# PROJECT NARRATIVE AND STORMWATER MANAGEMENT REPORT

**FOR**
**THE MALVERN SCHOOL**
**WESTTOWN TOWNSHIP, CHESTER COUNTY, PA**

**PREPARED BY**

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**EBWA FILE NO. 4432**

**APRIL 5, 2018**

Introduction:

The Malvern School is proposing to redevelop a 2.27 acre parcel that was the former Westtown Township Municipal Office. The proposed project calls for the removal of the existing structures and construction of a new Pre-School with parking.

The Westtown Township Stormwater Management Ordinance specifies this site as being located in the .5 release rate area of the Chester Creek Drainage Basin. That means that all post-development flows need to be reduced by half of the pre-development condition. The Ordinance and BMP and NPDES regulations require the infiltration of the difference in volume for the 2-year storm. If soil testing reveals that the 2-year volume could not be infiltrated, the Ordinance specifies other requirements that must be met.

Stormwater Narrative:

Edward B. Walsh and Associates, Inc. conducted soil and infiltration testing at six (6) locations throughout the site and determined that infiltration would be possible on the site. The testing report can be found in Appendix "A" of the analysis. The development of the site, its topography and the lack of available land outside of proposed impervious areas dictate that the stormwater detention be accomplished underground. One (1) infiltration bed will be designed to infiltrate the difference of the 2-year storm and control all of the storm events through the 100-year storm.

Worksheet #4 of the PA BMP Manual was utilized to determine the volume differential for the 2-year storm. This worksheet indicated that 2855 C.F. is required. Bed #1 infiltrates 4641 C.F. during the 2-year storm event. The system infiltrates more than that as other events are infiltrated as well.

The infiltration bed and stormwater management design was performed using the Rational Formula. This was chosen because the drainage areas are small and the Rational Formula is a more realistic representative of the stormwater occurrences with small drainage areas. Regardless of the design methodology, the required volume calculations is based on the SCS methodology.

The design concept is for Bed # 1 to collect and infiltrate the watershed. The total flow from Bed #1 is added to the uncontrolled bypass to obtain the total post-development flow. The following summary highlights the flows for the pre and post-development condition. A column is added showing the permissible .5 post-development flow. Post-Development Flows were determined by adding the hydrographs of the bypass and Bed #1 flows.

Flow Summary:

| Storm Event | Pre-Development | Perm. .5 Flow | By-Pass | Bed #1 | Combined Total Post |
|---|---|---|---|---|---|
| 2-Year | 5.316 | 2.658 | 1.287 | .0 | 1.287 |
| 5-Year | 6.245 | 3.123 | 1.512 | .039 | 1.512 |
| 10-Year | 6.929 | 3.645 | 1.677 | .209 | 1.677 |
| 25-Year | 7.86 | 3.93 | 1.902 | .589 | 1.902 |
| 50-Year | 8.782 | 4.391 | 2.126 | 1.095 | 2.126 |
| 100-Year | 9.6 | 4.8 | 2.324 | 1.552 | 2.324 |

As can be seen, all of the total post-development flows are below one-half of the pre-development conditions.

Conveyance System Design:

The stormwater conveyance system will be designed utilizing the Hydroflow Storm Sewer Design Software. The software analyzes the storm sewer system using Mannings Equation and headwater/tailwater for its analysis. Since all of the water in the storm sewer system is piped to the infiltration system, the 100-year storm flow was used in the analysis.

## WORKSHEET 4. CHANGE IN RUNOFF VOLUME FOR 2-YR STORM EVENT

PROJECT: Westtown site

Drainage Area: 2.27 acres *98881*

2-Year Rainfall: 3.2 in

Total Site Area: 2.27 acres

Protected Site Area: 0 acres

Managed Area: 2.27 acres

**Existing Conditions:**

| Cover Type / Condition | Soil Type | Area (sf) | Area (ac) | CN | S | Ia 0.2*s | Q Runoff[1] (in) | Runoff Volume[2] ($ft^3$) |
|---|---|---|---|---|---|---|---|---|
| Lawn | C | 67954 | 1.56 | 74 | 3.51 | 0.70 | 1.038 | 5875 |
| | | | 0.00 | | | | | |
| Woods | C | 12632 | 0.29 | 70 | 4.29 | 0.86 | 0.828 | 872 |
| IMPERVIOUS | C | 18194 | 0.42 | 98 | 0.20 | 0.04 | 2.967 | 4499 |
| Meadow | B | 0 | 0.00 | 58 | 7.24 | 1.45 | 0.341 | 0 |
| LAWN | B | 0 | 0.00 | 74 | 3.51 | 0.70 | 1.038 | 0 |
| IMPERVIOUS | B | 0 | 0.00 | 98 | 0.20 | 0.04 | 2.967 | 0 |
| **TOTAL:** | | | **2.27** | | | | | **11246** |

**Developed Conditions:**

| Cover Type / Condition | Soil Type | Area (sf) | Area (ac) | CN | S | Ia 0.2*s | Q Runoff[1] (in) | Runoff Volume[2] ($ft^3$) |
|---|---|---|---|---|---|---|---|---|
| Impervious | D | 0 | 0.00 | 98 | 0.20 | 0.04 | 2.967 | 0 |
| Lawn | D | 0 | 0.00 | 80 | 2.50 | 0.50 | 1.402 | 0 |
| Meadow | D | 0 | 0.00 | 78 | 2.82 | 0.56 | 1.273 | 0 |
| | | | | | | | | |
| Impervious | C | 34519 | 0.79 | 98 | 0.20 | 0.04 | 2.967 | 8536 |
| Lawn | C | 64362 | 1.48 | 74 | 3.51 | 0.70 | 1.038 | 5565 |
| Meadow | C | 0 | 0.00 | 71 | 4.08 | 0.82 | 0.878 | 0 |
| | | | | | | | | |
| Impervious | B | 0 | 0.00 | 98 | 0.20 | 0.04 | 2.967 | 0 |
| Lawn | B | 0 | 0.00 | 61 | 6.39 | 1.28 | 0.444 | 0 |
| Meadow | B | 0 | 0.00 | 58 | 7.24 | 1.45 | 0.341 | 0 |
| | | | | | | | | |
| **TOTAL:** | | | **2.27** | | | | | **14101** |

**2-Year Volume Increase ($ft^3$): 2,855**

2-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

1. Runoff (in) = $Q = (P-0.2S)^2 / (P + 0.8S)$ where

P = 2-Year Rainfall (in)

S = (1000/CN) - 10

2. Runoff Volume (CF) = Q x Area x 1/12

Q = Runoff (in)

Area = Land Use Area (sq. ft.)

NOTE: Runoff volume must be calculated for EACH land use type/condition and HSGI. The use of a weighted CN value for volume calculations is not acceptable.

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# Hydrograph Return Period Recap

Hydraflow Hydrographs by Intelisolve v9.1

| Hyd. No. | Hydrograph type (origin) | Inflow Hyd(s) | Peak Outflow (cfs) | | | | | | | | Hydrograph description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1-Yr | 2-Yr | 3-Yr | 5-Yr | 10-Yr | 25-Yr | 50-Yr | 100-Yr | |
| 1 | Rational | ------ | ------ | 5.316 | ------ | 6.245 | 6.929 | 7.860 | 8.782 | 9.600 | pre development |
| 2 | Rational | ------ | ------ | 1.287 | ------ | 1.512 | 1.677 | 1.902 | 2.126 | 2.324 | post bypass |
| 3 | Rational | ------ | ------ | 5.156 | ------ | 6.057 | 6.721 | 7.623 | 8.518 | 9.311 | post to bed 1 |
| 5 | Reservoir | 3 | ------ | 0.218 | ------ | 0.267 | 0.443 | 0.832 | 1.346 | 1.810 | bed 1 pipe |
| 6 | Diversion1 | 5 | ------ | 0.218 | ------ | 0.228 | 0.234 | 0.243 | 0.251 | 0.258 | infiltration |
| 7 | Diversion2 | 5 | ------ | 0.000 | ------ | 0.039 | 0.209 | 0.589 | 1.095 | 1.552 | pipe flow |
| 9 | Combine | 2, 7, | ------ | 1.287 | ------ | 1.512 | 1.677 | 1.902 | 2.126 | 2.324 | Total Post |
| 11 | SCS Runoff | ------ | ------ | 6.267 | ------ | 9.187 | 11.54 | 13.31 | 15.37 | 18.01 | post to bed 1 scs |

# Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 5.316 | 1 | 15 | 4,785 | ---- | ------ | ------ | pre development |
| 2 | Rational | 1.287 | 1 | 15 | 1,158 | ---- | ------ | ------ | post bypass |
| 3 | Rational | 5.156 | 1 | 15 | 4,641 | ---- | ------ | ------ | post to bed 1 |
| 5 | Reservoir | 0.218 | 1 | 29 | 4,640 | 3 | 354.14 | 4,317 | bed 1 pipe |
| 6 | Diversion1 | 0.218 | 1 | 29 | 4,640 | 5 | ------ | ------ | infiltration |
| 7 | Diversion2 | 0.000 | 1 | n/a | 0 | 5 | ------ | ------ | pipe flow |
| 9 | Combine | 1.287 | 1 | 15 | 1,158 | 2, 7, | ------ | ------ | Total Post |
| 11 | SCS Runoff | 6.267 | 2 | 716 | 12,740 | ---- | ------ | ------ | post to bed 1 scs |

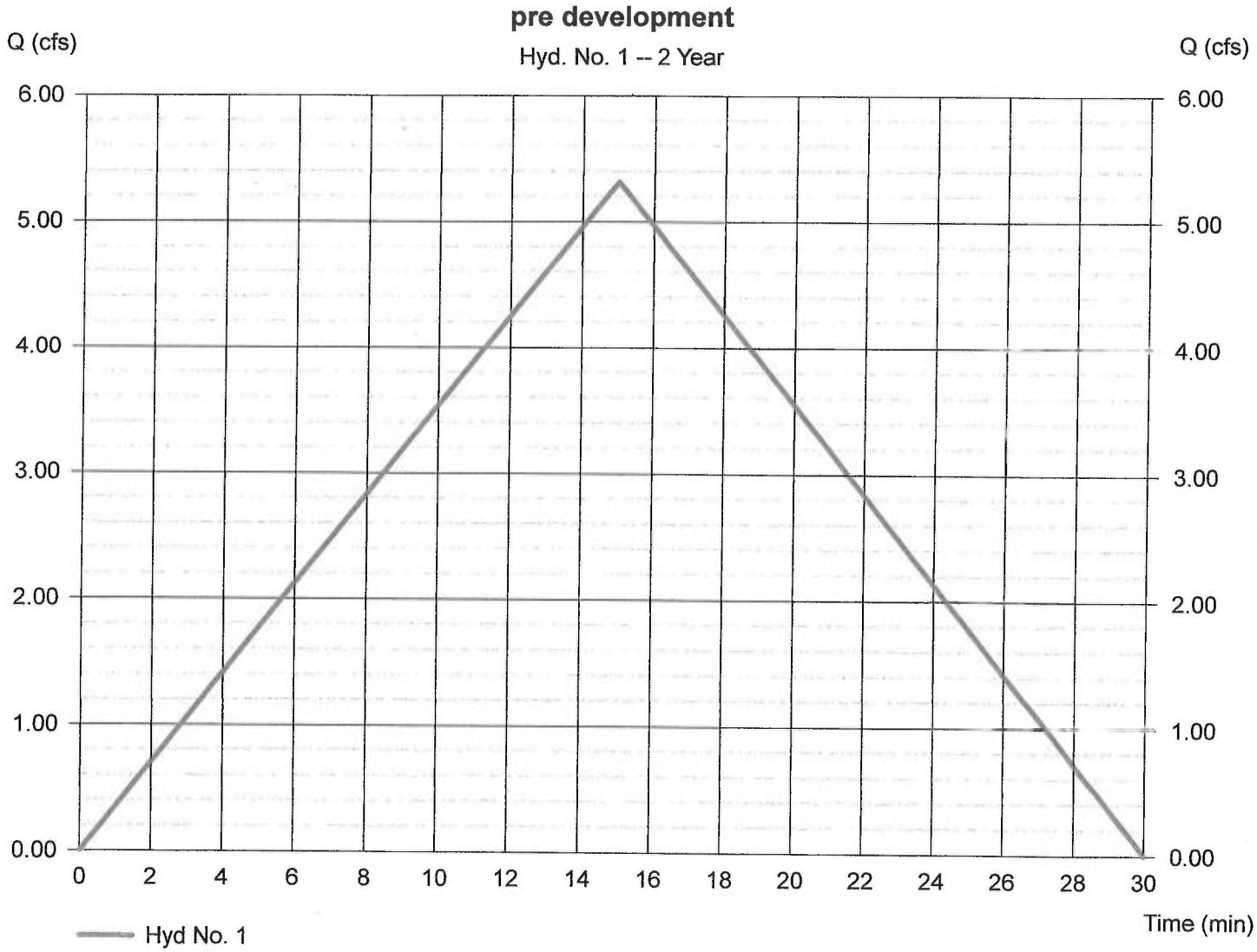
# Hydrograph Report



## Hyd. No. 1

pre development

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 5.316 cfs |
| Storm frequency | = 2 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 4,785 cuft |
| Drainage area | = 2.410 ac | Runoff coeff. | = 0.48 |
| Intensity | = 4.596 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |



# Hydrograph Report

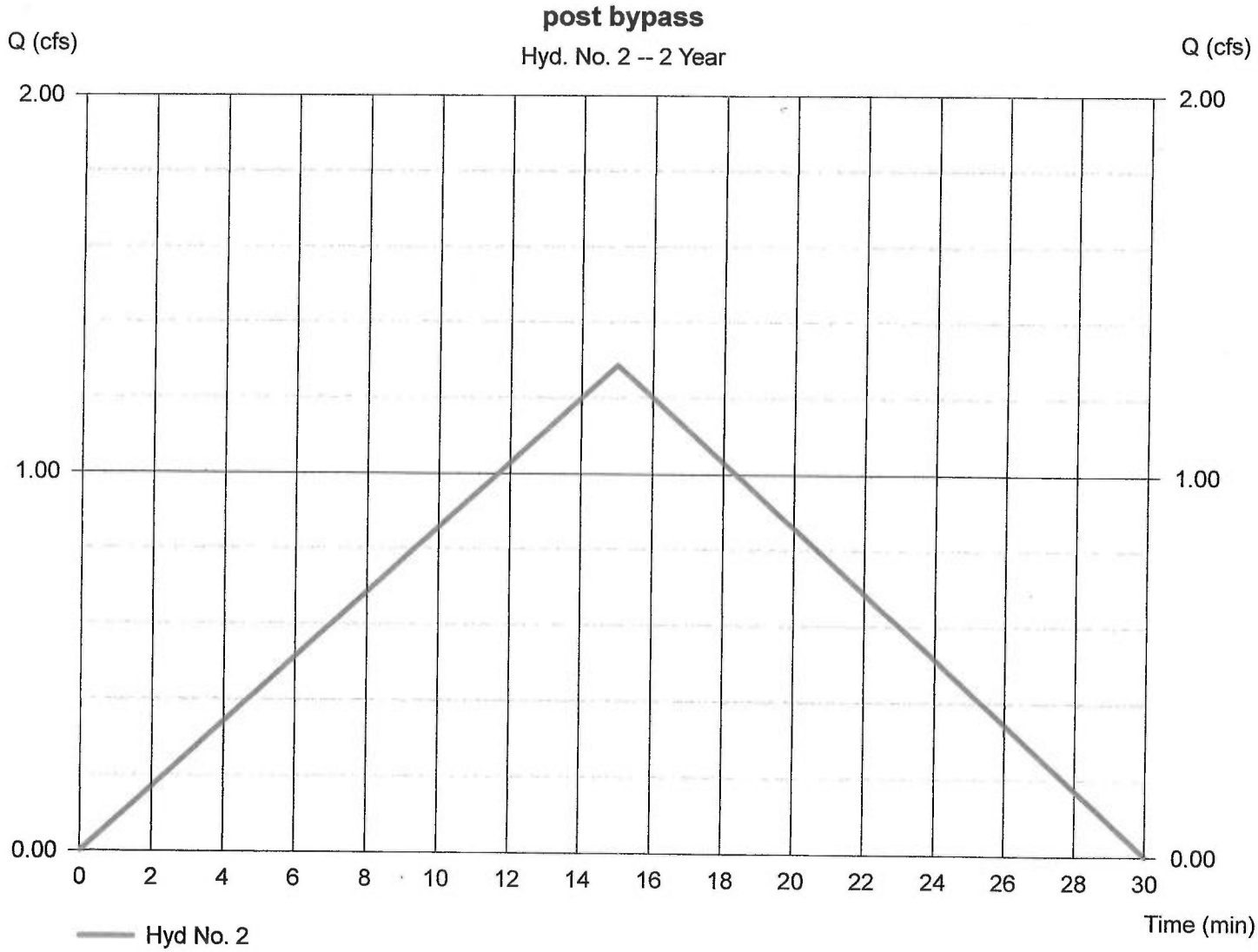


## Hyd. No. 2

post bypass

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 1.287 cfs |
| Storm frequency | = 2 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 1,158 cuft |
| Drainage area | = 0.700 ac | Runoff coeff. | = 0.4* |
| Intensity | = 4.596 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |

* Composite (Area/C) = [(0.060 x 0.95) + (0.640 x 0.35)] / 0.700



# Hydrograph Report

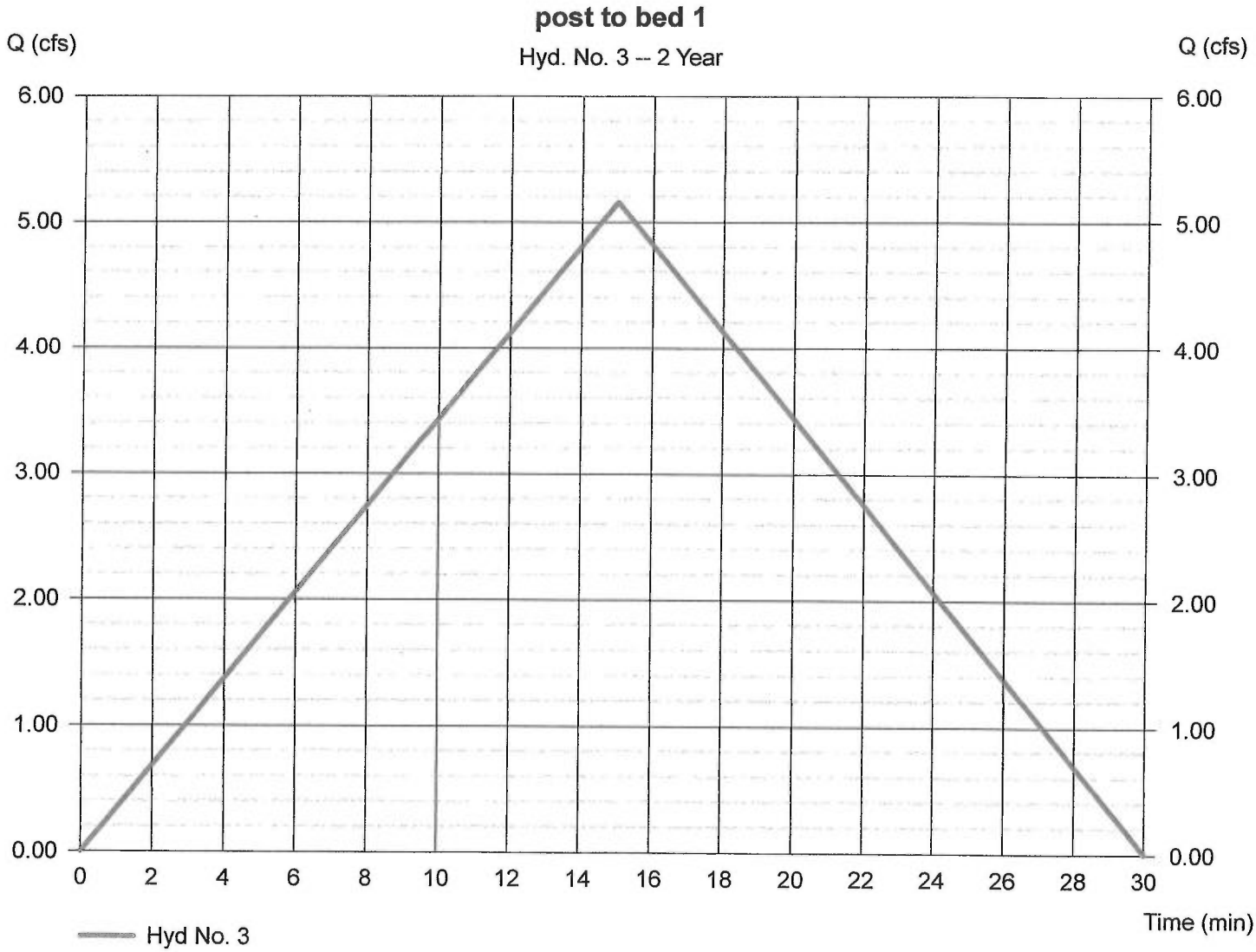


## Hyd. No. 3

post to bed 1

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 5.156 cfs |
| Storm frequency | = 2 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 4,641 cuft |
| Drainage area | = 2.040 ac | Runoff coeff. | = 0.55* |
| Intensity | = 4.596 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |

* Composite (Area/C) = [(1.370 x 0.35) + (0.665 x 0.95)] / 2.040



# Hydrograph Report

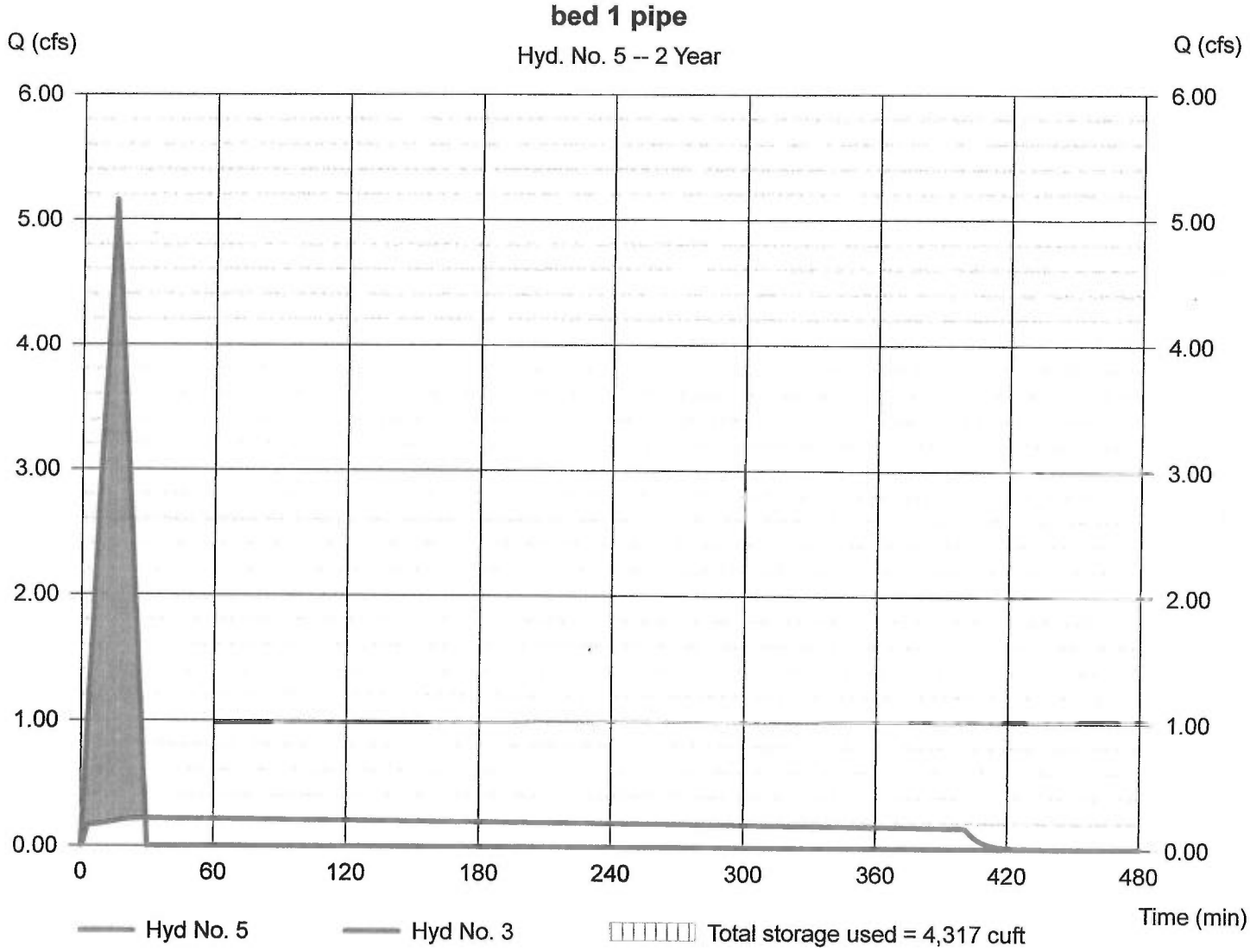


## Hyd. No. 5

bed 1 pipe

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 0.218 cfs |
| Storm frequency | = 2 yrs | Time to peak | = 29 min |
| Time interval | = 1 min | Hyd. volume | = 4,640 cuft |
| Inflow hyd. No. | = 3 - post to bed 1 | Max. Elevation | = 354.14 ft |
| Reservoir name | = bed 1 pipe | Max. Storage | = 4,317 cuft |

Storage Indication method used. Outflow includes exfiltration.



