT 3  | JCT  | 25              | .029             |      | 922.00       | .06          |                |                              |
| *OUT 3  | JCT  | 100             | .043             |      | 917.00       | .08          |                |                              |

Type.... Master Network Summary

Page 1.02

Name.... Watershed

File.... L:\HE DATA FILE\HE113\113039\D113039\POST.ppw

---

MASTER NETWORK SUMMARY  
SCS Unit Hydrograph Method

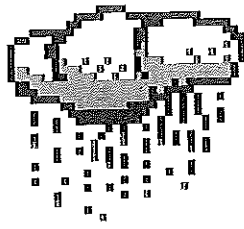
(\*Node=Outfall; +Node=Diversion;)  
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

| Node ID       | Type | Return<br>Event | HYG Vol<br>ac-ft | Trun | Qpeak<br>min | Qpeak<br>cfs | Max WSEL<br>ft | Max<br>Pond Storage<br>ac-ft |
|---------------|------|-----------------|------------------|------|--------------|--------------|----------------|------------------------------|
| PR-1          | AREA | 2               | .026             |      | 927.00       | .06          |                |                              |
| PR-1          | AREA | 10              | .071             |      | 928.00       | .14          |                |                              |
| PR-1          | AREA | 25              | .098             |      | 930.00       | .19          |                |                              |
| PR-1          | AREA | 100             | .147             |      | 931.00       | .28          |                |                              |
| PR-2 AND PR-3 | AREA | 2               | .277             |      | 936.00       | .53          |                |                              |
| PR-2 AND PR-3 | AREA | 10              | .551             |      | 934.00       | .97          |                |                              |
| PR-2 AND PR-3 | AREA | 25              | .697             |      | 934.00       | 1.20         |                |                              |
| PR-2 AND PR-3 | AREA | 100             | .948             |      | 932.00       | 1.57         |                |                              |
| PR-4          | AREA | 2               | .008             |      | 926.00       | .02          |                |                              |
| PR-4          | AREA | 10              | .021             |      | 912.00       | .04          |                |                              |
| PR-4          | AREA | 25              | .029             |      | 922.00       | .06          |                |                              |
| PR-4          | AREA | 100             | .043             |      | 917.00       | .08          |                |                              |

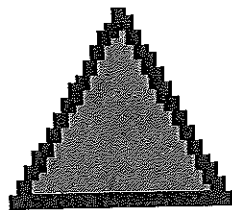
**SWALE**

**CALCULATIONS**

PR-2



Add link 10



Out 10

Type.... Runoff CN-Area

Page 6.01

Name.... PR-2

File.... L:\HE DATA FILE\HE113\113039\D113039\PR-2 SWALE CALCS.ppw

RUNOFF CURVE NUMBER DATA

.....

| Soil/Surface Description          | CN | Area<br>acres | Impervious<br>Adjustment |     | Adjusted<br>CN |
|-----------------------------------|----|---------------|--------------------------|-----|----------------|
|                                   |    |               | %C                       | %UC |                |
| IMPERVIOUS                        | 98 | .500          |                          |     | 98.00          |
| GRASS                             | 79 | .720          |                          |     | 79.00          |
| COMPOSITE AREA & WEIGHTED CN ---> |    | 1.220         |                          |     | 86.79 (87)     |

.....

Type.... Tc Calcs

Page 5.01

Name.... PR-2

File.... L:\HE DATA FILE\HE113\113039\D113039\PR-2 SWALE CALCS.ppw

::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::  
TIME OF CONCENTRATION CALCULATOR  
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

-----  
Segment #1: Tc: TR-55 Sheet

Mannings n           .0110  
Hydraulic Length     75.00 ft  
2yr, 24hr P          2.6400 in  
Slope                .020000 ft/ft

Avg.Velocity         1.18 ft/sec

Segment #1 Time:     1.06 min  
-----

Segment #2: Tc: TR-55 Shallow

Hydraulic Length     450.68 ft  
Slope                .005000 ft/ft  
Unpaved

Avg.Velocity         1.14 ft/sec

Segment #2 Time:     6.58 min  
-----

=====  
Total Tc:            7.64 min  
=====

Type.... Tc Calcs

Page 5.02

Name.... PR-2

File.... L:\HE DATA FILE\HE113\113039\D113039\PR-2 SWALE CALCS.ppw

---

-----  
Tc Equations used...  
-----

==== SCS TR-55 Sheet Flow =====

$$Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))$$

Where: Tc = Time of concentration, hrs  
n = Mannings n  
Lf = Flow length, ft  
P = 2yr, 24hr Rain depth, inches  
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow =====

Unpaved surface:

$$V = 16.1345 * (Sf**0.5)$$

Paved surface:

$$V = 20.3282 * (Sf**0.5)$$

$$Tc = (Lf / V) / (3600sec/hr)$$

Where: V = Velocity, ft/sec  
Sf = Slope, ft/ft  
Tc = Time of concentration, hrs  
Lf = Flow length, ft

