



**K&S ENGINEERING, INC.**  
Planning Engineering Surveying

## DRAINAGE STUDY

**For**

BRITANNIA AIRWAY LOGISTICS CENTER  
5761 Airway Road  
San Diego, CA 92154  
APN 646-100-74-00

PRJ-1088583

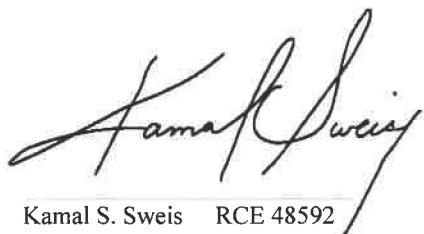
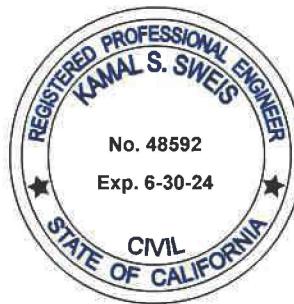
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December 20, 2022  
K&S JN 20-025



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December 20, 2022

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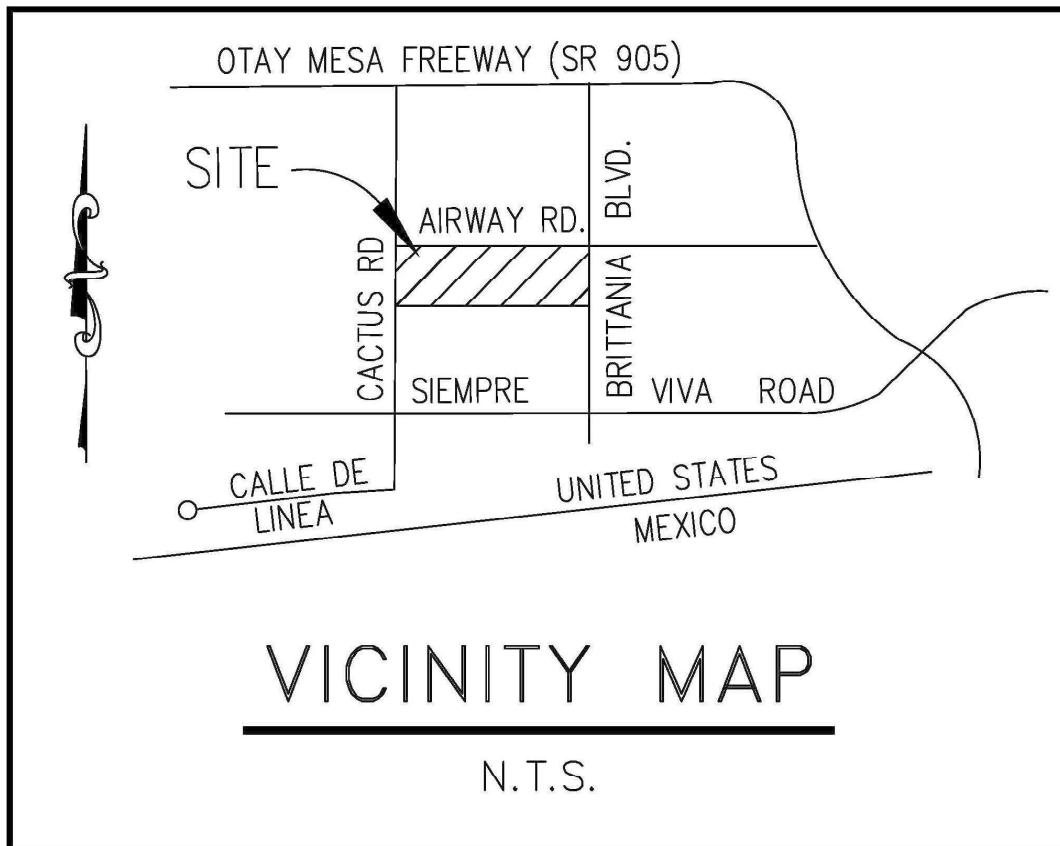
## APPENDIX A

Tables and Charts

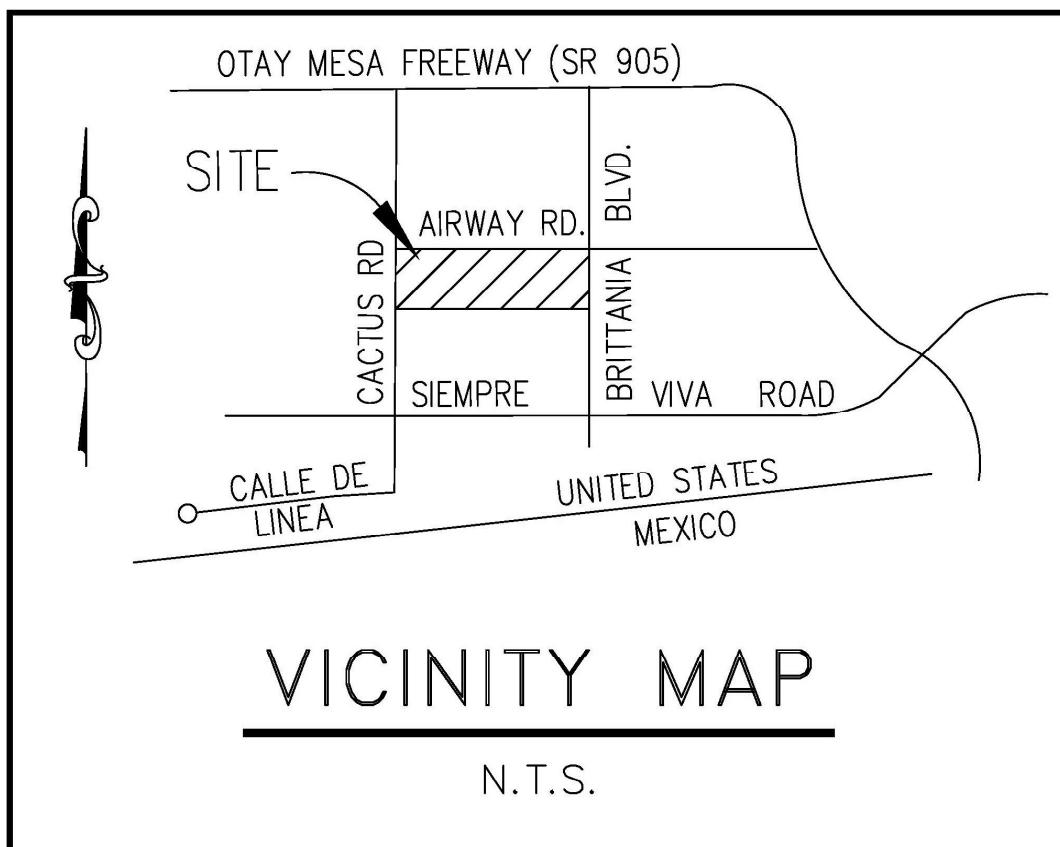
## APPENDIX B

Drainage Exhibit

1 VICINITY MAP



1 VICINITY MAP



## **2 INTRODUCTION**

The project is located at the Southwest corner of the intersection of Airway Road and Britannia Blvd in Otay Mesa, it is surrounded by Cactus Road to the West, Airway Road to the North, Britannia Boulevard to the East and a car auction facility to the South.

The Project consists of grading and drainage improvements for a truck parking and storage with pervious surface, nine office trailers with attached car parking, one biofiltration basin for water quality and flow control purposes; street widening improvements for Cactus Road, Airway Road and Britannia Blvd. are also part of the development.

## **3 PURPOSE OF THIS STUDY**

The purpose of this study is to determine the proposed peak flows produced by the proposed development for the 5, 10, 25 and 50 Year storm events, as well as to determine the pipe and inlet sizes.

The proposed project is not in the close vicinity of navigable waters or wetland. The proposed construction and any associated runoff will not result into navigable waters and therefore exempt from the Regional Water Quality Control Board under Federal Clean Water Act (CWA) Section 401 or 404.

## **4 PROJECT INFORMATION**

### **4.1 EXISTING CONDITION**

The existing site consists of one undeveloped lot with two drainage areas, one sheet flows in a Southeast direction into an existing channel located along Britannia Blvd. generating 32.1 CFS, said channel also receives off-site runoff from the development located North of the project (off-site drainage).

The second drainage area is located at the Northwest corner of the site to and sheet-flows in a Northwest direction towards the Southeast corner of the intersection of Airway Road and Cactus Road generating Q50=6.45 CFS.

A small portion of Cactus road drains South generating Q=0.72 CFS.

The calculated flows for existing condition are based by utilizing a runoff coefficient of C=0.45 for the onsite flows and C=0.90 for the improved streets

### **4.2 PROPOSED CONDITION**

The proposed site will maintain the same discharge points as the existing condition, the area draining towards the Southeast corner of the site will sheet flow into a proposed biofiltration basin along the Southerly property line where runoff will be treated and mitigated before exiting the site via storm drain pipe into the existing channel located at Britannia Blvd., at this point the confluenced undetained flow is Q50= 33.92 CFS.

The Northwest portion of the development will sheet flow towards the northwest corner of the site, runoff will be treated by means of a biofiltration basin, then flow will be conveyed via pipe into a proposed curb inlet located at the Southeast corner of the intersection of Airway Road and Britannia BLVD, the proposed confluence flow at this point is Q50= 6.45 CFS.

The street portion of Cactus Road draining towards the south generates Q50= 0.36 CFS.

The proposed land use utilized for on-site proposed condition is industrial with 35% imperviousness, therefore a runoff coefficient of C=0.50 was used. For the street widening improvements a runoff coefficient of C=0.90 was utilized.

### 4.3 DETENTION BASIN METHODOLOGY

See section 8 for detention basin calculations, one detention basin was designed for this project using the January 2017 City of San Diego Drainage Manual and Drainage Requirements in Otay Mesa Notice Dated August 7, 1997.

The purpose of this basin is to temporarily store the increased runoff and release it at a rate equal or less than the undeveloped condition. Hydrographs were determined using the rational method design storm hydrograph method. The detention basin size was determined using the single hydrograph procedure and by routing the 5, 10, 25 and 50- year storm event. The outlet structure has been sized to drain the basin within 96 hours.

The basin will also serve as a pollutant treatment and for hydromodification compliance.

### 4.4 SUMMARY

In order to mitigate the increased runoff from the existing to the proposed condition, A detention basin is proposed in compliance with the Otay Mesa Community Plan. Proposed flows after routing are smaller the ones generated by the undeveloped condition. Also, ultimate rational method flows were used to size the permanent drainage structures proposed by this development, therefore, the project would not create or contribute runoff water which would exceed the capacity of any existing or planned storm water drainage system, and will not expose people or structure to a significant risk or loss, injury or death involving flooding as a result of the failure of levee or dam.

The project will maintain the existing drainage pattern and will not result in any erosion or siltation; also, the project the project will not result in flooding on-site or off-site due to the installation of the peak flow detention basin. No adverse impact will occur to the downstream properties as a result of the proposed development, since the proposed flows are mitigated on-site.

The proposed condition of Northwest basin did not reflect an increase in run-off, therefore, no detention was proposed.

Also there is no peak flow detention for the widening of the public streets since Green Street Swales are being provided for treatment control only.

The following tables summarize the existing and proposed (on-site) peak flow rates for the 5, 10, 25 & 50 -Year storm events. Peak rational method flows were used to size all drainage structures.

**POINT 1 PEAK FLOW TABLE (CFS) SUMMARY TABLE**

| STORM EVENT | EXISTING CONDITION AT NODE 4 (cfs) | PROPOSED CONDITION BEFORE DETENTION AT NODE 7 (cfs) | PROPOSED CONDITION AFTER DETENTION (cfs) |
|-------------|------------------------------------|---|--|
| 5-Yr        | 23.55                              | 24.85   | 22.44                                    |
| 10-Yr       | 25.25                              | 26.61   | 23.76                                    |
| 25-Yr       | 28.03                              | 29.64   | 26.5                                     |
| 50-Yr       | 32.1                               | 33.92   | 30.22                                    |

### POINT 2 PEAK FLOW TABLE (CFS) SUMMARY TABLE

| STORM EVEN T | EXISTING CONDITION AT NODE 7 (cfs) | PROPOSED CONDITION BEFORE DETENTION AT NODE 11 (cfs) | NO DETENTION REQUIRED FOR THIS BASIN |
|--------------|------------------------------------|--|--------------------------------------|
| <b>5-Yr</b>  | <b>4.18</b>                        | <b>2.16</b>  | -                                    |
| <b>10-Yr</b> | <b>4.92</b>                        | <b>2.54</b>  | -                                    |
| <b>25-Yr</b> | <b>5.55</b>                        | <b>2.86</b>  | -                                    |
| <b>50-Yr</b> | <b>6.45</b>                        | <b>3.33</b>  | -                                    |

### POINT 3 PEAK FLOW TABLE (CFS) SUMMARY TABLE

| STORM EVEN T | EXISTING CONDITION AT NODE 9 (cfs) | PROPOSED CONDITION BEFORE DETENTION AT NODE 13 (cfs) | NO DETENTION REQUIRED FOR THIS BASIN |
|--------------|------------------------------------|--|--------------------------------------|
| <b>5-Yr</b>  | <b>0.54</b>                        | <b>0.24</b>  | -                                    |
| <b>10-Yr</b> | <b>0.61</b>                        | <b>0.28</b>  | -                                    |
| <b>25-Yr</b> | <b>0.65</b>                        | <b>0.31</b>  | -                                    |
| <b>50-Yr</b> | <b>0.72</b>                        | <b>0.36</b>  | -                                    |

## 5. DESIGN CRITERIA AND METHODOLOGY

This report was prepared using the City of San Diego Transportation and Stormwater Design Manual, January 2017 edition.

The proposed storm flows were determined using the rational method hydrology program CIVILCADD/CIVILDESIGN which is based on the City of San Diego Drainage Design Manual Dated 1984, See section 4 for Hydrology design models. The pipes were sized using the 50 Year storm.

## 6. HYDROLOGY DESIGN MODELS

### A. DESIGN METHODS

THE RATIONAL METHOD IS USED IN THIS HYDROLOGY STUDY; THE RATIONAL FORMULA IS AS FOLLOWS:

Q = CIA, WHERE : Q= PEAK DISCHARGE IN CUBIC FEET/SECOND \*

C = RUNOFF COEFFICIENT (DIMENSIONLESS)

I = RAINFALL INTENSITY IN INCHES/HOUR

A = TRIBUTARY DRAINAGE AREA IN ACRES

\*1 ACRE INCHES/HOUR = 1.008 CUBIC FEET/SEC

THE OVERLAND METHOD IS ALSO USED IN THIS HYDROLOGY STUDY;

THE URBAN AREAS OVERLAND FORMULA IS AS FOLLOWS:

$$T = [1.8(1.1-C)(L)^{(5)}]/[S(100)]^{.333}$$

L = LENGTH OF WATERSHED

C = COEFFICIENT OF RUNOFF

T = TIME IN MINUTES

S = DIFFERENCE IN ELEVATION DIVIDED BY DE LENGTH OF WATERSHED

### B. DESIGN CRITERIA

- FREQUENCY 50 YEAR STORM.

- RAIN FALL INTENSITY PER CITY OF SAN DIEGO DRAINAGE DESIGN

MANUAL, JANUARY 2017.

### C. REFERENCES

- CITY OF SAN DIEGO DRAINAGE DESIGN MANUAL, JANUARY 2017.

- COUNTY OF SAN DIEGO HYDROLOGY MANUAL, JUNE 2003

- HAND BOOK OF HYDRAULICS BY BRATER & KING, SIXTH EDITION.

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7 HYDROLOGY CALCULATIONS

## 7.1 RATIONAL METHOD CALCULATIONS

**EXISTING CONDITION HYDROLOGY  
5 YEAR STORM  
BADIEE TRUCK PARK AND STORAGE**

**J.N. 20-025**

San Diego County Rational Hydrology Program  
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3  
Rational method hydrology program based on  
San Diego County Flood Control Division 1985 hydrology manual  
Rational Hydrology Study Date: 12/13/21

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

Program License Serial Number 4035

Rational hydrology study storm event year is 5.0  
English (in-lb) input data Units used  
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and  
Elevation 0 - 1500 feet  
Factor (to multiply \* intensity) = 1.000  
Only used if inside City of San Diego  
San Diego hydrology manual 'C' values used  
Runoff coefficients by rational method

+++++

+++ Process from Point/Station 1.000 to Point/Station 2.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Initial subarea flow distance = 250.000(Ft.)  
Highest elevation = 516.000(Ft.)  
Lowest elevation = 514.000(Ft.)  
Elevation difference = 2.000(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 4.60 min.  
$$TC = [1.8*(1.1-C)*distance(Ft.)^{.5}]/(% slope^{(1/3)})$$
$$TC = [1.8*(1.1-0.9500)*( 250.000^{.5})/( 0.800^{(1/3)})= 4.60$$
  
Setting time of concentration to 5 minutes  
Rainfall intensity (I) = 3.149(In/Hr) for a 5.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950  
Subarea runoff = 0.748(CFS)  
Total initial stream area = 0.250(Ac.)

+++++

+++ Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

Upstream point elevation = 514.000(Ft.)  
Downstream point elevation = 497.000(Ft.)  
Channel length thru subarea = 1500.000(Ft.)  
Channel base width = 0.000(Ft.)  
Slope or 'Z' of left channel bank = 50.000  
Slope or 'Z' of right channel bank = 0.333

Estimated mean flow rate at midpoint of channel = 3.501(CFS)  
Manning's 'N' = 0.015  
Maximum depth of channel = 0.500(Ft.)  
Flow(q) thru subarea = 3.501(CFS)  
Depth of flow = 0.235(Ft.), Average velocity = 2.509(Ft/s)  
Channel flow top width = 11.851(Ft.)  
Flow Velocity = 2.51(Ft/s)  
Travel time = 9.96 min.  
Time of concentration = 14.96 min.  
Critical depth = 0.260(Ft.)  
Adding area flow to channel  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity = 1.818(In/Hr) for a 5.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 3.177(CFS) for 1.840(Ac.)  
Total runoff = 3.925(CFS) Total area = 2.09(Ac.)

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+++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
Stream flow area = 2.090(Ac.)  
Runoff from this stream = 3.925(CFS)  
Time of concentration = 14.96 min.  
Rainfall intensity = 1.818(In/Hr)

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+++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity (I) = 0.502(In/Hr) for a 5.0 year storm  
User specified values are as follows:  
TC = 124.00 min. Rain intensity = 0.50(In/Hr)  
Total area = 34.600(Ac.) Total runoff = 14.900(CFS)

++++++  
+++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 34.600(Ac.)  
Runoff from this stream = 14.900(CFS)  
Time of concentration = 124.00 min.  
Rainfall intensity = 0.502(In/Hr)  
Summary of stream data:

| Stream No. | Flow rate (CFS) | TC (min) | Rainfall Intensity (In/Hr) |
|------------|-----------------|----------|----------------------------|
|------------|-----------------|----------|----------------------------|

|           |                 |             |        |
|-----------|-----------------|-------------|--------|
| 1         | 3.925           | 14.96       | 1.818  |
| 2         | 14.900          | 124.00      | 0.502  |
| Qmax(1) = |                 |             |        |
|           | 1.000 * 1.000 * | 3.925) +    |        |
|           | 1.000 * 0.121 * | 14.900) + = | 5.723  |
| Qmax(2) = |                 |             |        |
|           | 0.276 * 1.000 * | 3.925) +    |        |
|           | 1.000 * 1.000 * | 14.900) + = | 15.983 |

Total of 2 streams to confluence:

Flow rates before confluence point:

3.925 14.900

Maximum flow rates at confluence using above data:

5.723 15.983

Area of streams before confluence:

2.090 34.600

Results of confluence:

Total flow rate = 15.983(CFS)

Time of concentration = 124.000 min.

Effective stream area after confluence = 36.690(Ac.)

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Process from Point/Station 3.000 to Point/Station 4.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 492.190(Ft.)  
 Downstream point elevation = 489.400(Ft.)  
 Channel length thru subarea = 600.000(Ft.)  
 Channel base width = 1.000(Ft.)  
 Slope or 'Z' of left channel bank = 2.000  
 Slope or 'Z' of right channel bank = 2.000  
 Estimated mean flow rate at midpoint of channel = 16.231(CFS)  
 Manning's 'N' = 0.023  
 Maximum depth of channel = 4.000(Ft.)  
 Flow(q) thru subarea = 16.231(CFS)  
 Depth of flow = 1.306(Ft.), Average velocity = 3.439(Ft/s)  
 Channel flow top width = 6.225(Ft.)  
 Flow Velocity = 3.44(Ft/s)  
 Travel time = 2.91 min.  
 Time of concentration = 126.91 min.  
 Critical depth = 1.102(Ft.)  
 Adding area flow to channel  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 1.000  
 [INDUSTRIAL area type ]  
 Rainfall intensity = 0.494(In/Hr) for a 5.0 year storm  
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
 Subarea runoff = 0.535(CFS) for 1.140(Ac.)  
 Total runoff = 16.518(CFS) Total area = 37.83(Ac.)

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Process from Point/Station 3.000 to Point/Station 4.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
 Stream flow area = 37.830(Ac.)  
 Runoff from this stream = 16.518(CFS)  
 Time of concentration = 126.91 min.  
 Rainfall intensity = 0.494(In/Hr)

+++  
+++++  
Process from Point/Station 5.000 to Point/Station 6.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

User specified 'C' value of 0.450 given for subarea  
Initial subarea flow distance = 750.000(Ft.)  
Highest elevation = 516.000(Ft.)  
Lowest elevation = 500.000(Ft.)  
Elevation difference = 16.000(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 24.89 min.  
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{0.5}] / (\% \text{slope}^{(1/3)})$   
 $TC = [1.8 * (1.1 - 0.45) * (750.000)^{0.5}] / (2.133^{(1/3)}) = 24.89$   
Rainfall intensity (I) = 1.391(In/Hr) for a 5.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450  
Subarea runoff = 6.956(CFS)  
Total initial stream area = 11.110(Ac.)

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+++++  
Process from Point/Station 6.000 to Point/Station 4.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 499.000(Ft.)  
Downstream point/station elevation = 489.400(Ft.)  
Pipe length = 1255.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 6.956(CFS)  
Given pipe size = 24.00(In.)  
Calculated individual pipe flow = 6.956(CFS)  
Normal flow depth in pipe = 10.64(In.)  
Flow top width inside pipe = 23.85(In.)  
Critical Depth = 11.23(In.)  
Pipe flow velocity = 5.17(Ft/s)  
Travel time through pipe = 4.04 min.  
Time of concentration (TC) = 28.93 min.

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+++++  
Process from Point/Station 6.000 to Point/Station 4.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

User specified 'C' value of 0.450 given for subarea  
Time of concentration = 28.93 min.  
Rainfall intensity = 1.275(In/Hr) for a 5.0 year storm  
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450  
Subarea runoff = 11.203(CFS) for 19.530(Ac.)  
Total runoff = 18.159(CFS) Total area = 30.64(Ac.)

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+++++  
Process from Point/Station 6.000 to Point/Station 4.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 30.640(Ac.)  
Runoff from this stream = 18.159(CFS)  
Time of concentration = 28.93 min.  
Rainfall intensity = 1.275(In/Hr)  
Summary of stream data:

Stream Flow rate TC Rainfall Intensity

| No.   | (CFS)  | (min)  | (In/Hr) |
|---|--------|--------|---------|
| 1   | 16.518 | 126.91 | 0.494   |
| 2   | 18.159 | 28.93  | 1.275   |
| Qmax(1) =<br>1.000 * 1.000 * 16.518) +<br>0.388 * 1.000 * 18.159) += 23.556 |        |        |         |
| Qmax(2) =<br>1.000 * 0.228 * 16.518) +<br>1.000 * 1.000 * 18.159) += 21.925 |        |        |         |

Total of 2 streams to confluence:

Flow rates before confluence point:

16.518 18.159

Maximum flow rates at confluence using above data:

23.556 21.925

Area of streams before confluence:

37.830 30.640

Results of confluence:

Total flow rate = 23.556(CFS)

Time of concentration = 126.908 min.

Effective stream area after confluence = 68.470(Ac.)

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Process from Point/Station 5.000 to Point/Station 7.000

\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

User specified 'C' value of 0.450 given for subarea

Initial subarea flow distance = 615.000(Ft.)

Highest elevation = 516.000(Ft.)