# Pond Report



## Pond No. 4 - bed 1 pipe

### Pond Data

**UG Chambers** - Invert elev. = 353.25 ft, Rise x Span = 1.50 x 1.50 ft, Barrel Len = 850.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No
**Encasement** - Invert elev. = 352.75 ft, Width = 8.00 ft, Height = 2.50 ft, Voids = 40.00%

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 352.75 | n/a | 0 | 0 |
| 0.25 | 353.00 | n/a | 680 | 680 |
| 0.50 | 353.25 | n/a | 680 | 1,360 |
| 0.75 | 353.50 | n/a | 779 | 2,139 |
| 1.00 | 353.75 | n/a | 844 | 2,984 |
| 1.25 | 354.00 | n/a | 868 | 3,851 |
| 1.50 | 354.25 | n/a | 868 | 4,719 |
| 1.75 | 354.50 | n/a | 844 | 5,564 |
| 2.00 | 354.75 | n/a | 779 | 6,343 |
| 2.25 | 355.00 | n/a | 680 | 7,023 |
| 2.50 | 355.25 | n/a | 680 | 7,703 |

### Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| Rise (in) | = 12.00 | 12.00 | 0.00 | 0.00 |
| Span (in) | = 12.00 | 12.00 | 0.00 | 0.00 |
| No. Barrels | = 1 | 1 | 0 | 0 |
| Invert El. (ft) | = 354.25 | 354.25 | 0.00 | 0.00 |
| Length (ft) | = 5.00 | 0.00 | 0.00 | 0.00 |
| Slope (%) | = 0.00 | 0.00 | 0.00 | n/a |
| N-Value | = .013 | .013 | .013 | n/a |
| Orifice Coeff. | = 0.60 | 0.60 | 0.60 | 0.60 |
| Multi-Stage | = n/a | Yes | No | No |

### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| Crest Len (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Crest El. (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Weir Coeff. | = 3.33 | 3.33 | 3.33 | 3.33 |
| Weir Type | = --- | --- | --- | --- |
| Multi-Stage | = No | No | No | No |

Exfil.(in/hr) = 1.030 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

### Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | PrfRsr cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | User cfs | Total cfs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 0 | 352.75 | 0.00 | 0.00 | --- | --- | --- | --- | --- | --- | 0.000 | --- | 0.00 |
| 0.25 | 680 | 353.00 | 0.00 | 0.00 | --- | --- | --- | --- | --- | --- | 0.172 | --- | 0.17 |
| 0.50 | 1,360 | 353.25 | 0.00 | 0.00 | --- | --- | --- | --- | --- | --- | 0.182 | --- | 0.18 |
| 0.75 | 2,139 | 353.50 | 0.00 | 0.00 | --- | --- | --- | --- | --- | --- | 0.193 | --- | 0.19 |
| 1.00 | 2,984 | 353.75 | 0.00 | 0.00 | --- | --- | --- | --- | --- | --- | 0.203 | --- | 0.20 |
| 1.25 | 3,851 | 354.00 | 0.00 | 0.00 | --- | --- | --- | --- | --- | --- | 0.213 | --- | 0.21 |
| 1.50 | 4,719 | 354.25 | 0.00 | 0.00 | --- | --- | --- | --- | --- | --- | 0.223 | --- | 0.22 |
| 1.75 | 5,564 | 354.50 | 0.17 ic | 0.17 ic | --- | --- | --- | --- | --- | --- | 0.233 | --- | 0.40 |
| 2.00 | 6,343 | 354.75 | 0.62 ic | 0.62 ic | --- | --- | --- | --- | --- | --- | 0.243 | --- | 0.87 |
| 2.25 | 7,023 | 355.00 | 1.24 ic | 1.24 ic | --- | --- | --- | --- | --- | --- | 0.253 | --- | 1.50 |
| 2.50 | 7,703 | 355.25 | 1.88 ic | 1.88 ic | --- | --- | --- | --- | --- | --- | 0.263 | --- | 2.14 |

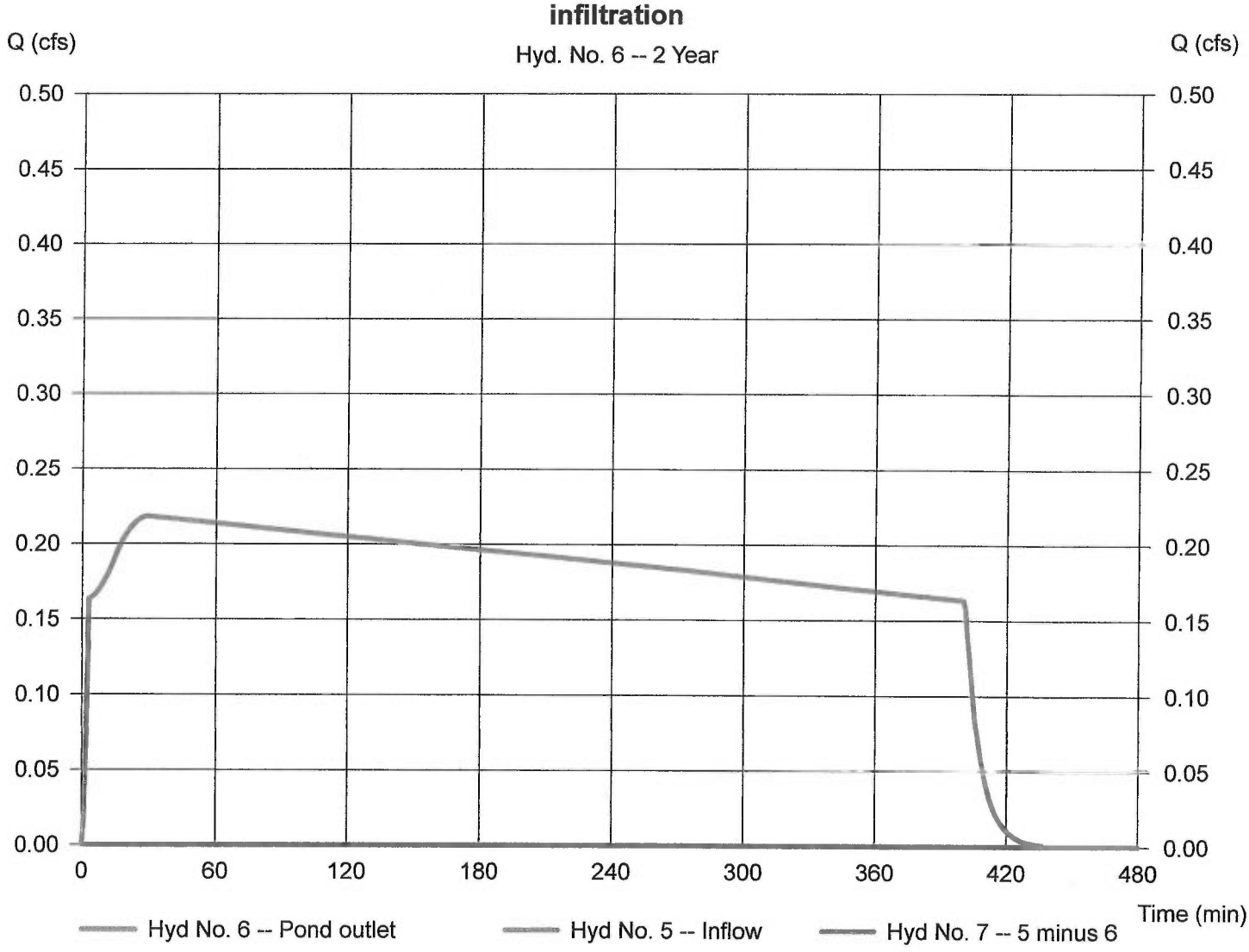
# Hydrograph Report



## Hyd. No. 6

infiltration

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion1 | Peak discharge | = 0.218 cfs |
| Storm frequency | = 2 yrs | Time to peak | = 29 min |
| Time interval | = 1 min | Hyd. volume | = 4,640 cuft |
| Inflow hydrograph | = 5 - bed 1 pipe | 2nd diverted hyd. | = 7 |
| Diversion method | = Pond - bed 1 pipe | Pond structure | = Exfiltration |



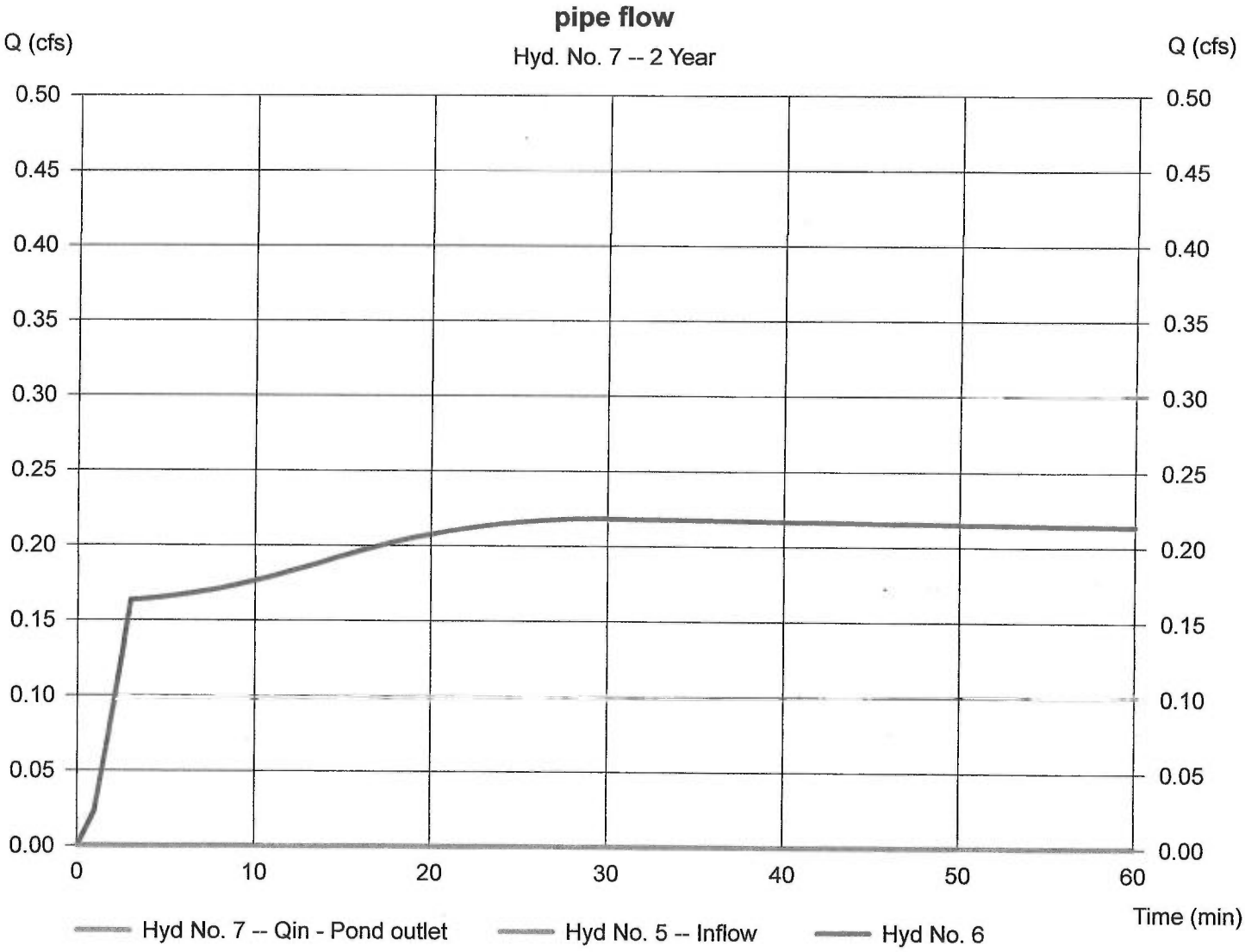
# Hydrograph Report



## Hyd. No. 7

pipe flow

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion2 | Peak discharge | = 0.000 cfs |
| Storm frequency | = 2 yrs | Time to peak | = n/a |
| Time interval | = 1 min | Hyd. volume | = 0 cuft |
| Inflow hydrograph | = 5 - bed 1 pipe | 2nd diverted hyd. | = 6 |
| Diversion method | = Pond - bed 1 pipe | Pond structure | = Exfiltration |



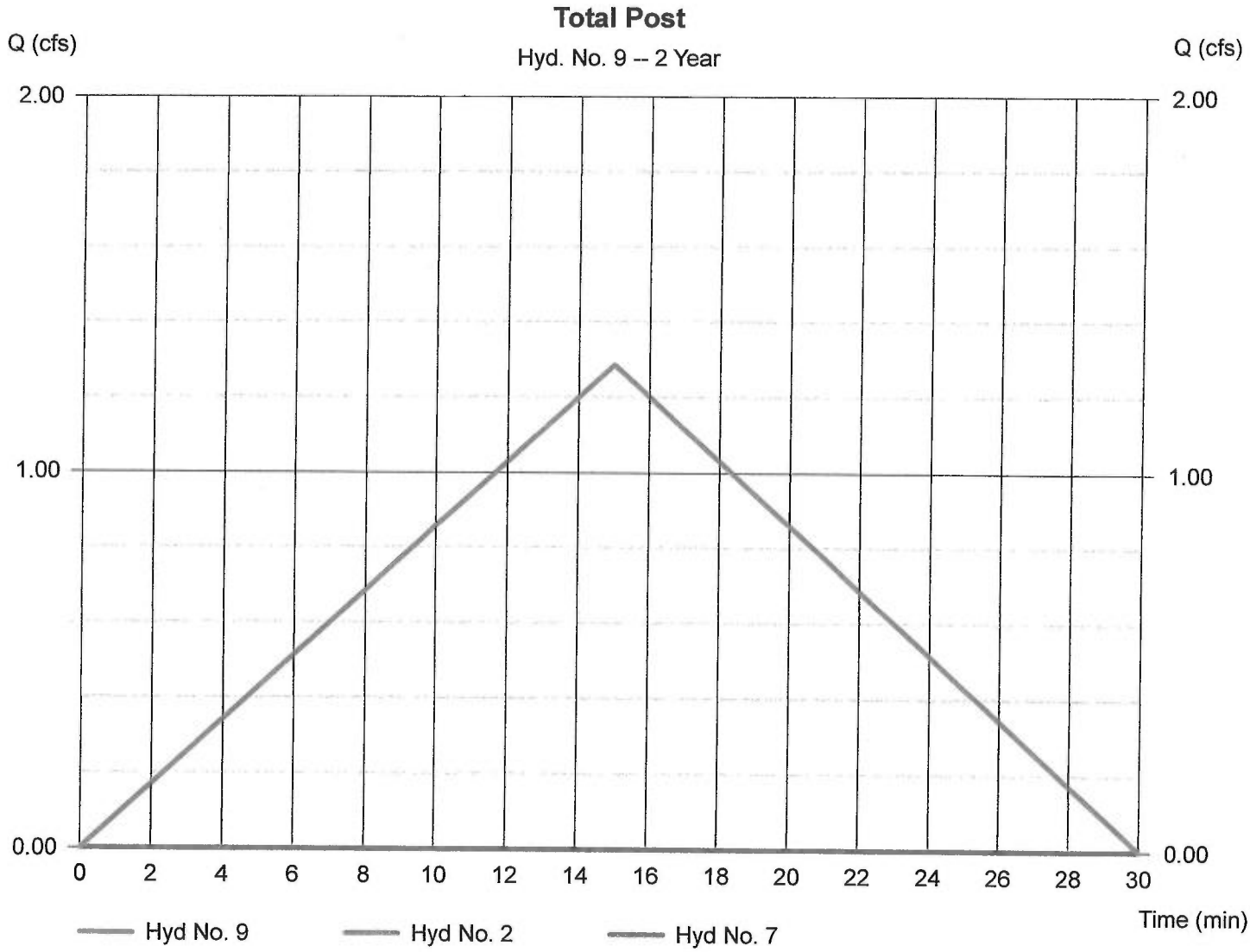
# Hydrograph Report



## Hyd. No. 9

Total Post

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 1.287 cfs |
| Storm frequency | = 2 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 1,158 cuft |
| Inflow hyds. | = 2, 7 | Contrib. drain. area | = 0.700 ac |



# Hydrograph Report

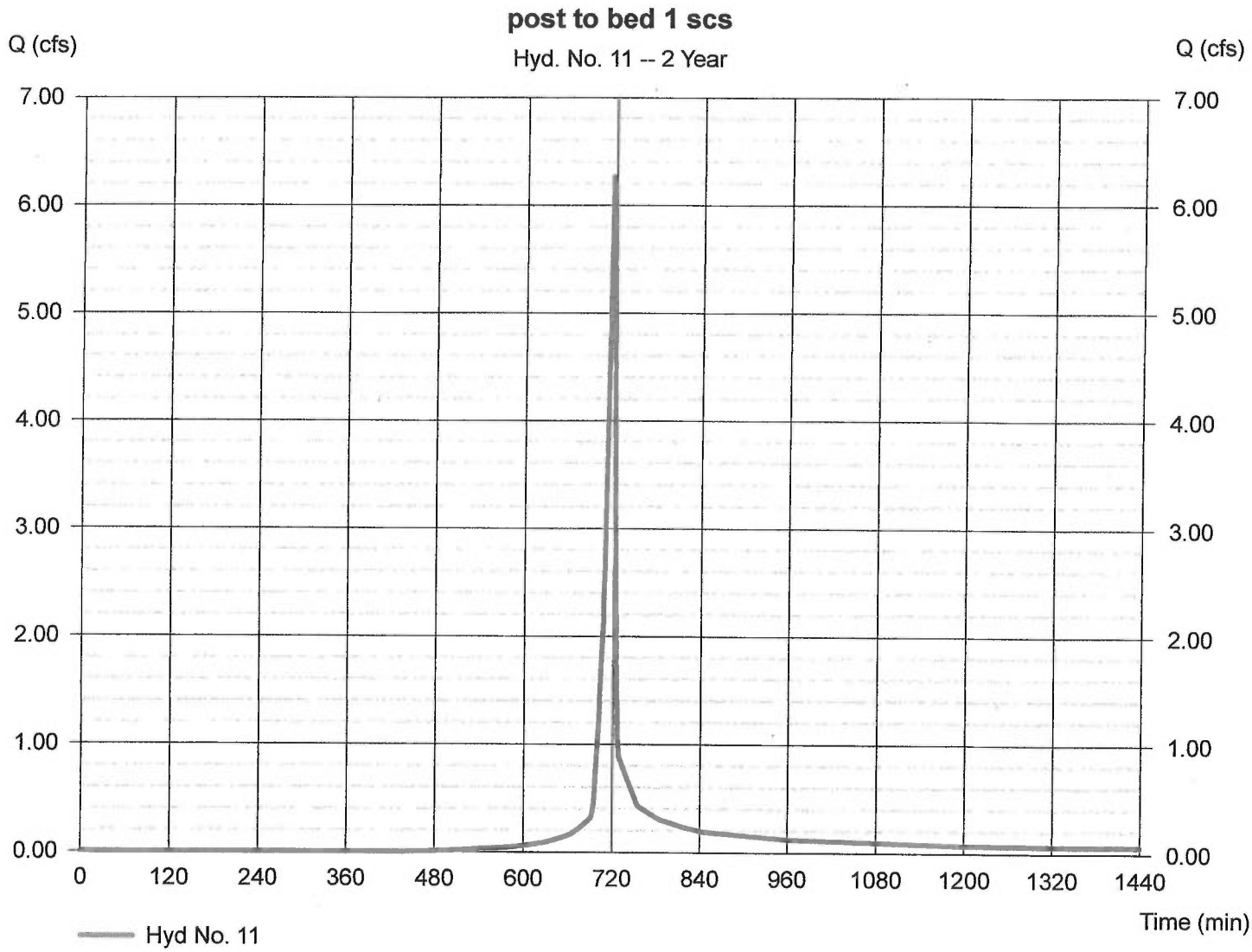
Hydraflow Hydrographs by Intelisolve v9.1 — Thursday, Apr 5, 2018

## Hyd. No. 11

post to bed 1 scs

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 6.267 cfs |
| Storm frequency | = 2 yrs | Time to peak | = 716 min |
| Time interval | = 2 min | Hyd. volume | = 12,740 cuft |
| Drainage area | = 2.040 ac | Curve number | = 86* |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5.00 min |
| Total precip. | = 3.20 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

* Composite (Area/CN) = [(1.370 x 80) + (0.670 x 98)] / 2.040



# Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 6.245 | 1 | 15 | 5,621 | ---- | ------ | ------ | pre development |
| 2 | Rational | 1.512 | 1 | 15 | 1,360 | ---- | ------ | ------ | post bypass |
| 3 | Rational | 6.057 | 1 | 15 | 5,451 | ---- | ------ | ------ | post to bed 1 |
| 5 | Reservoir | 0.267 | 1 | 29 | 5,451 | 3 | 354.37 | 5,110 | bed 1 pipe |
| 6 | Diversion1 | 0.228 | 1 | 29 | 5,422 | 5 | ------ | ------ | infiltration |
| 7 | Diversion2 | 0.039 | 1 | 29 | 29 | 5 | ------ | ------ | pipe flow |
| 9 | Combine | 1.512 | 1 | 15 | 1,390 | 2, 7, | ------ | ------ | Total Post |
| 11 | SCS Runoff | 9.187 | 2 | 716 | 18,940 | ---- | ------ | ------ | post to bed 1 scs |

# Hydrograph Report

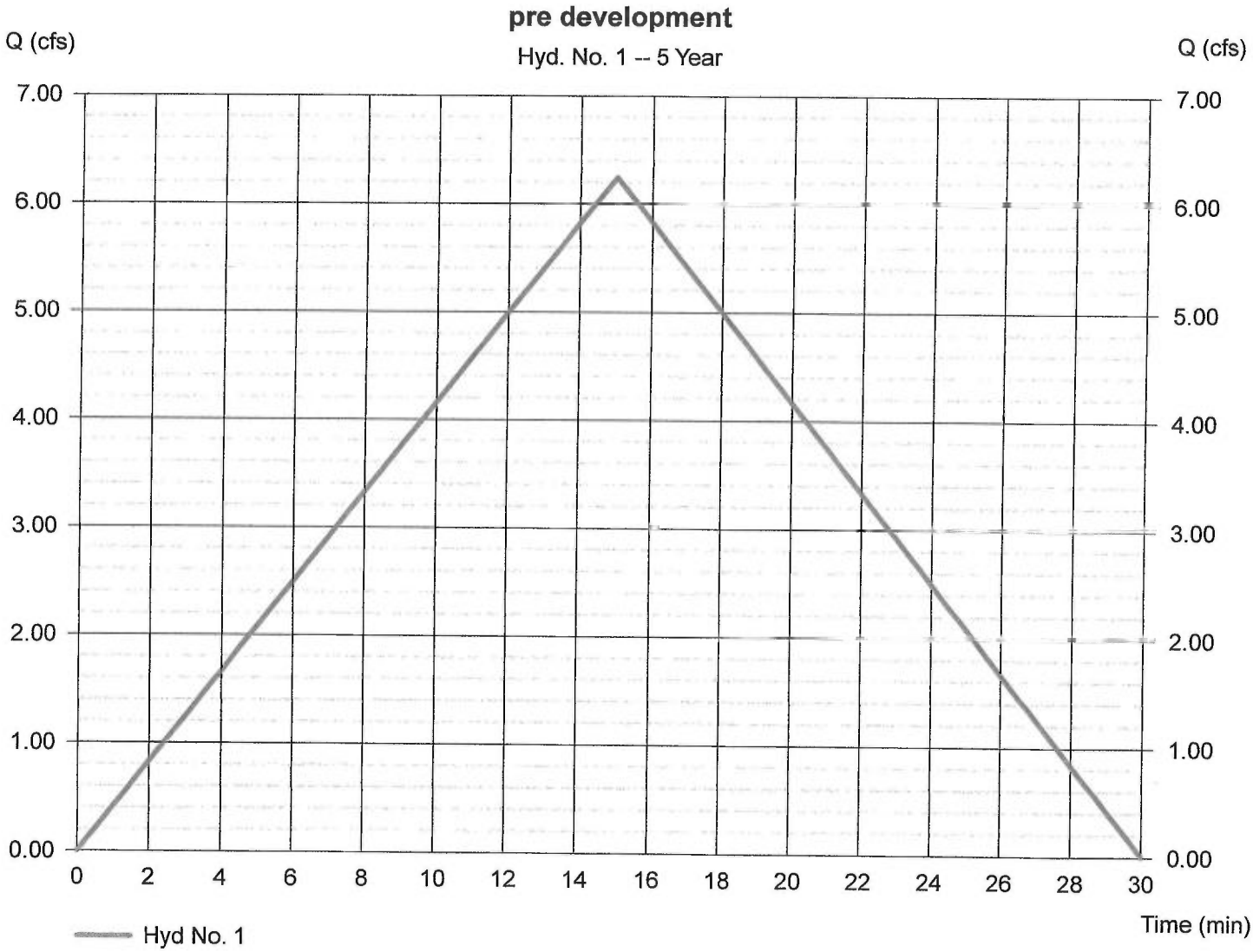
Hydraflow Hydrographs by Intelisolve v9.1

Thursday, Apr 5, 2018

## Hyd. No. 1

pre development

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 6.245 cfs |
| Storm frequency | = 5 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 5,621 cuft |
| Drainage area | = 2.410 ac | Runoff coeff. | = 0.48 |
| Intensity | = 5.399 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |



# Hydrograph Report

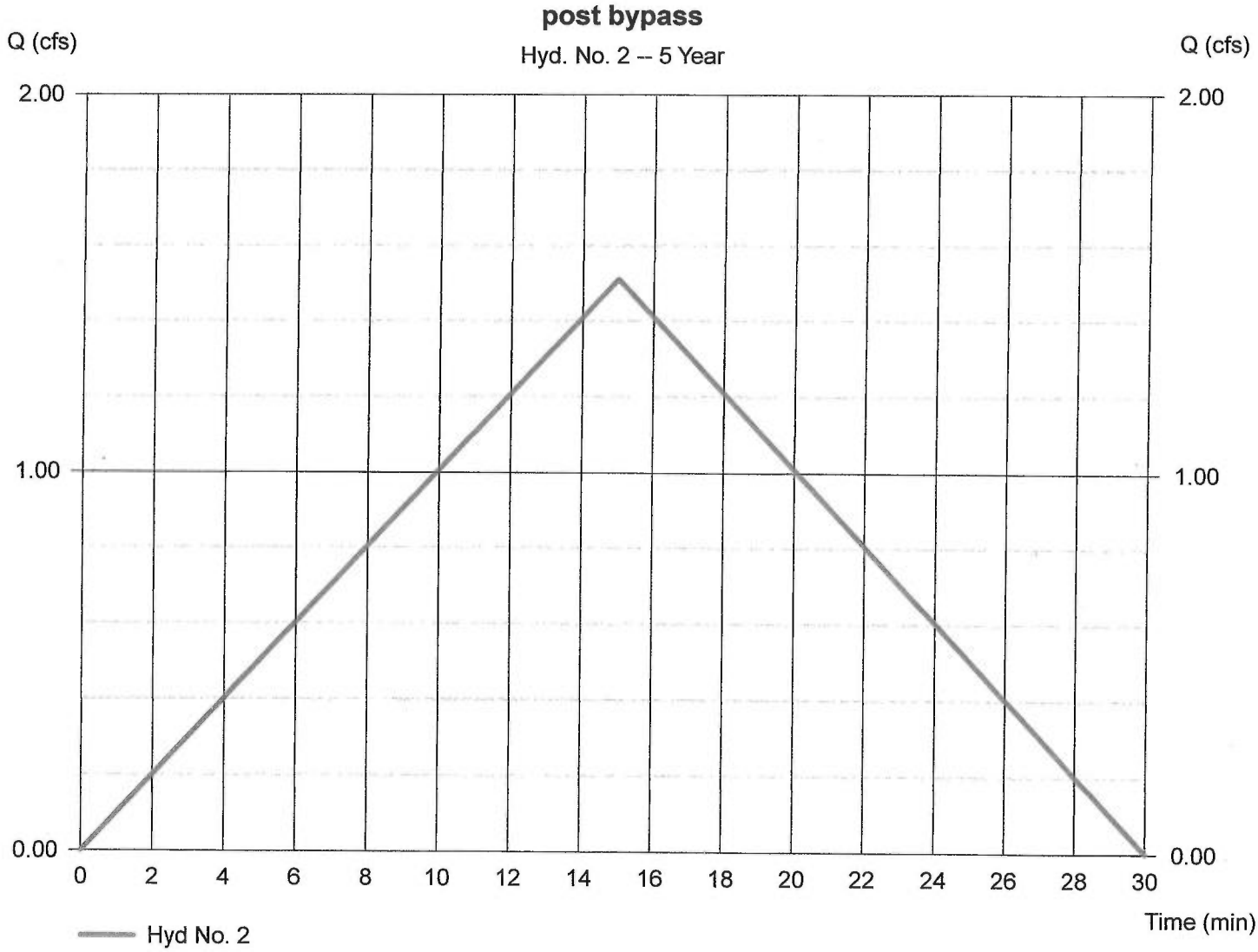


## Hyd. No. 2

post bypass

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 1.512 cfs |
| Storm frequency | = 5 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 1,360 cuft |
| Drainage area | = 0.700 ac | Runoff coeff. | = 0.4* |
| Intensity | = 5.399 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |

* Composite (Area/C) = [(0.060 x 0.95) + (0.640 x 0.35)] / 0.700



# Hydrograph Report

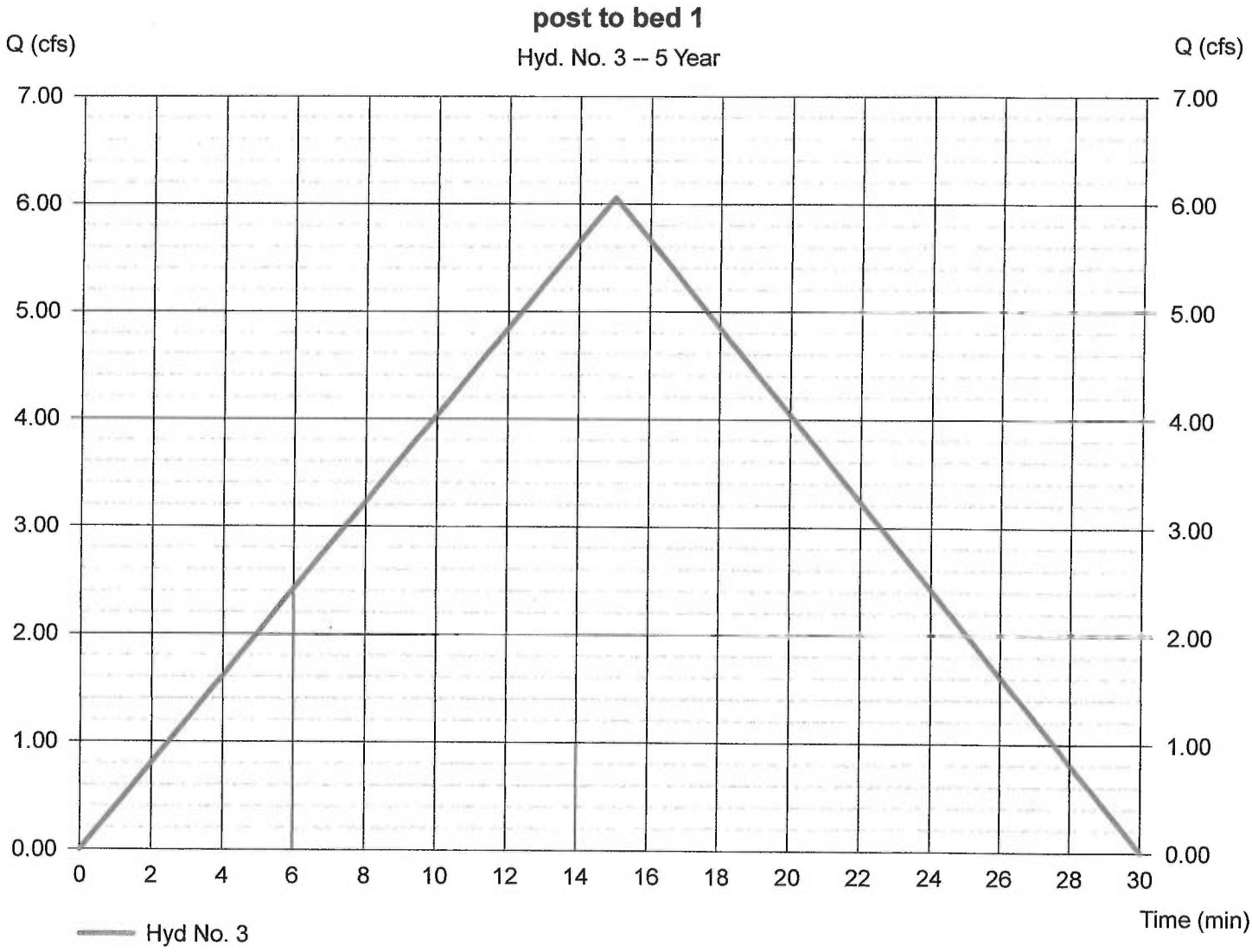


## Hyd. No. 3

post to bed 1

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 6.057 cfs |
| Storm frequency | = 5 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 5,451 cuft |
| Drainage area | = 2.040 ac | Runoff coeff. | = 0.55* |
| Intensity | = 5.399 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |

* Composite (Area/C) = [(1.370 x 0.35) + (0.665 x 0.95)] / 2.040



# Hydrograph Report

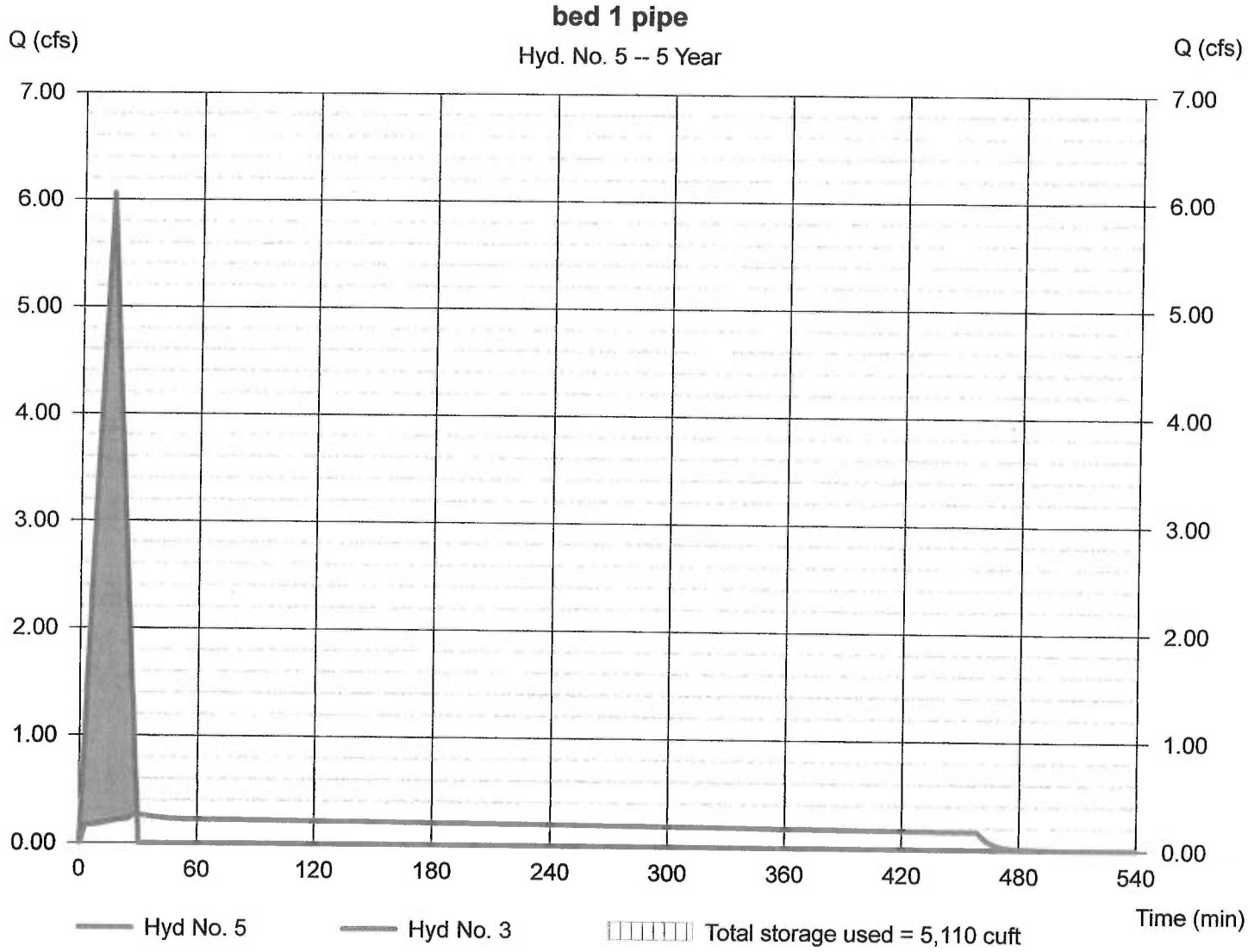


## Hyd. No. 5

bed 1 pipe

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 0.267 cfs |
| Storm frequency | = 5 yrs | Time to peak | = 29 min |
| Time interval | = 1 min | Hyd. volume | = 5,451 cuft |
| Inflow hyd. No. | = 3 - post to bed 1 | Max. Elevation | = 354.37 ft |
| Reservoir name | = bed 1 pipe | Max. Storage | = 5,110 cuft |

Storage Indication method used. Outflow includes exfiltration.



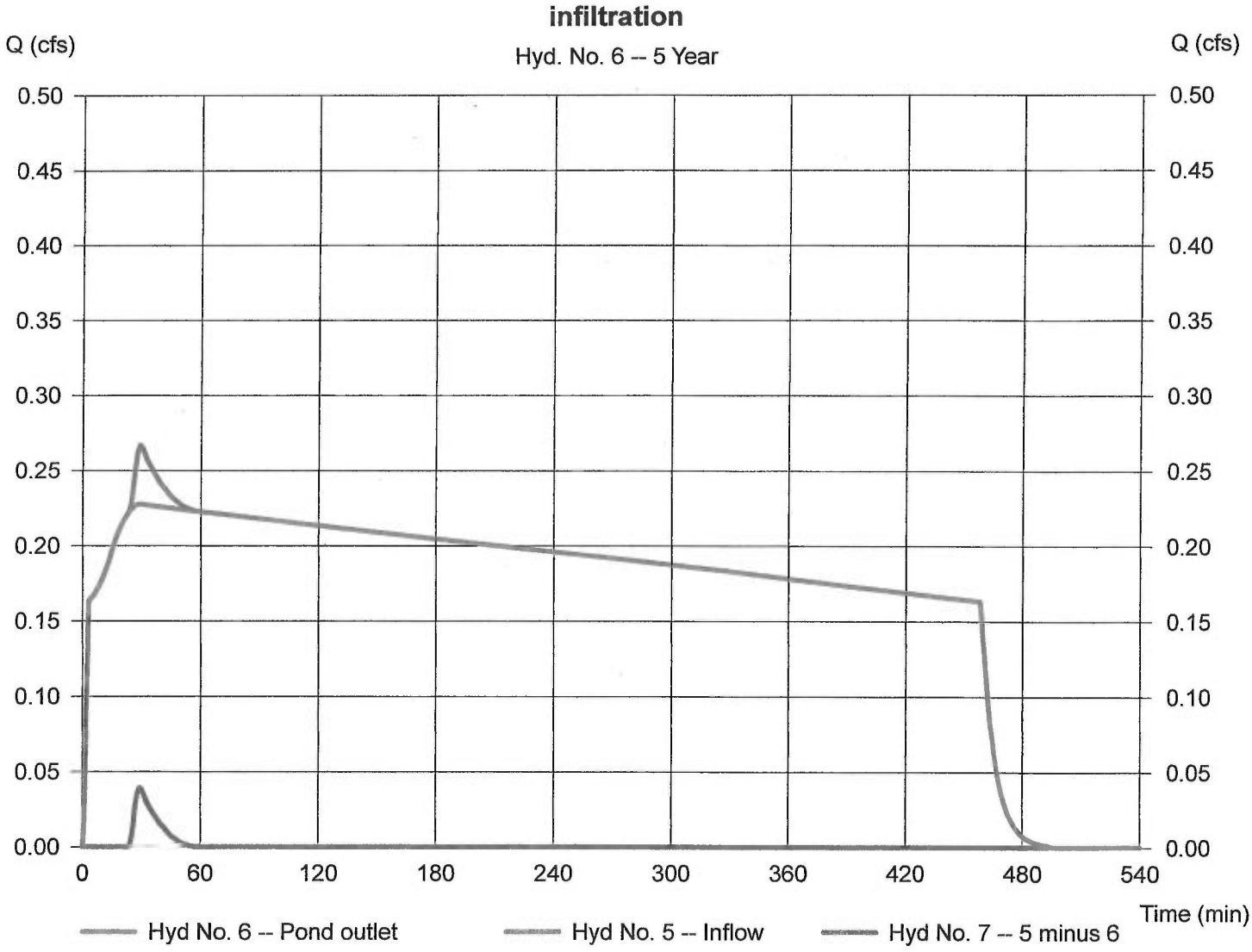
# Hydrograph Report



## Hyd. No. 6

infiltration

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion1 | Peak discharge | = 0.228 cfs |
| Storm frequency | = 5 yrs | Time to peak | = 29 min |
| Time interval | = 1 min | Hyd. volume | = 5,422 cuft |
| Inflow hydrograph | = 5 - bed 1 pipe | 2nd diverted hyd. | = 7 |
| Diversion method | = Pond - bed 1 pipe | Pond structure | = Exfiltration |



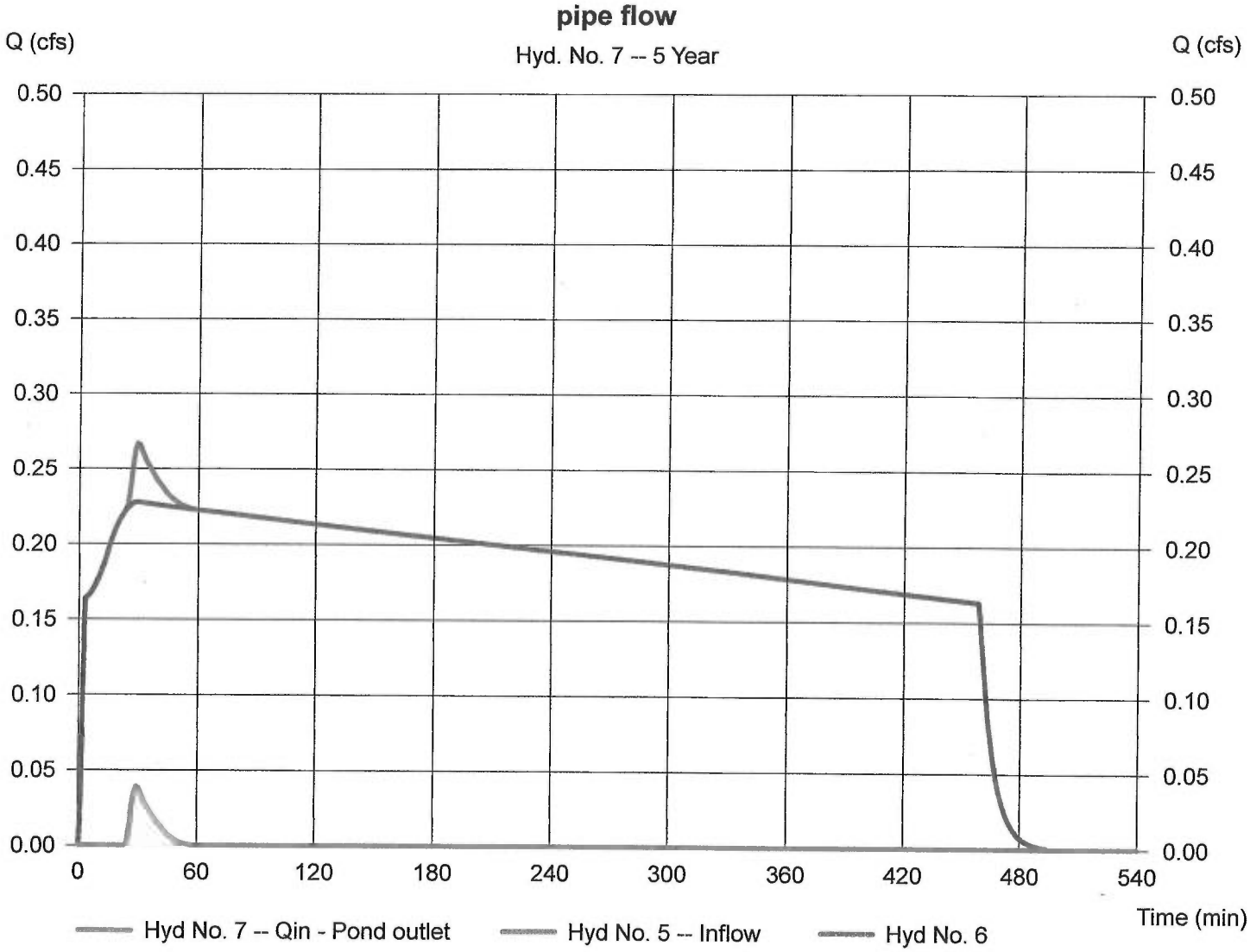
# Hydrograph Report



## Hyd. No. 7

pipe flow

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion2 | Peak discharge | = 0.039 cfs |
| Storm frequency | = 5 yrs | Time to peak | = 29 min |
| Time interval | = 1 min | Hyd. volume | = 29 cuft |
| Inflow hydrograph | = 5 - bed 1 pipe | 2nd diverted hyd. | = 6 |
| Diversion method | = Pond - bed 1 pipe | Pond structure | = Exfiltration |



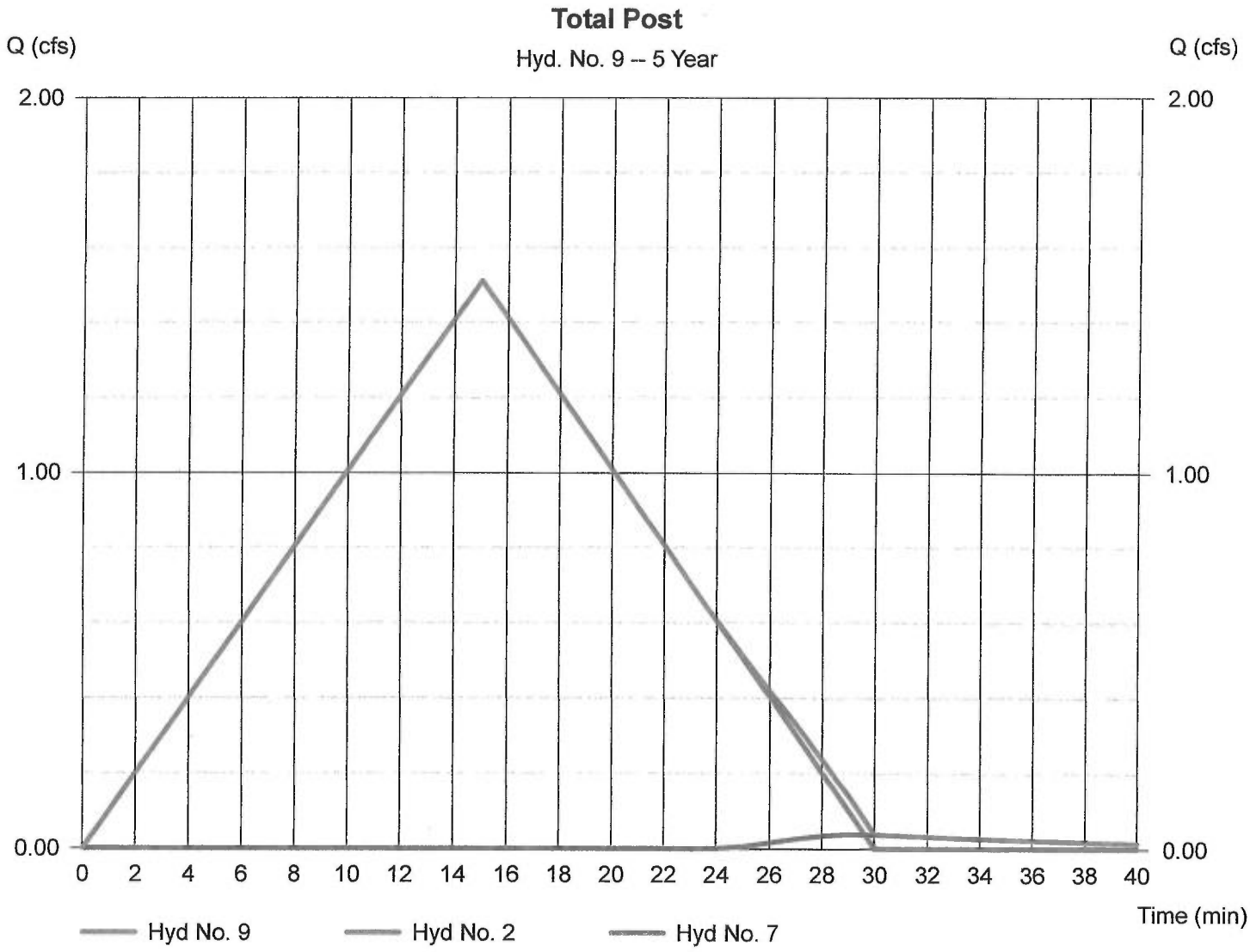
# Hydrograph Report



## Hyd. No. 9

Total Post

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 1.512 cfs |
| Storm frequency | = 5 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 1,390 cuft |
| Inflow hyds. | = 2, 7 | Contrib. drain. area | = 0.700 ac |



# Hydrograph Report

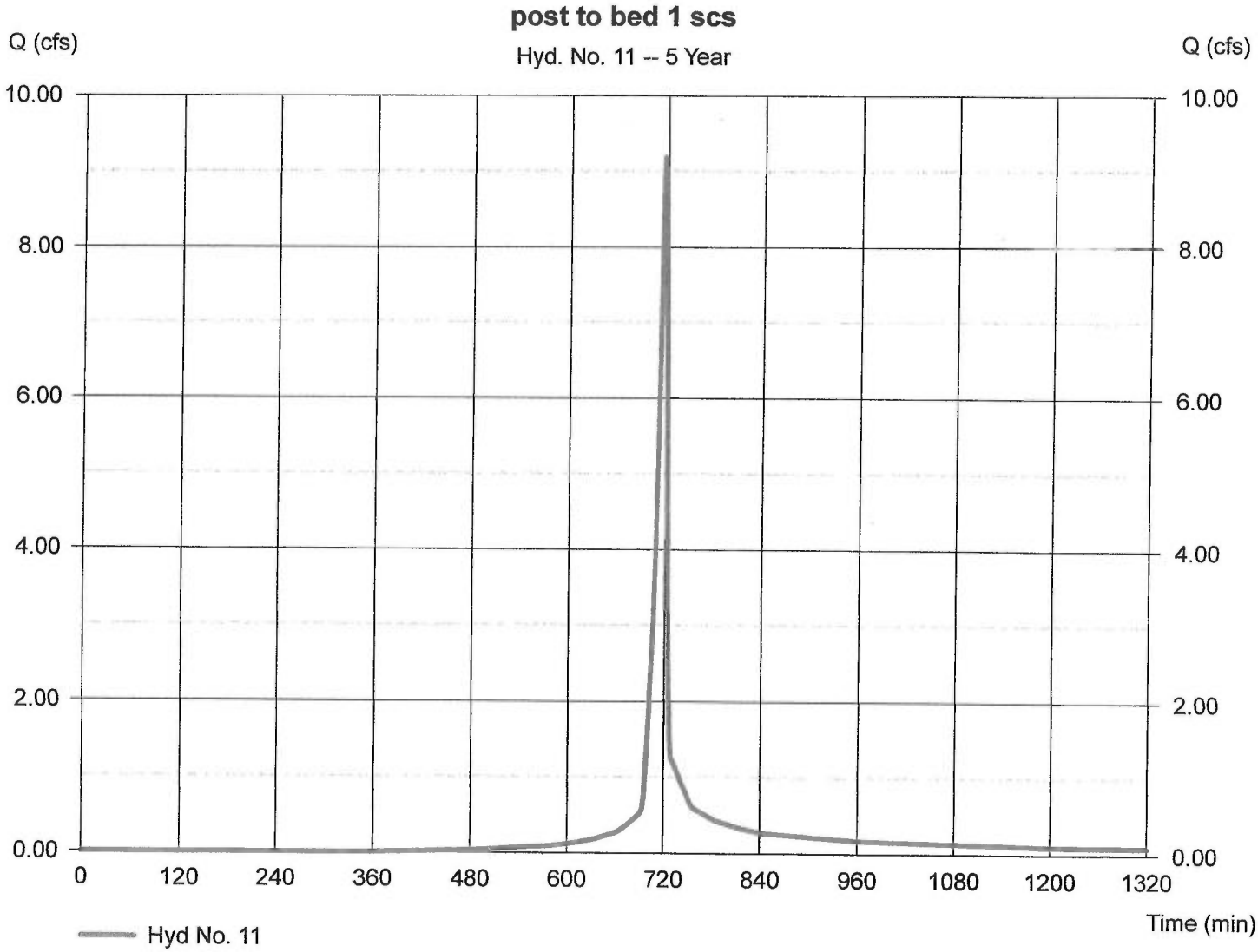


## Hyd. No. 11

post to bed 1 scs

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 9.187 cfs |
| Storm frequency | = 5 yrs | Time to peak | = 716 min |
| Time interval | = 2 min | Hyd. volume | = 18,940 cuft |
| Drainage area | = 2.040 ac | Curve number | = 86* |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5.00 min |
| Total precip. | = 4.20 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

* Composite (Area/CN) = [(1.370 x 80) + (0.670 x 98)] / 2.040



# Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 6.929 | 1 | 15 | 6,236 | ---- | ------ | ------ | pre development |
| 2 | Rational | 1.677 | 1 | 15 | 1,509 | ---- | ------ | ------ | post bypass |
| 3 | Rational | 6.721 | 1 | 15 | 6,049 | ---- | ------ | ------ | post to bed 1 |
| 5 | Reservoir | 0.443 | 1 | 29 | 6,048 | 3 | 354.53 | 5,650 | bed 1 pipe |
| 6 | Diversion1 | 0.234 | 1 | 29 | 5,797 | 5 | ------ | ------ | infiltration |
| 7 | Diversion2 | 0.209 | 1 | 29 | 252 | 5 | ------ | ------ | pipe flow |
| 9 | Combine | 1.677 | 1 | 15 | 1,761 | 2, 7, | ------ | ------ | Total Post |
| 11 | SCS Runoff | 11.54 | 2 | 716 | 24,069 | ---- | ------ | ------ | post to bed 1 scs |

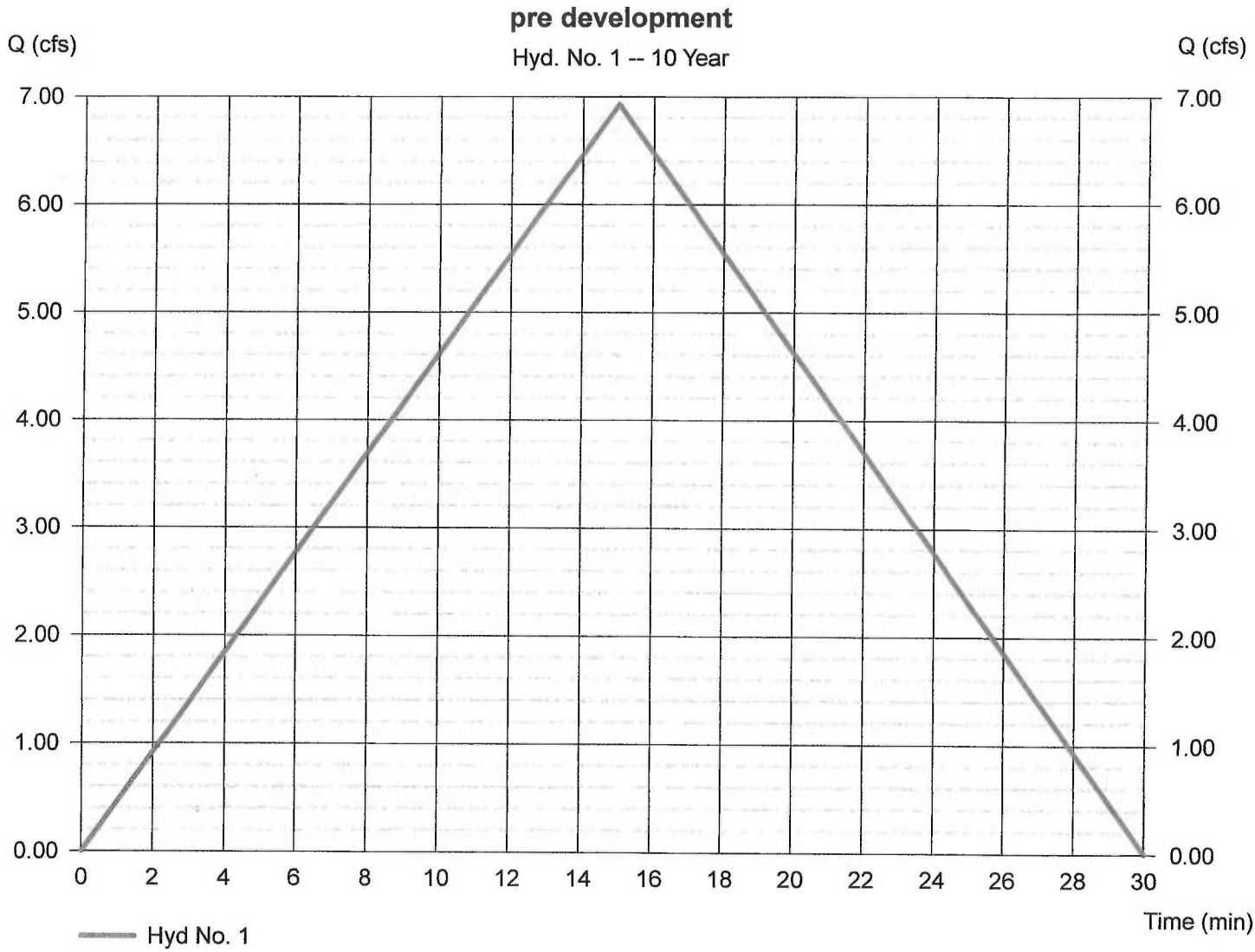
# Hydrograph Report



## Hyd. No. 1

pre development

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 6.929 cfs |
| Storm frequency | = 10 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 6,236 cuft |
| Drainage area | = 2.410 ac | Runoff coeff. | = 0.48 |
| Intensity | = 5.990 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |



# Hydrograph Report

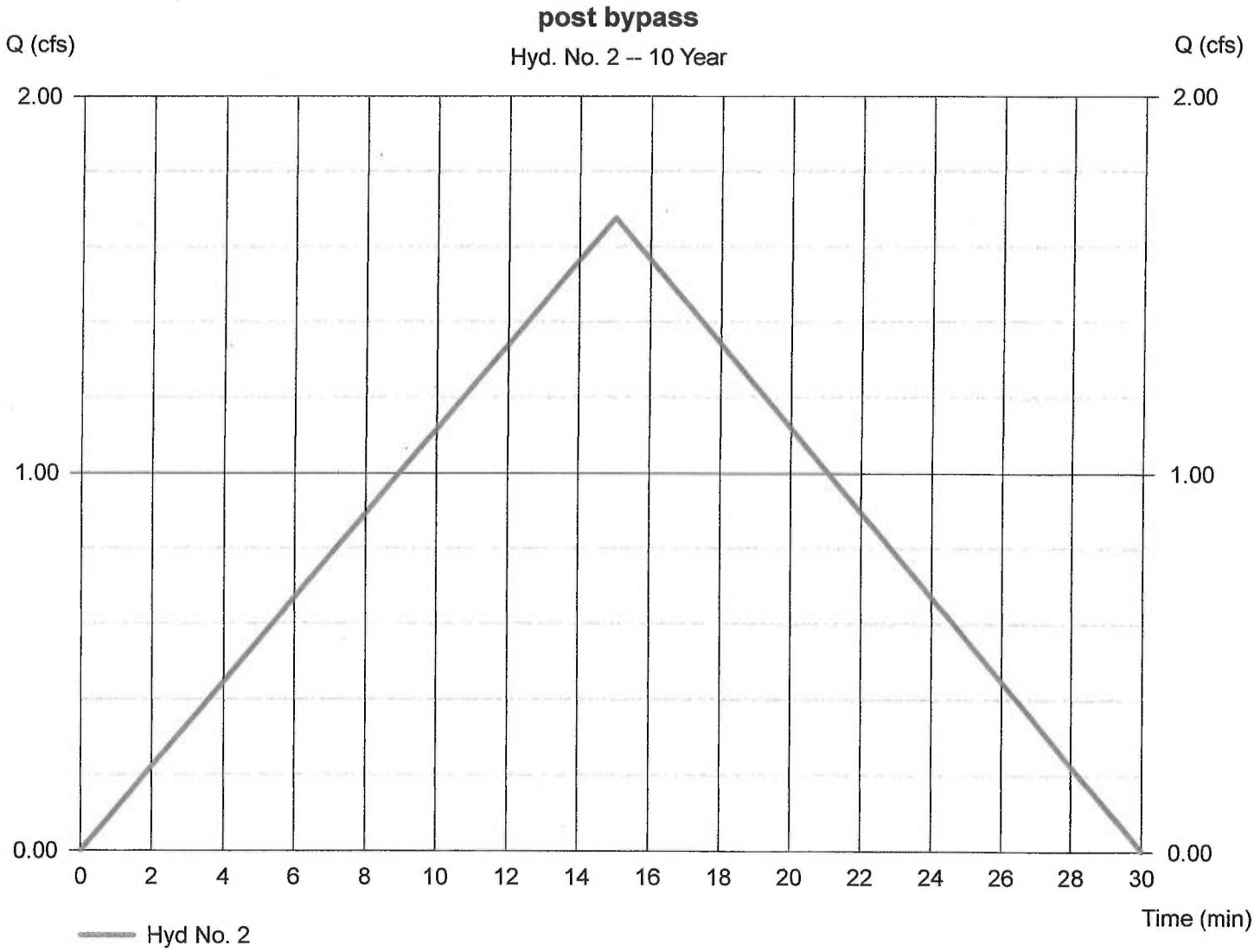


## Hyd. No. 2

post bypass

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 1.677 cfs |
| Storm frequency | = 10 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 1,509 cuft |
| Drainage area | = 0.700 ac | Runoff coeff. | = 0.4* |
| Intensity | = 5.990 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |

* Composite (Area/C) = [(0.060 x 0.95) + (0.640 x 0.35)] / 0.700



# Hydrograph Report

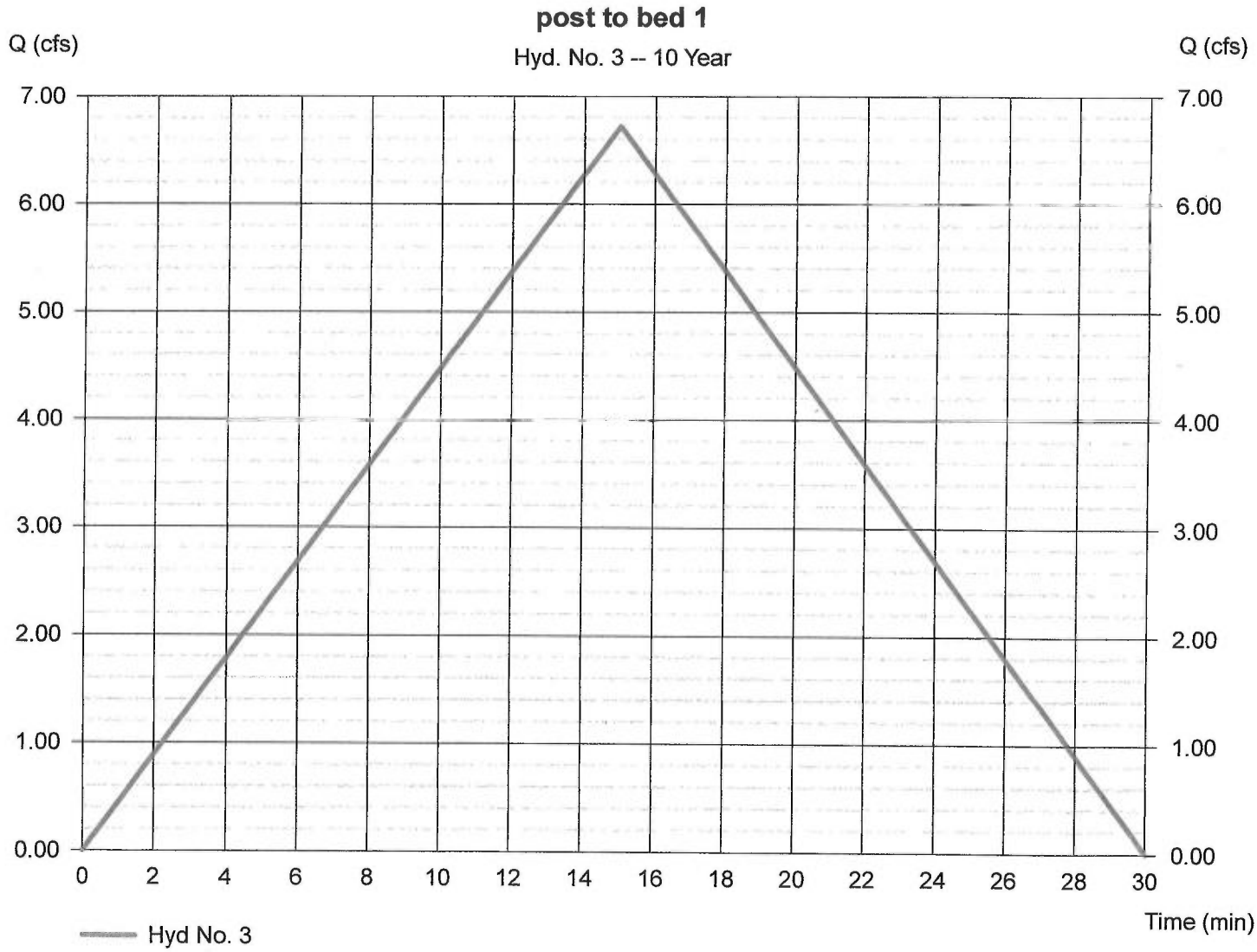


## Hyd. No. 3

post to bed 1

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 6.721 cfs |
| Storm frequency | = 10 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 6,049 cuft |
| Drainage area | = 2.040 ac | Runoff coeff. | = 0.55* |
| Intensity | = 5.990 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |

* Composite (Area/C) = [(1.370 x 0.35) + (0.665 x 0.95)] / 2.040



# Hydrograph Report

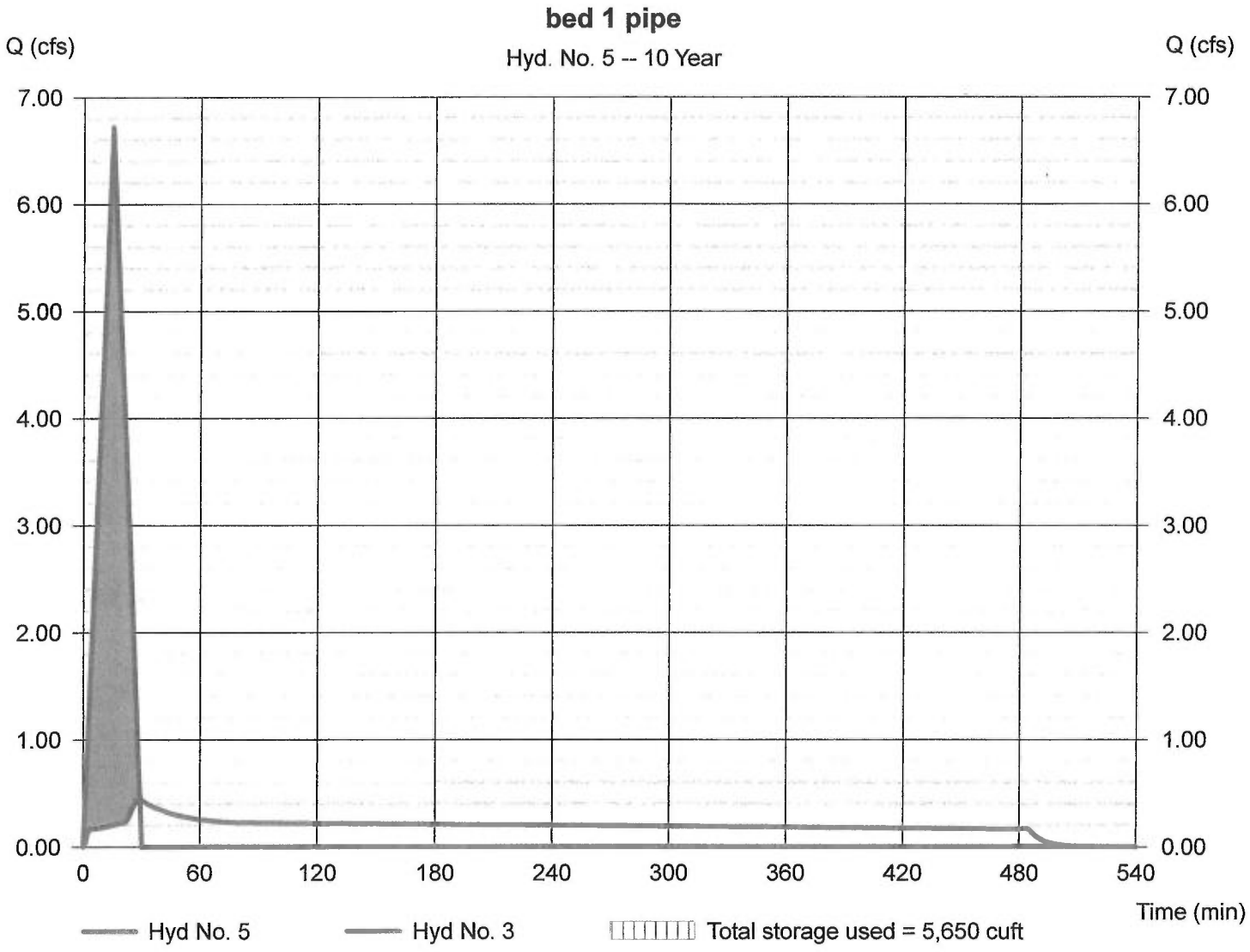


## Hyd. No. 5

bed 1 pipe

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 0.443 cfs |
| Storm frequency | = 10 yrs | Time to peak | = 29 min |
| Time interval | = 1 min | Hyd. volume | = 6,048 cuft |
| Inflow hyd. No. | = 3 - post to bed 1 | Max. Elevation | = 354.53 ft |
| Reservoir name | = bed 1 pipe | Max. Storage | = 5,650 cuft |

Storage Indication method used. Outflow includes exfiltration.



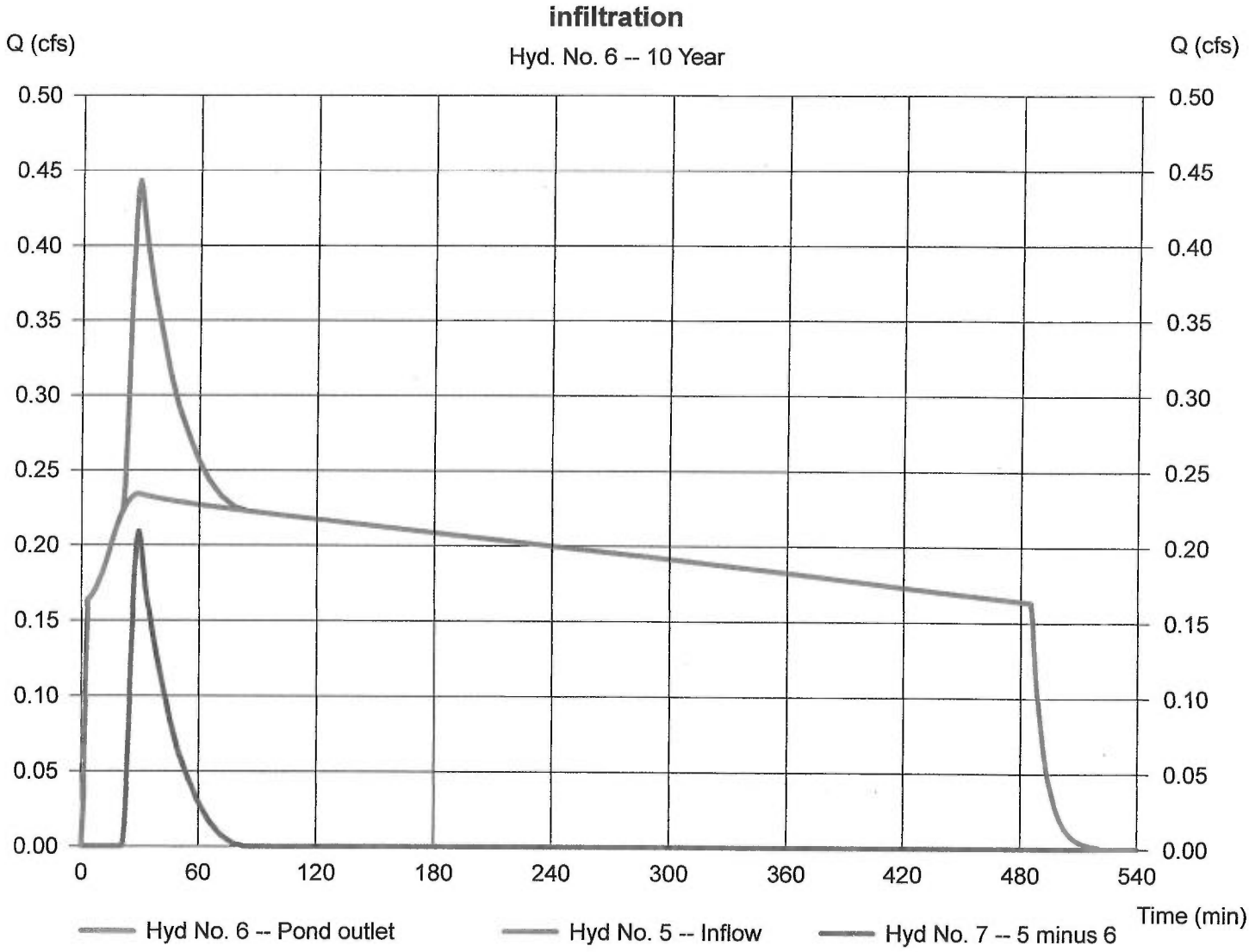
# Hydrograph Report



## Hyd. No. 6

infiltration

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion1 | Peak discharge | = 0.234 cfs |
| Storm frequency | = 10 yrs | Time to peak | = 29 min |
| Time interval | = 1 min | Hyd. volume | = 5,797 cuft |
| Inflow hydrograph | = 5 - bed 1 pipe | 2nd diverted hyd. | = 7 |
| Diversion method | = Pond - bed 1 pipe | Pond structure | = Exfiltration |



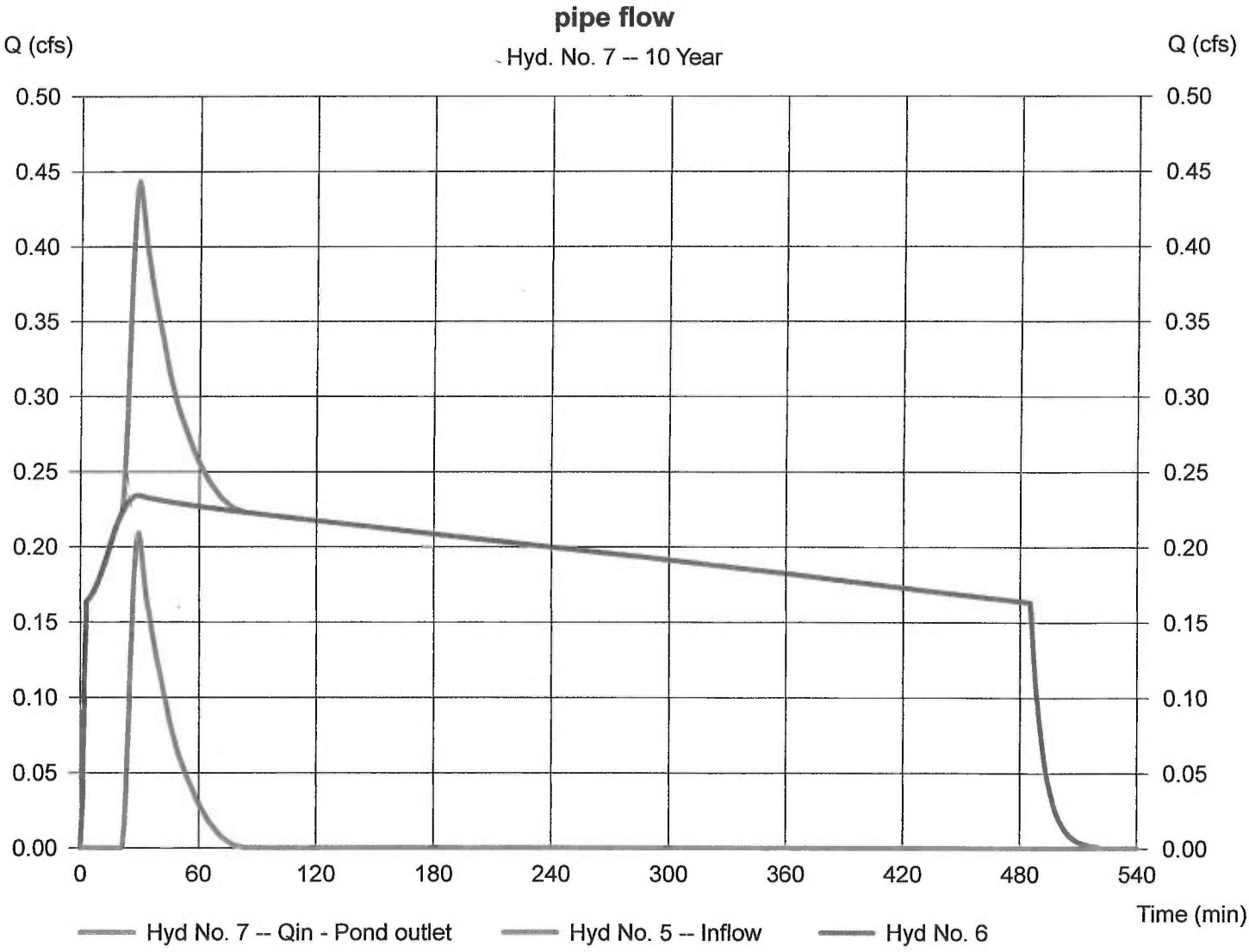
# Hydrograph Report



## Hyd. No. 7

pipe flow

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion2 | Peak discharge | = 0.209 cfs |
| Storm frequency | = 10 yrs | Time to peak | = 29 min |
| Time interval | = 1 min | Hyd. volume | = 252 cuft |
| Inflow hydrograph | = 5 - bed 1 pipe | 2nd diverted hyd. | = 6 |
| Diversion method | = Pond - bed 1 pipe | Pond structure | = Exfiltration |



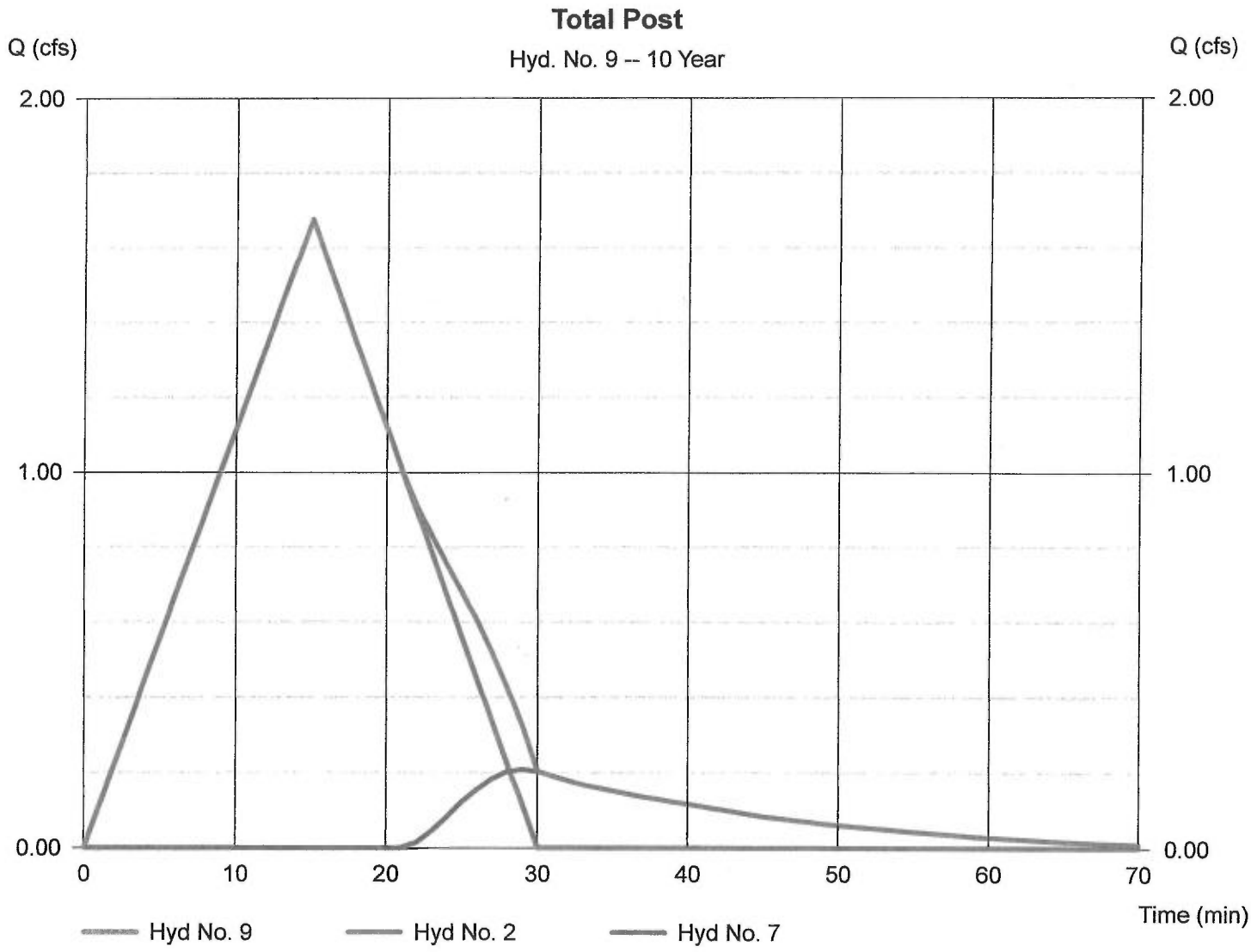
# Hydrograph Report



## Hyd. No. 9

Total Post

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 1.677 cfs |
| Storm frequency | = 10 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 1,761 cuft |
| Inflow hyds. | = 2, 7 | Contrib. drain. area | = 0.700 ac |