# Channel Report

Hydraflow Express by Intelisolve

Tuesday, May 14 2013, 12:13 PM

## CROSS SECTION A-A

### Triangular

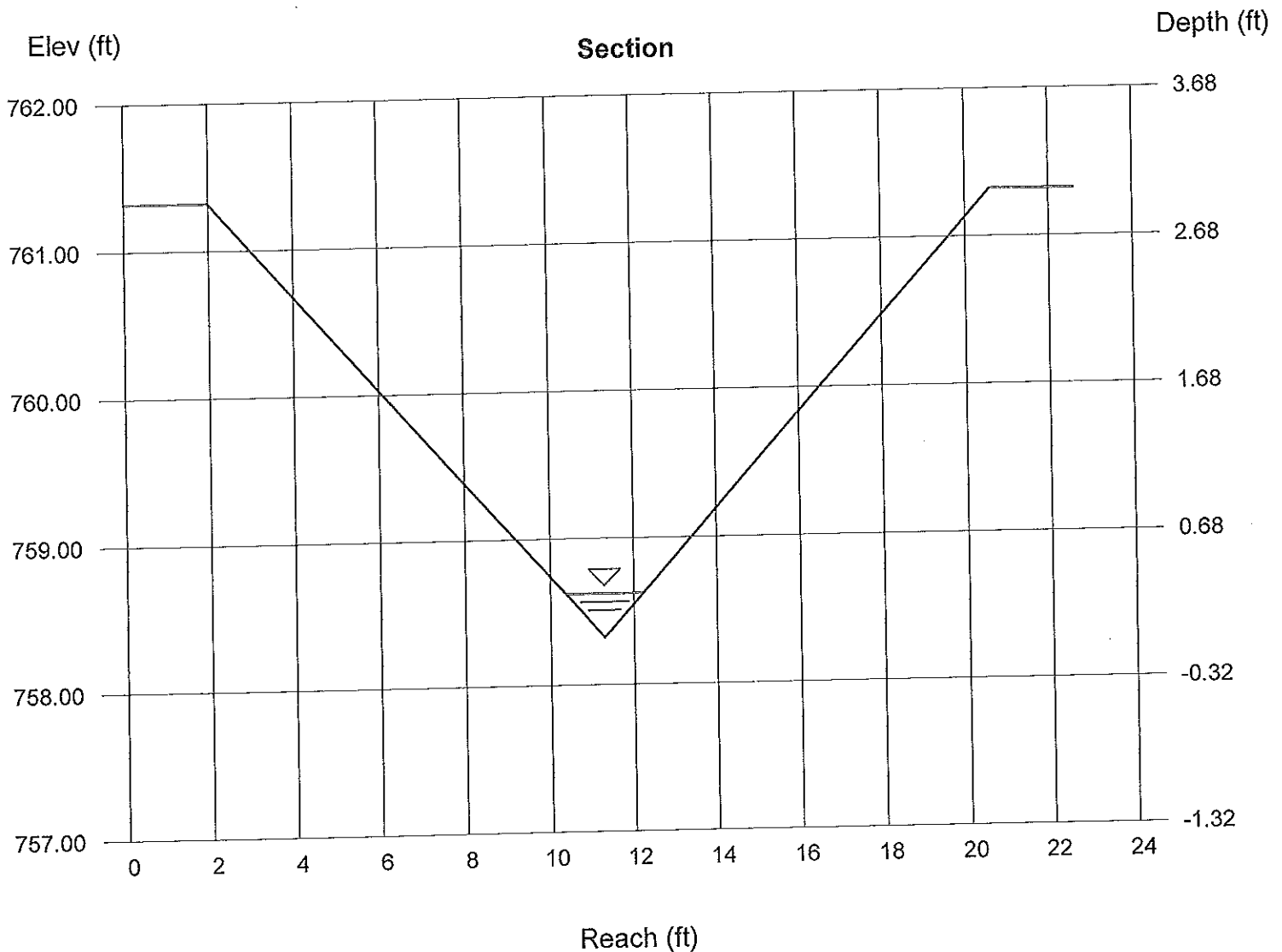
Side Slope (z:1) = 3.10  
Total Depth (ft) = 3.00  
  
Invert Elev (ft) = 758.32  
Slope (%) = 0.50  
N-Value = 0.300

### Highlighted

Depth (ft) = 0.30  
Q (cfs) = 0.027  
Area (sqft) = 0.28  
Velocity (ft/s) = 0.10  
Wetted Perim (ft) = 1.95  
Crit Depth,  $Y_c$  (ft) = 0.01  
Top Width (ft) = 1.86  
EGL (ft) = 0.30

### Calculations

Compute by: Q vs Depth  
No. Increments = 10



# HEARTLAND MACHINE

## DRAINAGE AREA NO. 1 POST-DEVELOPED RATIONAL METHOD Q=CIA

| SURFACE    | SURFACE DESCRIPTION         | C-FACTOR | X | AREA  | =                    |
|------------|-----------------------------|----------|---|-------|----------------------|
| IMPERVIOUS | PAVEMENT (ASHPALT & GRAVEL) | 0.850    | X | 0.270 | = 0.230              |
| PERVIOUS   | GRASS (TURF MEADOWS)        | 0.250    | X | 0.720 | = 0.180              |
| IMPERVIOUS | ROOF SURFACE                | 0.900    | X | 0.230 | = 0.207              |
|            |                             |          |   |       | WEIGHTED "C"         |
|            |                             |          |   |       | 0.617 / 1.220 = 0.51 |