Lowest elevation = 510.000(Ft.)

Elevation difference = 6.000(Ft.)

Time of concentration calculated by the urban

areas overland flow method (App X-C) = 29.25 min.

TC = [1.8\*(1.1-C)\*distance(Ft.)^0.5]/(% slope^(1/3))

TC = [1.8\*(1.1-0.4500)\*( 615.000^0.5)/( 0.976^(1/3))] = 29.25

Rainfall intensity (I) = 1.266(In/Hr) for a 5.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.450

Subarea runoff = 2.638(CFS)

Total initial stream area = 4.630(Ac.)

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Process from Point/Station 5.000 to Point/Station 7.000

\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

[INDUSTRIAL area type ]

Time of concentration = 29.25 min.

Rainfall intensity = 1.266(In/Hr) for a 5.0 year storm

Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950

Subarea runoff = 1.179(CFS) for 0.980(Ac.)

Total runoff = 3.817(CFS) Total area = 5.61(Ac.)

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Process from Point/Station 5.000 to Point/Station 7.000

\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 29.25 min.  
Rainfall intensity = 1.266(In/Hr) for a 5.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 0.361(CFS) for 0.300(Ac.)  
Total runoff = 4.178(CFS) Total area = 5.91(Ac.)

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Process from Point/Station 8.000 to Point/Station 9.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Initial subarea flow distance = 265.000(Ft.)  
Highest elevation = 514.000(Ft.)  
Lowest elevation = 512.000(Ft.)  
Elevation difference = 2.000(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 4.83 min.  
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{0.5}] / (% slope^{(1/3)})$   
 $TC = [1.8 * (1.1 - 0.9500) * (265.000)^{0.5}] / (0.755^{(1/3)}) = 4.83$   
Setting time of concentration to 5 minutes  
Rainfall intensity (I) = 3.149(In/Hr) for a 5.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950  
Subarea runoff = 0.539(CFS)  
Total initial stream area = 0.180(Ac.)  
End of computations, total study area = 74.560 (Ac.)



**EXISTING CONDITION HYDROLOGY****10 YEAR STORM****BADIEE TRUCK PARK AND STORAGE****J.N. 20-025**

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology program based on

San Diego County Flood Control Division 1985 hydrology manual

Rational Hydrology Study Date: 12/13/21

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

Program License Serial Number 4035

Rational hydrology study storm event year is 10.0

English (in-lb) input data Units used

English (in) rainfall data used

Standard intensity of Appendix I-B used for year and  
Elevation 0 - 1500 feet

Factor (to multiply \* intensity) = 1.000

Only used if inside City of San Diego

San Diego hydrology manual 'C' values used

Runoff coefficients by rational method

+++++  
+++Process from Point/Station 1.000 to Point/Station 2.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

[INDUSTRIAL area type ]

Initial subarea flow distance = 250.000(Ft.)

Highest elevation = 516.000(Ft.)

Lowest elevation = 514.000(Ft.)

Elevation difference = 2.000(Ft.)

Time of concentration calculated by the urban

areas overland flow method (App X-C) = 4.60 min.

TC = [1.8\*(1.1-C)\*distance(Ft.)^.5]/(% slope^(1/3)]

TC = [1.8\*(1.1-0.9500)\*( 250.000^.5)/( 0.800^(1/3)]= 4.60

Setting time of concentration to 5 minutes

Rainfall intensity (I) = 3.592(In/Hr) for a 10.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.950

Subarea runoff = 0.853(CFS)

Total initial stream area = 0.250(Ac.)

+++++  
+++Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

Upstream point elevation = 514.000(Ft.)

Downstream point elevation = 497.000(Ft.)

Channel length thru subarea = 1500.000(Ft.)

Channel base width = 0.000(Ft.)

Slope or 'Z' of left channel bank = 50.000

Slope or 'Z' of right channel bank = 0.333

Estimated mean flow rate at midpoint of channel = 3.993(CFS)  
Manning's 'N' = 0.015  
Maximum depth of channel = 0.500(Ft.)  
Flow(q) thru subarea = 3.993(CFS)  
Depth of flow = 0.247(Ft.), Average velocity = 2.593(Ft/s)  
Channel flow top width = 12.451(Ft.)  
Flow Velocity = 2.59(Ft/s)  
Travel time = 9.64 min.  
Time of concentration = 14.64 min.  
Critical depth = 0.275(Ft.)  
Adding area flow to channel  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity = 2.145(In/Hr) for a 10.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 3.749(CFS) for 1.840(Ac.)  
Total runoff = 4.602(CFS) Total area = 2.09(Ac.)

++++++  
+++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
Stream flow area = 2.090(Ac.)  
Runoff from this stream = 4.602(CFS)  
Time of concentration = 14.64 min.  
Rainfall intensity = 2.145(In/Hr)

++++++  
+++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity (I) = 0.592(In/Hr) for a 10.0 year storm  
User specified values are as follows:  
TC = 124.00 min. Rain intensity = 0.59(In/Hr)  
Total area = 34.600(Ac.) Total runoff = 14.900(CFS)

++++++  
+++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 34.600(Ac.)  
Runoff from this stream = 14.900(CFS)  
Time of concentration = 124.00 min.  
Rainfall intensity = 0.592(In/Hr)  
Summary of stream data:

| Stream No. | Flow rate (CFS) | TC (min) | Rainfall Intensity (In/Hr) |
|------------|-----------------|----------|----------------------------|
|------------|-----------------|----------|----------------------------|

|   |        |        |       |
|---|--------|--------|-------|
| 1   | 4.602  | 14.64  | 2.145 |
| 2   | 14.900 | 124.00 | 0.592 |
| Qmax(1) =   |        |        |       |
| $1.000 * 1.000 * 4.602 + 1.000 * 0.118 * 14.900 = 6.361$  |        |        |       |
| Qmax(2) =   |        |        |       |
| $0.276 * 1.000 * 4.602 + 1.000 * 1.000 * 14.900 = 16.169$ |        |        |       |

Total of 2 streams to confluence:

Flow rates before confluence point:

4.602     14.900

Maximum flow rates at confluence using above data:

6.361     16.169

Area of streams before confluence:

2.090     34.600

Results of confluence:

Total flow rate = 16.169(CFS)

Time of concentration = 124.000 min.

Effective stream area after confluence = 36.690(Ac.)

+++++

+++

Process from Point/Station     3.000 to Point/Station     4.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 492.190(Ft.)

Downstream point elevation = 489.400(Ft.)

Channel length thru subarea = 600.000(Ft.)

Channel base width = 1.000(Ft.)

Slope or 'Z' of left channel bank = 2.000

Slope or 'Z' of right channel bank = 2.000

Estimated mean flow rate at midpoint of channel = 16.421(CFS)

Manning's 'N' = 0.023

Maximum depth of channel = 4.000(Ft.)

Flow(q) thru subarea = 16.421(CFS)

Depth of flow = 1.313(Ft.), Average velocity = 3.449(Ft/s)

Channel flow top width = 6.252(Ft.)

Flow Velocity = 3.45(Ft/s)

Travel time = 2.90 min.

Time of concentration = 126.90 min.

Critical depth = 1.109(Ft.)

Adding area flow to channel

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

[INDUSTRIAL area type ]

Rainfall intensity = 0.583(In/Hr) for a 10.0 year storm

Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950

Subarea runoff = 0.631(CFS) for 1.140(Ac.)

Total runoff = 16.800(CFS) Total area = 37.83(Ac.)

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Process from Point/Station     3.000 to Point/Station     4.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1

Stream flow area = 37.830(Ac.)

Runoff from this stream = 16.800(CFS)

Time of concentration = 126.90 min.

Rainfall intensity = 0.583(In/Hr)

++++++  
+++

Process from Point/Station 5.000 to Point/Station 6.000  
**\*\*\*\* INITIAL AREA EVALUATION \*\*\*\***

---

User specified 'C' value of 0.450 given for subarea  
Initial subarea flow distance = 750.000(Ft.)  
Highest elevation = 516.000(Ft.)  
Lowest elevation = 500.000(Ft.)  
Elevation difference = 16.000(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 24.89 min.  
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{0.5}] / (% slope^{(1/3)})$   
 $TC = [1.8 * (1.1 - 0.450) * (750.000^{0.5}) / (2.133^{(1/3)})] = 24.89$   
Rainfall intensity (I) = 1.638(In/Hr) for a 10.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450  
Subarea runoff = 8.188(CFS)  
Total initial stream area = 11.110(Ac.)

++++++  
+++

Process from Point/Station 6.000 to Point/Station 4.000  
**\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\***

---

Upstream point/station elevation = 499.000(Ft.)  
Downstream point/station elevation = 489.400(Ft.)  
Pipe length = 1255.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 8.188(CFS)  
Given pipe size = 24.00(In.)  
Calculated individual pipe flow = 8.188(CFS)  
Normal flow depth in pipe = 11.68(In.)  
Flow top width inside pipe = 23.99(In.)  
Critical Depth = 12.23(In.)  
Pipe flow velocity = 5.40(Ft/s)  
Travel time through pipe = 3.88 min.  
Time of concentration (TC) = 28.77 min.

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+++

Process from Point/Station 6.000 to Point/Station 4.000  
**\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\***

---

User specified 'C' value of 0.450 given for subarea  
Time of concentration = 28.77 min.  
Rainfall intensity = 1.508(In/Hr) for a 10.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.450  
Subarea runoff = 13.249(CFS) for 19.530(Ac.)  
Total runoff = 21.437(CFS) Total area = 30.64(Ac.)

++++++  
+++

Process from Point/Station 6.000 to Point/Station 4.000  
**\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\***

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 30.640(Ac.)  
Runoff from this stream = 21.437(CFS)  
Time of concentration = 28.77 min.  
Rainfall intensity = 1.508(In/Hr)  
Summary of stream data:

| Stream | Flow rate | TC | Rainfall Intensity |
|--------|-----------|----|--------------------|
|        |           |    |                    |

| No.       | (CFS)           | (min)       | (In/Hr) |
|-----------|-----------------|-------------|---------|
| 1         | 16.800          | 126.90      | 0.583   |
| 2         | 21.437          | 28.77       | 1.508   |
| Qmax(1) = |                 |             |         |
|           | 1.000 * 1.000 * | 16.800) +   |         |
|           | 0.387 * 1.000 * | 21.437) + = | 25.088  |
| Qmax(2) = |                 |             |         |
|           | 1.000 * 0.227 * | 16.800) +   |         |
|           | 1.000 * 1.000 * | 21.437) + = | 25.246  |

Total of 2 streams to confluence:

Flow rates before confluence point:

16.800 21.437

Maximum flow rates at confluence using above data:

25.088 25.246

Area of streams before confluence:

37.830 30.640

Results of confluence:

Total flow rate = 25.246(CFS)

Time of concentration = 28.767 min.

Effective stream area after confluence = 68.470(Ac.)

+++++

+++

Process from Point/Station 5.000 to Point/Station 7.000

\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

User specified 'C' value of 0.450 given for subarea

Initial subarea flow distance = 615.000(Ft.)

Highest elevation = 516.000(Ft.)

Lowest elevation = 510.000(Ft.)

Elevation difference = 6.000(Ft.)

Time of concentration calculated by the urban

areas overland flow method (App X-C) = 29.25 min.

TC = [1.8\*(1.1-C)\*distance(Ft.)^0.5]/(% slope^(1/3)]

TC = [1.8\*(1.1-0.4500)\*( 615.000^0.5)/( 0.976^(1/3)] = 29.25

Rainfall intensity (I) = 1.493(In/Hr) for a 10.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.450

Subarea runoff = 3.110(CFS)

Total initial stream area = 4.630(Ac.)

+++++

+++

Process from Point/Station 5.000 to Point/Station 7.000

\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

[INDUSTRIAL area type ]

Time of concentration = 29.25 min.

Rainfall intensity = 1.493(In/Hr) for a 10.0 year storm

Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950

Subarea runoff = 1.390(CFS) for 0.980(Ac.)

Total runoff = 4.499(CFS) Total area = 5.61(Ac.)

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+++

Process from Point/Station 5.000 to Point/Station 7.000

\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 29.25 min.  
Rainfall intensity = 1.493(In/Hr) for a 10.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 0.425(CFS) for 0.300(Ac.)  
Total runoff = 4.925(CFS) Total area = 5.91(Ac.)

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+++  
Process from Point/Station 8.000 to Point/Station 9.000  
\*\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Initial subarea flow distance = 265.000(Ft.)  
Highest elevation = 514.000(Ft.)  
Lowest elevation = 512.000(Ft.)  
Elevation difference = 2.000(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 4.83 min.  
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (% slope^{(1/3)})$   
 $TC = [1.8 * (1.1 - 0.9500) * (265.000^{.5})] / (0.755^{(1/3)}) = 4.83$   
Setting time of concentration to 5 minutes  
Rainfall intensity (I) = 3.592(In/Hr) for a 10.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950  
Subarea runoff = 0.614(CFS)  
Total initial stream area = 0.180(Ac.)  
End of computations, total study area = 74.560 (Ac.)



**EXISTING CONDITION HYDROLOGY  
25 YEAR STORM  
BADIEE TRUCK PARK AND STORAGE**

**J.N. 20-025**

San Diego County Rational Hydrology Program  
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3  
Rational method hydrology program based on  
San Diego County Flood Control Division 1985 hydrology manual  
Rational Hydrology Study Date: 12/13/21

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

Program License Serial Number 4035

Rational hydrology study storm event year is 25.0  
English (in-lb) input data Units used  
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and  
Elevation 0 - 1500 feet  
Factor (to multiply \* intensity) = 1.000  
Only used if inside City of San Diego  
San Diego hydrology manual 'C' values used  
Runoff coefficients by rational method

+++++

+++ Process from Point/Station 1.000 to Point/Station 2.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Initial subarea flow distance = 250.000(Ft.)  
Highest elevation = 516.000(Ft.)  
Lowest elevation = 514.000(Ft.)  
Elevation difference = 2.000(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 4.60 min.  
$$TC = [1.8*(1.1-C)*distance(Ft.)^{.5}] / (% slope^{(1/3)})$$
$$TC = [1.8*(1.1-0.9500)*( 250.000^{.5}) / ( 0.800^{(1/3)})] = 4.60$$
  
Setting time of concentration to 5 minutes  
Rainfall intensity (I) = 3.845(In/Hr) for a 25.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950  
Subarea runoff = 0.913(CFS)  
Total initial stream area = 0.250(Ac.)

+++++

+++ Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

Upstream point elevation = 514.000(Ft.)  
Downstream point elevation = 497.000(Ft.)  
Channel length thru subarea = 1500.000(Ft.)  
Channel base width = 0.000(Ft.)  
Slope or 'Z' of left channel bank = 50.000  
Slope or 'Z' of right channel bank = 0.333

Estimated mean flow rate at midpoint of channel = 4.274(CFS)  
Manning's 'N' = 0.015  
Maximum depth of channel = 0.500(Ft.)  
Flow(q) thru subarea = 4.274(CFS)  
Depth of flow = 0.254(Ft.), Average velocity = 2.637(Ft/s)  
Channel flow top width = 12.772(Ft.)  
Flow Velocity = 2.64(Ft/s)  
Travel time = 9.48 min.  
Time of concentration = 14.48 min.  
Critical depth = 0.281(Ft.)  
Adding area flow to channel  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity = 2.394(In/Hr) for a 25.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 4.184(CFS) for 1.840(Ac.)  
Total runoff = 5.098(CFS) Total area = 2.09(Ac.)

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+++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
Stream flow area = 2.090(Ac.)  
Runoff from this stream = 5.098(CFS)  
Time of concentration = 14.48 min.  
Rainfall intensity = 2.394(In/Hr)

++++++  
+++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity (I) = 0.668(In/Hr) for a 25.0 year storm  
User specified values are as follows:  
TC = 124.00 min. Rain intensity = 0.67(In/Hr)  
Total area = 34.600(Ac.) Total runoff = 14.900(CFS)

++++++  
+++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 34.600(Ac.)  
Runoff from this stream = 14.900(CFS)  
Time of concentration = 124.00 min.  
Rainfall intensity = 0.668(In/Hr)  
Summary of stream data:

| Stream No. | Flow rate (CFS) | TC (min) | Rainfall Intensity (In/Hr) |
|------------|-----------------|----------|----------------------------|
|------------|-----------------|----------|----------------------------|

|                                      |        |        |       |
|--------------------------------------|--------|--------|-------|
| 1                                    | 5.098  | 14.48  | 2.394 |
| 2                                    | 14.900 | 124.00 | 0.668 |
| Qmax(1) =                            |        |        |       |
| $1.000 * 1.000 * 5.098 +$            |        |        |       |
| $1.000 * 0.117 * 14.900) + = 6.837$  |        |        |       |
| Qmax(2) =                            |        |        |       |
| $0.279 * 1.000 * 5.098 +$            |        |        |       |
| $1.000 * 1.000 * 14.900) + = 16.322$ |        |        |       |

Total of 2 streams to confluence:

Flow rates before confluence point:

5.098     14.900

Maximum flow rates at confluence using above data:

6.837     16.322

Area of streams before confluence:

2.090     34.600

Results of confluence:

Total flow rate = 16.322(CFS)

Time of concentration = 124.000 min.

Effective stream area after confluence = 36.690(Ac.)

+++++

+++

Process from Point/Station 3.000 to Point/Station 4.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 492.190(Ft.)  
 Downstream point elevation = 489.400(Ft.)  
 Channel length thru subarea = 600.000(Ft.)  
 Channel base width = 1.000(Ft.)  
 Slope or 'Z' of left channel bank = 2.000  
 Slope or 'Z' of right channel bank = 2.000  
 Estimated mean flow rate at midpoint of channel = 16.575(CFS)  
 Manning's 'N' = 0.023  
 Maximum depth of channel = 4.000(Ft.)  
 Flow(q) thru subarea = 16.575(CFS)  
 Depth of flow = 1.318(Ft.), Average velocity = 3.458(Ft/s)  
 Channel flow top width = 6.273(Ft.)  
 Flow Velocity = 3.46(Ft/s)  
 Travel time = 2.89 min.  
 Time of concentration = 126.89 min.  
 Critical depth = 1.109(Ft.)  
 Adding area flow to channel  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 1.000  
 [INDUSTRIAL area type ]  
 Rainfall intensity = 0.658(In/Hr) for a 25.0 year storm  
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
 Subarea runoff = 0.712(CFS) for 1.140(Ac.)  
 Total runoff = 17.034(CFS) Total area = 37.83(Ac.)

+++++

+++

Process from Point/Station 3.000 to Point/Station 4.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
 Stream flow area = 37.830(Ac.)  
 Runoff from this stream = 17.034(CFS)  
 Time of concentration = 126.89 min.  
 Rainfall intensity = 0.658(In/Hr)

+++  
 ++++++  
 Process from Point/Station 5.000 to Point/Station 6.000  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

User specified 'C' value of 0.450 given for subarea  
 Initial subarea flow distance = 750.000(Ft.)  
 Highest elevation = 516.000(Ft.)  
 Lowest elevation = 500.000(Ft.)  
 Elevation difference = 16.000(Ft.)  
 Time of concentration calculated by the urban  
 areas overland flow method (App X-C) = 24.89 min.  
 $TC = [1.8*(1.1-C)*distance(Ft.)^{.5}] / (% slope^{(1/3)})$   
 $TC = [1.8*(1.1-0.4500)*( 750.000^{.5}) / ( 2.133^{(1/3)})] = 24.89$   
 Rainfall intensity (I) = 1.843(In/Hr) for a 25.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.450  
 Subarea runoff = 9.214(CFS)  
 Total initial stream area = 11.110(Ac.)

+++  
 ++++++  
 Process from Point/Station 6.000 to Point/Station 4.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 499.000(Ft.)  
 Downstream point/station elevation = 489.400(Ft.)  
 Pipe length = 1255.00(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 9.214(CFS)  
 Given pipe size = 24.00(In.)  
 Calculated individual pipe flow = 9.214(CFS)  
 Normal flow depth in pipe = 12.53(In.)  
 Flow top width inside pipe = 23.98(In.)  
 Critical Depth = 12.99(In.)  
 Pipe flow velocity = 5.56(Ft/s)  
 Travel time through pipe = 3.76 min.  
 Time of concentration (TC) = 28.65 min.

+++  
 ++++++  
 Process from Point/Station 6.000 to Point/Station 4.000  
 \*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

User specified 'C' value of 0.450 given for subarea  
 Time of concentration = 28.65 min.  
 Rainfall intensity = 1.703(In/Hr) for a 25.0 year storm  
 Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450  
 Subarea runoff = 14.969(CFS) for 19.530(Ac.)  
 Total runoff = 24.183(CFS) Total area = 30.64(Ac.)

+++  
 ++++++  
 Process from Point/Station 6.000 to Point/Station 4.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
 Stream flow area = 30.640(Ac.)  
 Runoff from this stream = 24.183(CFS)  
 Time of concentration = 28.65 min.  
 Rainfall intensity = 1.703(In/Hr)  
 Summary of stream data:

| Stream | Flow rate | TC | Rainfall Intensity |
|--------|-----------|----|--------------------|
|        |           |    |                    |

| No.   | (CFS)  | (min)  | (In/Hr) |
|---|--------|--------|---------|
| 1   | 17.034 | 126.89 | 0.658   |
| 2   | 24.183 | 28.65  | 1.703   |
| Qmax(1) =<br>1.000 * 1.000 * 17.034) +<br>0.386 * 1.000 * 24.183) += 26.373 |        |        |         |
| Qmax(2) =<br>1.000 * 0.226 * 17.034) +<br>1.000 * 1.000 * 24.183) += 28.030 |        |        |         |

Total of 2 streams to confluence:

Flow rates before confluence point:

17.034 24.183

Maximum flow rates at confluence using above data:

26.373 28.030

Area of streams before confluence:

37.830 30.640

Results of confluence:

Total flow rate = 28.030(CFS)

Time of concentration = 28.654 min.

Effective stream area after confluence = 68.470(Ac.)

+++++

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Process from Point/Station 5.000 to Point/Station 7.000

\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

User specified 'C' value of 0.450 given for subarea

Initial subarea flow distance = 615.000(Ft.)

Highest elevation = 516.000(Ft.)

Lowest elevation = 510.000(Ft.)

Elevation difference = 6.000(Ft.)

Time of concentration calculated by the urban areas overland flow method (App X-C) = 29.25 min.

TC = [1.8\*(1.1-C)\*distance(Ft.)^0.5]/(% slope^(1/3)]

TC = [1.8\*(1.1-0.4500)\*( 615.000^0.5)/( 0.976^(1/3))] = 29.25

Rainfall intensity (I) = 1.683(In/Hr) for a 25.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.450

Subarea runoff = 3.506(CFS)

Total initial stream area = 4.630(Ac.)

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Process from Point/Station 5.000 to Point/Station 7.000

\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

[INDUSTRIAL area type ]

Time of concentration = 29.25 min.

Rainfall intensity = 1.683(In/Hr) for a 25.0 year storm

Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950

Subarea runoff = 1.567(CFS) for 0.980(Ac.)

Total runoff = 5.073(CFS) Total area = 5.61(Ac.)

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Process from Point/Station 5.000 to Point/Station 7.000

\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 29.25 min.  
Rainfall intensity = 1.683(In/Hr) for a 25.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 0.480(CFS) for 0.300(Ac.)  
Total runoff = 5.552(CFS) Total area = 5.91(Ac.)

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Process from Point/Station 8.000 to Point/Station 9.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Initial subarea flow distance = 265.000(Ft.)  
Highest elevation = 514.000(Ft.)  
Lowest elevation = 512.000(Ft.)  
Elevation difference = 2.000(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 4.83 min.  
$$TC = [1.8 * (1.1 - C) * distance(Ft.)^{0.5}] / (% slope^{(1/3)})$$
$$TC = [1.8 * (1.1 - 0.9500) * (265.000^{0.5})] / (0.755^{(1/3)}) = 4.83$$
  
Setting time of concentration to 5 minutes  
Rainfall intensity (I) = 3.845(In/Hr) for a 25.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950  
Subarea runoff = 0.658(CFS)  
Total initial stream area = 0.180(Ac.)  
End of computations, total study area = 74.560 (Ac.)