# Hydrograph Report

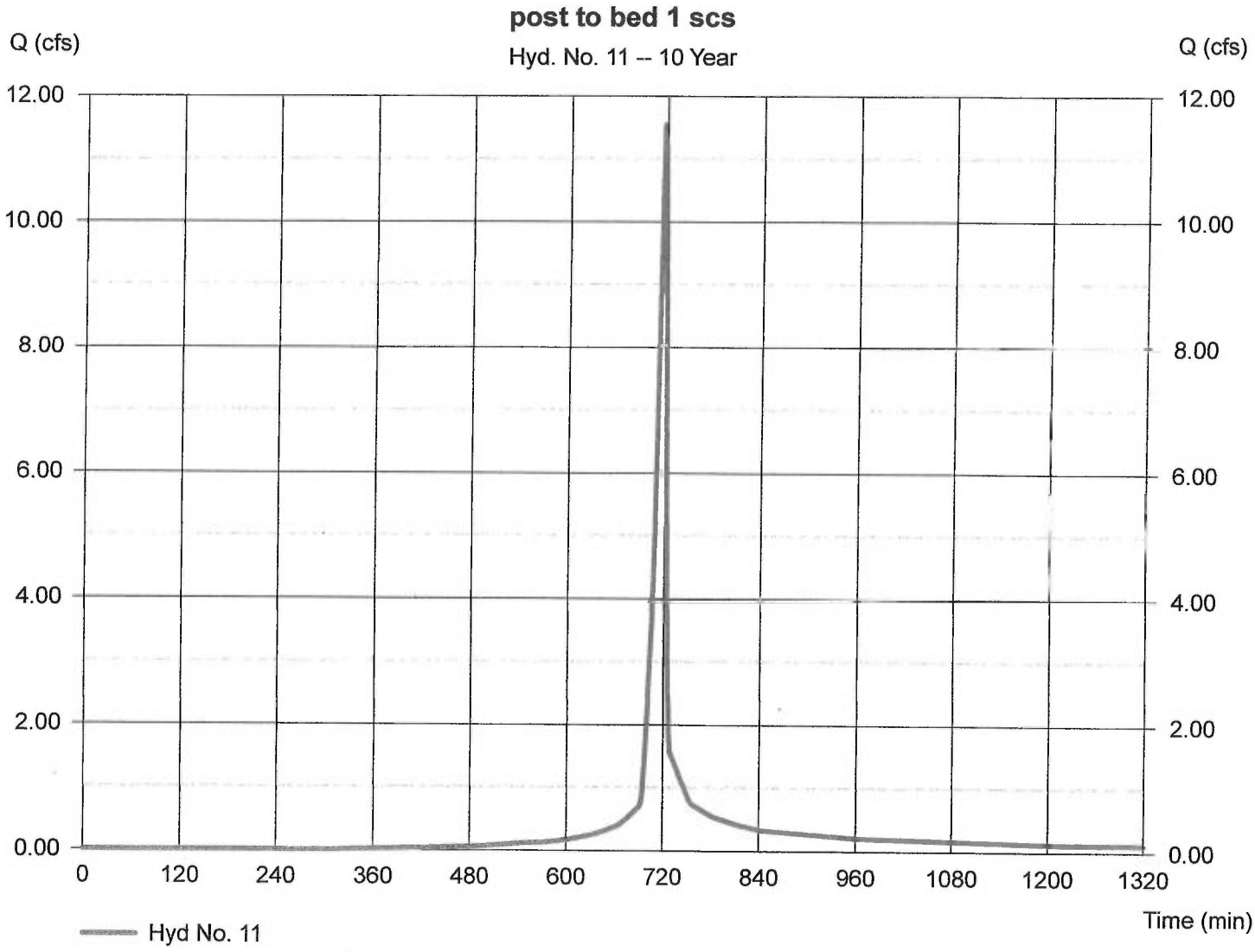


## Hyd. No. 11

post to bed 1 scs

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 11.54 cfs |
| Storm frequency | = 10 yrs | Time to peak | = 716 min |
| Time interval | = 2 min | Hyd. volume | = 24,069 cuft |
| Drainage area | = 2.040 ac | Curve number | = 86* |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5.00 min |
| Total precip. | = 5.00 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

* Composite (Area/CN) = [(1.370 x 80) + (0.670 x 98)] / 2.040



# Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 7.860 | 1 | 15 | 7,074 | ---- | ------ | ------ | pre development |
| 2 | Rational | 1.902 | 1 | 15 | 1,712 | ---- | ------ | ------ | post bypass |
| 3 | Rational | 7.623 | 1 | 15 | 6,861 | ---- | ------ | ------ | post to bed 1 |
| 5 | Reservoir | 0.832 | 1 | 28 | 6,860 | 3 | 354.74 | 6,300 | bed 1 pipe |
| 6 | Diversion1 | 0.243 | 1 | 28 | 6,058 | 5 | ------ | ------ | infiltration |
| 7 | Diversion2 | 0.589 | 1 | 28 | 803 | 5 | ------ | ------ | pipe flow |
| 9 | Combine | 1.902 | 1 | 15 | 2,515 | 2, 7, | ------ | ------ | Total Post |
| 11 | SCS Runoff | 13.31 | 2 | 716 | 27,981 | ---- | ------ | ------ | post to bed 1 scs |

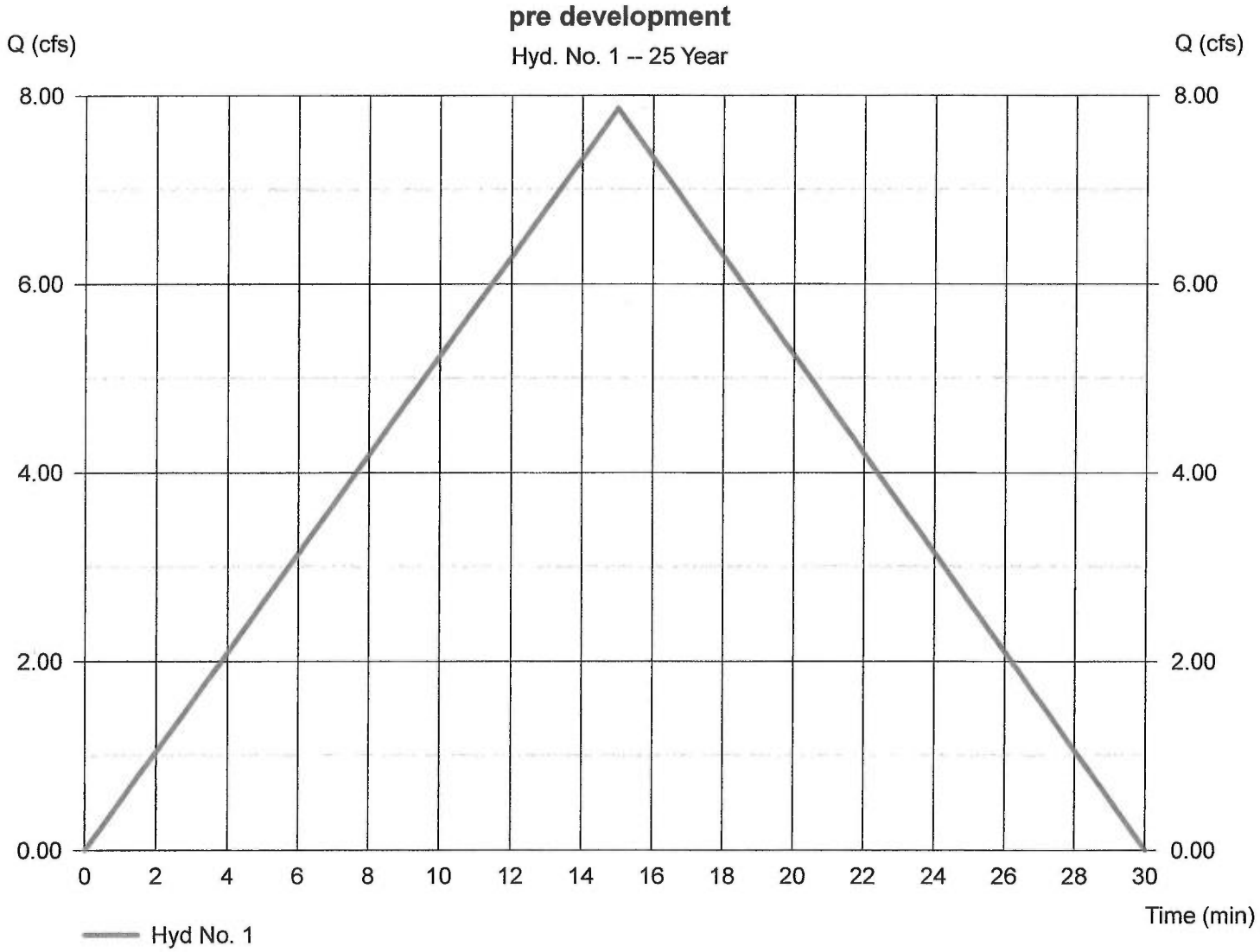
# Hydrograph Report



## Hyd. No. 1

pre development

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 7.860 cfs |
| Storm frequency | = 25 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 7,074 cuft |
| Drainage area | = 2.410 ac | Runoff coeff. | = 0.48 |
| Intensity | = 6.794 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |



# Hydrograph Report

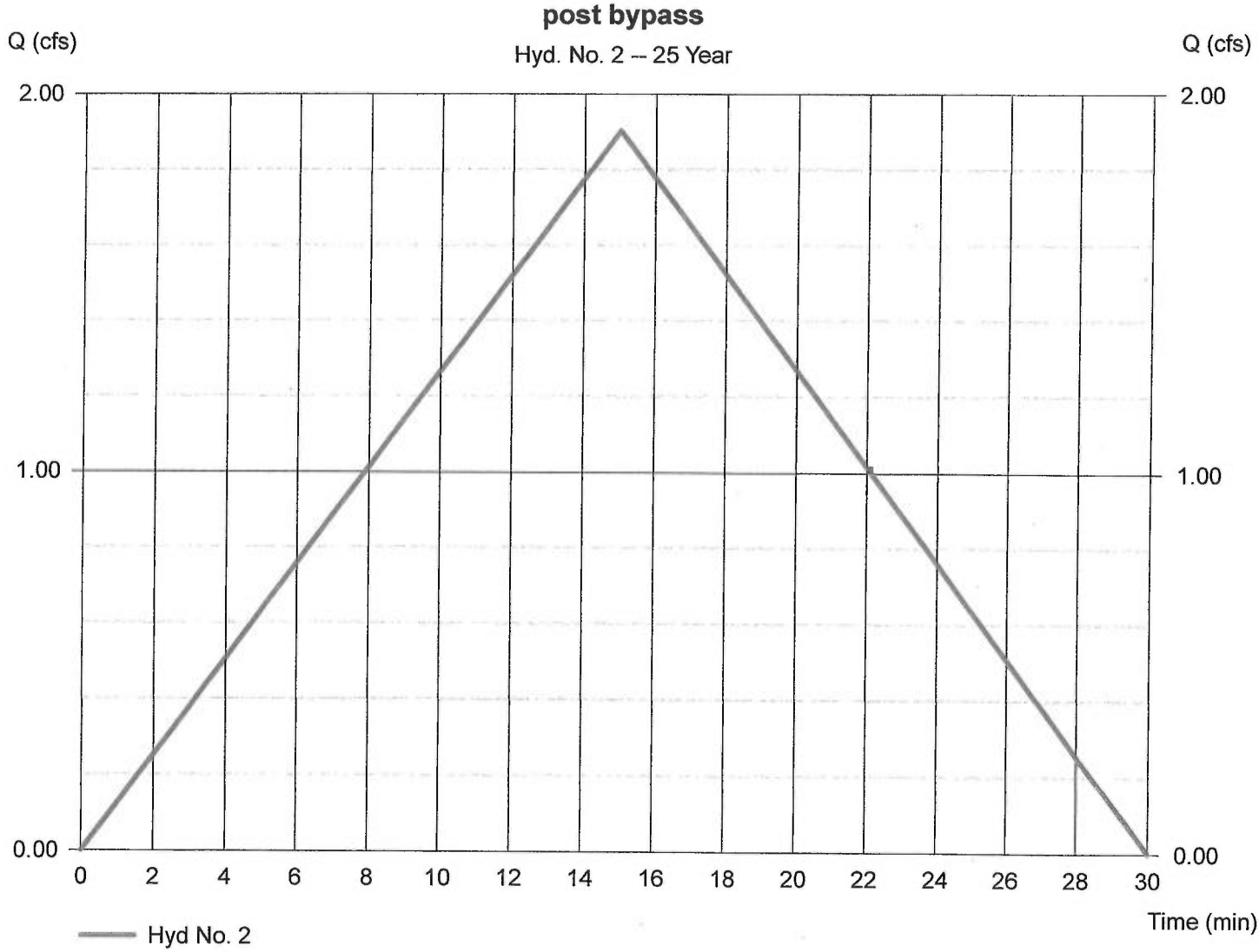


## Hyd. No. 2

post bypass

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 1.902 cfs |
| Storm frequency | = 25 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 1,712 cuft |
| Drainage area | = 0.700 ac | Runoff coeff. | = 0.4* |
| Intensity | = 6.794 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |

* Composite (Area/C) = [(0.060 x 0.95) + (0.640 x 0.35)] / 0.700



# Hydrograph Report

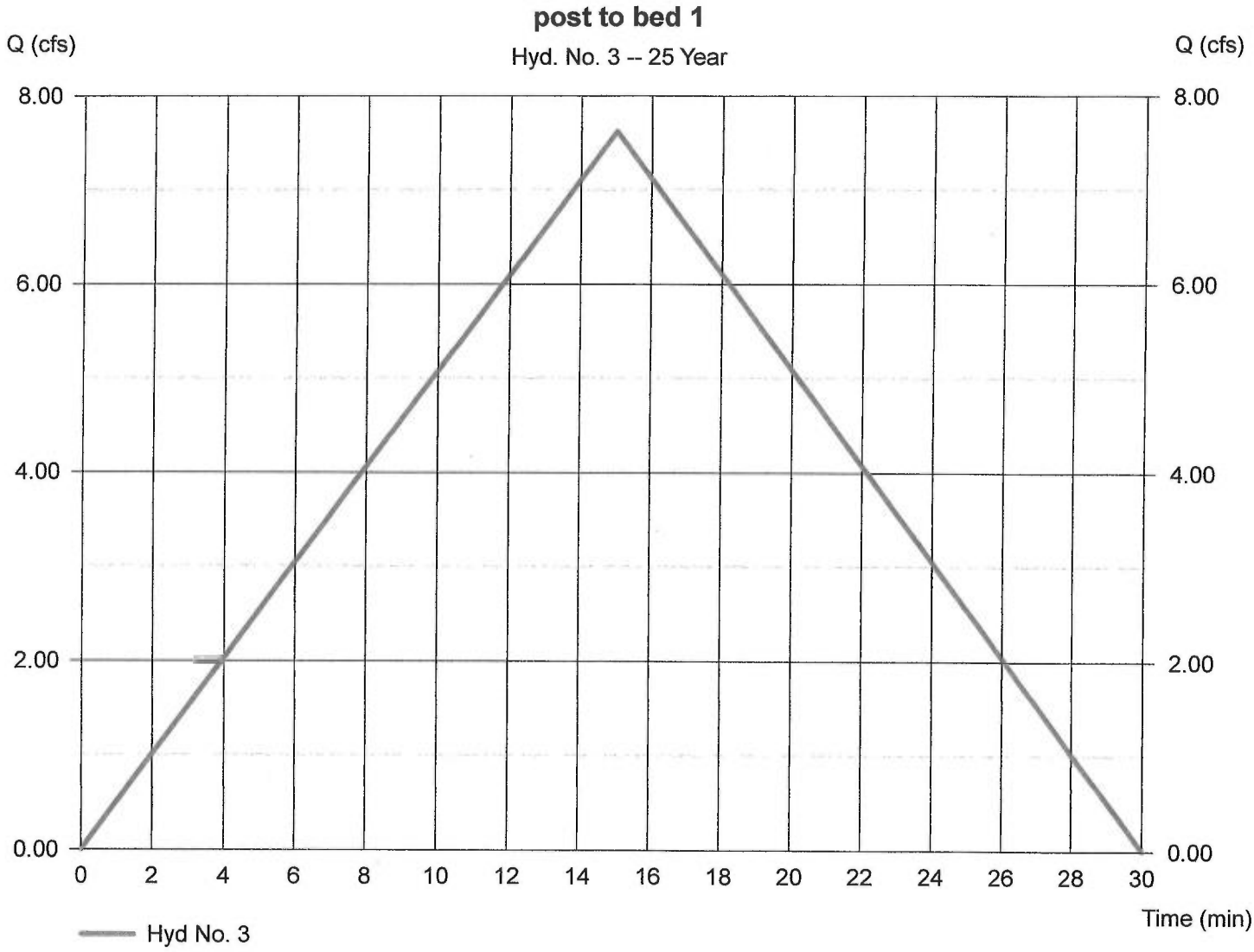
Hydraflow Hydrographs by Intelisolve v9.1 — Thursday, Apr 5, 2018

## Hyd. No. 3

post to bed 1

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 7.623 cfs |
| Storm frequency | = 25 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 6,861 cuft |
| Drainage area | = 2.040 ac | Runoff coeff. | = 0.55* |
| Intensity | = 6.794 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |

* Composite (Area/C) = [(1.370 x 0.35) + (0.665 x 0.95)] / 2.040



# Hydrograph Report

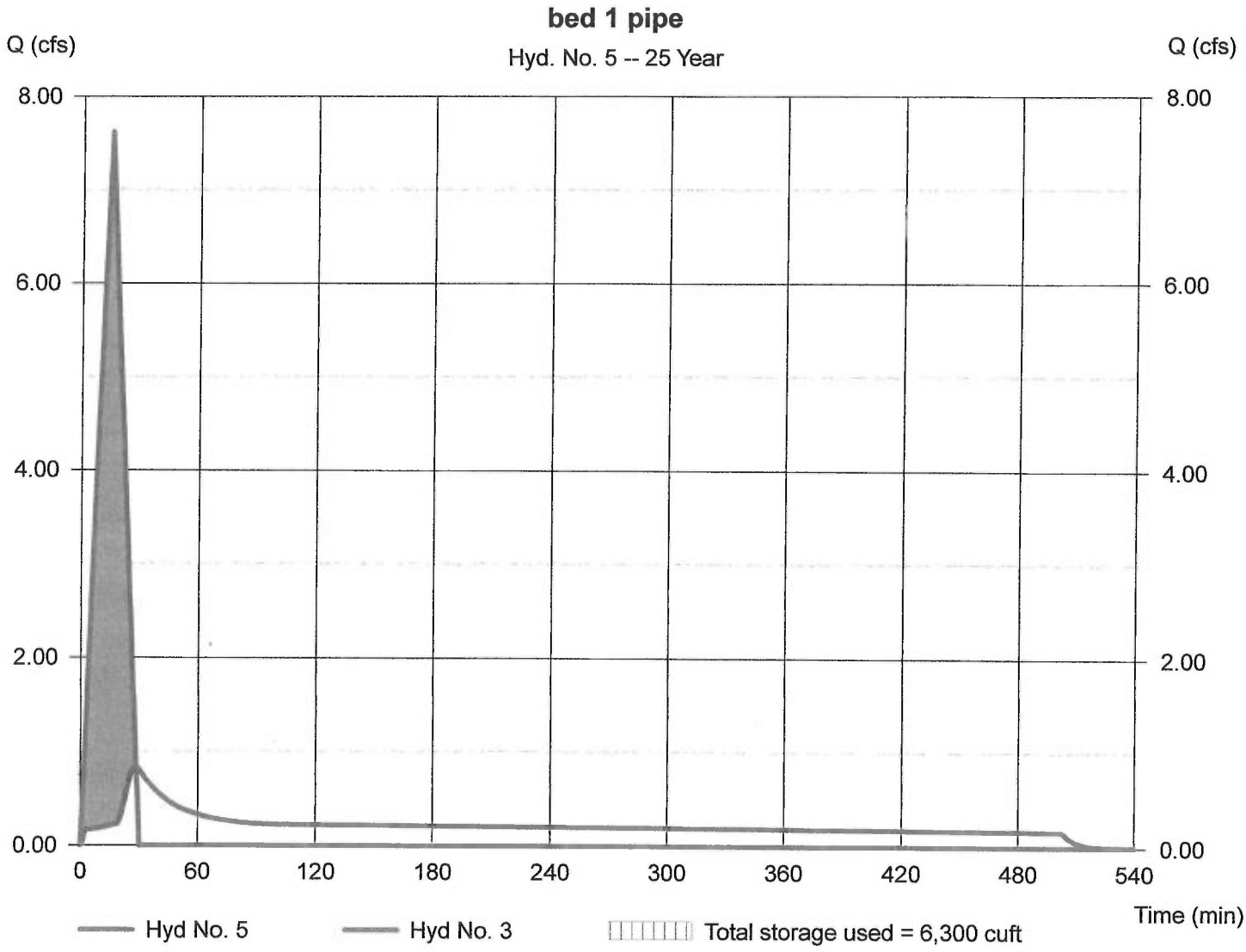


## Hyd. No. 5

bed 1 pipe

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 0.832 cfs |
| Storm frequency | = 25 yrs | Time to peak | = 28 min |
| Time interval | = 1 min | Hyd. volume | = 6,860 cuft |
| Inflow hyd. No. | = 3 - post to bed 1 | Max. Elevation | = 354.74 ft |
| Reservoir name | = bed 1 pipe | Max. Storage | = 6,300 cuft |

Storage Indication method used. Outflow includes exfiltration.



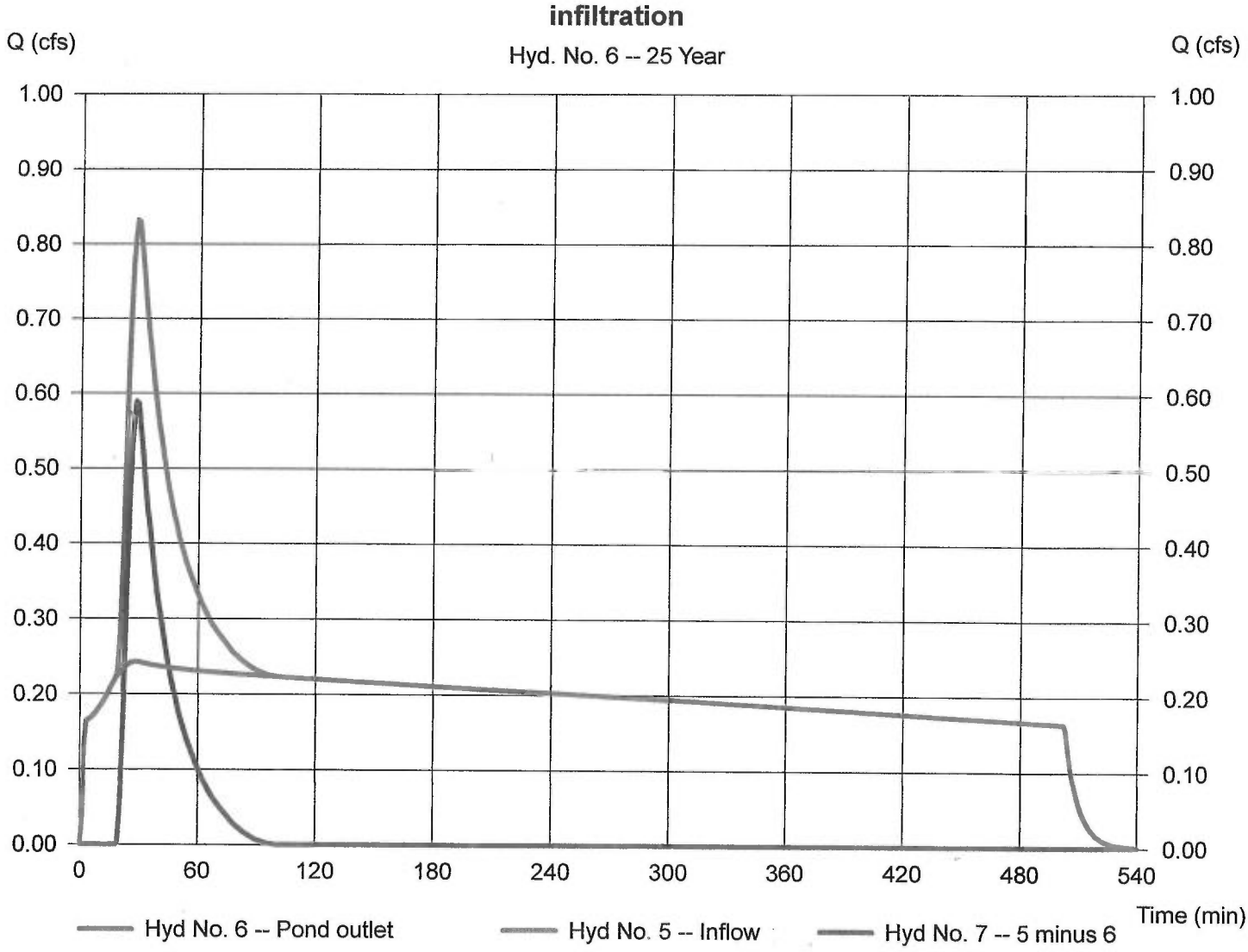
# Hydrograph Report



## Hyd. No. 6

infiltration

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion1 | Peak discharge | = 0.243 cfs |
| Storm frequency | = 25 yrs | Time to peak | = 28 min |
| Time interval | = 1 min | Hyd. volume | = 6,058 cuft |
| Inflow hydrograph | = 5 - bed 1 pipe | 2nd diverted hyd. | = 7 |
| Diversion method | = Pond - bed 1 pipe | Pond structure | = Exfiltration |



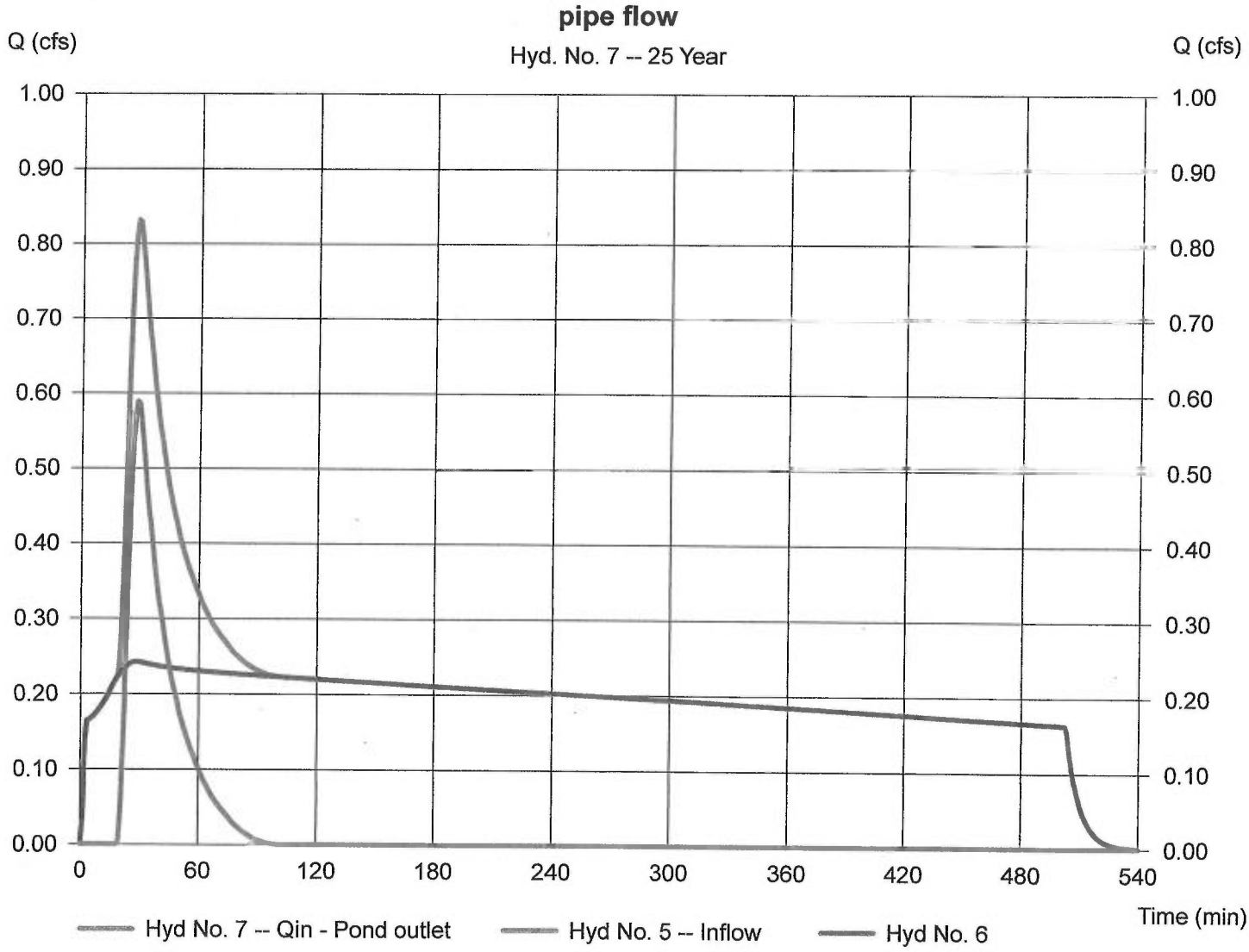
# Hydrograph Report



## Hyd. No. 7

pipe flow

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion2 | Peak discharge | = 0.589 cfs |
| Storm frequency | = 25 yrs | Time to peak | = 28 min |
| Time interval | = 1 min | Hyd. volume | = 803 cuft |
| Inflow hydrograph | = 5 - bed 1 pipe | 2nd diverted hyd. | = 6 |
| Diversion method | = Pond - bed 1 pipe | Pond structure | = Exfiltration |