| "C"  | "I" | "A"   | CFS    |
|------|-----|-------|--------|
| 0.51 | X   | 1.220 | = 3.75 |

PROPOSED RUNOFF AT DISCHARGE POINT Q10

Tc= 7.64

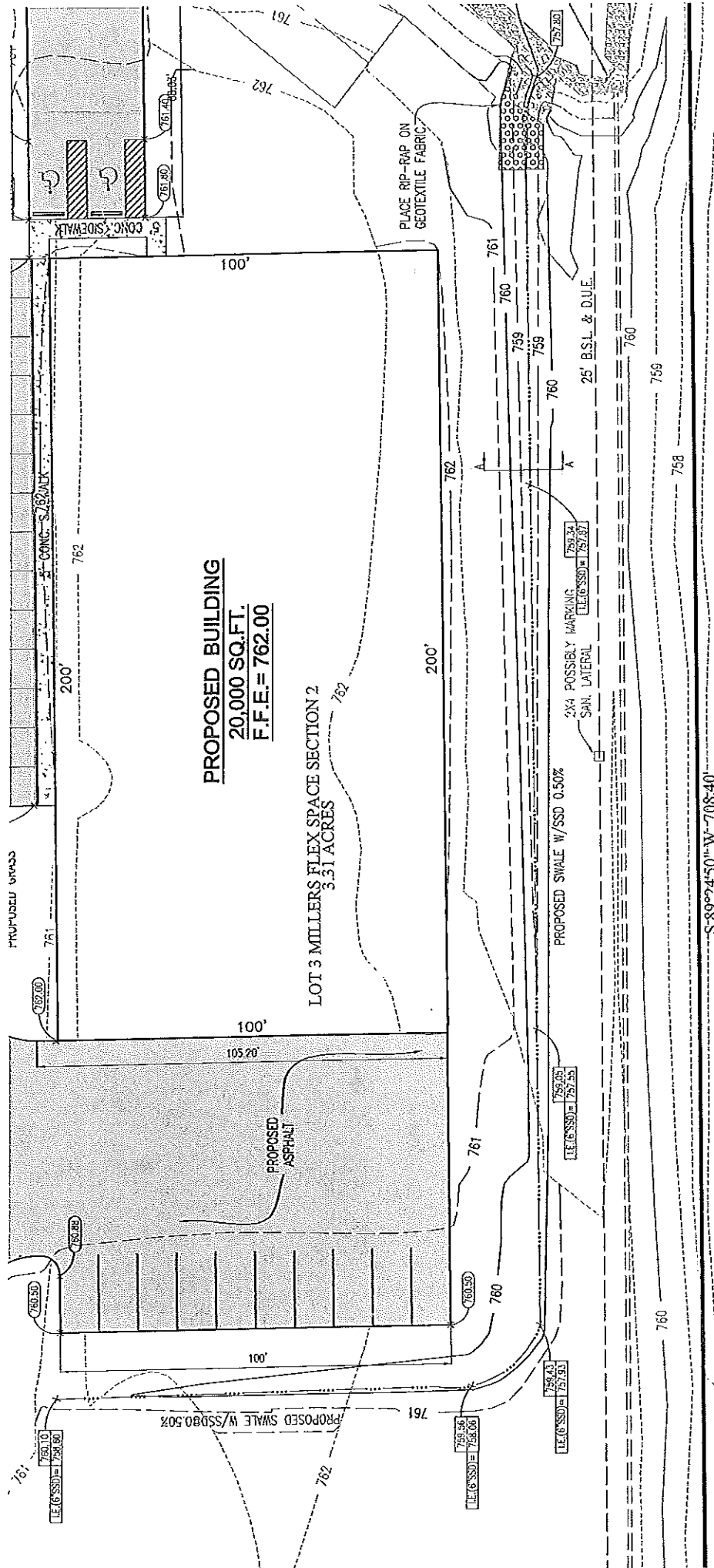
Use Tc= 7.64

| SURFACE DESCRIPTION         | SQ. FT. | ACRES   |
|-----------------------------|---------|---------|
| PAVEMENT (ASHPALT & GRAVEL) | 11761   | = 0.270 |
| GRASS (TURF MEADOWS)        | 31363   | = 0.720 |
| ROOF                        | 10018   | = 0.230 |
| TOTAL                       | 53142   | = 1.220 |

|                  |       |         |
|------------------|-------|---------|
| TOTAL IMPERVIOUS | 21779 | = 0.500 |
|------------------|-------|---------|

|                |       |         |
|----------------|-------|---------|
| TOTAL PERVIOUS | 31363 | = 0.720 |
|----------------|-------|---------|

Notes:  
Tc determined using TR-55 worksheet (attached.)  
"I" determined using the Intensity Equation (shown below) from section 202-1 in the Indianapolis Stormwater Specifications Manual  
 $i = a/(t+b)^N$  a,b,N are values from table 202-1  
a=56.974,b=9,N=0.7953



S-89°24'50"W-708-40'

**DRAINAGE**

**CALCULATION**

**INFORMATION**

Type.... Design Storms

Page 2.01

Name.... 0.5 HR

File.... L:\HE DATA FILE\HE113\113039\D113039\POST.ppw

---

Title... Project Date: 5/14/2013  
Project Engineer: Ross Holloway  
Project Title: Watershed  
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File, ID = 0.5 HR

Storm Tag Name = 2

---

Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 2 yr  
Total Rainfall Depth= .9900 in  
Duration Multiplier = 0.5  
Resulting Duration = 30.00 min  
Resulting Start Time= .00 min Step= 1.50 min End= 30.00 min

Storm Tag Name = 10

---

Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 10 yr  
Total Rainfall Depth= 1.5500 in  
Duration Multiplier = 0.5  
Resulting Duration = 30.00 min  
Resulting Start Time= .00 min Step= 1.50 min End= 30.00 min

Storm Tag Name = 25

---

Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 25 yr  
Total Rainfall Depth= 1.8300 in  
Duration Multiplier = 0.5  
Resulting Duration = 30.00 min  
Resulting Start Time= .00 min Step= 1.50 min End= 30.00 min

Storm Tag Name = 100

---

Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 100 yr  
Total Rainfall Depth= 2.2500 in  
Duration Multiplier = 0.5  
Resulting Duration = 30.00 min  
Resulting Start Time= .00 min Step= 1.50 min End= 30.00 min

Type.... Design Storms

Page 3.01

Name.... 1.0 HR

File.... L:\RE DATA FILE\HE113\113039\D113039\POST.ppw

---

Title... Project Date: 5/14/2013  
Project Engineer: Ross Holloway  
Project Title: Watershed  
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File, ID = 1.0 HR

Storm Tag Name = 2

-----  
Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 2 yr  
Total Rainfall Depth= 1.2500 in  
Duration Multiplier = 1  
Resulting Duration = 60.00 min  
Resulting Start Time= .00 min Step= 3.00 min End= 60.00 min

Storm Tag Name = 10

-----  
Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 10 yr  
Total Rainfall Depth= 1.9600 in  
Duration Multiplier = 1  
Resulting Duration = 60.00 min  
Resulting Start Time= .00 min Step= 3.00 min End= 60.00 min

Storm Tag Name = 25

-----  
Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 25 yr  
Total Rainfall Depth= 2.3100 in  
Duration Multiplier = 1  
Resulting Duration = 60.00 min  
Resulting Start Time= .00 min Step= 3.00 min End= 60.00 min

Storm Tag Name = 100

-----  
Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 100 yr  
Total Rainfall Depth= 2.8800 in  
Duration Multiplier = 1  
Resulting Duration = 60.00 min  
Resulting Start Time= .00 min Step= 3.00 min End= 60.00 min

Type.... Design Storms

Page 3.01

Name.... 2.0 HR

File.... L:\HE DATA FILE\HE113\113039\D113039\POST.ppw

---

Title... Project Date: 5/14/2013  
Project Engineer: Ross Holloway  
Project Title: Watershed  
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File, ID = 2.0 HR

Storm Tag Name = 2

-----  
Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 2 yr  
Total Rainfall Depth= 1.5200 in  
Duration Multiplier = 2  
Resulting Duration = 120.00 min  
Resulting Start Time= .00 min Step= 6.00 min End= 120.00 min

Storm Tag Name = 10

-----  
Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 10 yr  
Total Rainfall Depth= 2.4000 in  
Duration Multiplier = 2  
Resulting Duration = 120.00 min  
Resulting Start Time= .00 min Step= 6.00 min End= 120.00 min

Storm Tag Name = 25

-----  
Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 25 yr  
Total Rainfall Depth= 2.8000 in  
Duration Multiplier = 2  
Resulting Duration = 120.00 min  
Resulting Start Time= .00 min Step= 6.00 min End= 120.00 min