**EXISTING CONDITION HYDROLOGY  
50 YEAR STORM  
BADIEE TRUCK PARK AND STORAGE**

**J.N 20-025**

San Diego County Rational Hydrology Program  
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3  
Rational method hydrology program based on  
San Diego County Flood Control Division 1985 hydrology manual  
Rational Hydrology Study Date: 12/10/21

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

Program License Serial Number 4035

Rational hydrology study storm event year is 50.0  
English (in-lb) input data Units used  
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and  
Elevation 0 - 1500 feet  
Factor (to multiply \* intensity) = 1.000  
Only used if inside City of San Diego  
San Diego hydrology manual 'C' values used  
Runoff coefficients by rational method

+++++

+++  
Process from Point/Station 1.000 to Point/Station 2.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Initial subarea flow distance = 250.000(Ft.)  
Highest elevation = 516.000(Ft.)  
Lowest elevation = 514.000(Ft.)  
Elevation difference = 2.000(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 4.60 min.  
 $TC = [1.8*(1.1-C)*distance(Ft.)^{.5}] / (% slope^{(1/3)})$   
 $TC = [1.8*(1.1-0.9500)*( 250.000^{.5}) / ( 0.800^{(1/3)})] = 4.60$   
Setting time of concentration to 5 minutes  
Rainfall intensity (I) = 4.265(In/Hr) for a 50.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950  
Subarea runoff = 1.013(CFS)  
Total initial stream area = 0.250(Ac.)

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+++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

Upstream point elevation = 514.000(Ft.)  
Downstream point elevation = 497.000(Ft.)  
Channel length thru subarea = 1500.000(Ft.)  
Channel base width = 0.000(Ft.)  
Slope or 'Z' of left channel bank = 50.000  
Slope or 'Z' of right channel bank = 0.333

Estimated mean flow rate at midpoint of channel = 4.741(CFS)  
Manning's 'N' = 0.015  
Maximum depth of channel = 0.500(Ft.)  
Flow(q) thru subarea = 4.741(CFS)  
Depth of flow = 0.264(Ft.), Average velocity = 2.707(Ft/s)  
Channel flow top width = 13.279(Ft.)  
Flow Velocity = 2.71(Ft/s)  
Travel time = 9.24 min.  
Time of concentration = 14.24 min.  
Critical depth = 0.295(Ft.)  
Adding area flow to channel  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity = 2.766(In/Hr) for a 50.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 4.835(CFS) for 1.840(Ac.)  
Total runoff = 5.848(CFS) Total area = 2.09(Ac.)

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+++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
Stream flow area = 2.090(Ac.)  
Runoff from this stream = 5.848(CFS)  
Time of concentration = 14.24 min.  
Rainfall intensity = 2.766(In/Hr)

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+++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity (I) = 0.777(In/Hr) for a 50.0 year storm  
User specified values are as follows:  
TC = 124.00 min. Rain intensity = 0.78(In/Hr)  
Total area = 34.600(Ac.) Total runoff = 14.900(CFS)

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+++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 34.600(Ac.)  
Runoff from this stream = 14.900(CFS)  
Time of concentration = 124.00 min.  
Rainfall intensity = 0.777(In/Hr)  
Summary of stream data:

| Stream No. | Flow rate (CFS) | TC (min) | Rainfall Intensity (In/Hr) |
|------------|-----------------|----------|----------------------------|
|------------|-----------------|----------|----------------------------|

|           |                 |            |        |
|-----------|-----------------|------------|--------|
| 1         | 5.848           | 14.24      | 2.766  |
| 2         | 14.900          | 124.00     | 0.777  |
| Qmax(1) = |                 |            |        |
|           | 1.000 * 1.000 * | 5.848) +   |        |
|           | 1.000 * 0.115 * | 14.900) += | 7.559  |
| Qmax(2) = |                 |            |        |
|           | 0.281 * 1.000 * | 5.848) +   |        |
|           | 1.000 * 1.000 * | 14.900) += | 16.543 |

Total of 2 streams to confluence:

Flow rates before confluence point:

5.848 14.900

Maximum flow rates at confluence using above data:

7.559 16.543

Area of streams before confluence:

2.090 34.600

Results of confluence:

Total flow rate = 16.543(CFS)

Time of concentration = 124.000 min.

Effective stream area after confluence = 36.690(Ac.)

+++++

+++

Process from Point/Station 3.000 to Point/Station 4.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 492.190(Ft.)  
 Downstream point elevation = 489.400(Ft.)  
 Channel length thru subarea = 600.000(Ft.)  
 Channel base width = 1.000(Ft.)  
 Slope or 'Z' of left channel bank = 2.000  
 Slope or 'Z' of right channel bank = 2.000  
 Estimated mean flow rate at midpoint of channel = 16.800(CFS)  
 Manning's 'N' = 0.023  
 Maximum depth of channel = 4.000(Ft.)  
 Flow(q) thru subarea = 16.800(CFS)  
 Depth of flow = 1.326(Ft.), Average velocity = 3.469(Ft/s)  
 Channel flow top width = 6.304(Ft.)  
 Flow Velocity = 3.47(Ft/s)  
 Travel time = 2.88 min.  
 Time of concentration = 126.88 min.  
 Critical depth = 1.125(Ft.)  
 Adding area flow to channel  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 1.000  
 [INDUSTRIAL area type ]  
 Rainfall intensity = 0.766(In/Hr) for a 50.0 year storm  
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
 Subarea runoff = 0.829(CFS) for 1.140(Ac.)  
 Total runoff = 17.372(CFS) Total area = 37.83(Ac.)

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Process from Point/Station 3.000 to Point/Station 4.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1

Stream flow area = 37.830(Ac.)

Runoff from this stream = 17.372(CFS)

Time of concentration = 126.88 min.

Rainfall intensity = 0.766(In/Hr)

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+++++  
Process from Point/Station 5.000 to Point/Station 6.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

User specified 'C' value of 0.450 given for subarea  
Initial subarea flow distance = 750.000(Ft.)  
Highest elevation = 516.000(Ft.)  
Lowest elevation = 500.000(Ft.)  
Elevation difference = 16.000(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 24.89 min.  
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^5] / (% slope^{(1/3)})$   
 $TC = [1.8 * (1.1 - 0.4500) * (750.000^5) / (2.133^{(1/3)})] = 24.89$   
Rainfall intensity (I) = 2.140(In/Hr) for a 50.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450  
Subarea runoff = 10.699(CFS)  
Total initial stream area = 11.110(Ac.)

+++  
+++++  
Process from Point/Station 6.000 to Point/Station 4.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 499.000(Ft.)  
Downstream point/station elevation = 489.400(Ft.)  
Pipe length = 1255.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 10.699(CFS)  
Given pipe size = 24.00(In.)  
Calculated individual pipe flow = 10.699(CFS)  
Normal flow depth in pipe = 13.73(In.)  
Flow top width inside pipe = 23.75(In.)  
Critical Depth = 14.06(In.)  
Pipe flow velocity = 5.76(Ft/s)  
Travel time through pipe = 3.63 min.  
Time of concentration (TC) = 28.52 min.

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Process from Point/Station 6.000 to Point/Station 4.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

User specified 'C' value of 0.450 given for subarea  
Time of concentration = 28.52 min.  
Rainfall intensity = 1.986(In/Hr) for a 50.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.450  
Subarea runoff = 17.454(CFS) for 19.530(Ac.)  
Total runoff = 28.153(CFS) Total area = 30.64(Ac.)

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+++++  
Process from Point/Station 6.000 to Point/Station 4.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 30.640(Ac.)  
Runoff from this stream = 28.153(CFS)  
Time of concentration = 28.52 min.  
Rainfall intensity = 1.986(In/Hr)  
Summary of stream data:

Stream Flow rate TC Rainfall Intensity

| No.       | (CFS)           | (min)       | (In/Hr) |
|-----------|-----------------|-------------|---------|
| 1         | 17.372          | 126.88      | 0.766   |
| 2         | 28.153          | 28.52       | 1.986   |
| Qmax(1) = |                 |             |         |
|           | 1.000 * 1.000 * | 17.372) +   |         |
|           | 0.386 * 1.000 * | 28.153) + = | 28.228  |
| Qmax(2) = |                 |             |         |
|           | 1.000 * 0.225 * | 17.372) +   |         |
|           | 1.000 * 1.000 * | 28.153) + = | 32.059  |

Total of 2 streams to confluence:

Flow rates before confluence point:

17.372 28.153

Maximum flow rates at confluence using above data:

28.228 32.059

Area of streams before confluence:

37.830 30.640

Results of confluence:

Total flow rate = 32.059(CFS)

Time of concentration = 28.523 min.

Effective stream area after confluence = 68.470(Ac.)

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Process from Point/Station 5.000 to Point/Station 7.000

\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

User specified 'C' value of 0.450 given for subarea

Initial subarea flow distance = 615.000(Ft.)

Highest elevation = 516.000(Ft.)

Lowest elevation = 510.000(Ft.)

Elevation difference = 6.000(Ft.)

Time of concentration calculated by the urban

areas overland flow method (App X-C) = 29.25 min.

TC = [1.8\*(1.1-C)\*distance(Ft.)^.5]/(% slope^(1/3)]

TC = [1.8\*(1.1-0.4500)\*( 615.000^.5)/( 0.976^(1/3)] = 29.25

Rainfall intensity (I) = 1.957(In/Hr) for a 50.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.450

Subarea runoff = 4.078(CFS)

Total initial stream area = 4.630(Ac.)

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+++

Process from Point/Station 5.000 to Point/Station 7.000

\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

[INDUSTRIAL area type ]

Time of concentration = 29.25 min.

Rainfall intensity = 1.957(In/Hr) for a 50.0 year storm

Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950

Subarea runoff = 1.822(CFS) for 0.980(Ac.)

Total runoff = 5.901(CFS) Total area = 5.61(Ac.)

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Process from Point/Station 5.000 to Point/Station 7.000

\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 29.25 min.  
Rainfall intensity = 1.957(In/Hr) for a 50.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 0.558(CFS) for 0.300(Ac.)  
Total runoff = 6.458(CFS) Total area = 5.91(Ac.)

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Process from Point/Station 8.000 to Point/Station 9.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Initial subarea flow distance = 265.000(Ft.)  
Highest elevation = 514.000(Ft.)  
Lowest elevation = 512.000(Ft.)  
Elevation difference = 2.000(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 4.83 min.  
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5} / (% slope^{(1/3)})]$   
 $TC = [1.8 * (1.1 - 0.9500) * (265.000^{.5}) / (0.755^{(1/3)})] = 4.83$   
Setting time of concentration to 5 minutes  
Rainfall intensity (I) = 4.265(In/Hr) for a 50.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950  
Subarea runoff = 0.729(CFS)  
Total initial stream area = 0.180(Ac.)  
End of computations, total study area = 74.560 (Ac.)

**EXISTING CONDITION HYDROLOGY  
100 YEAR STORM  
BADIEE TRUCK PARK AND STORAGE**

**J.N 20-025**

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2005 Version 6.4

Rational method hydrology program based on  
San Diego County Flood Control Division 1985 hydrology manual  
Rational Hydrology Study Date: 05/17/22

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

Program License Serial Number 4035

Rational hydrology study storm event year is 100.0  
English (in-lb) input data Units used  
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and  
Elevation 0 - 1500 feet  
Factor (to multiply \* intensity) = 1.000  
Only used if inside City of San Diego  
San Diego hydrology manual 'C' values used  
Runoff coefficients by rational method

+++++  
Process from Point/Station 1.000 to Point/Station 2.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Initial subarea flow distance = 250.000(Ft.)  
Highest elevation = 516.000(Ft.)  
Lowest elevation = 514.000(Ft.)  
Elevation difference = 2.000(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 4.60 min.  
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{0.5}] / (% slope^{(1/3)})$   
 $TC = [1.8 * (1.1 - 0.95) * (250.000)^{0.5}] / (0.800^{(1/3)}) = 4.60$   
Setting time of concentration to 5 minutes  
Rainfall intensity (I) = 4.389(In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950  
Subarea runoff = 1.042(CFS)  
Total initial stream area = 0.250(Ac.)

+++++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

Upstream point elevation = 514.000(Ft.)  
Downstream point elevation = 497.000(Ft.)  
Channel length thru subarea = 1500.000(Ft.)

Channel base width = 0.000(Ft.)  
Slope or 'Z' of left channel bank = 50.000  
Slope or 'Z' of right channel bank = 0.333  
Estimated mean flow rate at midpoint of channel = 4.878(CFS)  
Manning's 'N' = 0.015  
Maximum depth of channel = 0.500(Ft.)  
Flow(q) thru subarea = 4.878(CFS)  
Depth of flow = 0.267(Ft.), Average velocity = 2.726(Ft/s)  
Channel flow top width = 13.422(Ft.)  
Flow Velocity = 2.73(Ft/s)  
Travel time = 9.17 min.  
Time of concentration = 14.17 min.  
Critical depth = 0.297(Ft.)  
Adding area flow to channel  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity = 2.969(In/Hr) for a 100.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 5.190(CFS) for 1.840(Ac.)  
Total runoff = 6.232(CFS) Total area = 2.09(Ac.)

+++++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
Stream flow area = 2.090(Ac.)  
Runoff from this stream = 6.232(CFS)  
Time of concentration = 14.17 min.  
Rainfall intensity = 2.969(In/Hr)

+++++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity (I) = 0.847(In/Hr) for a 100.0 year storm  
User specified values are as follows:  
TC = 124.00 min. Rain intensity = 0.85(In/Hr)  
Total area = 34.600(Ac.) Total runoff = 14.900(CFS)

+++++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 34.600(Ac.)  
Runoff from this stream = 14.900(CFS)  
Time of concentration = 124.00 min.  
Rainfall intensity = 0.847(In/Hr)  
Summary of stream data:

| Stream | Flow rate | TC | Rainfall Intensity |
|--------|-----------|----|--------------------|
|--------|-----------|----|--------------------|

| No.            | (CFS)   | (min)   | (In/Hr)                   |
|----------------|---------|---------|---------------------------|
| 1              | 6.232   | 14.17   | 2.969                     |
| 2              | 14.900  | 124.00  | 0.847                     |
| $Q_{max}(1) =$ | 1.000 * | 1.000 * | $6.232 + 14.900 = 7.935$  |
| $Q_{max}(2) =$ | 0.285 * | 1.000 * | $6.232 + 14.900 = 16.678$ |

Total of 2 streams to confluence:

Flow rates before confluence point:

6.232      14.900

Maximum flow rates at confluence using above data:

7.935      16.678

Area of streams before confluence:

2.090      34.600

Results of confluence:

Total flow rate = 16.678(CFS)

Time of concentration = 124.000 min.

Effective stream area after confluence = 36.690(Ac.)

---

+++++  
Process from Point/Station      3.000 to Point/Station      4.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 492.190(Ft.)  
 Downstream point elevation = 489.400(Ft.)  
 Channel length thru subarea = 600.000(Ft.)  
 Channel base width = 1.000(Ft.)  
 Slope or 'Z' of left channel bank = 2.000  
 Slope or 'Z' of right channel bank = 2.000  
 Estimated mean flow rate at midpoint of channel = 16.937(CFS)  
 Manning's 'N' = 0.023  
 Maximum depth of channel = 4.000(Ft.)  
 Flow(q) thru subarea = 16.937(CFS)  
 Depth of flow = 1.331(Ft.), Average velocity = 3.476(Ft/s)  
 Channel flow top width = 6.323(Ft.)  
 Flow Velocity = 3.48(Ft/s)  
 Travel time = 2.88 min.  
 Time of concentration = 126.88 min.  
 Critical depth = 1.125(Ft.)  
 Adding area flow to channel  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 1.000  
 [INDUSTRIAL area type ]  
 Rainfall intensity = 0.835(In/Hr) for a 100.0 year storm  
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
 Subarea runoff = 0.904(CFS) for 1.140(Ac.)  
 Total runoff = 17.582(CFS)      Total area = 37.83(Ac.)

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+++++  
Process from Point/Station      3.000 to Point/Station      4.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1

Stream flow area = 37.830(Ac.)

Runoff from this stream = 17.582(CFS)  
Time of concentration = 126.88 min.  
Rainfall intensity = 0.835(In/Hr)

+++++  
Process from Point/Station 5.000 to Point/Station 6.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

User specified 'C' value of 0.450 given for subarea  
Initial subarea flow distance = 750.000(Ft.)  
Highest elevation = 516.000(Ft.)  
Lowest elevation = 500.000(Ft.)  
Elevation difference = 16.000(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 24.89 min.  
TC = [1.8\*(1.1-C)\*distance(Ft.)^.5]/(% slope^(1/3)]  
TC = [1.8\*(1.1-0.4500)\*( 750.000^.5)/( 2.133^(1/3)] = 24.89  
Rainfall intensity (I) = 2.325(In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450  
Subarea runoff = 11.625(CFS)  
Total initial stream area = 11.110(Ac.)

+++++  
Process from Point/Station 6.000 to Point/Station 4.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 499.000(Ft.)  
Downstream point/station elevation = 489.400(Ft.)  
Pipe length = 1255.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 11.625(CFS)  
Given pipe size = 24.00(In.)  
Calculated individual pipe flow = 11.625(CFS)  
Normal flow depth in pipe = 14.48(In.)  
Flow top width inside pipe = 23.48(In.)  
Critical Depth = 14.68(In.)  
Pipe flow velocity = 5.86(Ft/s)  
Travel time through pipe = 3.57 min.  
Time of concentration (TC) = 28.46 min.

+++++  
Process from Point/Station 6.000 to Point/Station 4.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

User specified 'C' value of 0.450 given for subarea  
Time of concentration = 28.46 min.  
Rainfall intensity = 2.164(In/Hr) for a 100.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.450  
Subarea runoff = 19.023(CFS) for 19.530(Ac.)  
Total runoff = 30.648(CFS) Total area = 30.64(Ac.)

+++++  
Process from Point/Station 6.000 to Point/Station 4.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 30.640(Ac.)  
Runoff from this stream = 30.648(CFS)  
Time of concentration = 28.46 min.  
Rainfall intensity = 2.164(In/Hr)

Summary of stream data:

| Stream No. | Flow rate (CFS) | TC (min)        | Rainfall Intensity (In/Hr)   |
|------------|-----------------|-----------------|------------------------------|
| 1          | 17.582          | 126.88          | 0.835                        |
| 2          | 30.648          | 28.46           | 2.164                        |
| Qmax(1) =  | 1.000 * 0.386 * | 1.000 * 1.000 * | 17.582) + 30.648) + = 29.398 |
| Qmax(2) =  | 1.000 * 1.000 * | 0.224 * 1.000 * | 17.582) + 30.648) + = 34.591 |

Total of 2 streams to confluence:

Flow rates before confluence point:

17.582 30.648

Maximum flow rates at confluence using above data:

29.398 34.591

Area of streams before confluence:

37.830 30.640

Results of confluence:

Total flow rate = 34.591(CFS)

Time of concentration = 28.457 min.

Effective stream area after confluence = 68.470(Ac.)

+++++  
Process from Point/Station 5.000 to Point/Station 7.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

User specified 'C' value of 0.450 given for subarea  
Initial subarea flow distance = 615.000(Ft.)  
Highest elevation = 516.000(Ft.)  
Lowest elevation = 510.000(Ft.)  
Elevation difference = 6.000(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 29.25 min.  
TC = [1.8\*(1.1-C)\*distance(Ft.)^.5]/(% slope^(1/3)]  
TC = [1.8\*(1.1-0.4500)\*( 615.000^.5)/( 0.976^(1/3)] = 29.25  
Rainfall intensity (I) = 2.131(In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450  
Subarea runoff = 4.440(CFS)  
Total initial stream area = 4.630(Ac.)

+++++  
Process from Point/Station 5.000 to Point/Station 7.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 29.25 min.  
Rainfall intensity = 2.131(In/Hr) for a 100.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 1.984(CFS) for 0.980(Ac.)  
Total runoff = 6.424(CFS) Total area = 5.61(Ac.)

```
+++++
Process from Point/Station      5.000 to Point/Station      7.000
**** SUBAREA FLOW ADDITION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Time of concentration = 29.25 min.
Rainfall intensity = 2.131(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950
Subarea runoff = 0.607(CFS) for 0.300(Ac.)
Total runoff = 7.031(CFS) Total area = 5.91(Ac.)
```

```
+++++
Process from Point/Station      8.000 to Point/Station      9.000
**** INITIAL AREA EVALUATION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Initial subarea flow distance = 265.000(Ft.)
Highest elevation = 514.000(Ft.)
Lowest elevation = 512.000(Ft.)
Elevation difference = 2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 4.83 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.9500)*( 265.000^.5)/( 0.755^(1/3))]= 4.83
Setting time of concentration to 5 minutes
Rainfall intensity (I) = 4.389(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff = 0.751(CFS)
Total initial stream area = 0.180(Ac.)
End of computations, total study area = 74.560 (Ac.)
```

**Existing Condition @ Node 7**  
**Channel Calculator**

**Given Input Data:**

Shape ..... Trapezoidal  
Solving for ..... Depth of Flow  
Flowrate ..... 7.3100 cfs  
Slope ..... 0.0100 ft/ft  
Manning's n ..... 0.0350  
Height ..... 12.0000 in  
Bottom width ..... 60.0000 in  
Left slope ..... 0.5000 ft/ft (V/H)  
Right slope ..... 0.5000 ft/ft (V/H)

**Computed Results:**

Depth ..... 6.1104 in  
Velocity ..... 2.3853 fps  
Full Flowrate ..... 24.2931 cfs  
Flow area ..... 3.0645 ft<sup>2</sup>  
Flow perimeter ..... 87.3263 in  
Hydraulic radius ..... 5.0534 in  
Top width ..... 84.4414 in  
Area ..... 7.0000 ft<sup>2</sup>  
Perimeter ..... 113.6656 in  
Percent full ..... 50.9196 %

Existing Condition @ Node 9  
Channel Calculator

Given Input Data:

Shape ..... Trapezoidal  
Solving for ..... Depth of Flow  
Flowrate ..... 0.7500 cfs  
Slope ..... 0.0100 ft/ft  
Manning's n ..... 0.0300  
Height ..... 6.0000 in  
Bottom width ..... 24.0000 in  
Left slope ..... 0.5000 ft/ft (V/H)  
Right slope ..... 0.5000 ft/ft (V/H)

Computed Results:

Depth ..... 2.4616 in  
Velocity ..... 1.5169 fps  
Full Flowrate ..... 3.7188 cfs  
Flow area ..... 0.4944 ft<sup>2</sup>  
Flow perimeter ..... 35.0085 in  
Hydraulic radius ..... 2.0337 in  
Top width ..... 33.8463 in  
Area ..... 1.5000 ft<sup>2</sup>  
Perimeter ..... 50.8328 in  
Percent full ..... 41.0262 %

## PROPOSED CONDITION

**PROPOSED CONDITION HYDROLOGY  
5 YEAR STORM  
BADIEE TRUCK PARKING AND STORAGE**

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2005 Version 6.4

Rational method hydrology program based on  
San Diego County Flood Control Division 1985 hydrology manual  
Rational Hydrology Study Date: 12/22/22

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

Program License Serial Number 4035

Rational hydrology study storm event year is 5.0  
English (in-lb) input data Units used  
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and  
Elevation 0 - 1500 feet  
Factor (to multiply \* intensity) = 1.000  
Only used if inside City of San Diego  
San Diego hydrology manual 'C' values used  
Runoff coefficients by rational method

+++++  
Process from Point/Station 1.000 to Point/Station 2.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Initial subarea flow distance = 280.000(Ft.)  
Highest elevation = 516.000(Ft.)  
Lowest elevation = 513.000(Ft.)  
Elevation difference = 3.000(Ft..)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 4.42 min.  
TC = [1.8\*(1.1-C)\*distance(Ft.)^.5]/(% slope^(1/3))  
TC = [1.8\*(1.1-0.9500)\*( 280.000^.5)/( 1.071^(1/3))] = 4.42  
Setting time of concentration to 5 minutes  
Rainfall intensity (I) = 3.149(In/Hr) for a 5.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950  
Subarea runoff = 1.316(CFS)  
Total initial stream area = 0.440(Ac.)

+++++  
Process from Point/Station 1.000 to Point/Station 2.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 5.00 min.  
Rainfall intensity = 3.149(In/Hr) for a 5.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 0.748(CFS) for 0.250(Ac.)  
Total runoff = 2.064(CFS) Total area = 0.69(Ac.)