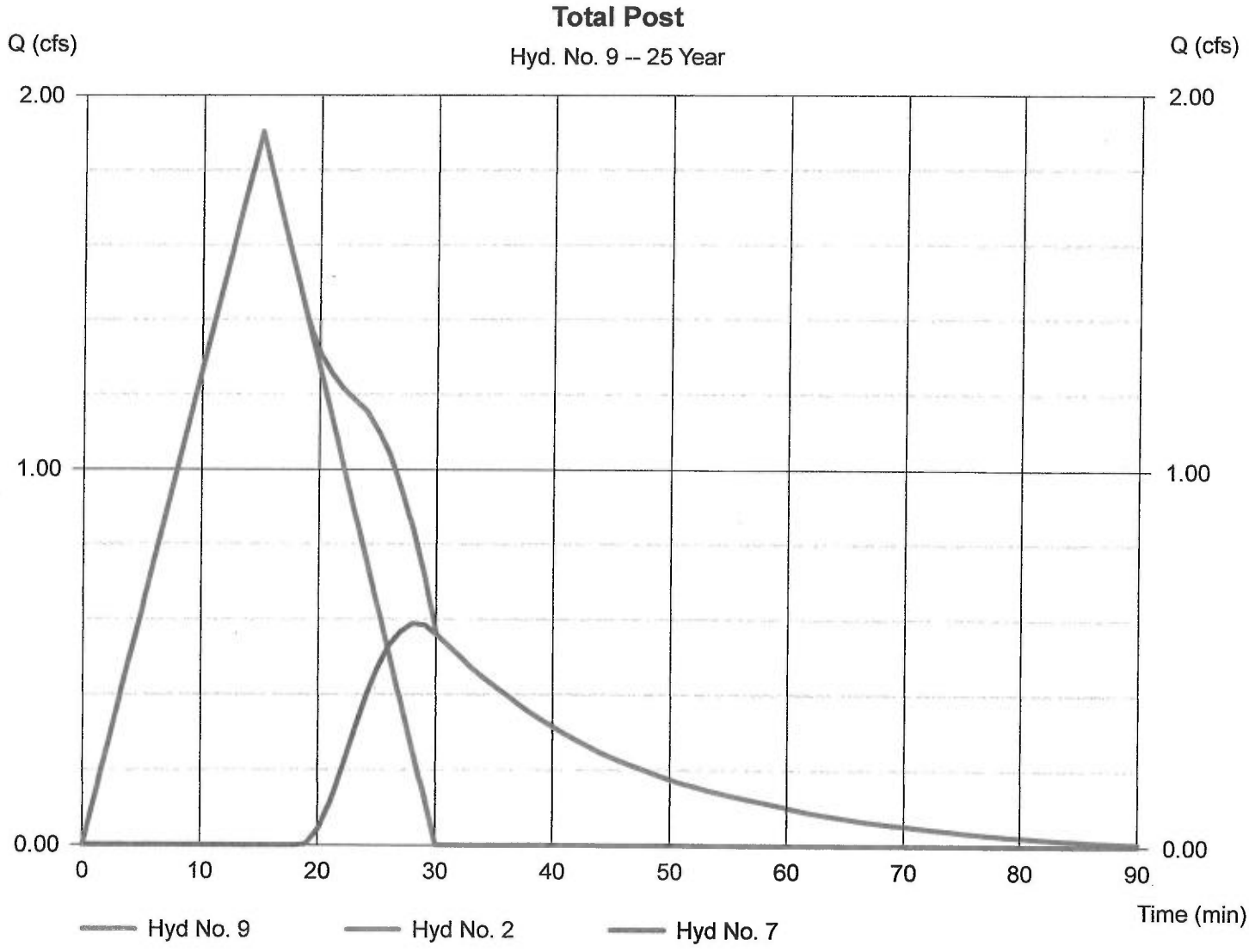
# Hydrograph Report



## Hyd. No. 9

Total Post

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 1.902 cfs |
| Storm frequency | = 25 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 2,515 cuft |
| Inflow hyds. | = 2, 7 | Contrib. drain. area | = 0.700 ac |



# Hydrograph Report

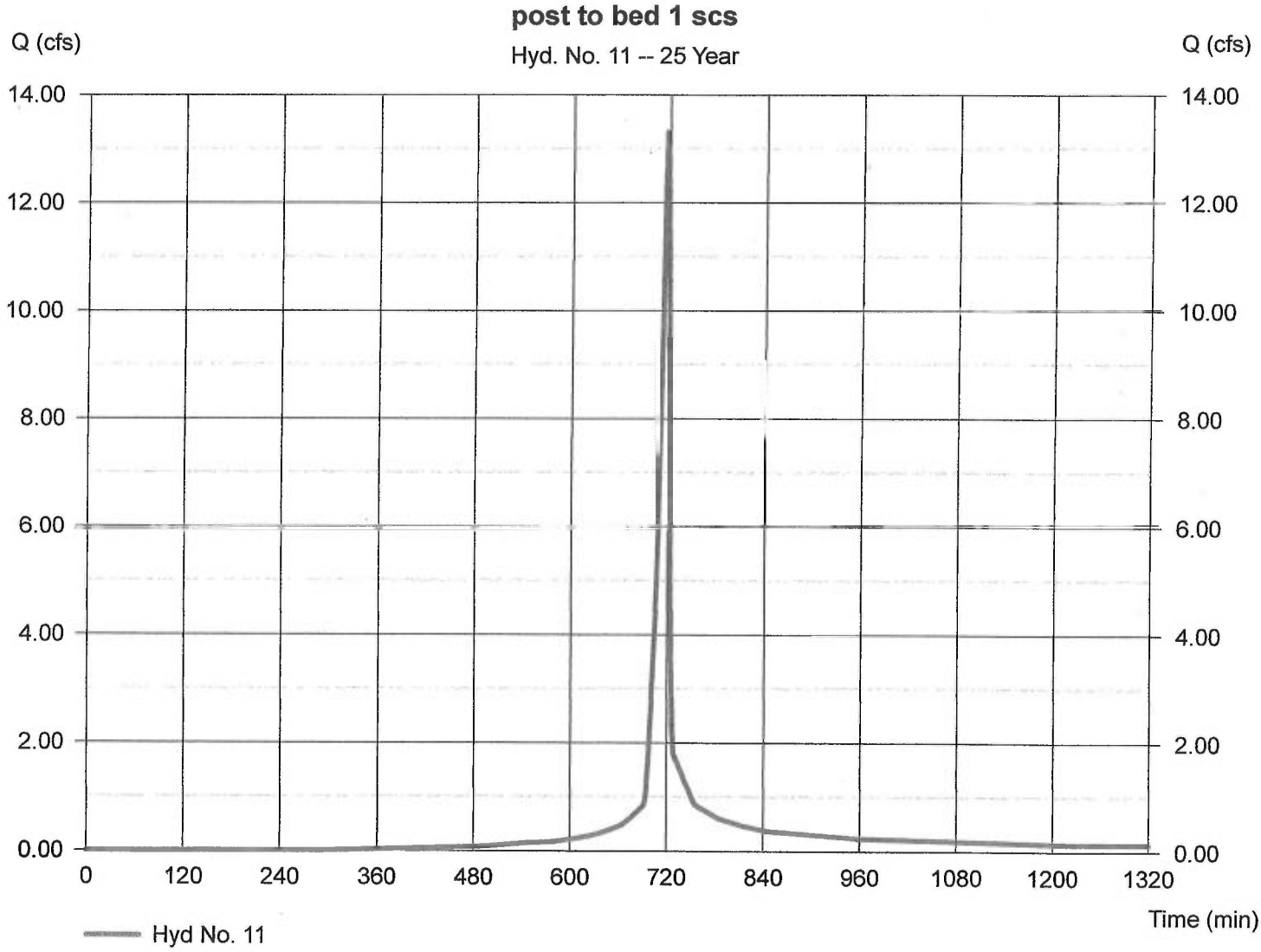


## Hyd. No. 11

post to bed 1 scs

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 13.31 cfs |
| Storm frequency | = 25 yrs | Time to peak | = 716 min |
| Time interval | = 2 min | Hyd. volume | = 27,981 cuft |
| Drainage area | = 2.040 ac | Curve number | = 86* |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5.00 min |
| Total precip. | = 5.60 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

* Composite (Area/CN) = [(1.370 x 80) + (0.670 x 98)] / 2.040



# Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 8.782 | 1 | 15 | 7,904 | ---- | ------ | ------ | pre development |
| 2 | Rational | 2.126 | 1 | 15 | 1,913 | ---- | ------ | ------ | post bypass |
| 3 | Rational | 8.518 | 1 | 15 | 7,666 | ---- | ------ | ------ | post to bed 1 |
| 5 | Reservoir | 1.346 | 1 | 28 | 7,666 | 3 | 354.94 | 6,867 | bed 1 pipe |
| 6 | Diversion1 | 0.251 | 1 | 28 | 6,193 | 5 | ------ | ------ | infiltration |
| 7 | Diversion2 | 1.095 | 1 | 28 | 1,473 | 5 | ------ | ------ | pipe flow |
| 9 | Combine | 2.126 | 1 | 15 | 3,386 | 2, 7, | ------ | ------ | Total Post |
| 11 | SCS Runoff | 15.37 | 2 | 716 | 32,595 | ---- | ------ | ------ | post to bed 1 scs |

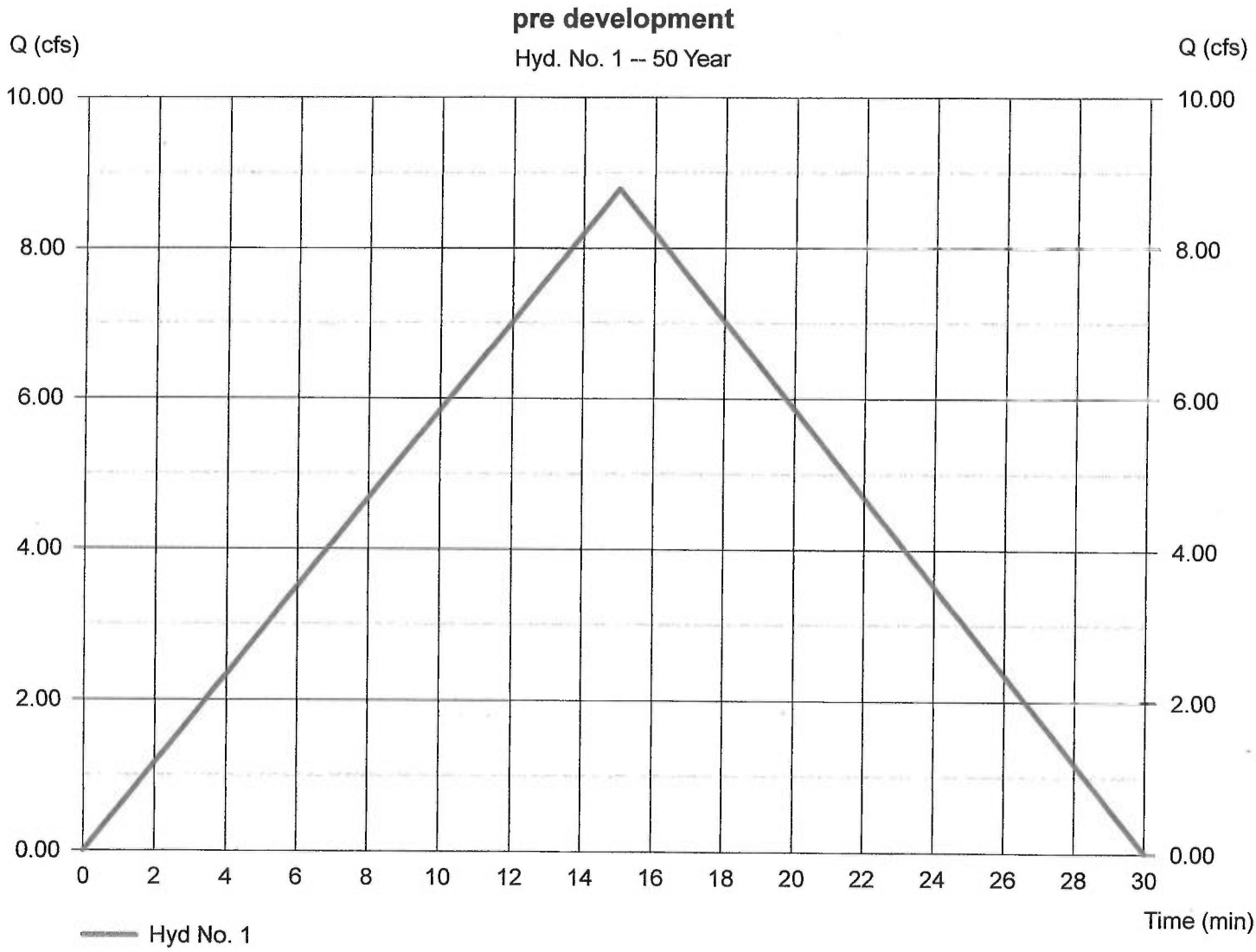
# Hydrograph Report



## Hyd. No. 1

pre development

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 8.782 cfs |
| Storm frequency | = 50 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 7,904 cuft |
| Drainage area | = 2.410 ac | Runoff coeff. | = 0.48 |
| Intensity | = 7.592 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |



# Hydrograph Report

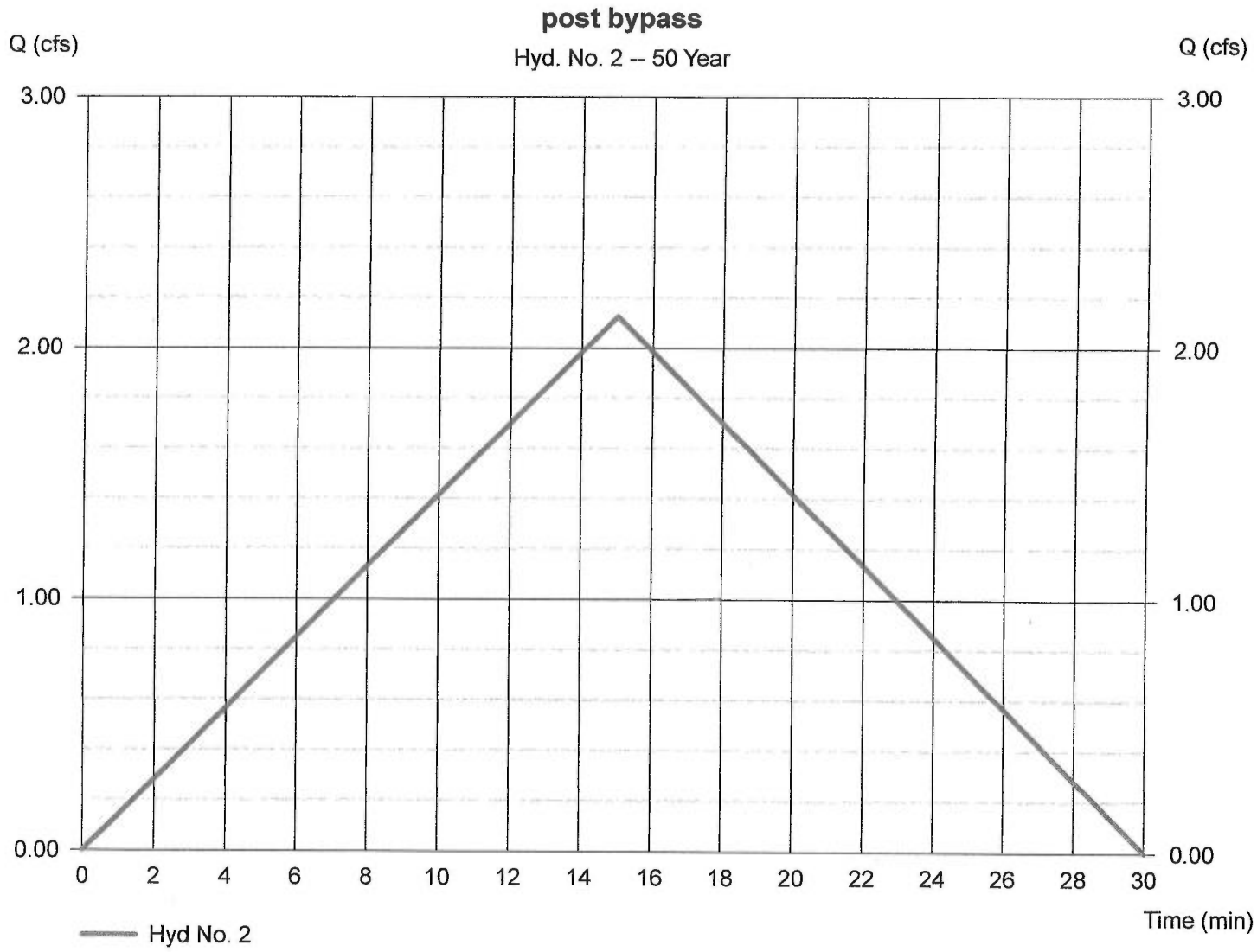


## Hyd. No. 2

post bypass

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 2.126 cfs |
| Storm frequency | = 50 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 1,913 cuft |
| Drainage area | = 0.700 ac | Runoff coeff. | = 0.4* |
| Intensity | = 7.592 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |

* Composite (Area/C) = [(0.060 x 0.95) + (0.640 x 0.35)] / 0.700



# Hydrograph Report

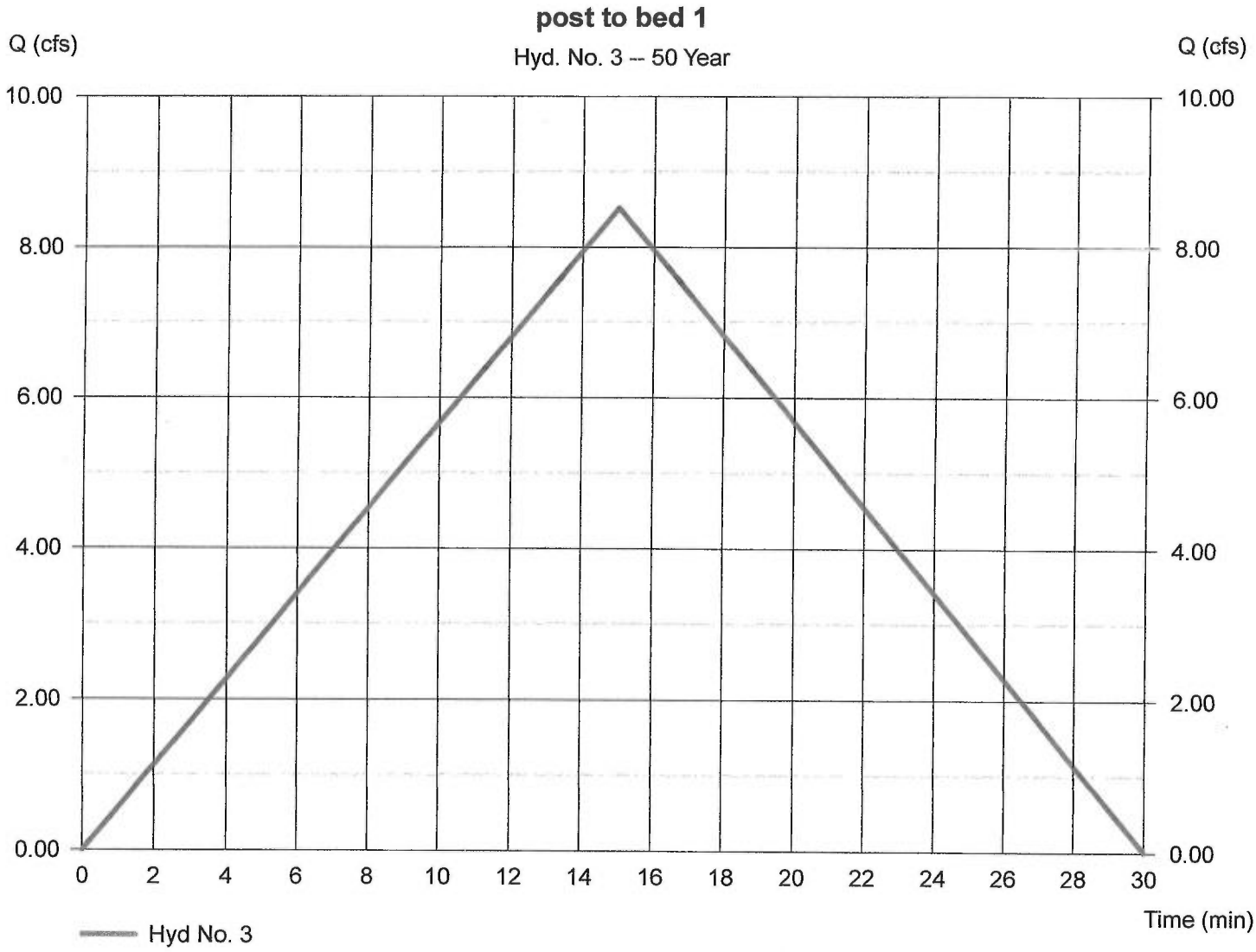


## Hyd. No. 3

post to bed 1

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 8.518 cfs |
| Storm frequency | = 50 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 7,666 cuft |
| Drainage area | = 2.040 ac | Runoff coeff. | = 0.55* |
| Intensity | = 7.592 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |

* Composite (Area/C) = [(1.370 x 0.35) + (0.665 x 0.95)] / 2.040



# Hydrograph Report

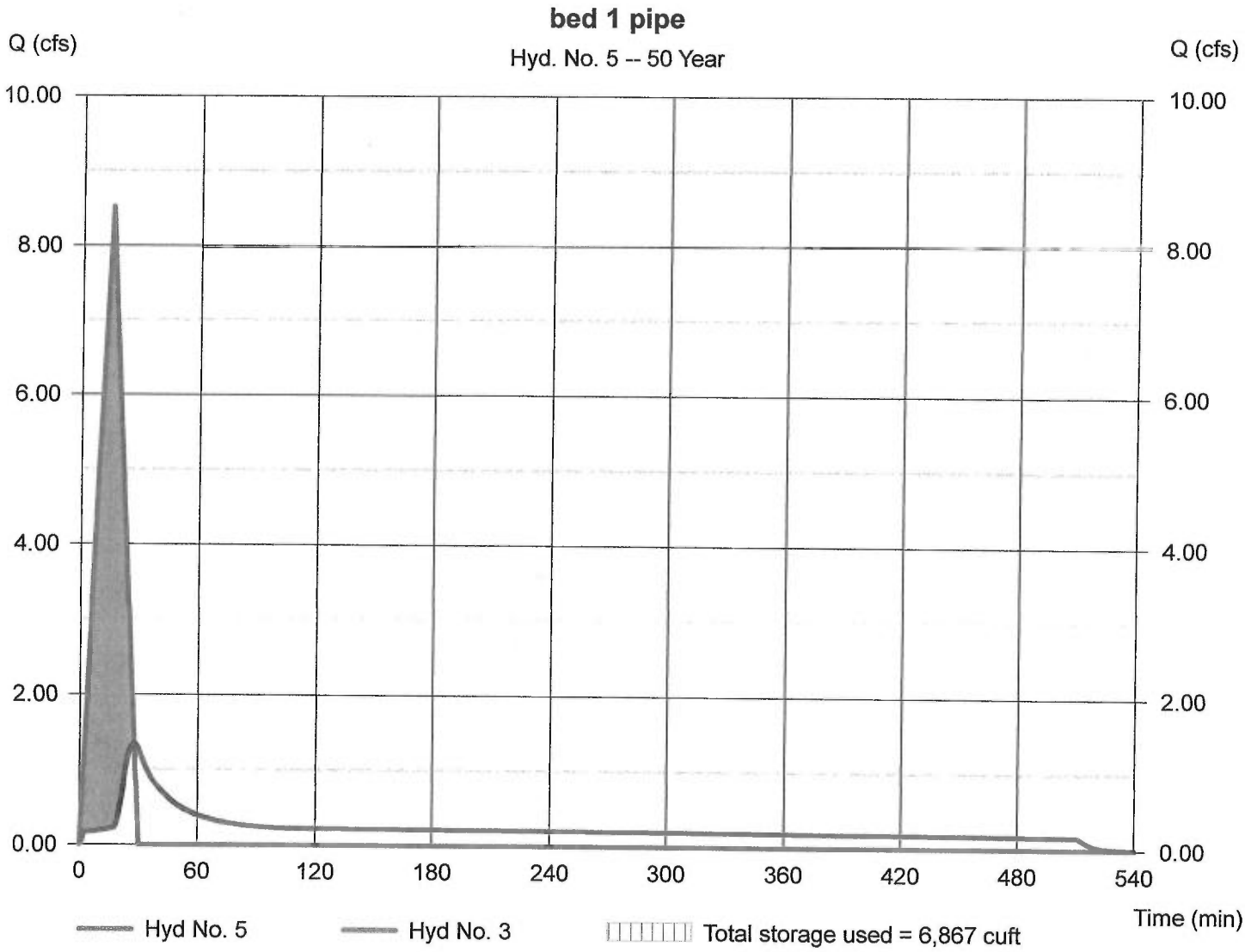


## Hyd. No. 5

bed 1 pipe

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 1.346 cfs |
| Storm frequency | = 50 yrs | Time to peak | = 28 min |
| Time interval | = 1 min | Hyd. volume | = 7,666 cuft |
| Inflow hyd. No. | = 3 - post to bed 1 | Max. Elevation | = 354.94 ft |
| Reservoir name | = bed 1 pipe | Max. Storage | = 6,867 cuft |

Storage Indication method used. Outflow includes exfiltration.