Storm Tag Name = 100

-----  
Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 100 yr  
Total Rainfall Depth= 3.5000 in  
Duration Multiplier = 2  
Resulting Duration = 120.00 min  
Resulting Start Time= .00 min Step= 6.00 min End= 120.00 min

Type.... Design Storms

Page 3.01

Name.... 3.0 HR

File.... L:\HE DATA FILE\HE113\113039\D113039\POST.ppw

---

Title... Project Date: 5/14/2013  
Project Engineer: Ross Holloway  
Project Title: Watershed  
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File, ID = 3.0 HR

Storm Tag Name = 2

-----  
Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 2 yr  
Total Rainfall Depth= 1.6800 in  
Duration Multiplier = 3  
Resulting Duration = 180.00 min  
Resulting Start Time= .00 min Step= 9.00 min End= 180.00 min

Storm Tag Name = 10

-----  
Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 10 yr  
Total Rainfall Depth= 2.6400 in  
Duration Multiplier = 3  
Resulting Duration = 180.00 min  
Resulting Start Time= .00 min Step= 9.00 min End= 180.00 min

Storm Tag Name = 25

-----  
Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 25 yr  
Total Rainfall Depth= 3.0900 in  
Duration Multiplier = 3  
Resulting Duration = 180.00 min  
Resulting Start Time= .00 min Step= 9.00 min End= 180.00 min

Storm Tag Name = 100

-----  
Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 100 yr  
Total Rainfall Depth= 3.8700 in  
Duration Multiplier = 3  
Resulting Duration = 180.00 min  
Resulting Start Time= .00 min Step= 9.00 min End= 180.00 min

Type.... Design Storms  
Name.... 6.0 HR

Page 3.01

File.... L:\HE DATA FILE\HE113\113039\D113039\POST.ppw

Title... Project Date: 5/14/2013  
Project Engineer: Ross Holloway  
Project Title: Watershed  
Project Comments:

#### DESIGN STORMS SUMMARY

Design Storm File, ID = 6.0 HR

Storm Tag Name = 2

-----  
Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 2 yr  
Total Rainfall Depth= 1.9800 in  
Duration Multiplier = 6  
Resulting Duration = 360.00 min  
Resulting Start Time= .00 min Step= 18.00 min End= 360.00 min

Storm Tag Name = 10

-----  
Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 10 yr  
Total Rainfall Depth= 3.1200 in  
Duration Multiplier = 6  
Resulting Duration = 360.00 min  
Resulting Start Time= .00 min Step= 18.00 min End= 360.00 min

Storm Tag Name = 25

-----  
Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 25 yr  
Total Rainfall Depth= 3.6000 in  
Duration Multiplier = 6  
Resulting Duration = 360.00 min  
Resulting Start Time= .00 min Step= 18.00 min End= 360.00 min

Storm Tag Name = 100

-----  
Data Type, File, ID = Synthetic Storm 0-10 1stQ 50%  
Storm Frequency = 100 yr  
Total Rainfall Depth= 4.5000 in  
Duration Multiplier = 6  
Resulting Duration = 360.00 min  
Resulting Start Time= .00 min Step= 18.00 min End= 360.00 min

Type.... Design Storms

Page 3.01

Name.... 12.0 HR

File.... L:\HE DATA FILE\HE113\113039\D113039\POST.ppw

---

Title... Project Date: 5/14/2013  
Project Engineer: Ross Holloway  
Project Title: Watershed  
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File, ID = 12.0 HR

Storm Tag Name = 2

-----  
Data Type, File, ID = Synthetic Storm 0-10 2ndQ 50%  
Storm Frequency = 2 yr  
Total Rainfall Depth= 2.4000 in  
Duration Multiplier = 12  
Resulting Duration = 720.00 min  
Resulting Start Time= .00 min Step= 36.00 min End= 720.00 min

Storm Tag Name = 10

-----  
Data Type, File, ID = Synthetic Storm 0-10 2ndQ 50%  
Storm Frequency = 10 yr  
Total Rainfall Depth= 3.6000 in  
Duration Multiplier = 12  
Resulting Duration = 720.00 min  
Resulting Start Time= .00 min Step= 36.00 min End= 720.00 min

Storm Tag Name = 25

-----  
Data Type, File, ID = Synthetic Storm 0-10 2ndQ 50%  
Storm Frequency = 25 yr  
Total Rainfall Depth= 4.2000 in  
Duration Multiplier = 12  
Resulting Duration = 720.00 min  
Resulting Start Time= .00 min Step= 36.00 min End= 720.00 min

Storm Tag Name = 100

-----  
Data Type, File, ID = Synthetic Storm 0-10 2ndQ 50%  
Storm Frequency = 100 yr  
Total Rainfall Depth= 5.1600 in  
Duration Multiplier = 12  
Resulting Duration = 720.00 min  
Resulting Start Time= .00 min Step= 36.00 min End= 720.00 min

Type.... Design Storms  
Name.... 24.0 HR

Page 3.01

File.... L:\HE DATA FILE\HE113\113039\D113039\POST.ppw

---

Title... Project Date: 5/14/2013  
Project Engineer: Ross Holloway  
Project Title: Watershed  
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File, ID = 24.0 HR

Storm Tag Name = 2

---

Data Type, File, ID = Synthetic Storm 0-10 3rdQ 50%  
Storm Frequency = 2 yr  
Total Rainfall Depth= 2.6400 in  
Duration Multiplier = 24  
Resulting Duration = 1440.00 min  
Resulting Start Time= .00 min Step= 72.00 min End= 1440.00 min

Storm Tag Name = 10

---

Data Type, File, ID = Synthetic Storm 0-10 3rdQ 50%  
Storm Frequency = 10 yr  
Total Rainfall Depth= 4.0800 in  
Duration Multiplier = 24  
Resulting Duration = 1440.00 min  
Resulting Start Time= .00 min Step= 72.00 min End= 1440.00 min

Storm Tag Name = 25

---

Data Type, File, ID = Synthetic Storm 0-10 3rdQ 50%  
Storm Frequency = 25 yr  
Total Rainfall Depth= 4.8000 in  
Duration Multiplier = 24  
Resulting Duration = 1440.00 min  
Resulting Start Time= .00 min Step= 72.00 min End= 1440.00 min