+++++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION \*\*\*\*

---

Top of street segment elevation = 513.000(Ft.)  
End of street segment elevation = 496.750(Ft.)  
Length of street segment = 1470.000(Ft.)  
Height of curb above gutter flowline = 6.0(In.)  
Width of half street (curb to crown) = 63.000(Ft.)  
Distance from crown to crossfall grade break = 61.500(Ft.)  
Slope from gutter to grade break (v/hz) = 0.083  
Slope from grade break to crown (v/hz) = 0.020  
Street flow is on [1] side(s) of the street  
Distance from curb to property line = 20.000(Ft.)  
Slope from curb to property line (v/hz) = 0.020  
Gutter width = 1.500(Ft.)  
Gutter hike from flowline = 1.500(In.)  
Manning's N in gutter = 0.0150  
Manning's N from gutter to grade break = 0.0150  
Manning's N from grade break to crown = 0.0180  
Estimated mean flow rate at midpoint of street = 6.732(CFS)  
Depth of flow = 0.413(Ft.), Average velocity = 2.596(Ft/s)  
Streetflow hydraulics at midpoint of street travel:  
Halfstreet flow width = 15.882(Ft.)  
Flow velocity = 2.60(Ft/s)  
Travel time = 9.44 min. TC = 14.44 min.  
Adding area flow to street  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity = 1.850(In/Hr) for a 5.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 5.484(CFS) for 3.120(Ac.)  
Total runoff = 7.548(CFS) Total area = 3.81(Ac.)  
Street flow at end of street = 7.548(CFS)  
Half street flow at end of street = 7.548(CFS)  
Depth of flow = 0.427(Ft.), Average velocity = 2.668(Ft/s)  
Flow width (from curb towards crown)= 16.606(Ft.)

+++++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Time of concentration = 14.44 min.

Rainfall intensity = 1.850 (In/Hr) for a 5.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500  
Subarea runoff = 0.148 (CFS) for 0.160 (Ac.)  
Total runoff = 7.696 (CFS) Total area = 3.97 (Ac.)

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 492.420 (Ft.)  
Downstream point/station elevation = 492.290 (Ft.)  
Pipe length = 24.00 (Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 7.696 (CFS)  
Given pipe size = 24.00 (In.)  
Calculated individual pipe flow = 7.696 (CFS)  
Normal flow depth in pipe = 12.47 (In.)  
Flow top width inside pipe = 23.98 (In.)  
Critical Depth = 11.83 (In.)  
Pipe flow velocity = 4.67 (Ft/s)  
Travel time through pipe = 0.09 min.  
Time of concentration (TC) = 14.52 min.

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
Stream flow area = 3.970 (Ac.)  
Runoff from this stream = 7.696 (CFS)  
Time of concentration = 14.52 min.  
Rainfall intensity = 1.845 (In/Hr)

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity (I) = 0.502 (In/Hr) for a 5.0 year storm  
User specified values are as follows:  
TC = 124.00 min. Rain intensity = 0.50 (In/Hr)  
Total area = 34.600 (Ac.) Total runoff = 14.900 (CFS)

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 34.600 (Ac.)  
Runoff from this stream = 14.900 (CFS)  
Time of concentration = 124.00 min.  
Rainfall intensity = 0.502 (In/Hr)  
Summary of stream data:

| Stream No. | Flow rate (CFS) | TC (min) | Rainfall Intensity (In/Hr) |
|------------|-----------------|----------|----------------------------|
|------------|-----------------|----------|----------------------------|

|           |         |         |                    |
|-----------|---------|---------|--------------------|
| 1         | 7.696   | 14.52   | 1.845              |
| 2         | 14.900  | 124.00  | 0.502              |
| Qmax(1) = |         |         |                    |
|           | 1.000 * | 1.000 * | 7.696) +           |
|           | 1.000 * | 0.117 * | 14.900) + = 9.441  |
| Qmax(2) = |         |         |                    |
|           | 0.272 * | 1.000 * | 7.696) +           |
|           | 1.000 * | 1.000 * | 14.900) + = 16.992 |

Total of 2 streams to confluence:

Flow rates before confluence point:

7.696 14.900

Maximum flow rates at confluence using above data:

9.441 16.992

Area of streams before confluence:

3.970 34.600

Results of confluence:

Total flow rate = 16.992(CFS)

Time of concentration = 124.000 min.

Effective stream area after confluence = 38.570(Ac.)

---

+++++  
Process from Point/Station 3.100 to Point/Station 4.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 492.290(Ft.)  
Downstream point/station elevation = 492.070(Ft.)  
Pipe length = 40.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 16.992(CFS)  
Given pipe size = 30.00(In.)  
Calculated individual pipe flow = 16.992(CFS)  
Normal flow depth in pipe = 17.53(In.)  
Flow top width inside pipe = 29.57(In.)  
Critical Depth = 16.71(In.)  
Pipe flow velocity = 5.71(Ft/s)  
Travel time through pipe = 0.12 min.  
Time of concentration (TC) = 124.12 min.

---

+++++  
Process from Point/Station 4.000 to Point/Station 5.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 492.070(Ft.)  
Downstream point/station elevation = 490.090(Ft.)  
Pipe length = 393.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 16.992(CFS)  
Given pipe size = 30.00(In.)  
Calculated individual pipe flow = 16.992(CFS)  
Normal flow depth in pipe = 18.02(In.)  
Flow top width inside pipe = 29.38(In.)  
Critical Depth = 16.71(In.)  
Pipe flow velocity = 5.51(Ft/s)  
Travel time through pipe = 1.19 min.  
Time of concentration (TC) = 125.30 min.

---

+++++  
Process from Point/Station 4.000 to Point/Station 5.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Time of concentration = 125.30 min.
Rainfall intensity = 0.498(In/Hr) for a 5.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950
Subarea runoff = 0.445(CFS) for 0.940(Ac.)
Total runoff = 17.437(CFS) Total area = 39.51(Ac.)
```

---

```
+++++
Process from Point/Station 4.000 to Point/Station 5.000
**** SUBAREA FLOW ADDITION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350
Time of concentration = 125.30 min.
Rainfall intensity = 0.498(In/Hr) for a 5.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500
Subarea runoff = 0.062(CFS) for 0.250(Ac.)
Total runoff = 17.500(CFS) Total area = 39.76(Ac.)
```

---

```
+++++
Process from Point/Station 4.000 to Point/Station 5.000
**** SUBAREA FLOW ADDITION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Time of concentration = 125.30 min.
Rainfall intensity = 0.498(In/Hr) for a 5.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950
Subarea runoff = 0.076(CFS) for 0.160(Ac.)
Total runoff = 17.575(CFS) Total area = 39.92(Ac.)
```

---

```
+++++
Process from Point/Station 5.000 to Point/Station 6.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

```
Upstream point/station elevation = 490.090(Ft.)
Downstream point/station elevation = 489.450(Ft.)
Pipe length = 125.00(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 17.575(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 17.575(CFS)
Normal flow depth in pipe = 18.33(In.)
Flow top width inside pipe = 29.25(In.)
Critical Depth = 17.04(In.)
Pipe flow velocity = 5.59(Ft/s)
Travel time through pipe = 0.37 min.
Time of concentration (TC) = 125.68 min.
```

```
+++++
Process from Point/Station      6.000 to Point/Station      7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

```
Upstream point/station elevation = 489.450(Ft.)
Downstream point/station elevation = 489.060(Ft.)
Pipe length = 45.00(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 17.575(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 17.575(CFS)
Normal flow depth in pipe = 15.54(In.)
Flow top width inside pipe = 29.98(In.)
Critical Depth = 17.04(In.)
Pipe flow velocity = 6.84(Ft/s)
Travel time through pipe = 0.11 min.
Time of concentration (TC) = 125.79 min.
```

```
+++++
Process from Point/Station      6.000 to Point/Station      7.000
**** CONFLUENCE OF MINOR STREAMS ****
```

---

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area = 39.920(Ac.)
Runoff from this stream = 17.575(CFS)
Time of concentration = 125.79 min.
Rainfall intensity = 0.497(In/Hr)
```

```
+++++
Process from Point/Station      8.000 to Point/Station      9.000
**** INITIAL AREA EVALUATION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350
Initial subarea flow distance = 806.000(Ft.)
Highest elevation = 513.500(Ft.)
Lowest elevation = 500.000(Ft.)
Elevation difference = 13.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 25.82 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.5000)*( 806.000^.5)/( 1.675^(1/3))] = 25.82
Rainfall intensity (I) = 1.363(In/Hr) for a 5.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.500
Subarea runoff = 13.245(CFS)
Total initial stream area = 19.440(Ac.)
```

```
+++++
Process from Point/Station      9.000 to Point/Station      10.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

```
Upstream point/station elevation = 492.400(Ft.)
Downstream point/station elevation = 489.800(Ft.)
Pipe length = 490.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 13.245(CFS)
Given pipe size = 30.00(In.)
```

Calculated individual pipe flow = 13.245(CFS)  
Normal flow depth in pipe = 13.99(In.)  
Flow top width inside pipe = 29.93(In.)  
Critical Depth = 14.70(In.)  
Pipe flow velocity = 5.90(Ft/s)  
Travel time through pipe = 1.38 min.  
Time of concentration (TC) = 27.20 min.

++++++  
Process from Point/Station 9.000 to Point/Station 10.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Time of concentration = 27.20 min.  
Rainfall intensity = 1.322(In/Hr) for a 5.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500  
Subarea runoff = 5.487(CFS) for 8.300(Ac.)  
Total runoff = 18.731(CFS) Total area = 27.74(Ac.)

++++++  
Process from Point/Station 10.000 to Point/Station 7.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 489.650(Ft.)  
Downstream point/station elevation = 489.060(Ft.)  
Pipe length = 47.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 18.731(CFS)  
Given pipe size = 30.00(In.)  
Calculated individual pipe flow = 18.731(CFS)  
Normal flow depth in pipe = 14.47(In.)  
Flow top width inside pipe = 29.98(In.)  
Critical Depth = 17.60(In.)  
Pipe flow velocity = 7.99(Ft/s)  
Travel time through pipe = 0.10 min.  
Time of concentration (TC) = 27.30 min.

++++++  
Process from Point/Station 10.000 to Point/Station 7.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 27.740(Ac.)  
Runoff from this stream = 18.731(CFS)  
Time of concentration = 27.30 min.  
Rainfall intensity = 1.319(In/Hr)  
Summary of stream data:

| Stream No. | Flow rate (CFS) | TC (min) | Rainfall Intensity (In/Hr) |
|------------|-----------------|----------|----------------------------|
| 1          | 17.575          | 125.79   | 0.497                      |
| 2          | 18.731          | 27.30    | 1.319                      |
| Qmax(1) =  | 1.000 *         | 1.000 *  | 17.575) +                  |

```
0.377 * 1.000 * 18.731) + = 24.630
Qmax(2) =
1.000 * 0.217 * 17.575) +
1.000 * 1.000 * 18.731) + = 22.546
```

Total of 2 streams to confluence:

Flow rates before confluence point:

17.575 18.731

Maximum flow rates at confluence using above data:

24.630 22.546

Area of streams before confluence:

39.920 27.740

Results of confluence:

Total flow rate = 24.630(CFS)

Time of concentration = 125.787 min.

Effective stream area after confluence = 67.660(Ac.)

---

```
+++++
Process from Point/Station 10.000 to Point/Station 7.000
**** SUBAREA FLOW ADDITION ****
```

---

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

[INDUSTRIAL area type ]

Time of concentration = 125.79 min.

Rainfall intensity = 0.497(In/Hr) for a 5.0 year storm

Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950

Subarea runoff = 0.109(CFS) for 0.230(Ac.)

Total runoff = 24.739(CFS) Total area = 67.89(Ac.)

---

```
+++++
Process from Point/Station 10.000 to Point/Station 7.000
**** SUBAREA FLOW ADDITION ****
```

---

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

[INDUSTRIAL area type ]

Note: user entry of impervious value, Ap = 0.350

Time of concentration = 125.79 min.

Rainfall intensity = 0.497(In/Hr) for a 5.0 year storm

Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500

Subarea runoff = 0.119(CFS) for 0.480(Ac.)

Total runoff = 24.858(CFS) Total area = 68.37(Ac.)

---

```
+++++
Process from Point/Station 7.000 to Point/Station 20.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

Upstream point/station elevation = 489.060(Ft.)

Downstream point/station elevation = 488.710(Ft.)

Pipe length = 70.00(Ft.) Manning's N = 0.011

No. of pipes = 2 Required pipe flow = 24.858(CFS)

Given pipe size = 30.00(In.)

Calculated individual pipe flow = 12.429(CFS)

Normal flow depth in pipe = 12.49(In.)

Flow top width inside pipe = 29.58(In.)

Critical Depth = 14.20 (In.)  
Pipe flow velocity = 6.42 (Ft/s)  
Travel time through pipe = 0.18 min.  
Time of concentration (TC) = 125.97 min.

+++++  
Process from Point/Station 8.000 to Point/Station 11.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Initial subarea flow distance = 510.000(Ft.)  
Highest elevation = 513.500(Ft.)  
Lowest elevation = 511.000(Ft.)  
Elevation difference = 2.500(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 30.93 min.  
TC = [1.8\*(1.1-C)\*distance(Ft.)^0.5]/(% slope^(1/3))  
TC = [1.8\*(1.1-0.500)\*( 510.000^0.5)/( 0.490^(1/3))] = 30.93  
Rainfall intensity (I) = 1.224 (In/Hr) for a 5.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.500  
Subarea runoff = 2.155(CFS)  
Total initial stream area = 3.520(Ac.)

+++++  
Process from Point/Station 11.000 to Point/Station 14.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 504.500(Ft.)  
Downstream point/station elevation = 503.980(Ft.)  
Pipe length = 50.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 2.155(CFS)  
Given pipe size = 18.00(In.)  
Calculated individual pipe flow = 2.155(CFS)  
Normal flow depth in pipe = 5.90(In.)  
Flow top width inside pipe = 16.90(In.)  
Critical Depth = 6.65(In.)  
Pipe flow velocity = 4.28(Ft/s)  
Travel time through pipe = 0.19 min.  
Time of concentration (TC) = 31.13 min.

+++++  
Process from Point/Station 11.000 to Point/Station 14.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 31.13 min.  
Rainfall intensity = 1.220 (In/Hr) for a 5.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 1.865(CFS) for 1.610(Ac.)  
Total runoff = 4.020(CFS) Total area = 5.13(Ac.)

```
+++++
Process from Point/Station      11.000 to Point/Station      14.000
**** SUBAREA FLOW ADDITION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Time of concentration = 31.13 min.
Rainfall intensity = 1.220(In/Hr) for a 5.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950
Subarea runoff = 0.904(CFS) for 0.780(Ac.)
Total runoff = 4.924(CFS) Total area = 5.91(Ac.)
```

```
+++++
Process from Point/Station      14.000 to Point/Station      15.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

```
Upstream point/station elevation = 499.950(Ft.)
Downstream point/station elevation = 499.850(Ft.)
Pipe length = 20.00(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 4.924(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 4.924(CFS)
Normal flow depth in pipe = 9.88(In.)
Flow top width inside pipe = 23.62(In.)
Critical Depth = 9.38(In.)
Pipe flow velocity = 4.04(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 31.21 min.
```

```
+++++
Process from Point/Station      12.000 to Point/Station      13.000
**** INITIAL AREA EVALUATION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.500
Initial subarea flow distance = 280.000(Ft.)
Highest elevation = 513.900(Ft.)
Lowest elevation = 511.830(Ft.)
Elevation difference = 2.070(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 19.06 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.5278)*( 280.000^.5)/( 0.739^(1/3))]= 19.06
Rainfall intensity (I) = 1.607(In/Hr) for a 5.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.528
Subarea runoff = 0.238(CFS)
Total initial stream area = 0.280(Ac.)
End of computations, total study area = 74.560 (Ac.)
```

**PROPOSED CONDITION HYDROLOGY  
10 YEAR STORM  
BADIEE TRUCK PARKING AND STORAGE**

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2005 Version 6.4

Rational method hydrology program based on  
San Diego County Flood Control Division 1985 hydrology manual  
Rational Hydrology Study Date: 12/22/22

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

Program License Serial Number 4035

Rational hydrology study storm event year is 10.0  
English (in-lb) input data Units used  
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and  
Elevation 0 - 1500 feet  
Factor (to multiply \* intensity) = 1.000  
Only used if inside City of San Diego  
San Diego hydrology manual 'C' values used  
Runoff coefficients by rational method

+++++  
Process from Point/Station 1.000 to Point/Station 2.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Initial subarea flow distance = 280.000(Ft.)  
Highest elevation = 516.000(Ft.)  
Lowest elevation = 513.000(Ft.)  
Elevation difference = 3.000(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 4.42 min.  
TC = [1.8\*(1.1-C)\*distance(Ft.)^0.5]/(% slope^(1/3))  
TC = [1.8\*(1.1-0.9500)\*( 280.000^0.5)/( 1.071^(1/3))] = 4.42  
Setting time of concentration to 5 minutes  
Rainfall intensity (I) = 3.592(In/Hr) for a 10.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950  
Subarea runoff = 1.502(CFS)  
Total initial stream area = 0.440(Ac.)

+++++  
Process from Point/Station 1.000 to Point/Station 2.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 5.00 min.  
Rainfall intensity = 3.592(In/Hr) for a 10.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 0.853(CFS) for 0.250(Ac.)  
Total runoff = 2.355(CFS) Total area = 0.69(Ac.)

+++++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION \*\*\*\*

---

Top of street segment elevation = 513.000(Ft.)  
End of street segment elevation = 496.750(Ft.)  
Length of street segment = 1470.000(Ft.)  
Height of curb above gutter flowline = 6.0(In.)  
Width of half street (curb to crown) = 63.000(Ft.)  
Distance from crown to crossfall grade break = 61.500(Ft.)  
Slope from gutter to grade break (v/hz) = 0.083  
Slope from grade break to crown (v/hz) = 0.020  
Street flow is on [1] side(s) of the street  
Distance from curb to property line = 20.000(Ft.)  
Slope from curb to property line (v/hz) = 0.020  
Gutter width = 1.500(Ft.)  
Gutter hike from flowline = 1.500(In.)  
Manning's N in gutter = 0.0150  
Manning's N from gutter to grade break = 0.0150  
Manning's N from grade break to crown = 0.0180  
Estimated mean flow rate at midpoint of street = 7.679(CFS)  
Depth of flow = 0.429(Ft.), Average velocity = 2.679(Ft/s)  
Streetflow hydraulics at midpoint of street travel:  
Halfstreet flow width = 16.717(Ft.)  
Flow velocity = 2.68(Ft/s)  
Travel time = 9.14 min. TC = 14.14 min.  
Adding area flow to street  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity = 2.180(In/Hr) for a 10.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 6.462(CFS) for 3.120(Ac.)  
Total runoff = 8.817(CFS) Total area = 3.81(Ac.)  
Street flow at end of street = 8.817(CFS)  
Half street flow at end of street = 8.817(CFS)  
Depth of flow = 0.448(Ft.), Average velocity = 2.771(Ft/s)  
Flow width (from curb towards crown)= 17.638(Ft.)

+++++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Time of concentration = 14.14 min.

Rainfall intensity = 2.180 (In/Hr) for a 10.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500  
Subarea runoff = 0.174 (CFS) for 0.160 (Ac.)  
Total runoff = 8.991 (CFS) Total area = 3.97 (Ac.)

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 492.420 (Ft.)  
Downstream point/station elevation = 492.290 (Ft.)  
Pipe length = 24.00 (Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 8.991 (CFS)  
Given pipe size = 24.00 (In.)  
Calculated individual pipe flow = 8.991 (CFS)  
Normal flow depth in pipe = 13.72 (In.)  
Flow top width inside pipe = 23.75 (In.)  
Critical Depth = 12.84 (In.)  
Pipe flow velocity = 4.84 (Ft/s)  
Travel time through pipe = 0.08 min.  
Time of concentration (TC) = 14.23 min.

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
Stream flow area = 3.970 (Ac.)  
Runoff from this stream = 8.991 (CFS)  
Time of concentration = 14.23 min.  
Rainfall intensity = 2.174 (In/Hr)

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity (I) = 0.592 (In/Hr) for a 10.0 year storm  
User specified values are as follows:  
TC = 124.00 min. Rain intensity = 0.59 (In/Hr)  
Total area = 34.600 (Ac.) Total runoff = 14.900 (CFS)

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 34.600 (Ac.)  
Runoff from this stream = 14.900 (CFS)  
Time of concentration = 124.00 min.  
Rainfall intensity = 0.592 (In/Hr)  
Summary of stream data:

| Stream No. | Flow rate (CFS) | TC (min) | Rainfall Intensity (In/Hr) |
|------------|-----------------|----------|----------------------------|
|------------|-----------------|----------|----------------------------|

|           |         |         |                    |
|-----------|---------|---------|--------------------|
| 1         | 8.991   | 14.23   | 2.174              |
| 2         | 14.900  | 124.00  | 0.592              |
| Qmax(1) = |         |         |                    |
|           | 1.000 * | 1.000 * | 8.991) +           |
|           | 1.000 * | 0.115 * | 14.900) + = 10.701 |
| Qmax(2) = |         |         |                    |
|           | 0.272 * | 1.000 * | 8.991) +           |
|           | 1.000 * | 1.000 * | 14.900) + = 17.346 |

Total of 2 streams to confluence:

Flow rates before confluence point:

8.991      14.900

Maximum flow rates at confluence using above data:

10.701      17.346

Area of streams before confluence:

3.970      34.600

Results of confluence:

Total flow rate = 17.346(CFS)

Time of concentration = 124.000 min.

Effective stream area after confluence = 38.570(Ac.)

---

+++++  
Process from Point/Station            3.100 to Point/Station            4.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 492.290(Ft.)  
Downstream point/station elevation = 492.070(Ft.)  
Pipe length = 40.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 17.346(CFS)  
Given pipe size = 30.00(In.)  
Calculated individual pipe flow = 17.346(CFS)  
Normal flow depth in pipe = 17.77(In.)  
Flow top width inside pipe = 29.49(In.)  
Critical Depth = 16.90(In.)  
Pipe flow velocity = 5.73(Ft/s)  
Travel time through pipe = 0.12 min.  
Time of concentration (TC) = 124.12 min.

---

+++++  
Process from Point/Station            4.000 to Point/Station            5.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 492.070(Ft.)  
Downstream point/station elevation = 490.090(Ft.)  
Pipe length = 393.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 17.346(CFS)  
Given pipe size = 30.00(In.)  
Calculated individual pipe flow = 17.346(CFS)  
Normal flow depth in pipe = 18.28(In.)  
Flow top width inside pipe = 29.27(In.)  
Critical Depth = 16.90(In.)  
Pipe flow velocity = 5.54(Ft/s)  
Travel time through pipe = 1.18 min.  
Time of concentration (TC) = 125.30 min.

---

+++++  
Process from Point/Station            4.000 to Point/Station            5.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Time of concentration = 125.30 min.
Rainfall intensity = 0.588(In/Hr) for a 10.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950
Subarea runoff = 0.525(CFS) for 0.940(Ac.)
Total runoff = 17.871(CFS) Total area = 39.51(Ac.)
```

---

```
+++++
Process from Point/Station 4.000 to Point/Station 5.000
**** SUBAREA FLOW ADDITION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350
Time of concentration = 125.30 min.
Rainfall intensity = 0.588(In/Hr) for a 10.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500
Subarea runoff = 0.073(CFS) for 0.250(Ac.)
Total runoff = 17.944(CFS) Total area = 39.76(Ac.)
```

---

```
+++++
Process from Point/Station 4.000 to Point/Station 5.000
**** SUBAREA FLOW ADDITION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Time of concentration = 125.30 min.
Rainfall intensity = 0.588(In/Hr) for a 10.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950
Subarea runoff = 0.089(CFS) for 0.160(Ac.)
Total runoff = 18.034(CFS) Total area = 39.92(Ac.)
```

---

```
+++++
Process from Point/Station 5.000 to Point/Station 6.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

```
Upstream point/station elevation = 490.090(Ft.)
Downstream point/station elevation = 489.450(Ft.)
Pipe length = 125.00(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 18.034(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 18.034(CFS)
Normal flow depth in pipe = 18.66(In.)
Flow top width inside pipe = 29.10(In.)
Critical Depth = 17.27(In.)
Pipe flow velocity = 5.62(Ft/s)
Travel time through pipe = 0.37 min.
Time of concentration (TC) = 125.67 min.
```

```
+++++
Process from Point/Station      6.000 to Point/Station      7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

```
Upstream point/station elevation = 489.450(Ft.)
Downstream point/station elevation = 489.060(Ft.)
Pipe length = 45.00(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 18.034(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 18.034(CFS)
Normal flow depth in pipe = 15.80(In.)
Flow top width inside pipe = 29.96(In.)
Critical Depth = 17.27(In.)
Pipe flow velocity = 6.89(Ft/s)
Travel time through pipe = 0.11 min.
Time of concentration (TC) = 125.78 min.
```

```
+++++
Process from Point/Station      6.000 to Point/Station      7.000
**** CONFLUENCE OF MINOR STREAMS ****
```

---

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area = 39.920(Ac.)
Runoff from this stream = 18.034(CFS)
Time of concentration = 125.78 min.
Rainfall intensity = 0.586(In/Hr)
```

```
+++++
Process from Point/Station      8.000 to Point/Station      9.000
**** INITIAL AREA EVALUATION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350
Initial subarea flow distance = 806.000(Ft.)
Highest elevation = 513.500(Ft.)
Lowest elevation = 500.000(Ft.)
Elevation difference = 13.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 25.82 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.5000)*( 806.000^.5)/( 1.675^(1/3))] = 25.82
Rainfall intensity (I) = 1.605(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.500
Subarea runoff = 15.597(CFS)
Total initial stream area = 19.440(Ac.)
```

```
+++++
Process from Point/Station      9.000 to Point/Station      10.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

```
Upstream point/station elevation = 492.400(Ft.)
Downstream point/station elevation = 489.800(Ft.)
Pipe length = 490.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 15.597(CFS)
Given pipe size = 30.00(In.)
```

Calculated individual pipe flow = 15.597(CFS)  
Normal flow depth in pipe = 15.39(In.)  
Flow top width inside pipe = 29.99(In.)  
Critical Depth = 16.01(In.)  
Pipe flow velocity = 6.15(Ft/s)  
Travel time through pipe = 1.33 min.  
Time of concentration (TC) = 27.15 min.