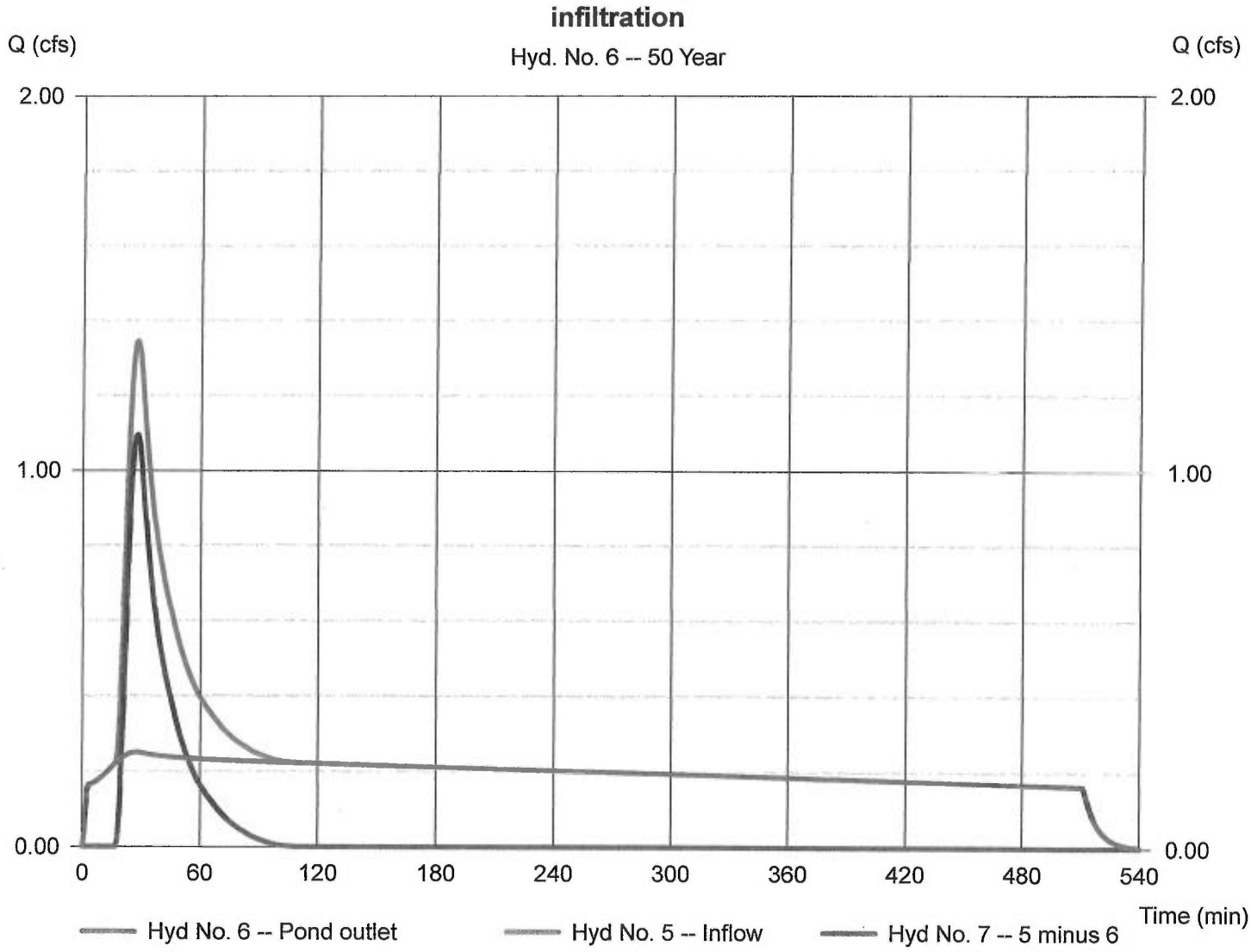
# Hydrograph Report



## Hyd. No. 6

infiltration

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion1 | Peak discharge | = 0.251 cfs |
| Storm frequency | = 50 yrs | Time to peak | = 28 min |
| Time interval | = 1 min | Hyd. volume | = 6,193 cuft |
| Inflow hydrograph | = 5 - bed 1 pipe | 2nd diverted hyd. | = 7 |
| Diversion method | = Pond - bed 1 pipe | Pond structure | = Exfiltration |



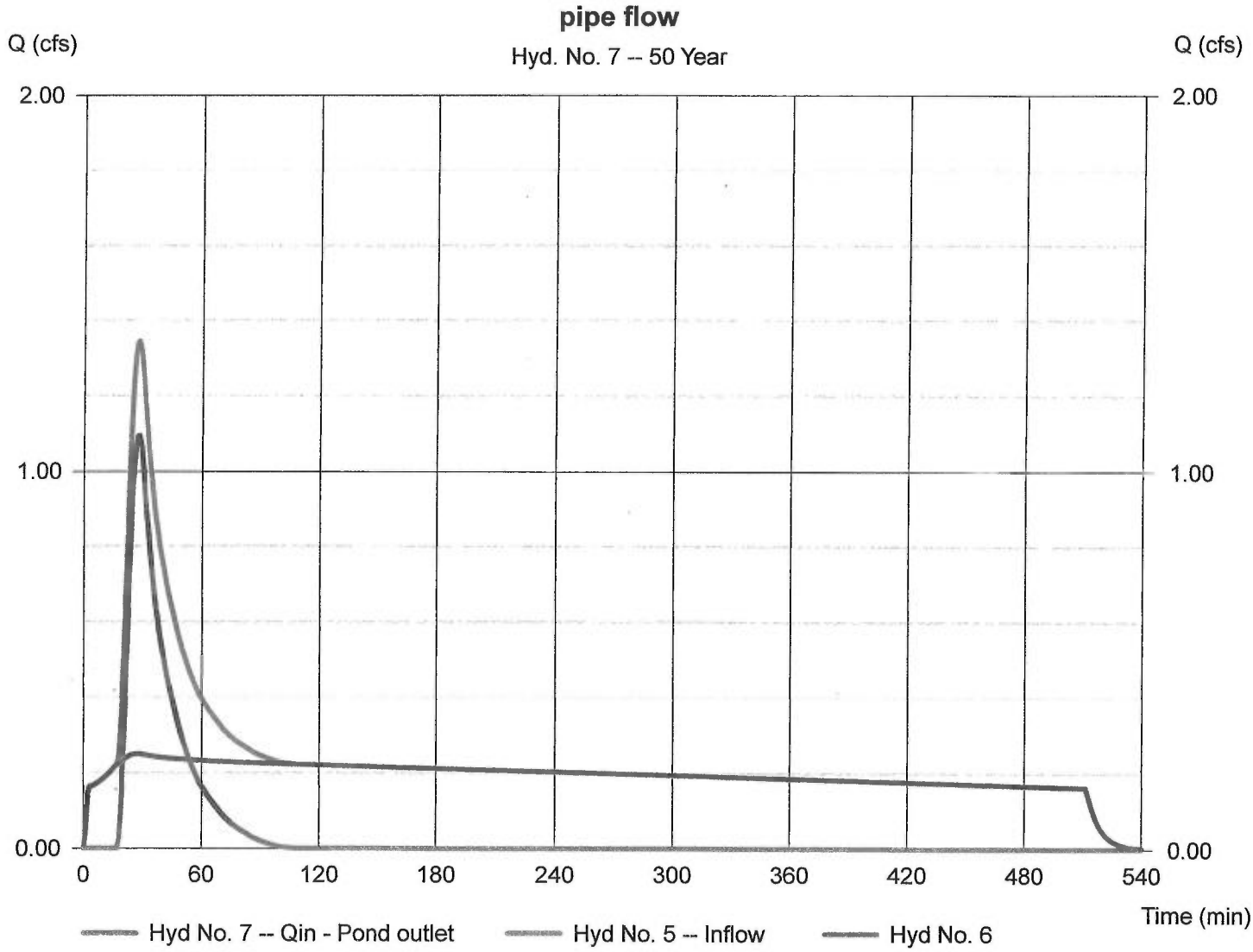
# Hydrograph Report



## Hyd. No. 7

pipe flow

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion2 | Peak discharge | = 1.095 cfs |
| Storm frequency | = 50 yrs | Time to peak | = 28 min |
| Time interval | = 1 min | Hyd. volume | = 1,473 cuft |
| Inflow hydrograph | = 5 - bed 1 pipe | 2nd diverted hyd. | = 6 |
| Diversion method | = Pond - bed 1 pipe | Pond structure | = Exfiltration |



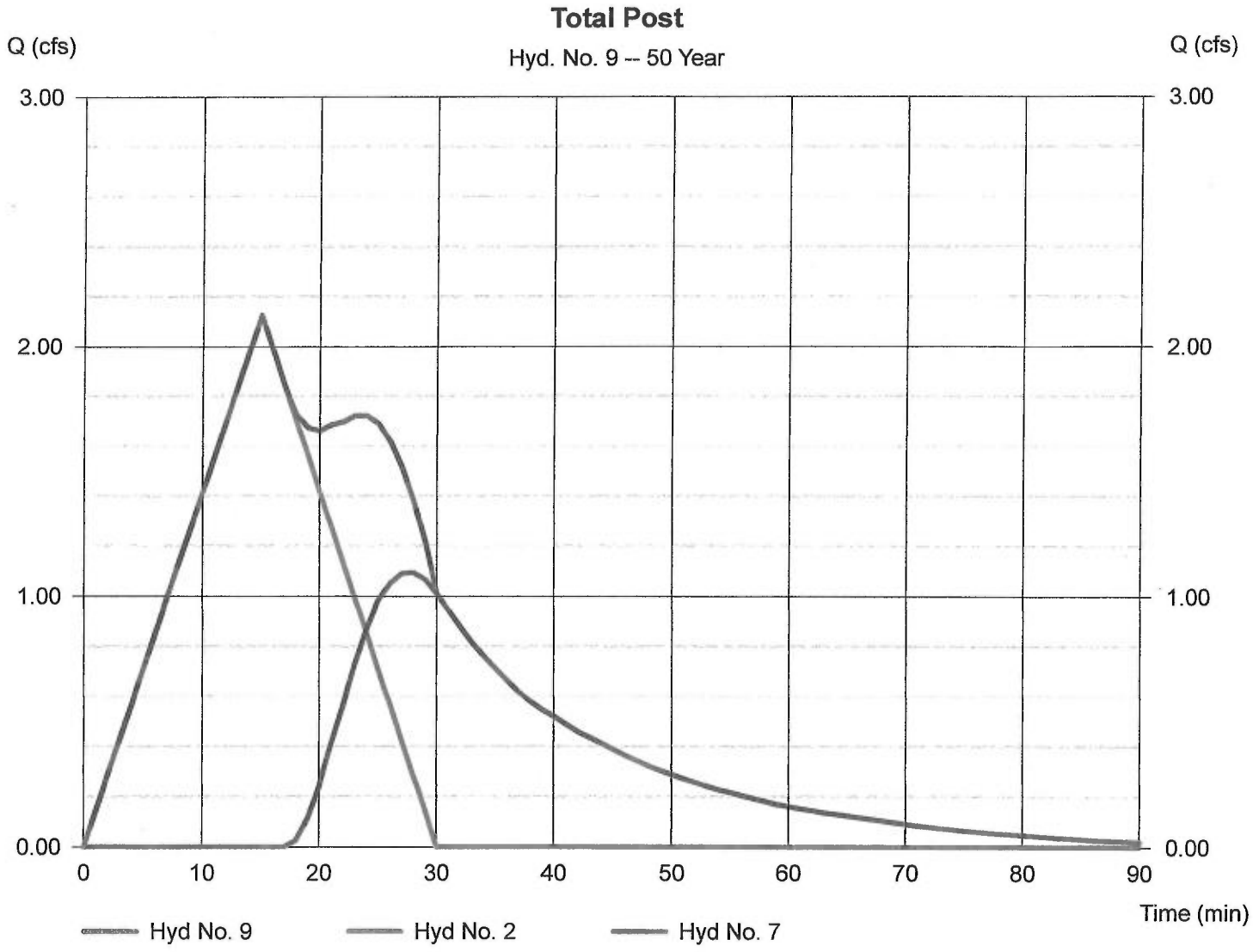
# Hydrograph Report



## Hyd. No. 9

Total Post

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 2.126 cfs |
| Storm frequency | = 50 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 3,386 cuft |
| Inflow hyds. | = 2, 7 | Contrib. drain. area | = 0.700 ac |



# Hydrograph Report

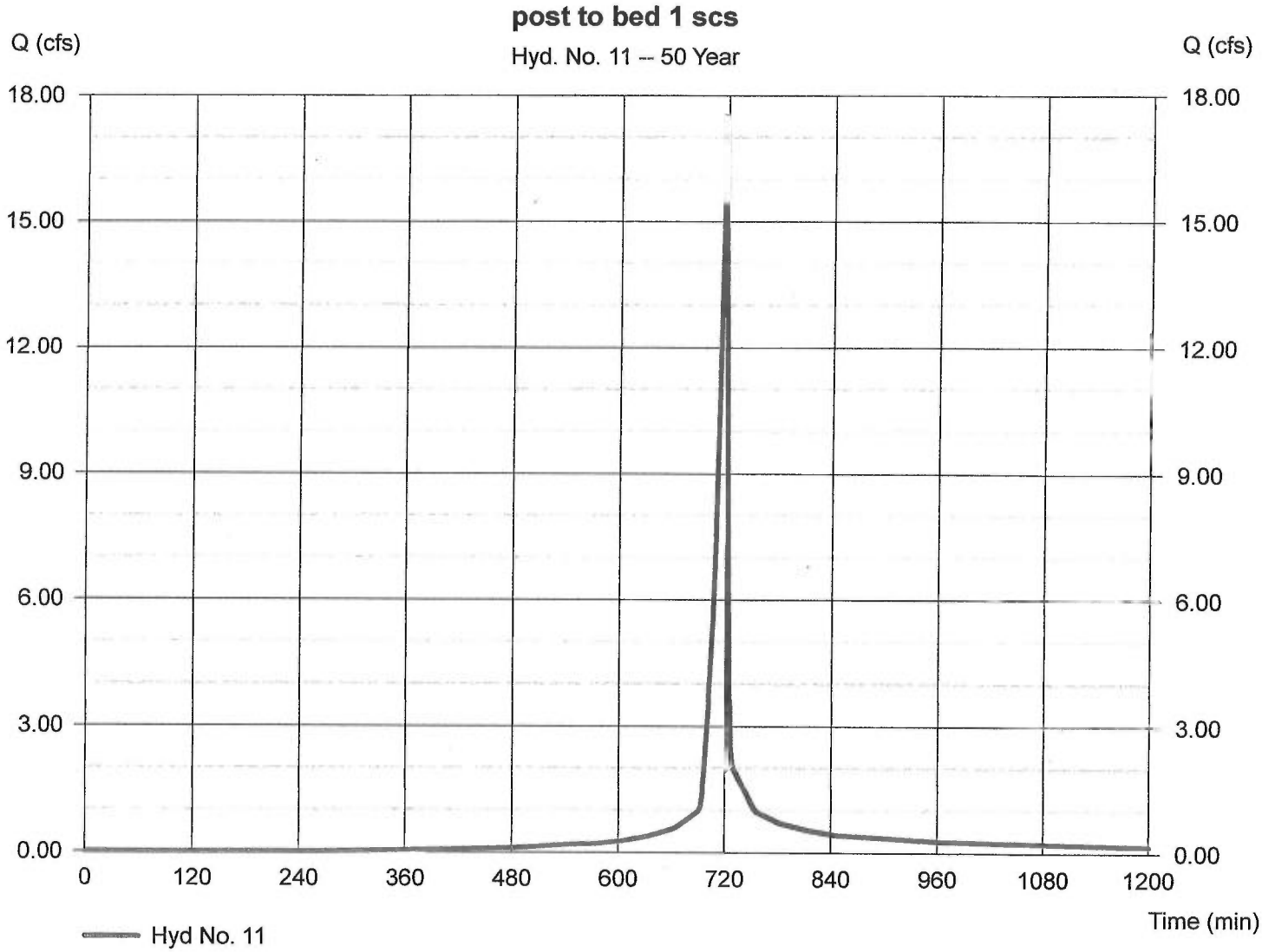


## Hyd. No. 11

post to bed 1 scs

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 15.37 cfs |
| Storm frequency | = 50 yrs | Time to peak | = 716 min |
| Time interval | = 2 min | Hyd. volume | = 32,595 cuft |
| Drainage area | = 2.040 ac | Curve number | = 86* |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5.00 min |
| Total precip. | = 6.30 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

* Composite (Area/CN) = [(1.370 x 80) + (0.670 x 98)] / 2.040



# Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 9.600 | 1 | 15 | 8,640 | ---- | ------ | ------ | pre development |
| 2 | Rational | 2.324 | 1 | 15 | 2,091 | ---- | ------ | ------ | post bypass |
| 3 | Rational | 9.311 | 1 | 15 | 8,380 | ---- | ------ | ------ | post to bed 1 |
| 5 | Reservoir | 1.810 | 1 | 27 | 8,379 | 3 | 355.11 | 7,332 | bed 1 pipe |
| 6 | Diversion1 | 0.258 | 1 | 27 | 6,272 | 5 | ------ | ------ | infiltration |
| 7 | Diversion2 | 1.552 | 1 | 27 | 2,107 | 5 | ------ | ------ | pipe flow |
| 9 | Combine | 2.324 | 1 | 15 | 4,199 | 2, 7, | ------ | ------ | Total Post |
| 11 | SCS Runoff | 18.01 | 2 | 716 | 38,587 | ---- | ------ | ------ | post to bed 1 scs |

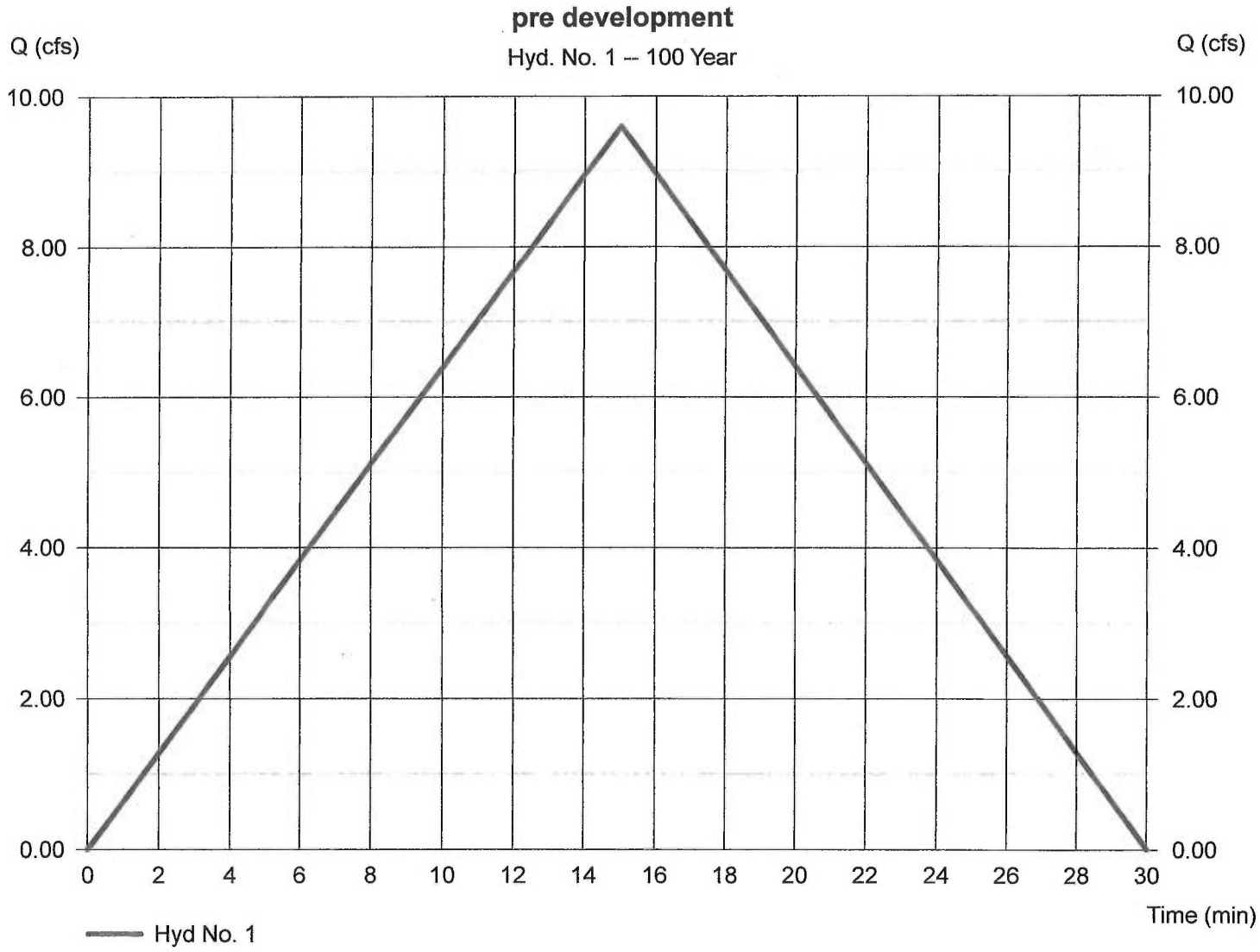
# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 — Thursday, Apr 5, 2018

## Hyd. No. 1

pre development

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 9.600 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 8,640 cuft |
| Drainage area | = 2.410 ac | Runoff coeff. | = 0.48 |
| Intensity | = 8.298 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |



# Hydrograph Report

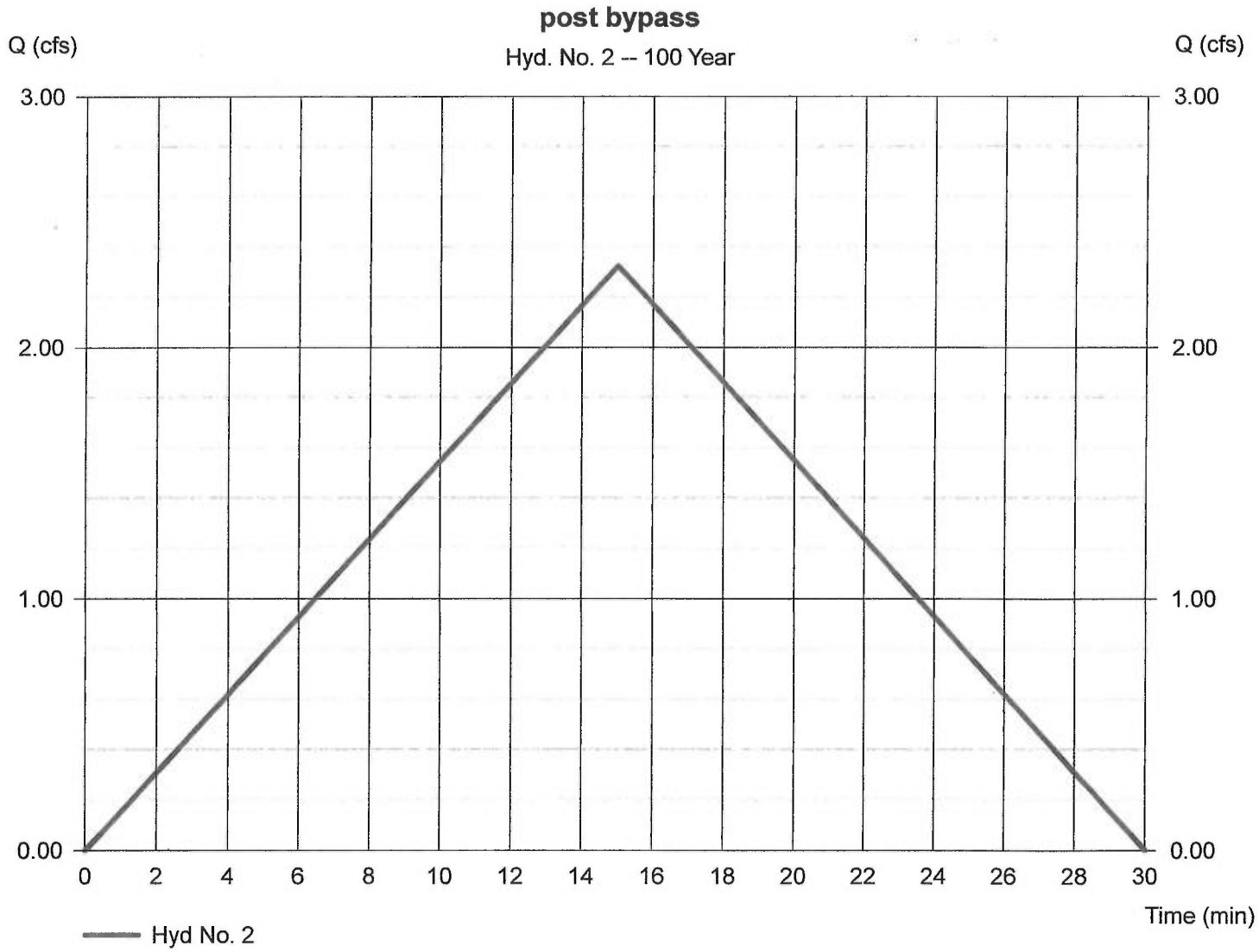


## Hyd. No. 2

post bypass

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 2.324 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 2,091 cuft |
| Drainage area | = 0.700 ac | Runoff coeff. | = 0.4* |
| Intensity | = 8.298 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |

* Composite (Area/C) = [(0.060 x 0.95) + (0.640 x 0.35)] / 0.700



# Hydrograph Report

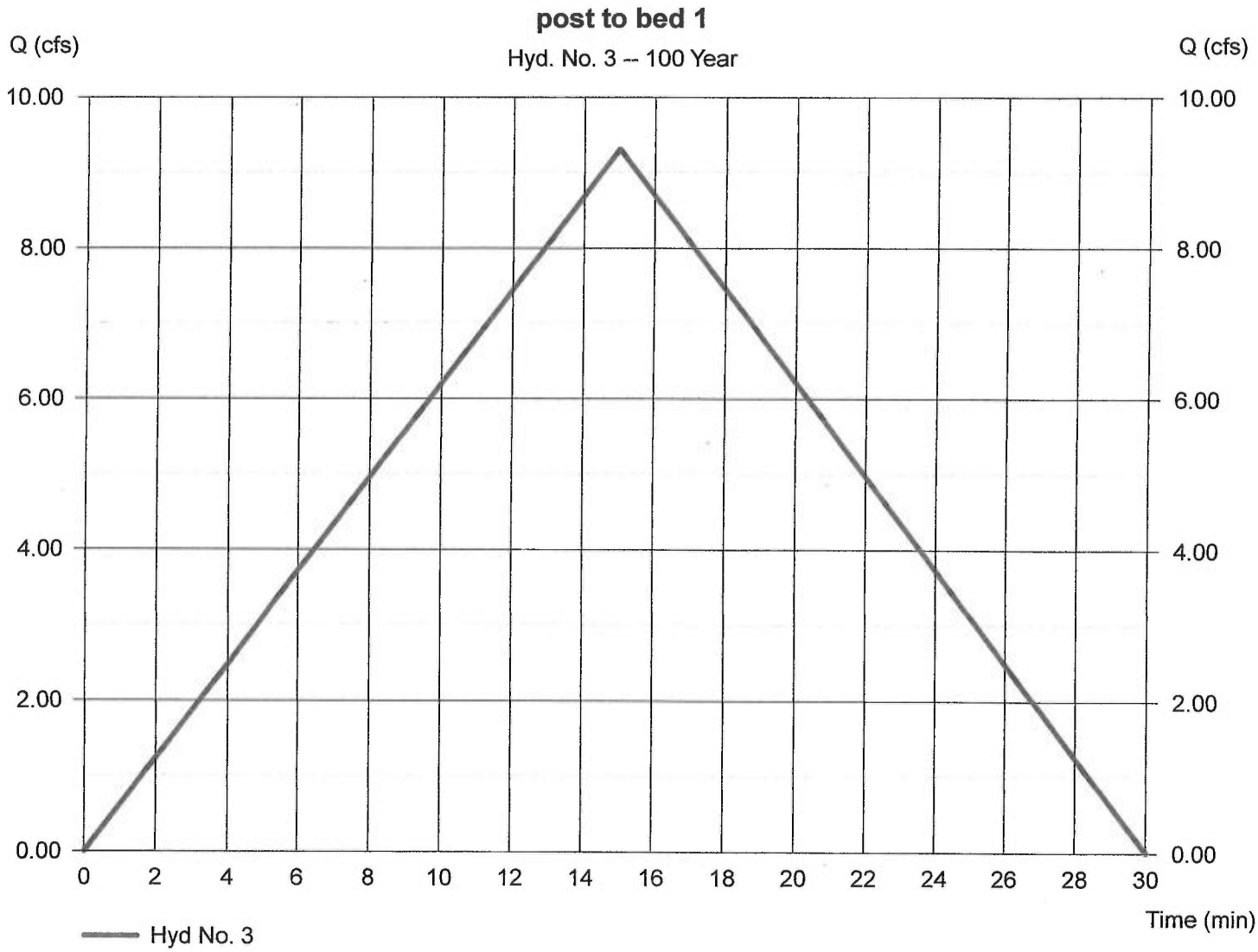


## Hyd. No. 3

post to bed 1

| | | | |
|---|---|---|---|
| Hydrograph type | = Rational | Peak discharge | = 9.311 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 8,380 cuft |
| Drainage area | = 2.040 ac | Runoff coeff. | = 0.55* |
| Intensity | = 8.298 in/hr | Tc by User | = 5.00 min |
| IDF Curve | = Phila.IDF | Asc/Rec limb fact | = 3/3 |

* Composite (Area/C) = [(1.370 x 0.35) + (0.665 x 0.95)] / 2.040



# Hydrograph Report

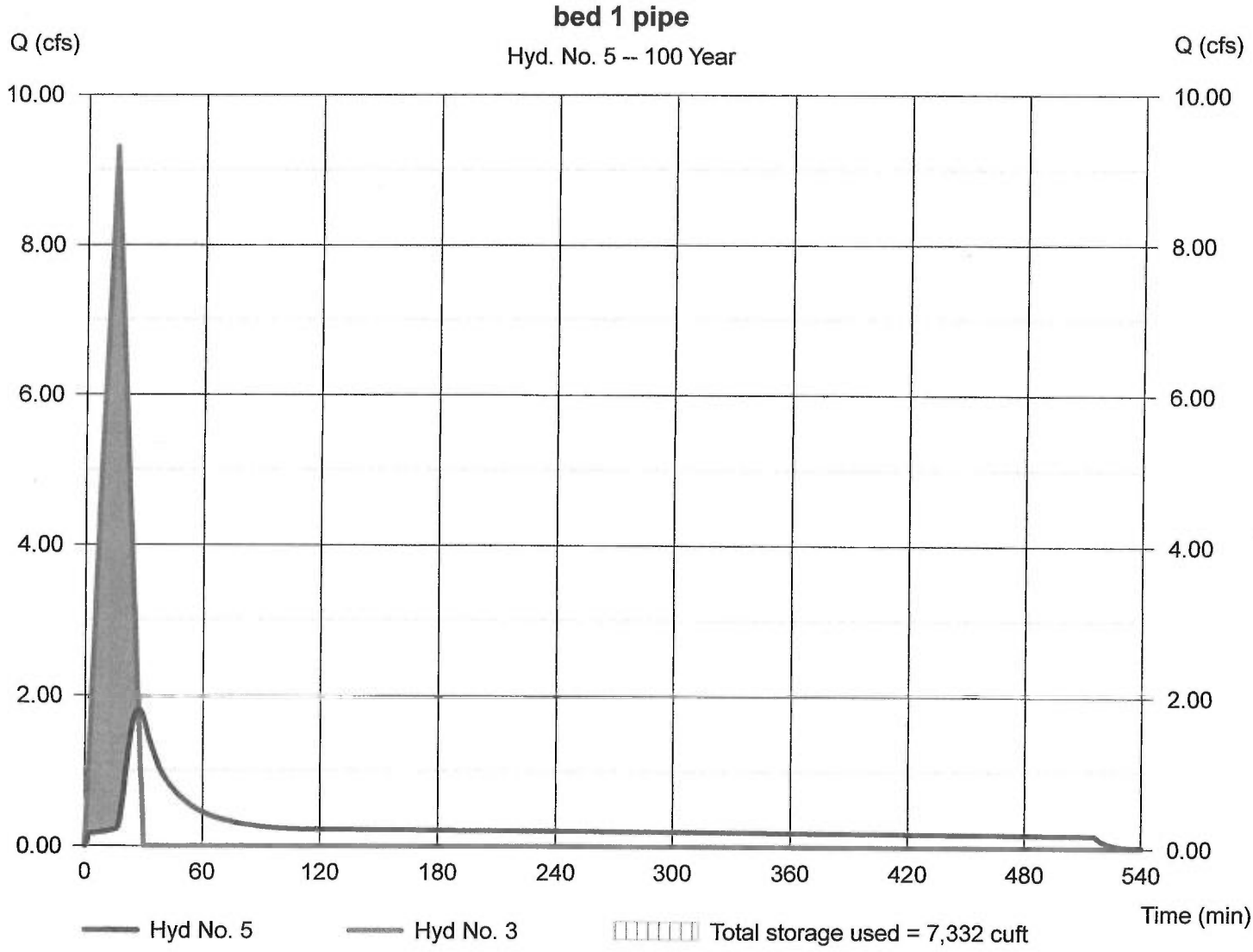


## Hyd. No. 5

bed 1 pipe

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 1.810 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 27 min |
| Time interval | = 1 min | Hyd. volume | = 8,379 cuft |
| Inflow hyd. No. | = 3 - post to bed 1 | Max. Elevation | = 355.11 ft |
| Reservoir name | = bed 1 pipe | Max. Storage | = 7,332 cuft |

Storage Indication method used. Outflow includes exfiltration.