Storm Tag Name = 100

---

Data Type, File, ID = Synthetic Storm 0-10 3rdQ 50%  
Storm Frequency = 100 yr  
Total Rainfall Depth= 6.0000 in  
Duration Multiplier = 24  
Resulting Duration = 1440.00 min  
Resulting Start Time= .00 min Step= 72.00 min End= 1440.00 min

| Return Period | a      | b  | N      | R <sup>2</sup> |
|---------------|--------|----|--------|----------------|
| 2             | 32.852 | 7  | 0.7780 | 0.99966        |
| 5             | 46.060 | 8  | 0.7859 | 0.99958        |
| 10            | 56.974 | 9  | 0.7953 | 0.99952        |
| 25            | 72.739 | 10 | 0.8115 | 0.99942        |
| 50            | 84.475 | 11 | 0.8147 | 0.99940        |
| 100           | 92.718 | 11 | 0.8145 | 0.99942        |

TABLE 202-01: IDF Equation Values for Indianapolis, IN

| Hours | Minutes | Return Period - Rainfall Intensity (in/hr) |      |      |      |      |      |
|-------|---------|--------------------------------------------|------|------|------|------|------|
|       |         | 2                                          | 5    | 10   | 25   | 50   | 100  |
| 0.08  | 5       | 4.75                                       | 6.14 | 6.99 | 8.08 | 8.83 | 9.69 |
| 0.17  | 10      | 3.63                                       | 4.75 | 5.48 | 6.40 | 7.07 | 7.77 |
| 0.25  | 15      | 2.97                                       | 3.92 | 4.55 | 5.34 | 5.94 | 6.53 |
| 0.5   | 30      | 1.98                                       | 2.64 | 3.09 | 3.65 | 4.10 | 4.50 |
| 1     | 60      | 1.25                                       | 1.67 | 1.96 | 2.31 | 2.62 | 2.88 |
| 2     | 120     | 0.76                                       | 1.02 | 1.20 | 1.40 | 1.59 | 1.75 |
| 3     | 180     | 0.56                                       | 0.75 | 0.88 | 1.03 | 1.17 | 1.29 |
| 6     | 360     | 0.33                                       | 0.44 | 0.52 | 0.60 | 0.68 | 0.75 |
| 12    | 720     | 0.20                                       | 0.26 | 0.30 | 0.35 | 0.39 | 0.43 |
| 24    | 1440    | 0.11                                       | 0.15 | 0.17 | 0.20 | 0.22 | 0.25 |

| Hours | Minutes | Return Period - Rainfall Depth (in) |      |      |      |      |      |
|-------|---------|-------------------------------------|------|------|------|------|------|
|       |         | 2                                   | 5    | 10   | 25   | 50   | 100  |
| 0.08  | 5       | 0.40                                | 0.51 | 0.58 | 0.67 | 0.74 | 0.81 |
| 0.17  | 10      | 0.61                                | 0.79 | 0.91 | 1.07 | 1.18 | 1.30 |
| 0.25  | 15      | 0.74                                | 0.98 | 1.14 | 1.34 | 1.49 | 1.63 |
| 0.5   | 30      | 0.99                                | 1.32 | 1.55 | 1.83 | 2.05 | 2.25 |
| 1     | 60      | 1.25                                | 1.67 | 1.96 | 2.31 | 2.62 | 2.88 |
| 2     | 120     | 1.52                                | 2.04 | 2.40 | 2.80 | 3.18 | 3.50 |
| 3     | 180     | 1.68                                | 2.25 | 2.64 | 3.09 | 3.51 | 3.87 |
| 6     | 360     | 1.98                                | 2.64 | 3.12 | 3.60 | 4.08 | 4.50 |
| 12    | 720     | 2.40                                | 3.12 | 3.60 | 4.20 | 4.68 | 5.16 |
| 24    | 1440    | 2.64                                | 3.60 | 4.08 | 4.80 | 5.28 | 6.00 |