++++++  
Process from Point/Station 9.000 to Point/Station 10.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Time of concentration = 27.15 min.  
Rainfall intensity = 1.559(In/Hr) for a 10.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500  
Subarea runoff = 6.472(CFS) for 8.300(Ac.)  
Total runoff = 22.068(CFS) Total area = 27.74(Ac.)

++++++  
Process from Point/Station 10.000 to Point/Station 7.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 489.650(Ft.)  
Downstream point/station elevation = 489.060(Ft.)  
Pipe length = 47.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 22.068(CFS)  
Given pipe size = 30.00(In.)  
Calculated individual pipe flow = 22.068(CFS)  
Normal flow depth in pipe = 15.95(In.)  
Flow top width inside pipe = 29.94(In.)  
Critical Depth = 19.17(In.)  
Pipe flow velocity = 8.32(Ft/s)  
Travel time through pipe = 0.09 min.  
Time of concentration (TC) = 27.24 min.

++++++  
Process from Point/Station 10.000 to Point/Station 7.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 27.740(Ac.)  
Runoff from this stream = 22.068(CFS)  
Time of concentration = 27.24 min.  
Rainfall intensity = 1.556(In/Hr)  
Summary of stream data:

| Stream No. | Flow rate (CFS) | TC (min) | Rainfall Intensity (In/Hr) |
|------------|-----------------|----------|----------------------------|
| 1          | 18.034          | 125.78   | 0.586                      |
| 2          | 22.068          | 27.24    | 1.556                      |
| Qmax(1) =  | 1.000 *         | 1.000 *  | 18.034) +                  |

```
0.377 * 1.000 * 22.068) + = 26.345  
Qmax(2) =  
1.000 * 0.217 * 18.034) +  
1.000 * 1.000 * 22.068) + = 25.974
```

Total of 2 streams to confluence:

Flow rates before confluence point:

18.034 22.068

Maximum flow rates at confluence using above data:

26.345 25.974

Area of streams before confluence:

39.920 27.740

Results of confluence:

Total flow rate = 26.345(CFS)

Time of concentration = 125.778 min.

Effective stream area after confluence = 67.660(Ac.)

---

```
*****  
Process from Point/Station 10.000 to Point/Station 7.000  
**** SUBAREA FLOW ADDITION ****
```

---

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

[INDUSTRIAL area type ]

Time of concentration = 125.78 min.

Rainfall intensity = 0.586(In/Hr) for a 10.0 year storm

Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950

Subarea runoff = 0.128(CFS) for 0.230(Ac.)

Total runoff = 26.473(CFS) Total area = 67.89(Ac.)

---

```
*****  
Process from Point/Station 10.000 to Point/Station 7.000  
**** SUBAREA FLOW ADDITION ****
```

---

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

[INDUSTRIAL area type ]

Note: user entry of impervious value, Ap = 0.350

Time of concentration = 125.78 min.

Rainfall intensity = 0.586(In/Hr) for a 10.0 year storm

Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500

Subarea runoff = 0.141(CFS) for 0.480(Ac.)

Total runoff = 26.614(CFS) Total area = 68.37(Ac.)

---

```
*****  
Process from Point/Station 7.000 to Point/Station 20.000  
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

Upstream point/station elevation = 489.060(Ft.)

Downstream point/station elevation = 488.710(Ft.)

Pipe length = 70.00(Ft.) Manning's N = 0.011

No. of pipes = 2 Required pipe flow = 26.614(CFS)

Given pipe size = 30.00(In.)

Calculated individual pipe flow = 13.307(CFS)

Normal flow depth in pipe = 12.97(In.)

Flow top width inside pipe = 29.72(In.)

Critical Depth = 14.72 (In.)  
Pipe flow velocity = 6.54 (Ft/s)  
Travel time through pipe = 0.18 min.  
Time of concentration (TC) = 125.96 min.

+++++  
Process from Point/Station 8.000 to Point/Station 11.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Initial subarea flow distance = 510.000(Ft.)  
Highest elevation = 513.500(Ft.)  
Lowest elevation = 511.000(Ft.)  
Elevation difference = 2.500(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 30.93 min.  
TC = [1.8\*(1.1-C)\*distance(Ft.)^0.5]/(% slope^(1/3))  
TC = [1.8\*(1.1-0.500)\*( 510.000^0.5)/( 0.490^(1/3))] = 30.93  
Rainfall intensity (I) = 1.443 (In/Hr) for a 10.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.500  
Subarea runoff = 2.540(CFS)  
Total initial stream area = 3.520(Ac.)

+++++  
Process from Point/Station 11.000 to Point/Station 14.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 504.500(Ft.)  
Downstream point/station elevation = 503.980(Ft.)  
Pipe length = 50.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 2.540(CFS)  
Given pipe size = 18.00(In.)  
Calculated individual pipe flow = 2.540(CFS)  
Normal flow depth in pipe = 6.43(In.)  
Flow top width inside pipe = 17.25(In.)  
Critical Depth = 7.24(In.)  
Pipe flow velocity = 4.48(Ft/s)  
Travel time through pipe = 0.19 min.  
Time of concentration (TC) = 31.12 min.

+++++  
Process from Point/Station 11.000 to Point/Station 14.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 31.12 min.  
Rainfall intensity = 1.438 (In/Hr) for a 10.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 2.200(CFS) for 1.610(Ac.)  
Total runoff = 4.740(CFS) Total area = 5.13(Ac.)

```
+++++
Process from Point/Station      11.000 to Point/Station      14.000
**** SUBAREA FLOW ADDITION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Time of concentration = 31.12 min.
Rainfall intensity = 1.438(In/Hr) for a 10.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950
Subarea runoff = 1.066(CFS) for 0.780(Ac.)
Total runoff = 5.806(CFS) Total area = 5.91(Ac.)
```

```
+++++
Process from Point/Station      14.000 to Point/Station      15.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

```
Upstream point/station elevation = 499.950(Ft.)
Downstream point/station elevation = 499.850(Ft.)
Pipe length = 20.00(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 5.806(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 5.806(CFS)
Normal flow depth in pipe = 10.83(In.)
Flow top width inside pipe = 23.89(In.)
Critical Depth = 10.22(In.)
Pipe flow velocity = 4.22(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 31.20 min.
```

```
+++++
Process from Point/Station      12.000 to Point/Station      13.000
**** INITIAL AREA EVALUATION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.500
Initial subarea flow distance = 280.000(Ft.)
Highest elevation = 513.900(Ft.)
Lowest elevation = 511.830(Ft.)
Elevation difference = 2.070(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 19.06 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.5278)*( 280.000^.5)/( 0.739^(1/3))]= 19.06
Rainfall intensity (I) = 1.886(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.528
Subarea runoff = 0.279(CFS)
Total initial stream area = 0.280(Ac.)
End of computations, total study area = 74.560 (Ac.)
```

**PROPOSED CONDITION HYDROLOGY  
25 YEAR STORM  
BADIEE TRUCK PARKING AND STORAGE**  
San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2005 Version 6.4

Rational method hydrology program based on  
San Diego County Flood Control Division 1985 hydrology manual  
Rational Hydrology Study Date: 12/22/22

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

Program License Serial Number 4035

Rational hydrology study storm event year is 25.0  
English (in-lb) input data Units used  
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and  
Elevation 0 - 1500 feet  
Factor (to multiply \* intensity) = 1.000  
Only used if inside City of San Diego  
San Diego hydrology manual 'C' values used  
Runoff coefficients by rational method

+++++  
Process from Point/Station 1.000 to Point/Station 2.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Initial subarea flow distance = 280.000(Ft.)  
Highest elevation = 516.000(Ft.)  
Lowest elevation = 513.000(Ft.)  
Elevation difference = 3.000(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 4.42 min.  
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{0.5}] / (% slope^{(1/3)})$   
 $TC = [1.8 * (1.1 - 0.95) * (280.000)^{0.5}] / (1.071^{(1/3)}) = 4.42$   
Setting time of concentration to 5 minutes  
Rainfall intensity (I) = 3.845 (In/Hr) for a 25.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950  
Subarea runoff = 1.607(CFS)  
Total initial stream area = 0.440(Ac.)

+++++  
Process from Point/Station 1.000 to Point/Station 2.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 5.00 min.  
Rainfall intensity = 3.845(In/Hr) for a 25.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 0.913(CFS) for 0.250(Ac.)  
Total runoff = 2.520(CFS) Total area = 0.69(Ac.)

+++++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION \*\*\*\*

---

Top of street segment elevation = 513.000(Ft.)  
End of street segment elevation = 496.750(Ft.)  
Length of street segment = 1470.000(Ft.)  
Height of curb above gutter flowline = 6.0(In.)  
Width of half street (curb to crown) = 63.000(Ft.)  
Distance from crown to crossfall grade break = 61.500(Ft.)  
Slope from gutter to grade break (v/hz) = 0.083  
Slope from grade break to crown (v/hz) = 0.020  
Street flow is on [1] side(s) of the street  
Distance from curb to property line = 20.000(Ft.)  
Slope from curb to property line (v/hz) = 0.020  
Gutter width = 1.500(Ft.)  
Gutter hike from flowline = 1.500(In.)  
Manning's N in gutter = 0.0150  
Manning's N from gutter to grade break = 0.0150  
Manning's N from grade break to crown = 0.0180  
Estimated mean flow rate at midpoint of street = 8.219(CFS)  
Depth of flow = 0.438(Ft.), Average velocity = 2.724(Ft/s)  
Streetflow hydraulics at midpoint of street travel:  
Halfstreet flow width = 17.164(Ft.)  
Flow velocity = 2.72(Ft/s)  
Travel time = 8.99 min. TC = 13.99 min.  
Adding area flow to street  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity = 2.430(In/Hr) for a 25.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 7.203(CFS) for 3.120(Ac.)  
Total runoff = 9.723(CFS) Total area = 3.81(Ac.)  
Street flow at end of street = 9.723(CFS)  
Half street flow at end of street = 9.723(CFS)  
Depth of flow = 0.461(Ft.), Average velocity = 2.837(Ft/s)  
Flow width (from curb towards crown)= 18.318(Ft.)

+++++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Time of concentration = 13.99 min.  
Rainfall intensity = 2.430(In/Hr) for a 25.0 year storm

Runoff coefficient used for sub-area, Rational method,  $Q=KCIA$ ,  $C = 0.500$   
Subarea runoff = 0.194(CFS) for 0.160(Ac.)  
Total runoff = 9.918(CFS) Total area = 3.97(Ac.)

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 492.420(Ft.)  
Downstream point/station elevation = 492.290(Ft.)  
Pipe length = 24.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 9.918(CFS)  
Given pipe size = 24.00(In.)  
Calculated individual pipe flow = 9.918(CFS)  
Normal flow depth in pipe = 14.63(In.)  
Flow top width inside pipe = 23.42(In.)  
Critical Depth = 13.52(In.)  
Pipe flow velocity = 4.95(Ft/s)  
Travel time through pipe = 0.08 min.  
Time of concentration (TC) = 14.08 min.

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
Stream flow area = 3.970(Ac.)  
Runoff from this stream = 9.918(CFS)  
Time of concentration = 14.08 min.  
Rainfall intensity = 2.424(In/Hr)

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity (I) = 0.668(In/Hr) for a 25.0 year storm  
User specified values are as follows:  
TC = 124.00 min. Rain intensity = 0.67(In/Hr)  
Total area = 34.600(Ac.) Total runoff = 14.900(CFS)

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 34.600(Ac.)  
Runoff from this stream = 14.900(CFS)  
Time of concentration = 124.00 min.  
Rainfall intensity = 0.668(In/Hr)  
Summary of stream data:

| Stream No. | Flow rate (CFS) | TC (min) | Rainfall Intensity (In/Hr) |
|------------|-----------------|----------|----------------------------|
|------------|-----------------|----------|----------------------------|

|           |         |         |                    |
|-----------|---------|---------|--------------------|
| 1         | 9.918   | 14.08   | 2.424              |
| 2         | 14.900  | 124.00  | 0.668              |
| Qmax(1) = |         |         |                    |
|           | 1.000 * | 1.000 * | 9.918) +           |
|           | 1.000 * | 0.114 * | 14.900) + = 11.609 |
| Qmax(2) = |         |         |                    |
|           | 0.275 * | 1.000 * | 9.918) +           |
|           | 1.000 * | 1.000 * | 14.900) + = 17.631 |

Total of 2 streams to confluence:

Flow rates before confluence point:

9.918      14.900

Maximum flow rates at confluence using above data:

11.609      17.631

Area of streams before confluence:

3.970      34.600

Results of confluence:

Total flow rate = 17.631(CFS)

Time of concentration = 124.000 min.

Effective stream area after confluence = 38.570 (Ac.)

---

+++++  
Process from Point/Station        3.100 to Point/Station        4.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 492.290(Ft.)  
Downstream point/station elevation = 492.070(Ft.)  
Pipe length = 40.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 17.631(CFS)  
Given pipe size = 30.00(In.)  
Calculated individual pipe flow = 17.631(CFS)  
Normal flow depth in pipe = 17.95(In.)  
Flow top width inside pipe = 29.41(In.)  
Critical Depth = 17.04(In.)  
Pipe flow velocity = 5.75(Ft/s)  
Travel time through pipe = 0.12 min.  
Time of concentration (TC) = 124.12 min.

---

+++++  
Process from Point/Station        4.000 to Point/Station        5.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 492.070(Ft.)  
Downstream point/station elevation = 490.090(Ft.)  
Pipe length = 393.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 17.631(CFS)  
Given pipe size = 30.00(In.)  
Calculated individual pipe flow = 17.631(CFS)  
Normal flow depth in pipe = 18.47(In.)  
Flow top width inside pipe = 29.19(In.)  
Critical Depth = 17.04(In.)  
Pipe flow velocity = 5.56(Ft/s)  
Travel time through pipe = 1.18 min.  
Time of concentration (TC) = 125.29 min.

---

+++++  
Process from Point/Station        4.000 to Point/Station        5.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 125.29 min.  
Rainfall intensity = 0.663(In/Hr) for a 25.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 0.592(CFS) for 0.940(Ac.)  
Total runoff = 18.224(CFS) Total area = 39.51(Ac.)

+++++  
Process from Point/Station 4.000 to Point/Station 5.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Time of concentration = 125.29 min.  
Rainfall intensity = 0.663(In/Hr) for a 25.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500  
Subarea runoff = 0.083(CFS) for 0.250(Ac.)  
Total runoff = 18.307(CFS) Total area = 39.76(Ac.)

+++++  
Process from Point/Station 4.000 to Point/Station 5.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 125.29 min.  
Rainfall intensity = 0.663(In/Hr) for a 25.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 0.101(CFS) for 0.160(Ac.)  
Total runoff = 18.407(CFS) Total area = 39.92(Ac.)

+++++  
Process from Point/Station 5.000 to Point/Station 6.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 490.090(Ft.)  
Downstream point/station elevation = 489.450(Ft.)  
Pipe length = 125.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 18.407(CFS)  
Given pipe size = 30.00(In.)  
Calculated individual pipe flow = 18.407(CFS)  
Normal flow depth in pipe = 18.91(In.)  
Flow top width inside pipe = 28.96(In.)  
Critical Depth = 17.44(In.)  
Pipe flow velocity = 5.65(Ft/s)  
Travel time through pipe = 0.37 min.  
Time of concentration (TC) = 125.66 min.

+++++  
Process from Point/Station 6.000 to Point/Station 7.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 489.450(Ft.)  
Downstream point/station elevation = 489.060(Ft.)  
Pipe length = 45.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 18.407(CFS)  
Given pipe size = 30.00(In.)  
Calculated individual pipe flow = 18.407(CFS)  
Normal flow depth in pipe = 15.98(In.)  
Flow top width inside pipe = 29.94(In.)  
Critical Depth = 17.44(In.)  
Pipe flow velocity = 6.92(Ft/s)  
Travel time through pipe = 0.11 min.  
Time of concentration (TC) = 125.77 min.

+++++  
Process from Point/Station 6.000 to Point/Station 7.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
Stream flow area = 39.920(Ac.)  
Runoff from this stream = 18.407(CFS)  
Time of concentration = 125.77 min.  
Rainfall intensity = 0.662(In/Hr)

+++++  
Process from Point/Station 8.000 to Point/Station 9.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Initial subarea flow distance = 806.000(Ft.)  
Highest elevation = 513.500(Ft.)  
Lowest elevation = 500.000(Ft.)  
Elevation difference = 13.500(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 25.82 min.  
TC = [1.8\*(1.1-C)\*distance(Ft.)^.5]/(% slope^(1/3))  
TC = [1.8\*(1.1-0.5000)\*( 806.000^.5)/( 1.675^(1/3))] = 25.82  
Rainfall intensity (I) = 1.807(In/Hr) for a 25.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.500  
Subarea runoff = 17.560(CFS)  
Total initial stream area = 19.440(Ac.)

+++++  
Process from Point/Station 9.000 to Point/Station 10.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 492.400(Ft.)  
Downstream point/station elevation = 489.800(Ft.)  
Pipe length = 490.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 17.560(CFS)  
Given pipe size = 30.00(In.)  
Calculated individual pipe flow = 17.560(CFS)

Normal flow depth in pipe = 16.54 (In.)  
Flow top width inside pipe = 29.84 (In.)  
Critical Depth = 17.02 (In.)  
Pipe flow velocity = 6.33 (Ft/s)  
Travel time through pipe = 1.29 min.  
Time of concentration (TC) = 27.11 min.

++++++  
Process from Point/Station 9.000 to Point/Station 10.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Time of concentration = 27.11 min.  
Rainfall intensity = 1.758 (In/Hr) for a 25.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500  
Subarea runoff = 7.296 (CFS) for 8.300 (Ac.)  
Total runoff = 24.856 (CFS) Total area = 27.74 (Ac.)

++++++  
Process from Point/Station 10.000 to Point/Station 7.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 489.650 (Ft.)  
Downstream point/station elevation = 489.060 (Ft.)  
Pipe length = 47.00 (Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 24.856 (CFS)  
Given pipe size = 30.00 (In.)  
Calculated individual pipe flow = 24.856 (CFS)  
Normal flow depth in pipe = 17.17 (In.)  
Flow top width inside pipe = 29.69 (In.)  
Critical Depth = 20.37 (In.)  
Pipe flow velocity = 8.56 (Ft/s)  
Travel time through pipe = 0.09 min.  
Time of concentration (TC) = 27.20 min.

++++++  
Process from Point/Station 10.000 to Point/Station 7.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 27.740 (Ac.)  
Runoff from this stream = 24.856 (CFS)  
Time of concentration = 27.20 min.  
Rainfall intensity = 1.755 (In/Hr)  
Summary of stream data:

| Stream No. | Flow rate (CFS) | TC (min) | Rainfall Intensity (In/Hr) |
|------------|-----------------|----------|----------------------------|
|------------|-----------------|----------|----------------------------|

|           |         |         |                    |
|-----------|---------|---------|--------------------|
| 1         | 18.407  | 125.77  | 0.662              |
| 2         | 24.856  | 27.20   | 1.755              |
| Qmax(1) = | 1.000 * | 1.000 * | 18.407) +          |
|           | 0.377 * | 1.000 * | 24.856) + = 27.777 |

```
Qmax(2) =
    1.000 *      0.216 *      18.407) +
    1.000 *      1.000 *      24.856) + =      28.837
```

Total of 2 streams to confluence:

Flow rates before confluence point:

18.407 24.856

Maximum flow rates at confluence using above data:

27.777 28.837

Area of streams before confluence:

39.920 27.740

Results of confluence:

Total flow rate = 28.837(CFS)

Time of concentration = 27.200 min.

Effective stream area after confluence = 67.660(Ac.)

```
+++++++++++++++++++++
Process from Point/Station      10.000 to Point/Station      7.000
**** SUBAREA FLOW ADDITION ****
```

---

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

[INDUSTRIAL area type ]

Time of concentration = 27.20 min.

Rainfall intensity = 1.755(In/Hr) for a 25.0 year storm

Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950

Subarea runoff = 0.383(CFS) for 0.230(Ac.)

Total runoff = 29.220(CFS) Total area = 67.89(Ac.)

```
+++++++++++++++++++++
Process from Point/Station      10.000 to Point/Station      7.000
**** SUBAREA FLOW ADDITION ****
```

---

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

[INDUSTRIAL area type ]

Note: user entry of impervious value, Ap = 0.350

Time of concentration = 27.20 min.

Rainfall intensity = 1.755(In/Hr) for a 25.0 year storm

Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500

Subarea runoff = 0.421(CFS) for 0.480(Ac.)

Total runoff = 29.642(CFS) Total area = 68.37(Ac.)

```
+++++++++++++++++++++
Process from Point/Station      7.000 to Point/Station      20.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

Upstream point/station elevation = 489.060(Ft.)

Downstream point/station elevation = 488.710(Ft.)

Pipe length = 70.00(Ft.) Manning's N = 0.011

No. of pipes = 2 Required pipe flow = 29.642(CFS)

Given pipe size = 30.00(In.)

Calculated individual pipe flow = 14.821(CFS)

Normal flow depth in pipe = 13.79(In.)

Flow top width inside pipe = 29.90(In.)

Critical Depth = 15.59(In.)

Pipe flow velocity = 6.73(Ft/s)  
Travel time through pipe = 0.17 min.  
Time of concentration (TC) = 27.37 min.

+++++  
Process from Point/Station 8.000 to Point/Station 11.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Initial subarea flow distance = 510.000(Ft.)  
Highest elevation = 513.500(Ft.)  
Lowest elevation = 511.000(Ft.)  
Elevation difference = 2.500(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 30.93 min.  
TC = [1.8\*(1.1-C)\*distance(Ft.)^.5]/(% slope^(1/3))  
TC = [1.8\*(1.1-0.5000)\*( 510.000^.5)/( 0.490^(1/3))] = 30.93  
Rainfall intensity (I) = 1.628(In/Hr) for a 25.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.500  
Subarea runoff = 2.865(CFS)  
Total initial stream area = 3.520(Ac.)

+++++  
Process from Point/Station 11.000 to Point/Station 14.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 504.500(Ft.)  
Downstream point/station elevation = 503.980(Ft.)  
Pipe length = 50.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 2.865(CFS)  
Given pipe size = 18.00(In.)  
Calculated individual pipe flow = 2.865(CFS)  
Normal flow depth in pipe = 6.87(In.)  
Flow top width inside pipe = 17.49(In.)  
Critical Depth = 7.71(In.)  
Pipe flow velocity = 4.63(Ft/s)  
Travel time through pipe = 0.18 min.  
Time of concentration (TC) = 31.11 min.

+++++  
Process from Point/Station 11.000 to Point/Station 14.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 31.11 min.  
Rainfall intensity = 1.622(In/Hr) for a 25.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 2.481(CFS) for 1.610(Ac.)  
Total runoff = 5.347(CFS) Total area = 5.13(Ac.)