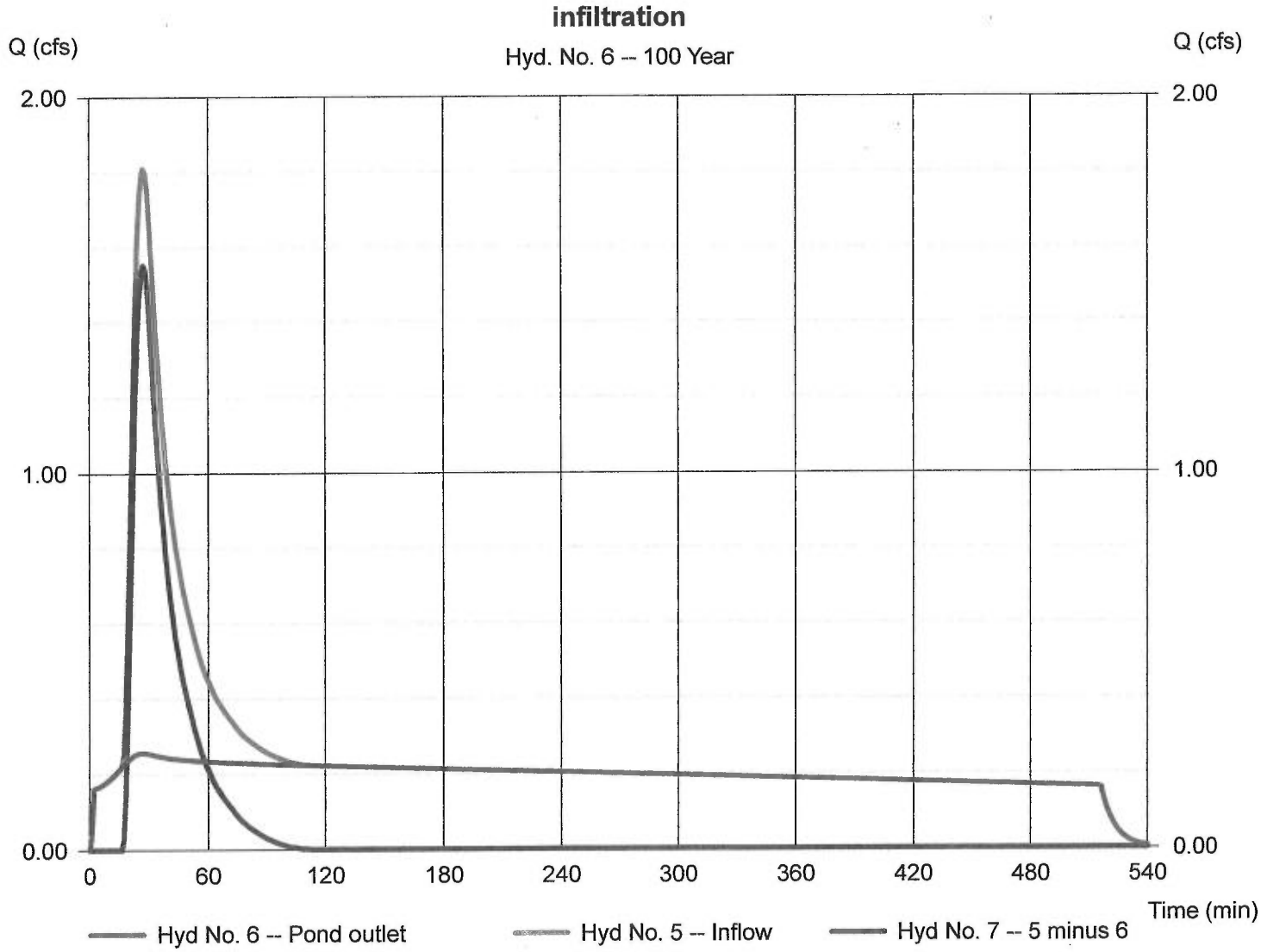
# Hydrograph Report



## Hyd. No. 6

infiltration

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion1 | Peak discharge | = 0.258 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 27 min |
| Time interval | = 1 min | Hyd. volume | = 6,272 cuft |
| Inflow hydrograph | = 5 - bed 1 pipe | 2nd diverted hyd. | = 7 |
| Diversion method | = Pond - bed 1 pipe | Pond structure | = Exfiltration |



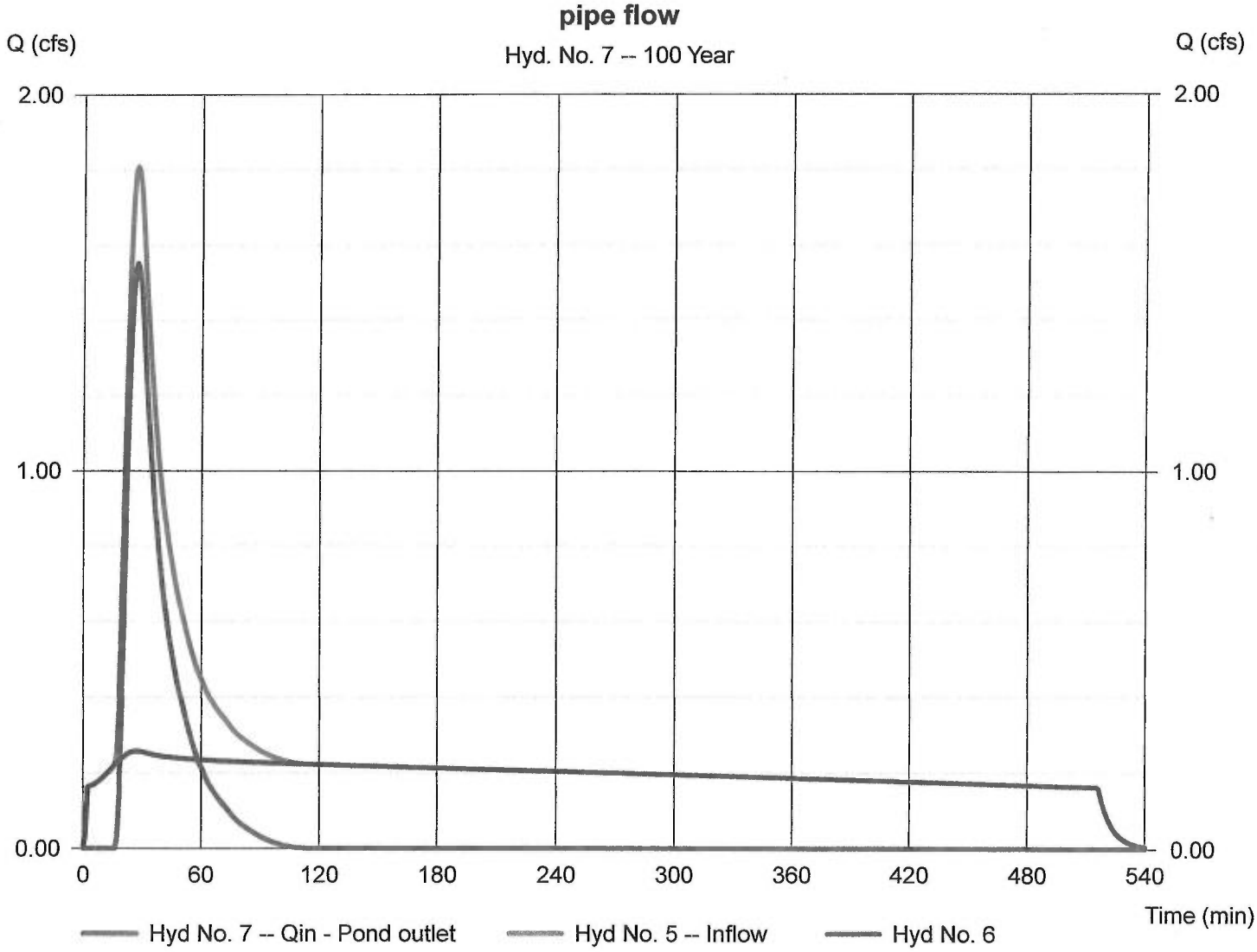
# Hydrograph Report



## Hyd. No. 7

pipe flow

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion2 | Peak discharge | = 1.552 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 27 min |
| Time interval | = 1 min | Hyd. volume | = 2,107 cuft |
| Inflow hydrograph | = 5 - bed 1 pipe | 2nd diverted hyd. | = 6 |
| Diversion method | = Pond - bed 1 pipe | Pond structure | = Exfiltration |



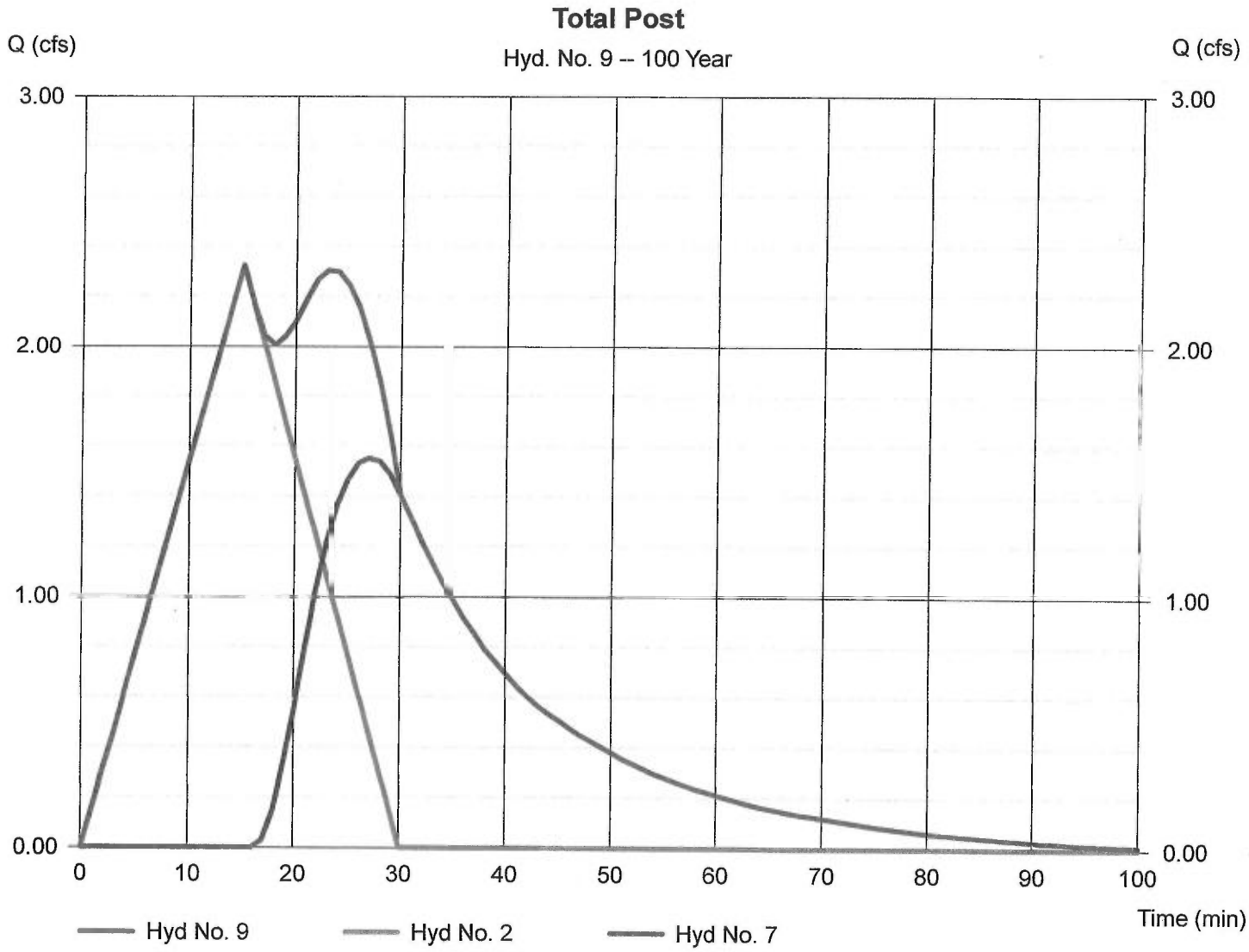
# Hydrograph Report



## Hyd. No. 9

Total Post

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 2.324 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 15 min |
| Time interval | = 1 min | Hyd. volume | = 4,199 cuft |
| Inflow hyds. | = 2, 7 | Contrib. drain. area | = 0.700 ac |



# Hydrograph Report

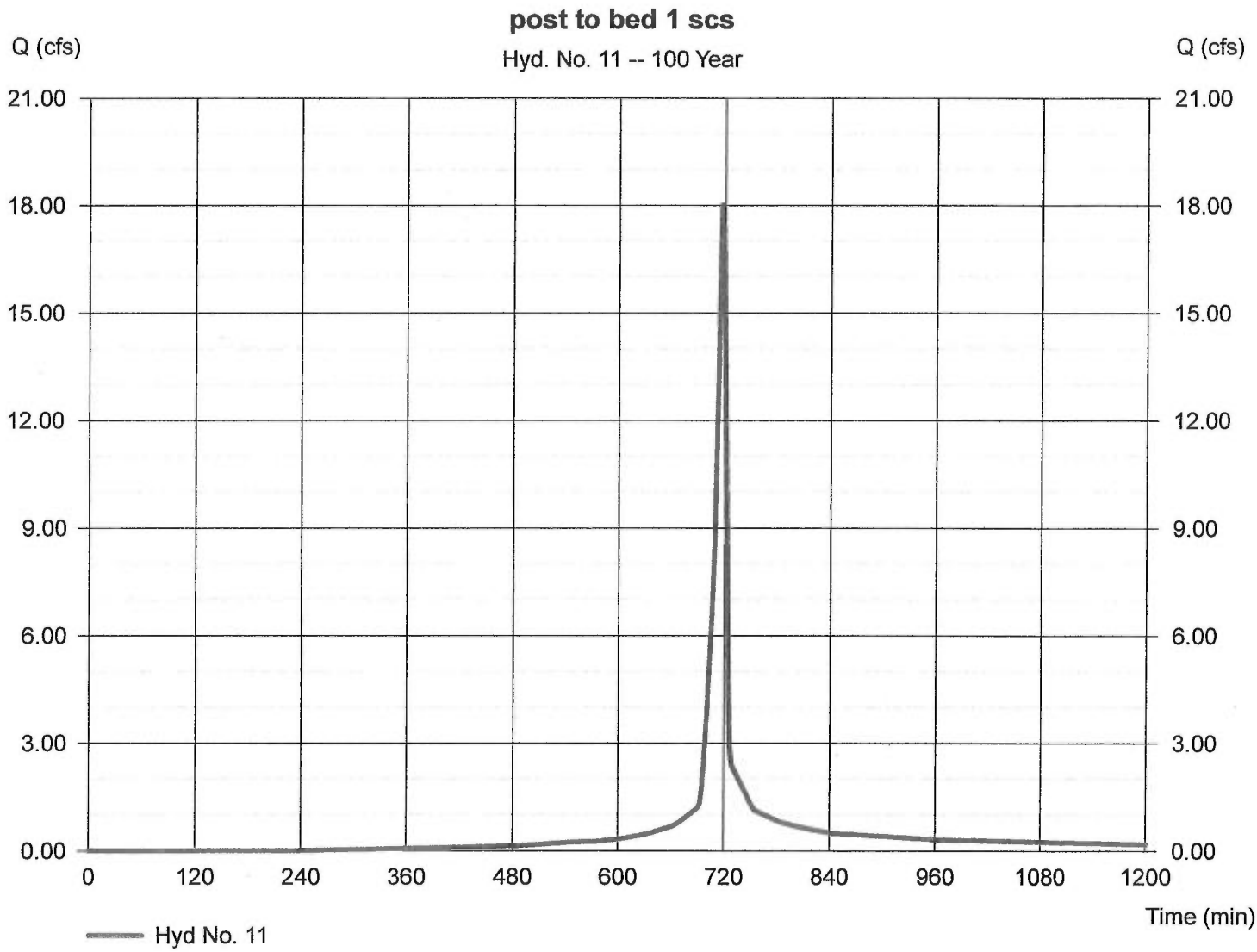
Hydraflow Hydrographs by Intelisolve v9.1 — Thursday, Apr 5, 2018

## Hyd. No. 11

post to bed 1 scs

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 18.01 cfs |
| Storm frequency | = 100 yrs | Time to peak | = 716 min |
| Time interval | = 2 min | Hyd. volume | = 38,587 cuft |
| Drainage area | = 2.040 ac | Curve number | = 86* |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5.00 min |
| Total precip. | = 7.20 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |

* Composite (Area/CN) = [(1.370 x 80) + (0.670 x 98)] / 2.040



POST TO INFILTRATION BED

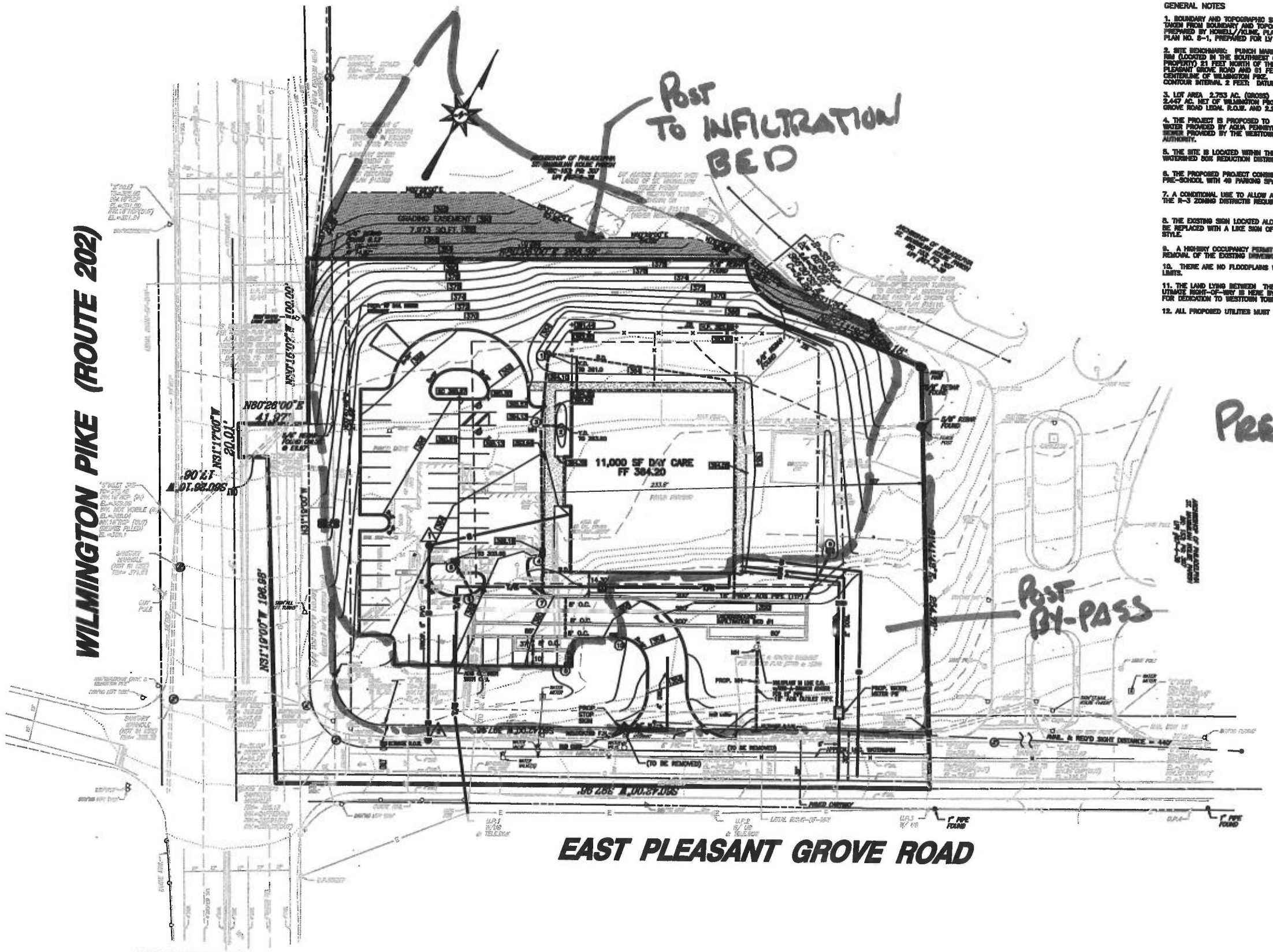
WILMINGTON PIKE (ROUTE 202)

EAST PLEASANT GROVE ROAD

POST BY-PASS

PRE = TOTAL OF BOTH POST

DRAINAGE PLAN




GENERAL NOTES

1. BOUNDARY AND TOPOGRAPHIC SURVEY INFORMATION TAKEN FROM BOUNDARY AND TOPOGRAPHY SURVEY PLAN PREPARED BY HOWELL/KLINE, PLAN DATED 11/20/2006, PLAN NO. S-1, PREPARED FOR LV ASSOCIATES, LP.

2. SITE BENCHMARK: PUNCH MARK ON SANITARY MANHOLE RIM (LOCATED IN THE SOUTHWEST CORNER OF THE PROPERTY) 51 FEET NORTH OF THE CENTERLINE OF EAST PLEASANT GROVE ROAD AND 51 FEET EAST OF THE CENTERLINE OF WILMINGTON PIKE. ELEVATION 383.13 FEET, CONTOUR INTERVAL 2 FEET. DATUM NAVD 1988.

3. LOT AREA 2.753 AC. (GROSS)
2.447 AC. NET OF WILMINGTON PIKE AND EAST PLEASANT GROVE ROAD LEGAL R.O.W. AND 2.37 AC. NET OF THE ULTIMATE R.O.W.

4. THE PROJECT IS PROPOSED TO BE SERVED BY PUBLIC WATER PROVIDED BY AQUA PENNSYLVANIA AND PUBLIC SEWERS PROVIDED BY THE WESTTOWN TOWNSHIP SEWER AUTHORITY.

5. THE SITE IS LOCATED WITHIN THE CHESTER CREEK WATERSHED 50% REDUCTION DISTRICT.

6. THE PROPOSED PROJECT CONSISTS OF 11,000 S.F. OF PRE-SCHOOL WITH 49 PARKING SPACES.

7. A CONDITIONAL USE TO ALLOW A PRE-SCHOOL/ DAY CARE USE WITHIN THE R-3 ZONING DISTRICTS REQUIRED.

8. THE EXISTING SIGN LOCATED ALONG RT. 202 IS TO BE REPLACED WITH A LIKE SIGN OF SIMILAR SIZE AND STYLE.

9. A HIGHWAY OCCUPANCY PERMIT IS REQUIRED FOR THE REMOVAL OF THE EXISTING DRIVEWAY ACCESS TO ROUTE 202.

10. THERE ARE NO FLOODPLAINS WITHIN THE PROPERTY LIMITS.

11. THE LAND LYING BETWEEN THE EXISTING LEGAL AND ULTIMATE RIGHT-OF-WAY IS HERE BY OFFERED IN PURPETUITY FOR DEDICATION TO WESTTOWN TOWNSHIP

12. ALL PROPOSED UTILITIES MUST BE PLACED UNDERGROUND.

LOCATION MAP
SCALE: 1" = 2000'

PENNSYLVANIA ONE CALL SYSTEM, INC.
1-800-242-1776
SERIAL # 1825925

ASSESSMENT MAP 67-4, PARCEL 38 (UPI NO. 67-4-38)

CONDITIONAL USE
GRADING UTILITY PLAN

LAND DEVELOPMENT
FOR
THE MALVERN SCHOOL
WESTTOWN TOWNSHIP CHESTER COUNTY, PA.

Edward B. Walsh & Associates, Inc.
CIVIL ENGINEERS & SURVEYORS
185 Dowlin Forge Rd.
Exton, Pennsylvania 19341
Phone: 610-903-0060
Fax: 610-903-0090

| | |
|---|---|
| Project- | 4432 |
| Date- | 4-2-18 |
| Scale- | 1"= 30' |
| Drawn- | AE |
| Checked- | A.E. |
| Sheet- | 2 OF 5 |

Revised 4/9/2018