TABLE 202-02: IDF and IDD Tables for Indianapolis, IN

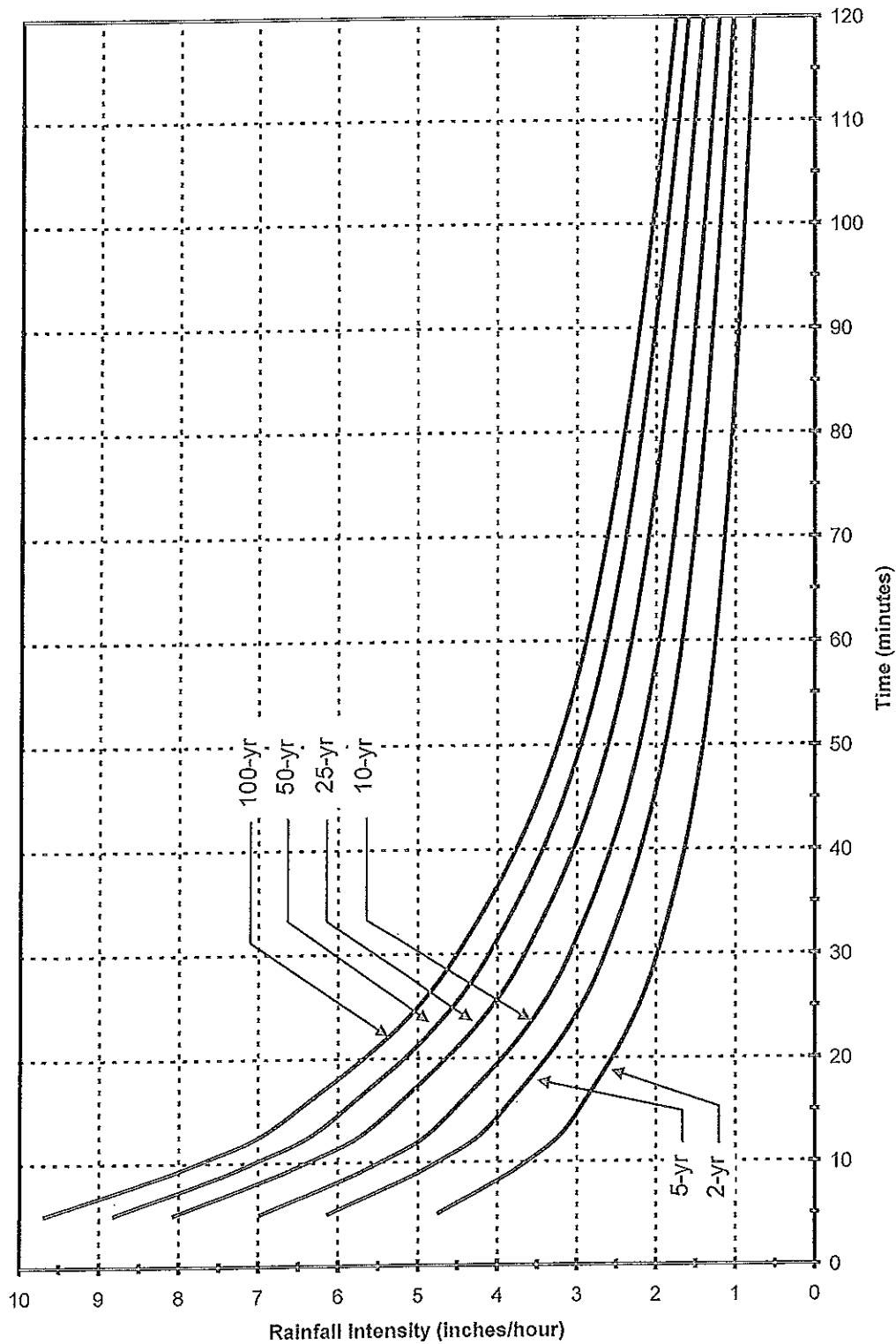


FIGURE 202-01: Indianapolis IDF Curve

| Surface Description                                          | n     |
|--------------------------------------------------------------|-------|
| Smooth surfaces<br>(concrete, asphalt, gravel, or bare soil) | 0.011 |
| Fallow (no residue)                                          | 0.05  |
| Cultivated Soils:                                            |       |
| Residue cover $\leq 20\%$                                    | 0.06  |
| Residue cover $> 20\%$                                       | 0.17  |
| Grass:                                                       |       |
| Short grass prairie                                          | 0.15  |
| Dense grasses                                                | 0.24  |
| Bermuda grass                                                | 0.41  |
| Range (natural)                                              | 0.13  |
| Woods:                                                       |       |
| Light underbrush                                             | 0.40  |
| Dense underbrush                                             | 0.80  |

TABLE 203-01: Roughness coefficients (Manning's n) for sheet flow

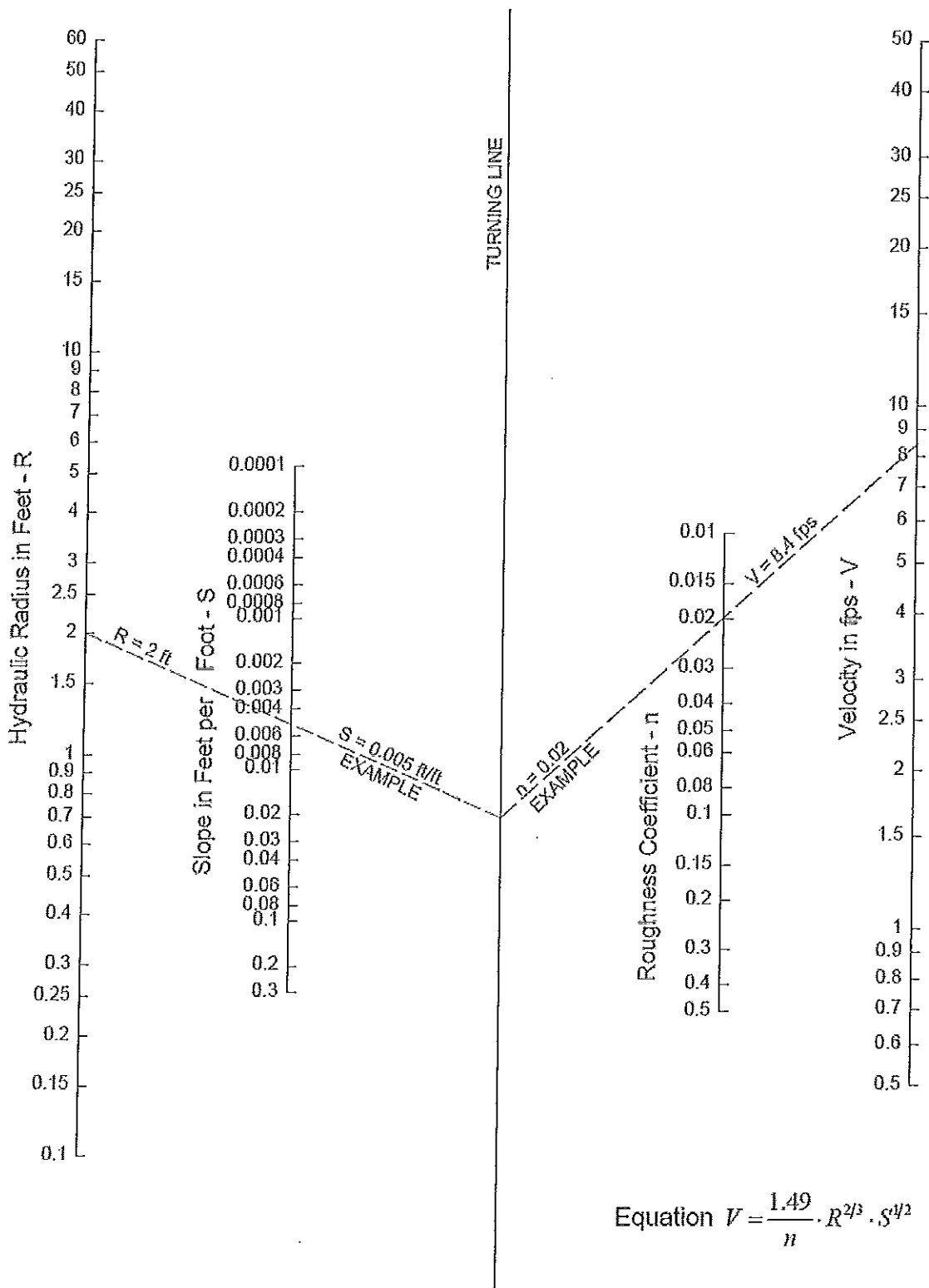


FIGURE 203-03: Nomograph for Solution of Manning Equation  
(SOURCE: North Carolina Erosion & Sediment Control Planning & Design Manual, 09/01/88)