```
+++++
Process from Point/Station      11.000 to Point/Station      14.000
**** SUBAREA FLOW ADDITION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Time of concentration = 31.11 min.
Rainfall intensity = 1.622(In/Hr) for a 25.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950
Subarea runoff = 1.202(CFS) for 0.780(Ac.)
Total runoff = 6.549(CFS) Total area = 5.91(Ac.)
```

```
+++++
Process from Point/Station      14.000 to Point/Station      15.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

```
Upstream point/station elevation = 499.950(Ft.)
Downstream point/station elevation = 499.850(Ft.)
Pipe length = 20.00(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 6.549(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 6.549(CFS)
Normal flow depth in pipe = 11.60(In.)
Flow top width inside pipe = 23.99(In.)
Critical Depth = 10.88(In.)
Pipe flow velocity = 4.35(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 31.19 min.
```

```
+++++
Process from Point/Station      12.000 to Point/Station      13.000
**** INITIAL AREA EVALUATION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.500
Initial subarea flow distance = 280.000(Ft.)
Highest elevation = 513.900(Ft.)
Lowest elevation = 511.830(Ft.)
Elevation difference = 2.070(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 19.06 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.5278)*( 280.000^.5)/( 0.739^(1/3))] = 19.06
Rainfall intensity (I) = 2.110(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.528
Subarea runoff = 0.312(CFS)
Total initial stream area = 0.280(Ac.)
End of computations, total study area = 74.560 (Ac.)
```

**PROPOSED CONDITION HYDROLOGY**  
**50 YEAR STORM**  
**BADIEE TRUCK PARKING AND STORAGE**  
San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2005 Version 6.4

Rational method hydrology program based on  
San Diego County Flood Control Division 1985 hydrology manual  
Rational Hydrology Study Date: 12/22/22

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

Program License Serial Number 4035

Rational hydrology study storm event year is 50.0  
English (in-lb) input data Units used  
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and  
Elevation 0 - 1500 feet  
Factor (to multiply \* intensity) = 1.000  
Only used if inside City of San Diego  
San Diego hydrology manual 'C' values used  
Runoff coefficients by rational method

+++++  
Process from Point/Station 1.000 to Point/Station 2.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Initial subarea flow distance = 280.000(Ft.)  
Highest elevation = 516.000(Ft.)  
Lowest elevation = 513.000(Ft.)  
Elevation difference = 3.000(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 4.42 min.  
TC = [1.8\*(1.1-C)\*distance(Ft.)^.5]/(% slope^(1/3))  
TC = [1.8\*(1.1-0.9500)\*( 280.000^.5)/( 1.071^(1/3))] = 4.42  
Setting time of concentration to 5 minutes  
Rainfall intensity (I) = 4.265(In/Hr) for a 50.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950  
Subarea runoff = 1.783(CFS)  
Total initial stream area = 0.440(Ac.)

+++++  
Process from Point/Station 1.000 to Point/Station 2.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 5.00 min.  
Rainfall intensity = 4.265(In/Hr) for a 50.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 1.013(CFS) for 0.250(Ac.)  
Total runoff = 2.796(CFS) Total area = 0.69(Ac.)

+++++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION \*\*\*\*

---

Top of street segment elevation = 513.000(Ft.)  
End of street segment elevation = 496.750(Ft.)  
Length of street segment = 1470.000(Ft.)  
Height of curb above gutter flowline = 6.0(In.)  
Width of half street (curb to crown) = 63.000(Ft.)  
Distance from crown to crossfall grade break = 61.500(Ft.)  
Slope from gutter to grade break (v/hz) = 0.083  
Slope from grade break to crown (v/hz) = 0.020  
Street flow is on [1] side(s) of the street  
Distance from curb to property line = 20.000(Ft.)  
Slope from curb to property line (v/hz) = 0.020  
Gutter width = 1.500(Ft.)  
Gutter hike from flowline = 1.500(In.)  
Manning's N in gutter = 0.0150  
Manning's N from gutter to grade break = 0.0150  
Manning's N from grade break to crown = 0.0180  
Estimated mean flow rate at midpoint of street = 9.117(CFS)  
Depth of flow = 0.452(Ft.), Average velocity = 2.793(Ft/s)  
Streetflow hydraulics at midpoint of street travel:  
Halfstreet flow width = 17.868(Ft.)  
Flow velocity = 2.79(Ft/s)  
Travel time = 8.77 min. TC = 13.77 min.  
Adding area flow to street  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity = 2.804(In/Hr) for a 50.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 8.312(CFS) for 3.120(Ac.)  
Total runoff = 11.108(CFS) Total area = 3.81(Ac.)  
Street flow at end of street = 11.108(CFS)  
Half street flow at end of street = 11.108(CFS)  
Depth of flow = 0.481(Ft.), Average velocity = 2.931(Ft/s)  
Flow width (from curb towards crown)= 19.284(Ft.)

+++++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Time of concentration = 13.77 min.  
Rainfall intensity = 2.804(In/Hr) for a 50.0 year storm

Runoff coefficient used for sub-area, Rational method,  $Q=KCIA$ ,  $C = 0.500$   
Subarea runoff = 0.224(CFS) for 0.160(Ac.)  
Total runoff = 11.332(CFS) Total area = 3.97(Ac.)

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 492.420(Ft.)  
Downstream point/station elevation = 492.290(Ft.)  
Pipe length = 24.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 11.332(CFS)  
Given pipe size = 24.00(In.)  
Calculated individual pipe flow = 11.332(CFS)  
Normal flow depth in pipe = 16.03(In.)  
Flow top width inside pipe = 22.61(In.)  
Critical Depth = 14.49(In.)  
Pipe flow velocity = 5.09(Ft/s)  
Travel time through pipe = 0.08 min.  
Time of concentration (TC) = 13.85 min.

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
Stream flow area = 3.970(Ac.)  
Runoff from this stream = 11.332(CFS)  
Time of concentration = 13.85 min.  
Rainfall intensity = 2.798(In/Hr)

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity (I) = 0.777(In/Hr) for a 50.0 year storm  
User specified values are as follows:  
TC = 124.00 min. Rain intensity = 0.78(In/Hr)  
Total area = 34.600(Ac.) Total runoff = 14.900(CFS)

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 34.600(Ac.)  
Runoff from this stream = 14.900(CFS)  
Time of concentration = 124.00 min.  
Rainfall intensity = 0.777(In/Hr)  
Summary of stream data:

| Stream No. | Flow rate (CFS) | TC (min) | Rainfall Intensity (In/Hr) |
|------------|-----------------|----------|----------------------------|
|------------|-----------------|----------|----------------------------|

|           |         |         |                    |
|-----------|---------|---------|--------------------|
| 1         | 11.332  | 13.85   | 2.798              |
| 2         | 14.900  | 124.00  | 0.777              |
| Qmax(1) = |         |         |                    |
|           | 1.000 * | 1.000 * | 11.332) +          |
|           | 1.000 * | 0.112 * | 14.900) + = 12.997 |
| Qmax(2) = |         |         |                    |
|           | 0.278 * | 1.000 * | 11.332) +          |
|           | 1.000 * | 1.000 * | 14.900) + = 18.048 |

Total of 2 streams to confluence:

Flow rates before confluence point:

11.332      14.900

Maximum flow rates at confluence using above data:

12.997      18.048

Area of streams before confluence:

3.970      34.600

Results of confluence:

Total flow rate = 18.048(CFS)

Time of concentration = 124.000 min.

Effective stream area after confluence = 38.570(Ac.)

---

+++++  
Process from Point/Station      3.100 to Point/Station      4.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 492.290(Ft.)  
Downstream point/station elevation = 492.070(Ft.)  
Pipe length = 40.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 18.048(CFS)  
Given pipe size = 30.00(In.)  
Calculated individual pipe flow = 18.048(CFS)  
Normal flow depth in pipe = 18.23(In.)  
Flow top width inside pipe = 29.29(In.)  
Critical Depth = 17.27(In.)  
Pipe flow velocity = 5.78(Ft/s)  
Travel time through pipe = 0.12 min.  
Time of concentration (TC) = 124.12 min.

---

+++++  
Process from Point/Station      4.000 to Point/Station      5.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 492.070(Ft.)  
Downstream point/station elevation = 490.090(Ft.)  
Pipe length = 393.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 18.048(CFS)  
Given pipe size = 30.00(In.)  
Calculated individual pipe flow = 18.048(CFS)  
Normal flow depth in pipe = 18.77(In.)  
Flow top width inside pipe = 29.04(In.)  
Critical Depth = 17.27(In.)  
Pipe flow velocity = 5.59(Ft/s)  
Travel time through pipe = 1.17 min.  
Time of concentration (TC) = 125.29 min.

---

+++++  
Process from Point/Station      4.000 to Point/Station      5.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 125.29 min.  
Rainfall intensity = 0.772(In/Hr) for a 50.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 0.689(CFS) for 0.940(Ac.)  
Total runoff = 18.737(CFS) Total area = 39.51(Ac.)

+++++  
Process from Point/Station 4.000 to Point/Station 5.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Time of concentration = 125.29 min.  
Rainfall intensity = 0.772(In/Hr) for a 50.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500  
Subarea runoff = 0.097(CFS) for 0.250(Ac.)  
Total runoff = 18.834(CFS) Total area = 39.76(Ac.)

+++++  
Process from Point/Station 4.000 to Point/Station 5.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 125.29 min.  
Rainfall intensity = 0.772(In/Hr) for a 50.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 0.117(CFS) for 0.160(Ac.)  
Total runoff = 18.951(CFS) Total area = 39.92(Ac.)

+++++  
Process from Point/Station 5.000 to Point/Station 6.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 490.090(Ft.)  
Downstream point/station elevation = 489.450(Ft.)  
Pipe length = 125.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 18.951(CFS)  
Given pipe size = 30.00(In.)  
Calculated individual pipe flow = 18.951(CFS)  
Normal flow depth in pipe = 19.29(In.)  
Flow top width inside pipe = 28.75(In.)  
Critical Depth = 17.70(In.)  
Pipe flow velocity = 5.68(Ft/s)  
Travel time through pipe = 0.37 min.  
Time of concentration (TC) = 125.65 min.

```
+++++
Process from Point/Station      6.000 to Point/Station      7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

```
Upstream point/station elevation = 489.450(Ft.)
Downstream point/station elevation = 489.060(Ft.)
Pipe length = 45.00(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 18.951(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 18.951(CFS)
Normal flow depth in pipe = 16.27(In.)
Flow top width inside pipe = 29.89(In.)
Critical Depth = 17.70(In.)
Pipe flow velocity = 6.97(Ft/s)
Travel time through pipe = 0.11 min.
Time of concentration (TC) = 125.76 min.
```

```
+++++
Process from Point/Station      6.000 to Point/Station      7.000
**** CONFLUENCE OF MINOR STREAMS ****
```

---

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area = 39.920(Ac.)
Runoff from this stream = 18.951(CFS)
Time of concentration = 125.76 min.
Rainfall intensity = 0.770(In/Hr)
```

```
+++++
Process from Point/Station      8.000 to Point/Station      9.000
**** INITIAL AREA EVALUATION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350
Initial subarea flow distance = 806.000(Ft.)
Highest elevation = 513.500(Ft.)
Lowest elevation = 500.000(Ft.)
Elevation difference = 13.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 25.82 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.5000)*( 806.000^.5)/( 1.675^(1/3))] = 25.82
Rainfall intensity (I) = 2.099(In/Hr) for a 50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.500
Subarea runoff = 20.400(CFS)
Total initial stream area = 19.440(Ac.)
```

```
+++++
Process from Point/Station      9.000 to Point/Station      10.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

```
Upstream point/station elevation = 492.400(Ft.)
Downstream point/station elevation = 489.800(Ft.)
Pipe length = 490.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 20.400(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 20.400(CFS)
```

Normal flow depth in pipe = 18.19 (In.)  
Flow top width inside pipe = 29.31 (In.)  
Critical Depth = 18.40 (In.)  
Pipe flow velocity = 6.55 (Ft/s)  
Travel time through pipe = 1.25 min.  
Time of concentration (TC) = 27.06 min.

++++++  
Process from Point/Station 9.000 to Point/Station 10.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Time of concentration = 27.06 min.  
Rainfall intensity = 2.045 (In/Hr) for a 50.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500  
Subarea runoff = 8.489 (CFS) for 8.300 (Ac.)  
Total runoff = 28.888 (CFS) Total area = 27.74 (Ac.)

++++++  
Process from Point/Station 10.000 to Point/Station 7.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 489.650 (Ft.)  
Downstream point/station elevation = 489.060 (Ft.)  
Pipe length = 47.00 (Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 28.888 (CFS)  
Given pipe size = 30.00 (In.)  
Calculated individual pipe flow = 28.888 (CFS)  
Normal flow depth in pipe = 18.94 (In.)  
Flow top width inside pipe = 28.95 (In.)  
Critical Depth = 21.98 (In.)  
Pipe flow velocity = 8.84 (Ft/s)  
Travel time through pipe = 0.09 min.  
Time of concentration (TC) = 27.15 min.

++++++  
Process from Point/Station 10.000 to Point/Station 7.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 27.740 (Ac.)  
Runoff from this stream = 28.888 (CFS)  
Time of concentration = 27.15 min.  
Rainfall intensity = 2.042 (In/Hr)  
Summary of stream data:

---

| Stream No. | Flow rate (CFS) | TC (min) | Rainfall Intensity (In/Hr) |
|------------|-----------------|----------|----------------------------|
|------------|-----------------|----------|----------------------------|

|           |         |         |                    |
|-----------|---------|---------|--------------------|
| 1         | 18.951  | 125.76  | 0.770              |
| 2         | 28.888  | 27.15   | 2.042              |
| Qmax(1) = | 1.000 * | 1.000 * | 18.951) +          |
|           | 0.377 * | 1.000 * | 28.888) + = 29.848 |

$Q_{max}(2) =$   
1.000 \* 0.216 \* 18.951) +  
1.000 \* 1.000 \* 28.888) + = 32.980

Total of 2 streams to confluence:  
Flow rates before confluence point:  
18.951 28.888  
Maximum flow rates at confluence using above data:  
29.848 32.980  
Area of streams before confluence:  
39.920 27.740  
Results of confluence:  
Total flow rate = 32.980(CFS)  
Time of concentration = 27.154 min.  
Effective stream area after confluence = 67.660(Ac.)

+++++  
Process from Point/Station 10.000 to Point/Station 7.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 27.15 min.  
Rainfall intensity = 2.042(In/Hr) for a 50.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 0.446(CFS) for 0.230(Ac.)  
Total runoff = 33.426(CFS) Total area = 67.89(Ac.)

+++++  
Process from Point/Station 10.000 to Point/Station 7.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Time of concentration = 27.15 min.  
Rainfall intensity = 2.042(In/Hr) for a 50.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500  
Subarea runoff = 0.490(CFS) for 0.480(Ac.)  
Total runoff = 33.916(CFS) Total area = 68.37(Ac.)

+++++  
Process from Point/Station 7.000 to Point/Station 20.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 489.060(Ft.)  
Downstream point/station elevation = 488.710(Ft.)  
Pipe length = 70.00(Ft.) Manning's N = 0.011  
No. of pipes = 2 Required pipe flow = 33.916(CFS)  
Given pipe size = 30.00(In.)  
Calculated individual pipe flow = 16.958(CFS)  
Normal flow depth in pipe = 14.91(In.)  
Flow top width inside pipe = 30.00(In.)  
Critical Depth = 16.71(In.)

Pipe flow velocity = 6.96(Ft/s)  
Travel time through pipe = 0.17 min.  
Time of concentration (TC) = 27.32 min.

+++++  
Process from Point/Station 8.000 to Point/Station 11.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Initial subarea flow distance = 510.000(Ft.)  
Highest elevation = 513.500(Ft.)  
Lowest elevation = 511.000(Ft.)  
Elevation difference = 2.500(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 30.93 min.  
TC = [1.8\*(1.1-C)\*distance(Ft.)^.5]/(% slope^(1/3))  
TC = [1.8\*(1.1-0.5000)\*( 510.000^.5)/( 0.490^(1/3))] = 30.93  
Rainfall intensity (I) = 1.894(In/Hr) for a 50.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.500  
Subarea runoff = 3.334(CFS)  
Total initial stream area = 3.520(Ac.)

+++++  
Process from Point/Station 11.000 to Point/Station 14.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 504.500(Ft.)  
Downstream point/station elevation = 503.980(Ft.)  
Pipe length = 50.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 3.334(CFS)  
Given pipe size = 18.00(In.)  
Calculated individual pipe flow = 3.334(CFS)  
Normal flow depth in pipe = 7.45(In.)  
Flow top width inside pipe = 17.73(In.)  
Critical Depth = 8.34(In.)  
Pipe flow velocity = 4.82(Ft/s)  
Travel time through pipe = 0.17 min.  
Time of concentration (TC) = 31.11 min.

+++++  
Process from Point/Station 11.000 to Point/Station 14.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 31.11 min.  
Rainfall intensity = 1.888(In/Hr) for a 50.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 2.888(CFS) for 1.610(Ac.)  
Total runoff = 6.222(CFS) Total area = 5.13(Ac.)

```
+++++
Process from Point/Station      11.000 to Point/Station      14.000
**** SUBAREA FLOW ADDITION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Time of concentration = 31.11 min.
Rainfall intensity = 1.888(In/Hr) for a 50.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950
Subarea runoff = 1.399(CFS) for 0.780(Ac.)
Total runoff = 7.621(CFS) Total area = 5.91(Ac.)
```

```
+++++
Process from Point/Station      14.000 to Point/Station      15.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

```
Upstream point/station elevation = 499.950(Ft.)
Downstream point/station elevation = 499.850(Ft.)
Pipe length = 20.00(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 7.621(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 7.621(CFS)
Normal flow depth in pipe = 12.70(In.)
Flow top width inside pipe = 23.96(In.)
Critical Depth = 11.78(In.)
Pipe flow velocity = 4.52(Ft/s)
Travel time through pipe = 0.07 min.
Time of concentration (TC) = 31.18 min.
```

```
+++++
Process from Point/Station      12.000 to Point/Station      13.000
**** INITIAL AREA EVALUATION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.500
Initial subarea flow distance = 280.000(Ft.)
Highest elevation = 513.900(Ft.)
Lowest elevation = 511.830(Ft.)
Elevation difference = 2.070(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 19.06 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.5278)*( 280.000^.5)/( 0.739^(1/3))] = 19.06
Rainfall intensity (I) = 2.439(In/Hr) for a 50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.528
Subarea runoff = 0.360(CFS)
Total initial stream area = 0.280(Ac.)
End of computations, total study area = 74.560 (Ac.)
```

**PROPOSED CONDITION HYDROLOGY  
100 YEAR STORM  
BADIEE TRUCK PARKING AND STORAGE**

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2005 Version 6.4

Rational method hydrology program based on  
San Diego County Flood Control Division 1985 hydrology manual  
Rational Hydrology Study Date: 12/22/22

\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*

Program License Serial Number 4035

Rational hydrology study storm event year is 100.0  
English (in-lb) input data Units used  
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and  
Elevation 0 - 1500 feet  
Factor (to multiply \* intensity) = 1.000  
Only used if inside City of San Diego  
San Diego hydrology manual 'C' values used  
Runoff coefficients by rational method

+++++  
Process from Point/Station 1.000 to Point/Station 2.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Initial subarea flow distance = 280.000(Ft.)  
Highest elevation = 516.000(Ft.)  
Lowest elevation = 513.000(Ft.)  
Elevation difference = 3.000(Ft..)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 4.42 min.  
TC = [1.8\*(1.1-C)\*distance(Ft.)^.5]/(% slope^(1/3))  
TC = [1.8\*(1.1-0.9500)\*( 280.000^.5)/( 1.071^(1/3))] = 4.42  
Setting time of concentration to 5 minutes  
Rainfall intensity (I) = 4.389(In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950  
Subarea runoff = 1.835(CFS)  
Total initial stream area = 0.440(Ac.)

+++++  
Process from Point/Station 1.000 to Point/Station 2.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 5.00 min.  
Rainfall intensity = 4.389(In/Hr) for a 100.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 1.042(CFS) for 0.250(Ac.)  
Total runoff = 2.877(CFS) Total area = 0.69(Ac.)

+++++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION \*\*\*\*

---

Top of street segment elevation = 513.000(Ft.)  
End of street segment elevation = 496.750(Ft.)  
Length of street segment = 1470.000(Ft.)  
Height of curb above gutter flowline = 6.0(In.)  
Width of half street (curb to crown) = 63.000(Ft.)  
Distance from crown to crossfall grade break = 61.500(Ft.)  
Slope from gutter to grade break (v/hz) = 0.083  
Slope from grade break to crown (v/hz) = 0.020  
Street flow is on [1] side(s) of the street  
Distance from curb to property line = 20.000(Ft.)  
Slope from curb to property line (v/hz) = 0.020  
Gutter width = 1.500(Ft.)  
Gutter hike from flowline = 1.500(In.)  
Manning's N in gutter = 0.0150  
Manning's N from gutter to grade break = 0.0150  
Manning's N from grade break to crown = 0.0180  
Estimated mean flow rate at midpoint of street = 9.382(CFS)  
Depth of flow = 0.456(Ft.), Average velocity = 2.813(Ft/s)  
Streetflow hydraulics at midpoint of street travel:  
Halfstreet flow width = 18.067(Ft.)  
Flow velocity = 2.81(Ft/s)  
Travel time = 8.71 min. TC = 13.71 min.  
Adding area flow to street  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity = 3.006(In/Hr) for a 100.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 8.910(CFS) for 3.120(Ac.)  
Total runoff = 11.787(CFS) Total area = 3.81(Ac.)  
Street flow at end of street = 11.787(CFS)  
Half street flow at end of street = 11.787(CFS)  
Depth of flow = 0.490(Ft.), Average velocity = 2.974(Ft/s)  
Flow width (from curb towards crown)= 19.730(Ft.)

+++++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Time of concentration = 13.71 min.

Rainfall intensity = 3.006 (In/Hr) for a 100.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500  
Subarea runoff = 0.240 (CFS) for 0.160 (Ac.)  
Total runoff = 12.028 (CFS) Total area = 3.97 (Ac.)

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 492.420 (Ft.)  
Downstream point/station elevation = 492.290 (Ft.)  
Pipe length = 24.00 (Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 12.028 (CFS)  
Given pipe size = 24.00 (In.)  
Calculated individual pipe flow = 12.028 (CFS)  
Normal flow depth in pipe = 16.73 (In.)  
Flow top width inside pipe = 22.05 (In.)  
Critical Depth = 14.94 (In.)  
Pipe flow velocity = 5.14 (Ft/s)  
Travel time through pipe = 0.08 min.  
Time of concentration (TC) = 13.79 min.

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
Stream flow area = 3.970 (Ac.)  
Runoff from this stream = 12.028 (CFS)  
Time of concentration = 13.79 min.  
Rainfall intensity = 3.000 (In/Hr)

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Rainfall intensity (I) = 0.847 (In/Hr) for a 100.0 year storm  
User specified values are as follows:  
TC = 124.00 min. Rain intensity = 0.85 (In/Hr)  
Total area = 34.600 (Ac.) Total runoff = 14.900 (CFS)

+++++  
Process from Point/Station 3.000 to Point/Station 3.100  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 34.600 (Ac.)  
Runoff from this stream = 14.900 (CFS)  
Time of concentration = 124.00 min.  
Rainfall intensity = 0.847 (In/Hr)  
Summary of stream data:

| Stream No. | Flow rate (CFS) | TC (min) | Rainfall Intensity (In/Hr) |
|------------|-----------------|----------|----------------------------|
|------------|-----------------|----------|----------------------------|

|                |                 |             |        |
|----------------|-----------------|-------------|--------|
| 1              | 12.028          | 13.79       | 3.000  |
| 2              | 14.900          | 124.00      | 0.847  |
| $Q_{max}(1) =$ |                 |             |        |
|                | 1.000 * 1.000 * | 12.028) +   |        |
|                | 1.000 * 0.111 * | 14.900) + = | 13.685 |
| $Q_{max}(2) =$ |                 |             |        |
|                | 0.282 * 1.000 * | 12.028) +   |        |
|                | 1.000 * 1.000 * | 14.900) + = | 18.296 |

Total of 2 streams to confluence:

Flow rates before confluence point:

12.028 14.900

Maximum flow rates at confluence using above data:

13.685 18.296

Area of streams before confluence:

3.970 34.600

Results of confluence:

Total flow rate = 18.296(CFS)

Time of concentration = 124.000 min.