| <u>TYPE OF SURFACE</u>               | <u>RUNOFF COEFFICIENT<sup>®</sup></u> |
|--------------------------------------|---------------------------------------|
| <u>Non-Urban Areas</u>               |                                       |
| Bare earth                           | 0.55                                  |
| Steep grassed areas (slope 2:1)      | 0.60                                  |
| Turf meadows                         | 0.25                                  |
| Forested areas                       | 0.20                                  |
| Cultivated fields                    | 0.30                                  |
| <u>Urban Areas</u>                   |                                       |
| All watertight roof surfaces         | 0.90                                  |
| Pavement                             | 0.85                                  |
| Gravel                               | 0.85                                  |
| Impervious soils (heavy)             | 0.55                                  |
| Impervious soils (with turf)         | 0.45                                  |
| Slightly pervious soil               | 0.25                                  |
| Slightly pervious soil (with turf)   | 0.20                                  |
| Moderately pervious soil             | 0.15                                  |
| Moderately pervious soil (with turf) | 0.10                                  |
| Business, Commercial & Industrial    | 0.85                                  |
| Apartments & Townhouses              | 0.70                                  |
| Schools & Churches                   | 0.55                                  |
| Single Family Lots < 10,000 SF       | 0.45                                  |
| Lots < 12,000 SF                     | 0.45                                  |
| Lots < 17,000 SF                     | 0.40                                  |
| Lots > ½ acre                        | 0.35                                  |
| Park, Cemetery or Unimproved Area    | 0.30                                  |

TABLE 204-01: Runoff Coefficients<sup>®</sup> for Use in the Rational Method

[Absence of an entry indicates the feature is not a concern. The symbol < means less than; > means greater than]

| Soil name and map symbol                                   | Hydro-logic group | Flooding      |            |              | High water table       |               |              | Potential frost action |
|------------------------------------------------------------|-------------------|---------------|------------|--------------|------------------------|---------------|--------------|------------------------|
|                                                            |                   | Frequency     | Duration   | Months       | Depth                  | Kind          | Months       |                        |
| Brookston:<br>Br.....                                      | B/D               | Frequent..... | Brief..... | Dec-May..... | <sup>Ft</sup><br>0-1.0 | Apparent..... | Dec-May..... | High.                  |
| Crosby:<br>Ca.....                                         | C                 | None.....     |            |              | 1.0-3.0                | Apparent..... | Jan-Apr..... | High.                  |
| <sup>1</sup> CaB2:<br>Crosby part.....                     | C                 | None.....     |            |              | 1.0-3.0                | Apparent..... | Jan-Apr..... | High.                  |
| Miami part.....                                            | B                 | None.....     |            |              | >6.0                   |               |              | Moderate.              |
| Eel:<br>Ea.....                                            | C                 | Frequent..... | Brief..... | Oct-Jun..... | 3.0-6.0                | Apparent..... | Jan-Apr..... | High.                  |
| Fox:<br>FoA, FoB2, <sup>1</sup> FxC2.....                  | B                 | None.....     |            |              | >6.0                   |               |              | Moderate.              |
| Genesee:<br>Ga.....                                        | B                 | Frequent..... | Brief..... | Oct-Jun..... | >6.0                   |               |              | Moderate.              |
| Hennepin:<br>Ha.....                                       | B                 | None.....     |            |              | >6.0                   |               |              | Moderate.              |
| Martinsville:<br>MaA, MaB2.....                            | B                 | None.....     |            |              | >6.0                   |               |              | Moderate.              |
| Miami:<br>MaA, MaB2, MxC2,<br><sup>1</sup> MxB2, MxE2..... | B                 | None.....     |            |              | >6.0                   |               |              | Moderate.              |
| Oakley:<br>OaA, OaB2.....                                  | B                 | None.....     |            |              | >6.0                   |               |              | Moderate.              |
| Rensselaer:<br>Ra.....                                     | B/D               | None.....     |            |              | 0-1.0                  | Apparent..... | Dec-May..... | High.                  |
| Shoals:<br>Sh.....                                         | C                 | Frequent..... | Brief..... | Oct-Jun..... | 1.0-3.0                | Apparent..... | Jan-Apr..... | High.                  |
| Sleeth:<br>Sk.....                                         | C                 | None.....     |            |              | 1.0-3.0                | Apparent..... | Jan-Apr..... | High.                  |
| Sloan:<br>Sa.....                                          | B/D               | Frequent..... | Long.....  | Oct-Jun..... | 0-0.5                  | Apparent..... | Nov-Jun..... | High.                  |
| Urban land:<br><sup>1</sup> Ua:<br>Brookston part.....     | B/D               | Frequent..... | Brief..... | Dec-May..... | 0-1.0                  | Apparent..... | Dec-May..... | High.                  |
| <sup>1</sup> Uc:<br>Crosby part.....                       | C                 | None.....     |            |              | 1.0-3.0                | Apparent..... | Jan-Apr..... | High.                  |
| <sup>1</sup> UfA:<br>Fox part.....                         | B                 | None.....     |            |              | >6.0                   |               |              | Moderate.              |
| <sup>1</sup> UfC:<br>Fox part.....                         | B                 | None.....     |            |              | >6.0                   |               |              | Moderate.              |
| <sup>1</sup> Ug:<br>Genesee part.....                      | B                 | Frequent..... | Brief..... | Oct-Jun..... | >6.0                   |               |              | Moderate.              |
| <sup>1</sup> UmB:<br>Miami part.....                       | B                 | None.....     |            |              | >6.0                   |               |              | Moderate.              |
| <sup>1</sup> UmC:<br>Miami part.....                       | B                 | None.....     |            |              | >6.0                   |               |              | Moderate.              |
| <sup>1</sup> Uw:<br>Westland part.....                     | B/D               | Frequent..... | Brief..... | Dec-May..... | 0-1.0                  | Apparent..... | Dec-May..... | High.                  |
| Westland:<br>We.....                                       | B/D               | Frequent..... | Brief..... | Dec-May..... | 0-1.0                  | Apparent..... | Dec-May..... | High.                  |
| Whitaker:<br>Wk.....                                       | C                 | None.....     |            |              | 1.0-3.0                | Apparent..... | Jan-Apr..... | High.                  |

<sup>1</sup> This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 205-01: Soil and Water Features for Marion County, Indiana  
(SOURCE: NRCS, Soil Survey of Marion county, Indiana, 1991)

| Cover Description                                                                            | Curve Numbers for Hydrologic Soil Groups     |    |    |    |    |
|----------------------------------------------------------------------------------------------|----------------------------------------------|----|----|----|----|
| Cover Type and Hydrologic Condition                                                          | Average Percent <sup>2</sup> Impervious Area | A  | B  | C  | D  |
| Fully developed urban areas (vegetation established)                                         |                                              |    |    |    |    |
| Open space (lawns, parks, golf courses, cemeteries, etc.)                                    |                                              | 68 | 79 | 86 | 89 |
| Poor condition (grass cover < 50%)                                                           |                                              | 49 | 69 | 79 | 84 |
| Fair condition (grass cover 50% to 75%)                                                      |                                              | 39 | 61 | 74 | 80 |
| Good condition (grass cover > 75%)                                                           |                                              |    |    |    |    |
| Impervious Areas:                                                                            |                                              |    |    |    |    |
| Paved parking lots, roofs, driveways, etc. (excluding right-of-way)                          |                                              | 98 | 98 | 98 | 98 |
| Streets and Roads:                                                                           |                                              |    |    |    |    |
| Paved; curbs and storm drains (excluding right-of-way)                                       |                                              | 98 | 98 | 98 | 98 |
| Paved; open ditches (including right-of-way)                                                 |                                              | 83 | 89 | 92 | 93 |
| Gravel (including right-of-way)                                                              |                                              | 76 | 85 | 89 | 91 |
| Dirt (including right-of-way)                                                                |                                              | 72 | 82 | 87 | 89 |
| Urban Districts:                                                                             |                                              |    |    |    |    |
| Commercial and Business                                                                      | 85                                           | 89 | 92 | 94 | 95 |
| Industrial                                                                                   | 72                                           | 81 | 88 | 91 | 93 |
| Residential Districts by Average Lot Size:                                                   |                                              |    |    |    |    |
| 0.125 acre or less (townhouses)                                                              | 65                                           | 77 | 85 | 90 | 92 |
| 0.25 acre                                                                                    | 38                                           | 61 | 75 | 83 | 87 |
| 0.33 acre                                                                                    | 30                                           | 57 | 72 | 81 | 86 |
| 0.50 acre                                                                                    | 25                                           | 54 | 70 | 80 | 85 |
| 1.00 acre                                                                                    | 20                                           | 51 | 68 | 79 | 84 |
| 2.00 acre                                                                                    | 12                                           | 46 | 65 | 77 | 82 |
| Developing Urban Areas                                                                       |                                              |    |    |    |    |
| Newly graded areas (pervious area only, no vegetation)                                       |                                              | 77 | 86 | 91 | 94 |
| Idle lands (CN's are determined using cover types similar to those in <i>Table 205-04</i> ). |                                              |    |    |    |    |

<sup>1</sup> Average runoff condition, and  $I_a = 0.2S$

<sup>2</sup> The average percent impervious area shown was used to develop the composite CNs. Other assumptions are as follows: Impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. If the impervious area is not connected, the NRCS method has an adjustment to reduce the effect.

<sup>3</sup> CNs shown are equivalent to those of pasture. Composite CNs may be computed for other combinations of open space cover type.

**TABLE 205-02: Runoff Curve Numbers for Urban Areas**  
(SOURCE: 210-VI-TR-55, Second Ed., June 1986)

| Cover Description                   | Curve Numbers for Hydrologic Soil Groups |    |    |    |
|-------------------------------------|------------------------------------------|----|----|----|
| Cover Type and Hydrologic Condition | A                                        | B  | C  | D  |
| Cultivated Land (Row Crops)         | 72                                       | 81 | 88 | 91 |
| With conservation treatment         | 62                                       | 71 | 78 | 81 |
| Without conservation treatment      |                                          |    |    |    |
| Pasture or Range Land               | 68                                       | 79 | 86 | 89 |
| Poor condition                      | 39                                       | 61 | 74 | 80 |
| Good condition                      |                                          |    |    |    |
| Meadow                              | 30                                       | 58 | 71 | 78 |
| Good condition                      |                                          |    |    |    |
| Wood or Forest Land                 |                                          |    |    |    |
| Thin stand, poor cover, no mulch    | 45                                       | 66 | 77 | 83 |
|                                     | 25                                       | 55 | 70 | 77 |
| Good cover                          |                                          |    |    |    |

**TABLE 205-03: Runoff Curve Numbers for Undeveloped Areas**  
(SOURCE: 210-VI-TR-55, Second Ed., June 1986)

| Cover Description                                                                 | Curve Numbers for Hydrologic Soil Groups |    |    |    |
|-----------------------------------------------------------------------------------|------------------------------------------|----|----|----|
| Cover Type and Hydrologic Condition                                               | A                                        | B  | C  | D  |
| Pasture, grassland or range with continuous forage for grazing.                   |                                          |    |    |    |
| Poor                                                                              | 68                                       | 79 | 86 | 89 |
| Fair                                                                              | 49                                       | 69 | 79 | 84 |
| Good                                                                              | 39                                       | 61 | 74 | 80 |
| Meadow with continuous grass, protected from grazing and generally mowed for hay. | 30                                       | 58 | 71 | 78 |
| Brush/brush-weed-grass mixture with brush being the major element.                |                                          |    |    |    |
| Poor                                                                              | 48                                       | 67 | 77 | 83 |
| Fair                                                                              | 35                                       | 56 | 70 | 77 |
| Good                                                                              | 30                                       | 48 | 65 | 73 |
| Woods and grass combination (orchard or tree farm).                               |                                          |    |    |    |
| Poor                                                                              | 57                                       | 73 | 82 | 86 |
| Fair                                                                              | 43                                       | 65 | 76 | 82 |
| Good                                                                              | 32                                       | 58 | 72 | 79 |
| Woods                                                                             |                                          |    |    |    |
| Poor                                                                              | 45                                       | 66 | 77 | 83 |
| Fair                                                                              | 36                                       | 60 | 73 | 79 |
| Good                                                                              | 30                                       | 55 | 70 | 77 |
| Farmsteads                                                                        | 59                                       | 74 | 82 | 86 |

**TABLE 205-04: Runoff Curve Numbers for Agricultural Lands**  
(SOURCE: 210-VI-TR-55, Second Ed., June 1986)