Effective stream area after confluence = 38.570(Ac.)

---

Process from Point/Station 3.100 to Point/Station 4.000

\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 492.290(Ft.)  
 Downstream point/station elevation = 492.070(Ft.)  
 Pipe length = 40.00(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 18.296(CFS)  
 Given pipe size = 30.00(In.)  
 Calculated individual pipe flow = 18.296(CFS)  
 Normal flow depth in pipe = 18.40(In.)  
 Flow top width inside pipe = 29.22(In.)  
 Critical Depth = 17.39(In.)  
 Pipe flow velocity = 5.80(Ft/s)  
 Travel time through pipe = 0.11 min.  
 Time of concentration (TC) = 124.11 min.

---

Process from Point/Station 4.000 to Point/Station 5.000

\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 492.070(Ft.)  
 Downstream point/station elevation = 490.090(Ft.)  
 Pipe length = 393.00(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 18.296(CFS)  
 Given pipe size = 30.00(In.)  
 Calculated individual pipe flow = 18.296(CFS)  
 Normal flow depth in pipe = 18.94(In.)  
 Flow top width inside pipe = 28.95(In.)  
 Critical Depth = 17.39(In.)  
 Pipe flow velocity = 5.60(Ft/s)  
 Travel time through pipe = 1.17 min.  
 Time of concentration (TC) = 125.28 min.

---

Process from Point/Station 4.000 to Point/Station 5.000

\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Time of concentration = 125.28 min.
Rainfall intensity = 0.841(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950
Subarea runoff = 0.751(CFS) for 0.940(Ac.)
Total runoff = 19.047(CFS) Total area = 39.51(Ac.)
```

---

```
+++++
Process from Point/Station 4.000 to Point/Station 5.000
**** SUBAREA FLOW ADDITION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350
Time of concentration = 125.28 min.
Rainfall intensity = 0.841(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500
Subarea runoff = 0.105(CFS) for 0.250(Ac.)
Total runoff = 19.152(CFS) Total area = 39.76(Ac.)
```

---

```
+++++
Process from Point/Station 4.000 to Point/Station 5.000
**** SUBAREA FLOW ADDITION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Time of concentration = 125.28 min.
Rainfall intensity = 0.841(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950
Subarea runoff = 0.128(CFS) for 0.160(Ac.)
Total runoff = 19.280(CFS) Total area = 39.92(Ac.)
```

---

```
+++++
Process from Point/Station 5.000 to Point/Station 6.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

```
Upstream point/station elevation = 490.090(Ft.)
Downstream point/station elevation = 489.450(Ft.)
Pipe length = 125.00(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 19.280(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 19.280(CFS)
Normal flow depth in pipe = 19.52(In.)
Flow top width inside pipe = 28.60(In.)
Critical Depth = 17.88(In.)
Pipe flow velocity = 5.70(Ft/s)
Travel time through pipe = 0.37 min.
Time of concentration (TC) = 125.65 min.
```

```
+++++
Process from Point/Station      6.000 to Point/Station      7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

```
Upstream point/station elevation = 489.450(Ft.)
Downstream point/station elevation = 489.060(Ft.)
Pipe length = 45.00(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 19.280(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 19.280(CFS)
Normal flow depth in pipe = 16.45(In.)
Flow top width inside pipe = 29.86(In.)
Critical Depth = 17.88(In.)
Pipe flow velocity = 7.00(Ft/s)
Travel time through pipe = 0.11 min.
Time of concentration (TC) = 125.76 min.
```

```
+++++
Process from Point/Station      6.000 to Point/Station      7.000
**** CONFLUENCE OF MINOR STREAMS ****
```

---

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area = 39.920(Ac.)
Runoff from this stream = 19.280(CFS)
Time of concentration = 125.76 min.
Rainfall intensity = 0.839(In/Hr)
```

```
+++++
Process from Point/Station      8.000 to Point/Station      9.000
**** INITIAL AREA EVALUATION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350
Initial subarea flow distance = 806.000(Ft.)
Highest elevation = 513.500(Ft.)
Lowest elevation = 500.000(Ft.)
Elevation difference = 13.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 25.82 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.5000)*( 806.000^.5)/( 1.675^(1/3))] = 25.82
Rainfall intensity (I) = 2.282(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.500
Subarea runoff = 22.178(CFS)
Total initial stream area = 19.440(Ac.)
```

```
+++++
Process from Point/Station      9.000 to Point/Station      10.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

```
Upstream point/station elevation = 492.400(Ft.)
Downstream point/station elevation = 489.800(Ft.)
Pipe length = 490.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 22.178(CFS)
Given pipe size = 30.00(In.)
```

Calculated individual pipe flow = 22.178(CFS)  
Normal flow depth in pipe = 19.24(In.)  
Flow top width inside pipe = 28.78(In.)  
Critical Depth = 19.22(In.)  
Pipe flow velocity = 6.67(Ft/s)  
Travel time through pipe = 1.23 min.  
Time of concentration (TC) = 27.04 min.

++++++  
Process from Point/Station 9.000 to Point/Station 10.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Time of concentration = 27.04 min.  
Rainfall intensity = 2.226(In/Hr) for a 100.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500  
Subarea runoff = 9.238(CFS) for 8.300(Ac.)  
Total runoff = 31.416(CFS) Total area = 27.74(Ac.)

++++++  
Process from Point/Station 10.000 to Point/Station 7.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 489.650(Ft.)  
Downstream point/station elevation = 489.060(Ft.)  
Pipe length = 47.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 31.416(CFS)  
Given pipe size = 30.00(In.)  
Calculated individual pipe flow = 31.416(CFS)  
Normal flow depth in pipe = 20.09(In.)  
Flow top width inside pipe = 28.22(In.)  
Critical Depth = 22.90(In.)  
Pipe flow velocity = 8.99(Ft/s)  
Travel time through pipe = 0.09 min.  
Time of concentration (TC) = 27.13 min.

++++++  
Process from Point/Station 10.000 to Point/Station 7.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 27.740(Ac.)  
Runoff from this stream = 31.416(CFS)  
Time of concentration = 27.13 min.  
Rainfall intensity = 2.222(In/Hr)  
Summary of stream data:

| Stream No. | Flow rate (CFS) | TC (min) | Rainfall Intensity (In/Hr) |
|------------|-----------------|----------|----------------------------|
| 1          | 19.280          | 125.76   | 0.839                      |
| 2          | 31.416          | 27.13    | 2.222                      |
| Qmax(1) =  | 1.000 *         | 1.000 *  | 19.280) +                  |

```
0.378 * 1.000 * 31.416) + = 31.146
Qmax(2) =
1.000 * 0.216 * 19.280) +
1.000 * 1.000 * 31.416) + = 35.575
```

Total of 2 streams to confluence:  
Flow rates before confluence point:

19.280 31.416

Maximum flow rates at confluence using above data:

31.146 35.575

Area of streams before confluence:  
39.920 27.740

Results of confluence:

Total flow rate = 35.575(CFS)

Time of concentration = 27.130 min.

Effective stream area after confluence = 67.660(Ac.)

---

```
+++++
Process from Point/Station 10.000 to Point/Station 7.000
**** SUBAREA FLOW ADDITION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]]
Time of concentration = 27.13 min.
Rainfall intensity = 2.222(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950
Subarea runoff = 0.486(CFS) for 0.230(Ac.)
Total runoff = 36.061(CFS) Total area = 67.89(Ac.)
```

---

```
+++++
Process from Point/Station 10.000 to Point/Station 7.000
**** SUBAREA FLOW ADDITION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]
Note: user entry of impervious value, Ap = 0.350
Time of concentration = 27.13 min.
Rainfall intensity = 2.222(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.500
Subarea runoff = 0.533(CFS) for 0.480(Ac.)
Total runoff = 36.594(CFS) Total area = 68.37(Ac.)
```

---

```
+++++
Process from Point/Station 7.000 to Point/Station 20.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

```
Upstream point/station elevation = 489.060(Ft.)
Downstream point/station elevation = 488.710(Ft.)
Pipe length = 70.00(Ft.) Manning's N = 0.011
No. of pipes = 2 Required pipe flow = 36.594(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 18.297(CFS)
Normal flow depth in pipe = 15.59(In.)
Flow top width inside pipe = 29.98(In.)
```

Critical Depth = 17.39 (In.)  
Pipe flow velocity = 7.10 (Ft/s)  
Travel time through pipe = 0.16 min.  
Time of concentration (TC) = 27.29 min.

+++++  
Process from Point/Station 8.000 to Point/Station 11.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.350  
Initial subarea flow distance = 510.000(Ft.)  
Highest elevation = 513.500(Ft.)  
Lowest elevation = 511.000(Ft.)  
Elevation difference = 2.500(Ft.)  
Time of concentration calculated by the urban  
areas overland flow method (App X-C) = 30.93 min.  
TC = [1.8\*(1.1-C)\*distance(Ft.)^0.5]/(% slope^(1/3))  
TC = [1.8\*(1.1-0.500)\*( 510.000^0.5)/( 0.490^(1/3))] = 30.93  
Rainfall intensity (I) = 2.063 (In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.500  
Subarea runoff = 3.631(CFS)  
Total initial stream area = 3.520(Ac.)

+++++  
Process from Point/Station 11.000 to Point/Station 14.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 504.500(Ft.)  
Downstream point/station elevation = 503.980(Ft.)  
Pipe length = 50.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 3.631(CFS)  
Given pipe size = 18.00(In.)  
Calculated individual pipe flow = 3.631(CFS)  
Normal flow depth in pipe = 7.82(In.)  
Flow top width inside pipe = 17.84(In.)  
Critical Depth = 8.73(In.)  
Pipe flow velocity = 4.93(Ft/s)  
Travel time through pipe = 0.17 min.  
Time of concentration (TC) = 31.10 min.

+++++  
Process from Point/Station 11.000 to Point/Station 14.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 1.000  
[INDUSTRIAL area type ]  
Time of concentration = 31.10 min.  
Rainfall intensity = 2.057 (In/Hr) for a 100.0 year storm  
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950  
Subarea runoff = 3.145(CFS) for 1.610(Ac.)  
Total runoff = 6.777(CFS) Total area = 5.13(Ac.)

```
+++++
Process from Point/Station      11.000 to Point/Station      14.000
**** SUBAREA FLOW ADDITION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Time of concentration = 31.10 min.
Rainfall intensity = 2.057(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950
Subarea runoff = 1.524(CFS) for 0.780(Ac.)
Total runoff = 8.300(CFS) Total area = 5.91(Ac.)
```

```
+++++
Process from Point/Station      14.000 to Point/Station      15.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

---

```
Upstream point/station elevation = 499.950(Ft.)
Downstream point/station elevation = 499.850(Ft.)
Pipe length = 20.00(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 8.300(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 8.300(CFS)
Normal flow depth in pipe = 13.38(In.)
Flow top width inside pipe = 23.84(In.)
Critical Depth = 12.32(In.)
Pipe flow velocity = 4.61(Ft/s)
Travel time through pipe = 0.07 min.
Time of concentration (TC) = 31.17 min.
```

```
+++++
Process from Point/Station      12.000 to Point/Station      13.000
**** INITIAL AREA EVALUATION ****
```

---

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type ]  
Note: user entry of impervious value, Ap = 0.500
Initial subarea flow distance = 280.000(Ft.)
Highest elevation = 513.900(Ft.)
Lowest elevation = 511.830(Ft.)
Elevation difference = 2.070(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 19.06 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3)]
TC = [1.8*(1.1-0.5278)*( 280.000^.5)/( 0.739^(1/3)] = 19.06
Rainfall intensity (I) = 2.635(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.528
Subarea runoff = 0.389(CFS)
Total initial stream area = 0.280(Ac.)
End of computations, total study area = 74.560 (Ac.)
```

**Proposed Condition @ Node 13**  
**Channel Calculator**

**Given Input Data:**

Shape ..... Trapezoidal  
Solving for ..... Depth of Flow  
Flowrate ..... 1.1700 cfs  
Slope ..... 0.0100 ft/ft  
Manning's n ..... 0.0300  
Height ..... 6.0000 in  
Bottom width ..... 36.0000 in  
Left slope ..... 0.5000 ft/ft (V/H)  
Right slope ..... 0.5000 ft/ft (V/H)

**Computed Results:**

Depth ..... 2.5535 in  
Velocity ..... 1.6051 fps  
Full Flowrate ..... 5.2153 cfs  
Flow area ..... 0.7289 ft<sup>2</sup>  
Flow perimeter ..... 47.4195 in  
Hydraulic radius ..... 2.2135 in  
Top width ..... 46.2139 in  
Area ..... 2.0000 ft<sup>2</sup>  
Perimeter ..... 62.8328 in  
Percent full ..... 42.5578 %

8. DETENTION BASIN CALCULATIONS

RUN DATE 12/15/2021

HYDROGRAPH FILE NAME Text1

TIME OF CONCENTRATION 27 MIN.

6 HOUR RAINFALL 1.4 INCHES

BASIN AREA 8.28 ACRES

RUNOFF COEFFICIENT 0.5

PEAK DISCHARGE 5.47 CFS

|                  |                        |
|------------------|------------------------|
| TIME (MIN) = 0   | DISCHARGE (CFS) = 0    |
| TIME (MIN) = 27  | DISCHARGE (CFS) = 0    |
| TIME (MIN) = 54  | DISCHARGE (CFS) = 0.4  |
| TIME (MIN) = 81  | DISCHARGE (CFS) = 0.4  |
| TIME (MIN) = 108 | DISCHARGE (CFS) = 0.5  |
| TIME (MIN) = 135 | DISCHARGE (CFS) = 0.5  |
| TIME (MIN) = 162 | DISCHARGE (CFS) = 0.6  |
| TIME (MIN) = 189 | DISCHARGE (CFS) = 0.7  |
| TIME (MIN) = 216 | DISCHARGE (CFS) = 1    |
| TIME (MIN) = 243 | DISCHARGE (CFS) = 1.1  |
| TIME (MIN) = 270 | DISCHARGE (CFS) = 5.47 |
| TIME (MIN) = 297 | DISCHARGE (CFS) = 0.8  |
| TIME (MIN) = 324 | DISCHARGE (CFS) = 0.5  |
| TIME (MIN) = 351 | DISCHARGE (CFS) = 0.4  |
| TIME (MIN) = 378 | DISCHARGE (CFS) = 0    |

RUN DATE 12/15/2021  
HYDROGRAPH FILE NAME Text1  
TIME OF CONCENTRATION 27 MIN.  
6 HOUR RAINFALL 1.6 INCHES  
BASIN AREA 8.28 ACRES  
RUNOFF COEFFICIENT 0.5  
PEAK DISCHARGE 6.46 CFS

|                  |                        |
|------------------|------------------------|
| TIME (MIN) = 0   | DISCHARGE (CFS) = 0    |
| TIME (MIN) = 27  | DISCHARGE (CFS) = 0    |
| TIME (MIN) = 54  | DISCHARGE (CFS) = 0.4  |
| TIME (MIN) = 81  | DISCHARGE (CFS) = 0.5  |
| TIME (MIN) = 108 | DISCHARGE (CFS) = 0.5  |
| TIME (MIN) = 135 | DISCHARGE (CFS) = 0.6  |
| TIME (MIN) = 162 | DISCHARGE (CFS) = 0.7  |
| TIME (MIN) = 189 | DISCHARGE (CFS) = 0.8  |
| TIME (MIN) = 216 | DISCHARGE (CFS) = 1.2  |
| TIME (MIN) = 243 | DISCHARGE (CFS) = 1.1  |
| TIME (MIN) = 270 | DISCHARGE (CFS) = 6.46 |
| TIME (MIN) = 297 | DISCHARGE (CFS) = 0.9  |
| TIME (MIN) = 324 | DISCHARGE (CFS) = 0.6  |
| TIME (MIN) = 351 | DISCHARGE (CFS) = 0.5  |
| TIME (MIN) = 378 | DISCHARGE (CFS) = 0    |

RUN DATE 12/15/2021

HYDROGRAPH FILE NAME Text1

TIME OF CONCENTRATION 27 MIN.

6 HOUR RAINFALL 1.8 INCHES

BASIN AREA 8.28 ACRES

RUNOFF COEFFICIENT 0.5

PEAK DISCHARGE 7.28 CFS

|                  |                        |
|------------------|------------------------|
| TIME (MIN) = 0   | DISCHARGE (CFS) = 0    |
| TIME (MIN) = 27  | DISCHARGE (CFS) = 0    |
| TIME (MIN) = 54  | DISCHARGE (CFS) = 0.5  |
| TIME (MIN) = 81  | DISCHARGE (CFS) = 0.5  |
| TIME (MIN) = 108 | DISCHARGE (CFS) = 0.6  |
| TIME (MIN) = 135 | DISCHARGE (CFS) = 0.6  |
| TIME (MIN) = 162 | DISCHARGE (CFS) = 0.8  |
| TIME (MIN) = 189 | DISCHARGE (CFS) = 0.9  |
| TIME (MIN) = 216 | DISCHARGE (CFS) = 1.3  |
| TIME (MIN) = 243 | DISCHARGE (CFS) = 1.2  |
| TIME (MIN) = 270 | DISCHARGE (CFS) = 7.28 |
| TIME (MIN) = 297 | DISCHARGE (CFS) = 1.1  |
| TIME (MIN) = 324 | DISCHARGE (CFS) = 0.7  |
| TIME (MIN) = 351 | DISCHARGE (CFS) = 0.6  |
| TIME (MIN) = 378 | DISCHARGE (CFS) = 0    |

RUN DATE 12/15/2021

HYDROGRAPH FILE NAME Text1

TIME OF CONCENTRATION 27 MIN.

6 HOUR RAINFALL 2 INCHES

BASIN AREA 8.28 ACRES

RUNOFF COEFFICIENT 0.5

PEAK DISCHARGE 8.47 CFS

|                  |                        |
|------------------|------------------------|
| TIME (MIN) = 0   | DISCHARGE (CFS) = 0    |
| TIME (MIN) = 27  | DISCHARGE (CFS) = 0    |
| TIME (MIN) = 54  | DISCHARGE (CFS) = 0.5  |
| TIME (MIN) = 81  | DISCHARGE (CFS) = 0.6  |
| TIME (MIN) = 108 | DISCHARGE (CFS) = 0.7  |
| TIME (MIN) = 135 | DISCHARGE (CFS) = 0.7  |
| TIME (MIN) = 162 | DISCHARGE (CFS) = 0.9  |
| TIME (MIN) = 189 | DISCHARGE (CFS) = 1    |
| TIME (MIN) = 216 | DISCHARGE (CFS) = 1.5  |
| TIME (MIN) = 243 | DISCHARGE (CFS) = 0.9  |
| TIME (MIN) = 270 | DISCHARGE (CFS) = 8.47 |
| TIME (MIN) = 297 | DISCHARGE (CFS) = 1.2  |
| TIME (MIN) = 324 | DISCHARGE (CFS) = 0.8  |
| TIME (MIN) = 351 | DISCHARGE (CFS) = 0.6  |
| TIME (MIN) = 378 | DISCHARGE (CFS) = 0    |

RUN DATE 12/15/2021  
HYDROGRAPH FILE NAME Text1  
TIME OF CONCENTRATION 26 MIN.  
6 HOUR RAINFALL 1.4 INCHES  
BASIN AREA 19.44 ACRES  
RUNOFF COEFFICIENT 0.5  
PEAK DISCHARGE 13.25 CFS

|                  |                         |
|------------------|-------------------------|
| TIME (MIN) = 0   | DISCHARGE (CFS) = 0     |
| TIME (MIN) = 26  | DISCHARGE (CFS) = 0.8   |
| TIME (MIN) = 52  | DISCHARGE (CFS) = 0.9   |
| TIME (MIN) = 78  | DISCHARGE (CFS) = 1     |
| TIME (MIN) = 104 | DISCHARGE (CFS) = 1.1   |
| TIME (MIN) = 130 | DISCHARGE (CFS) = 1.2   |
| TIME (MIN) = 156 | DISCHARGE (CFS) = 1.5   |
| TIME (MIN) = 182 | DISCHARGE (CFS) = 1.7   |
| TIME (MIN) = 208 | DISCHARGE (CFS) = 2.5   |
| TIME (MIN) = 234 | DISCHARGE (CFS) = 2.6   |
| TIME (MIN) = 260 | DISCHARGE (CFS) = 13.25 |
| TIME (MIN) = 286 | DISCHARGE (CFS) = 2     |
| TIME (MIN) = 312 | DISCHARGE (CFS) = 1.3   |
| TIME (MIN) = 338 | DISCHARGE (CFS) = 1     |
| TIME (MIN) = 364 | DISCHARGE (CFS) = 0.9   |
| TIME (MIN) = 390 | DISCHARGE (CFS) = 0     |

RUN DATE 12/15/2021

HYDROGRAPH FILE NAME Text1

TIME OF CONCENTRATION 26 MIN.

6 HOUR RAINFALL 1.6 INCHES

BASIN AREA 19.44 ACRES

RUNOFF COEFFICIENT 0.5

PEAK DISCHARGE 15.6 CFS

|                  |                        |
|------------------|------------------------|
| TIME (MIN) = 0   | DISCHARGE (CFS) = 0    |
| TIME (MIN) = 26  | DISCHARGE (CFS) = 0.9  |
| TIME (MIN) = 52  | DISCHARGE (CFS) = 1    |
| TIME (MIN) = 78  | DISCHARGE (CFS) = 1.1  |
| TIME (MIN) = 104 | DISCHARGE (CFS) = 1.3  |
| TIME (MIN) = 130 | DISCHARGE (CFS) = 1.4  |
| TIME (MIN) = 156 | DISCHARGE (CFS) = 1.7  |
| TIME (MIN) = 182 | DISCHARGE (CFS) = 1.9  |
| TIME (MIN) = 208 | DISCHARGE (CFS) = 2.8  |
| TIME (MIN) = 234 | DISCHARGE (CFS) = 2.5  |
| TIME (MIN) = 260 | DISCHARGE (CFS) = 15.6 |
| TIME (MIN) = 286 | DISCHARGE (CFS) = 2.2  |
| TIME (MIN) = 312 | DISCHARGE (CFS) = 1.5  |
| TIME (MIN) = 338 | DISCHARGE (CFS) = 1.2  |
| TIME (MIN) = 364 | DISCHARGE (CFS) = 1    |
| TIME (MIN) = 390 | DISCHARGE (CFS) = 0    |

RUN DATE 12/15/2021

HYDROGRAPH FILE NAME Text1

TIME OF CONCENTRATION 26 MIN.

6 HOUR RAINFALL 1.8 INCHES

BASIN AREA 19.44 ACRES

RUNOFF COEFFICIENT 0.5

PEAK DISCHARGE 17.56 CFS

|                  |                         |
|------------------|-------------------------|
| TIME (MIN) = 0   | DISCHARGE (CFS) = 0     |
| TIME (MIN) = 26  | DISCHARGE (CFS) = 1.1   |
| TIME (MIN) = 52  | DISCHARGE (CFS) = 1.2   |
| TIME (MIN) = 78  | DISCHARGE (CFS) = 1.2   |
| TIME (MIN) = 104 | DISCHARGE (CFS) = 1.4   |
| TIME (MIN) = 130 | DISCHARGE (CFS) = 1.5   |
| TIME (MIN) = 156 | DISCHARGE (CFS) = 1.9   |
| TIME (MIN) = 182 | DISCHARGE (CFS) = 2.1   |
| TIME (MIN) = 208 | DISCHARGE (CFS) = 3.2   |
| TIME (MIN) = 234 | DISCHARGE (CFS) = 2.8   |
| TIME (MIN) = 260 | DISCHARGE (CFS) = 17.56 |
| TIME (MIN) = 286 | DISCHARGE (CFS) = 2.5   |
| TIME (MIN) = 312 | DISCHARGE (CFS) = 1.7   |
| TIME (MIN) = 338 | DISCHARGE (CFS) = 1.3   |
| TIME (MIN) = 364 | DISCHARGE (CFS) = 1.1   |
| TIME (MIN) = 390 | DISCHARGE (CFS) = 0     |

RUN DATE 12/15/2021

HYDROGRAPH FILE NAME Text1

TIME OF CONCENTRATION 26 MIN.

6 HOUR RAINFALL 2 INCHES

BASIN AREA 19.44 ACRES

RUNOFF COEFFICIENT 0.5

PEAK DISCHARGE 20.4 CFS

|                  |                        |
|------------------|------------------------|
| TIME (MIN) = 0   | DISCHARGE (CFS) = 0    |
| TIME (MIN) = 26  | DISCHARGE (CFS) = 1.2  |
| TIME (MIN) = 52  | DISCHARGE (CFS) = 1.3  |
| TIME (MIN) = 78  | DISCHARGE (CFS) = 1.4  |
| TIME (MIN) = 104 | DISCHARGE (CFS) = 1.6  |
| TIME (MIN) = 130 | DISCHARGE (CFS) = 1.7  |
| TIME (MIN) = 156 | DISCHARGE (CFS) = 2.1  |
| TIME (MIN) = 182 | DISCHARGE (CFS) = 2.4  |
| TIME (MIN) = 208 | DISCHARGE (CFS) = 3.5  |
| TIME (MIN) = 234 | DISCHARGE (CFS) = 2.2  |
| TIME (MIN) = 260 | DISCHARGE (CFS) = 20.4 |
| TIME (MIN) = 286 | DISCHARGE (CFS) = 2.8  |
| TIME (MIN) = 312 | DISCHARGE (CFS) = 1.9  |
| TIME (MIN) = 338 | DISCHARGE (CFS) = 1.5  |
| TIME (MIN) = 364 | DISCHARGE (CFS) = 1.2  |
| TIME (MIN) = 390 | DISCHARGE (CFS) = 0    |

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

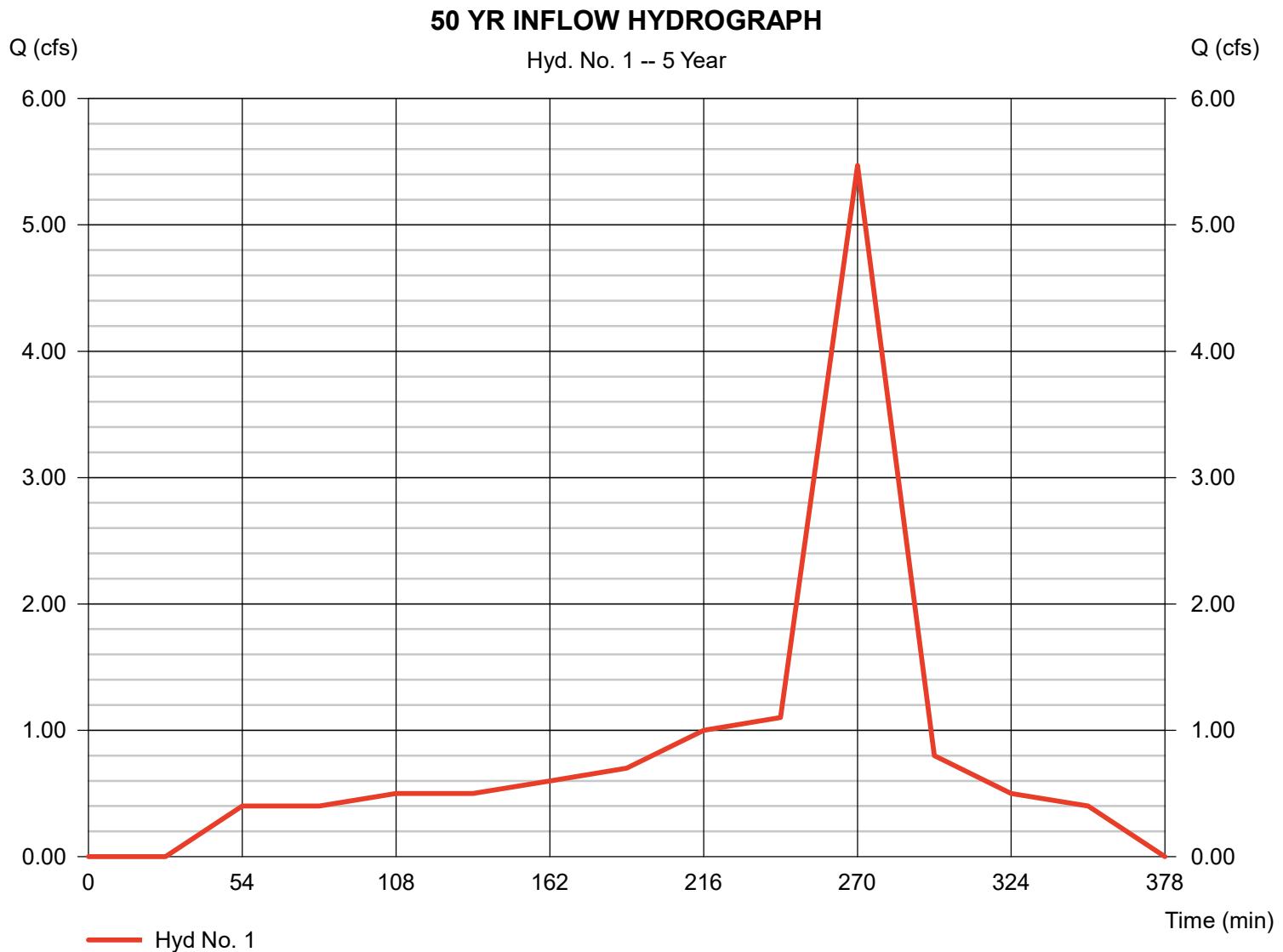
Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YR INFLOW HYDROGRAPH

Hydrograph type = Manual  
Storm frequency = 5 yrs  
Time interval = 27 min

Peak discharge = 5.470 cfs  
Time to peak = 270 min  
Hyd. volume = 20,039 cuft



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

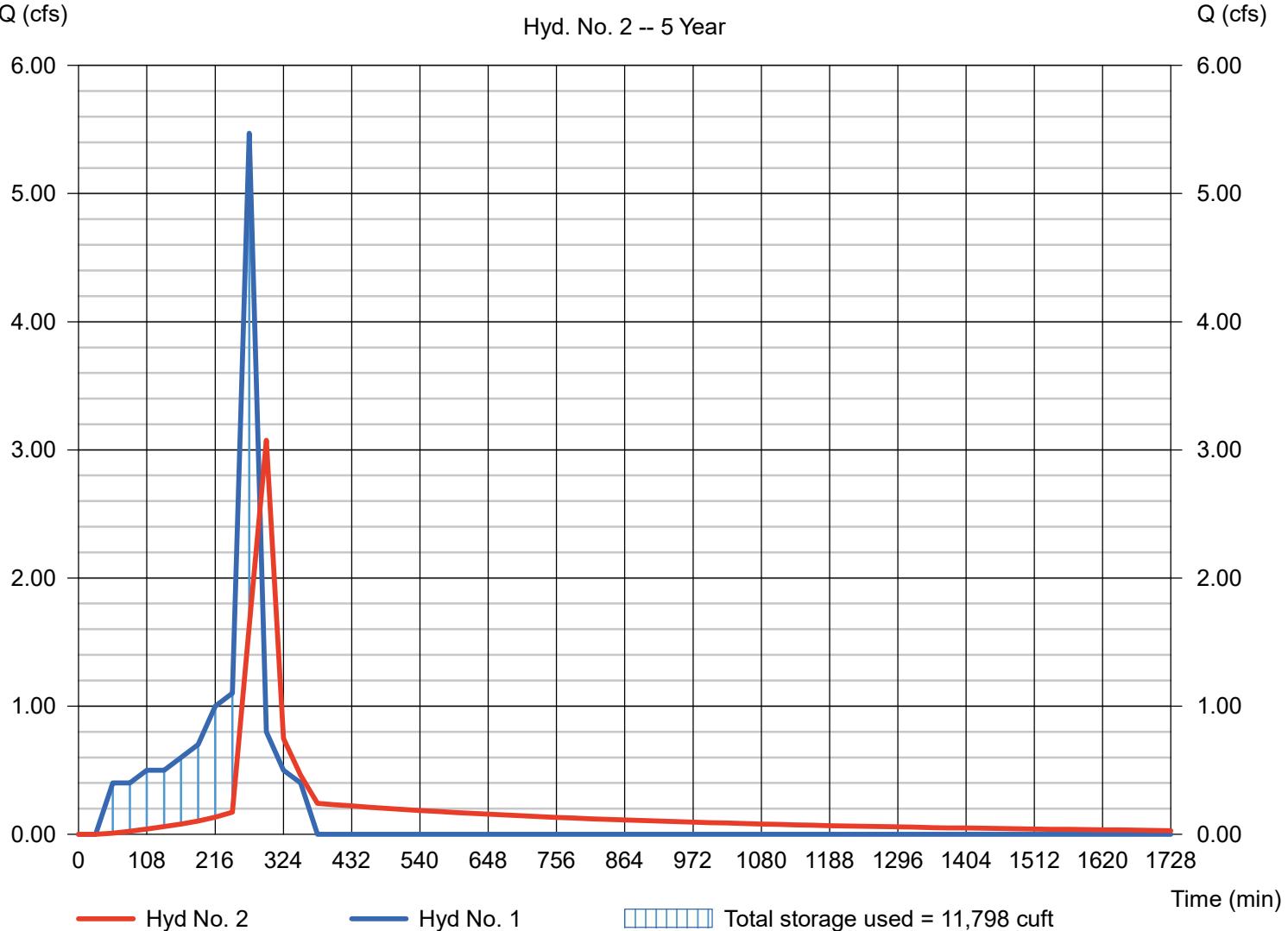
### BMP 1 ROUTING

|                 |                               |                |               |
|-----------------|-------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                   | Peak discharge | = 3.075 cfs   |
| Storm frequency | = 5 yrs                       | Time to peak   | = 297 min     |
| Time interval   | = 27 min                      | Hyd. volume    | = 20,001 cuft |
| Inflow hyd. No. | = 1 - 50 YR INFLOW HYDROGRAPH | Max. Elevation | = 494.23 ft   |
| Reservoir name  | = <New Pond>                  | Max. Storage   | = 11,798 cuft |

Storage Indication method used.

### BMP 1 ROUTING

Hyd. No. 2 -- 5 Year



# Pond Report

3

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Pond No. 1 - <New Pond>

### Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 493.50 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|------------|----------------|---------------------|----------------------|----------------------|
| 0.00       | 493.50         | 15,044              | 0                    | 0                    |
| 2.50       | 496.00         | 22,208              | 46,565               | 46,565               |

### Culvert / Orifice Structures

### Weir Structures

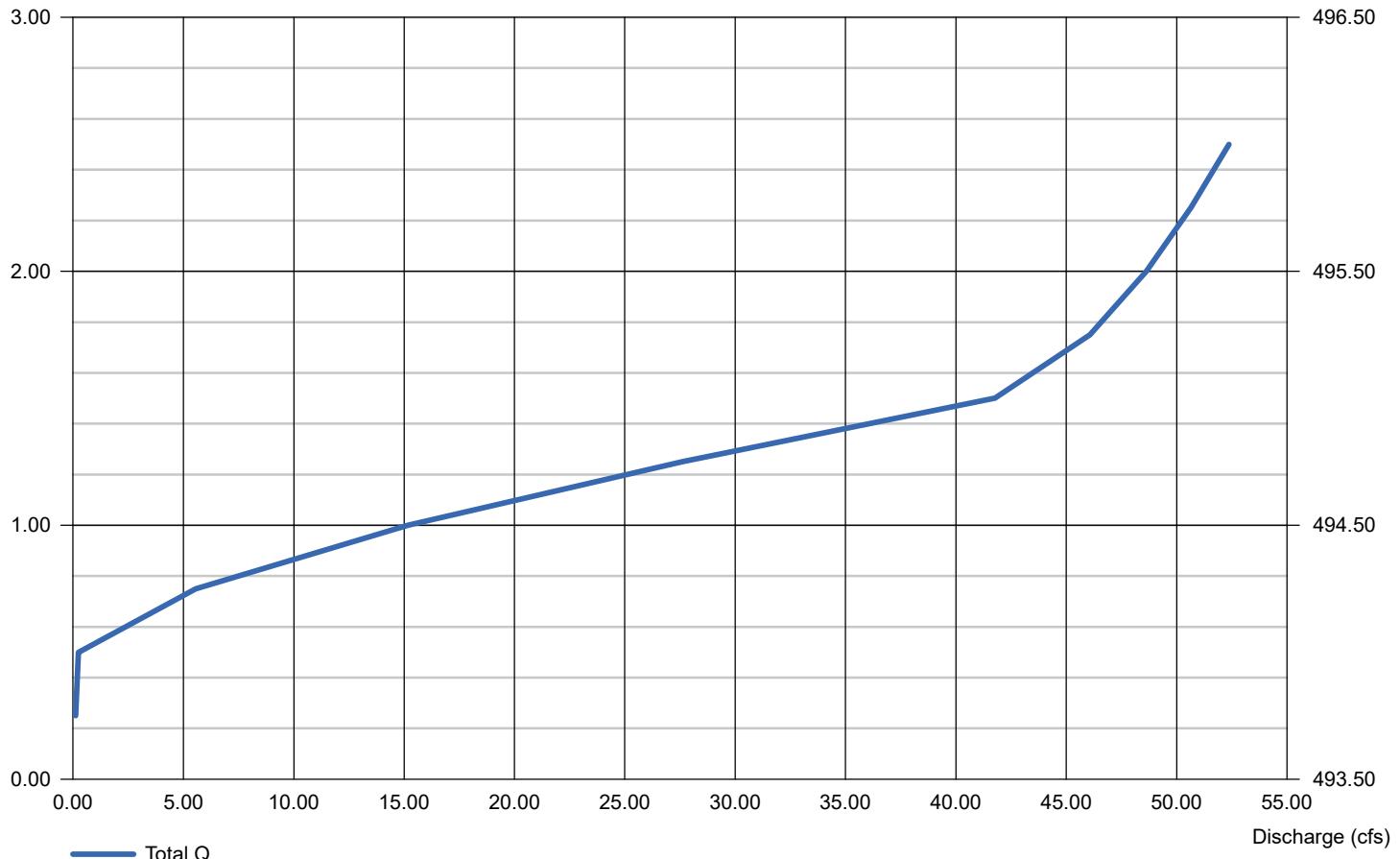
|                 | [A]      | [B]    | [C]  | [PrfRsr] |                | [A]                   | [B]  | [C]  | [D]  |
|-----------------|----------|--------|------|----------|----------------|-----------------------|------|------|------|
| Rise (in)       | = 30.00  | 4.00   | 0.00 | 0.00     | Crest Len (ft) | = 12.56               | 0.00 | 0.00 | 0.00 |
| Span (in)       | = 30.00  | 4.00   | 0.00 | 0.00     | Crest El. (ft) | = 494.00              | 0.00 | 0.00 | 0.00 |
| No. Barrels     | = 1      | 1      | 0    | 0        | Weir Coeff.    | = 3.33                | 3.33 | 3.33 | 3.33 |
| Invert El. (ft) | = 489.80 | 493.50 | 0.00 | 0.00     | Weir Type      | = Riser               | ---  | ---  | ---  |
| Length (ft)     | = 20.00  | 0.00   | 0.00 | 0.00     | Multi-Stage    | = Yes                 | No   | No   | No   |
| Slope (%)       | = 0.50   | 0.00   | 0.00 | n/a      | Exfil.(in/hr)  | = 0.000 (by Wet area) |      |      |      |
| N-Value         | = .013   | .013   | .013 | n/a      | TW Elev. (ft)  | = 0.00                |      |      |      |
| Orifice Coeff.  | = 0.60   | 0.60   | 0.60 | 0.60     |                |                       |      |      |      |
| Multi-Stage     | = n/a    | No     | No   | No       |                |                       |      |      |      |

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

Stage (ft)

### Stage / Discharge

Elev (ft)



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

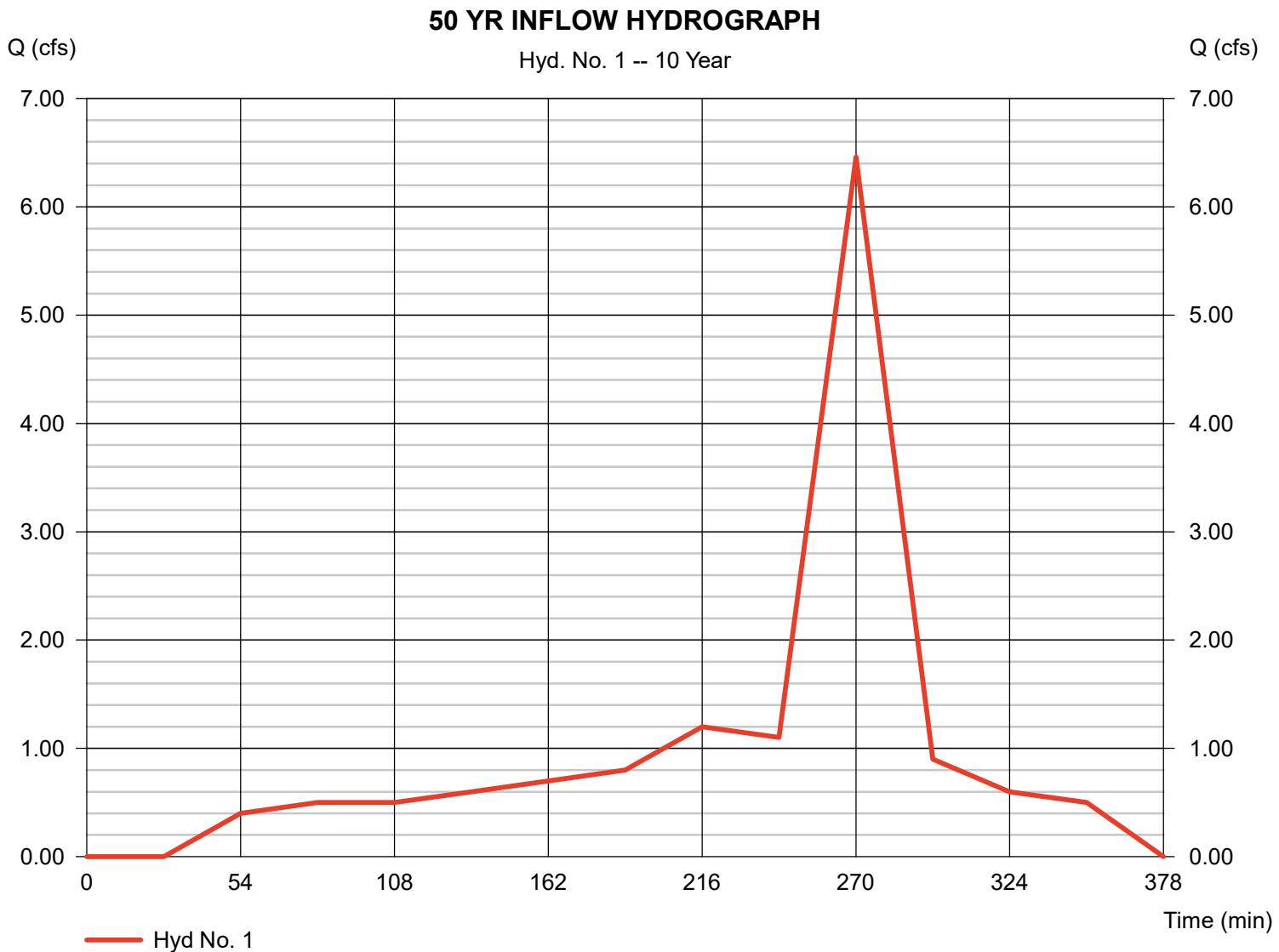
Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YR INFLOW HYDROGRAPH

Hydrograph type = Manual  
Storm frequency = 10 yrs  
Time interval = 27 min

Peak discharge = 6.460 cfs  
Time to peak = 270 min  
Hyd. volume = 23,101 cuft



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

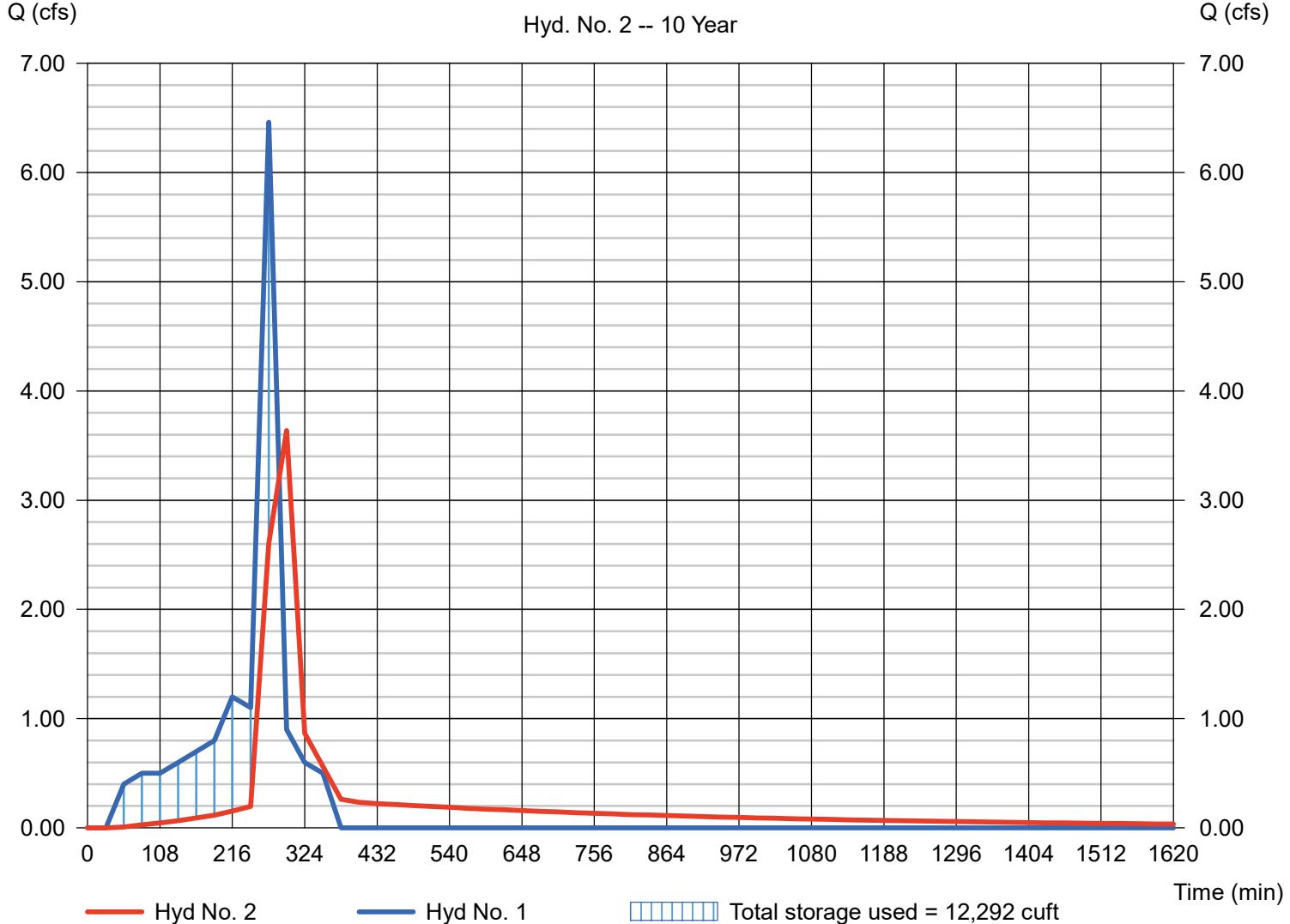
### BMP 1 ROUTING

|                 |                               |                |               |
|-----------------|-------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                   | Peak discharge | = 3.637 cfs   |
| Storm frequency | = 10 yrs                      | Time to peak   | = 297 min     |
| Time interval   | = 27 min                      | Hyd. volume    | = 23,062 cuft |
| Inflow hyd. No. | = 1 - 50 YR INFLOW HYDROGRAPH | Max. Elevation | = 494.28 ft   |
| Reservoir name  | = <New Pond>                  | Max. Storage   | = 12,292 cuft |

Storage Indication method used.

### BMP 1 ROUTING

Hyd. No. 2 -- 10 Year



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

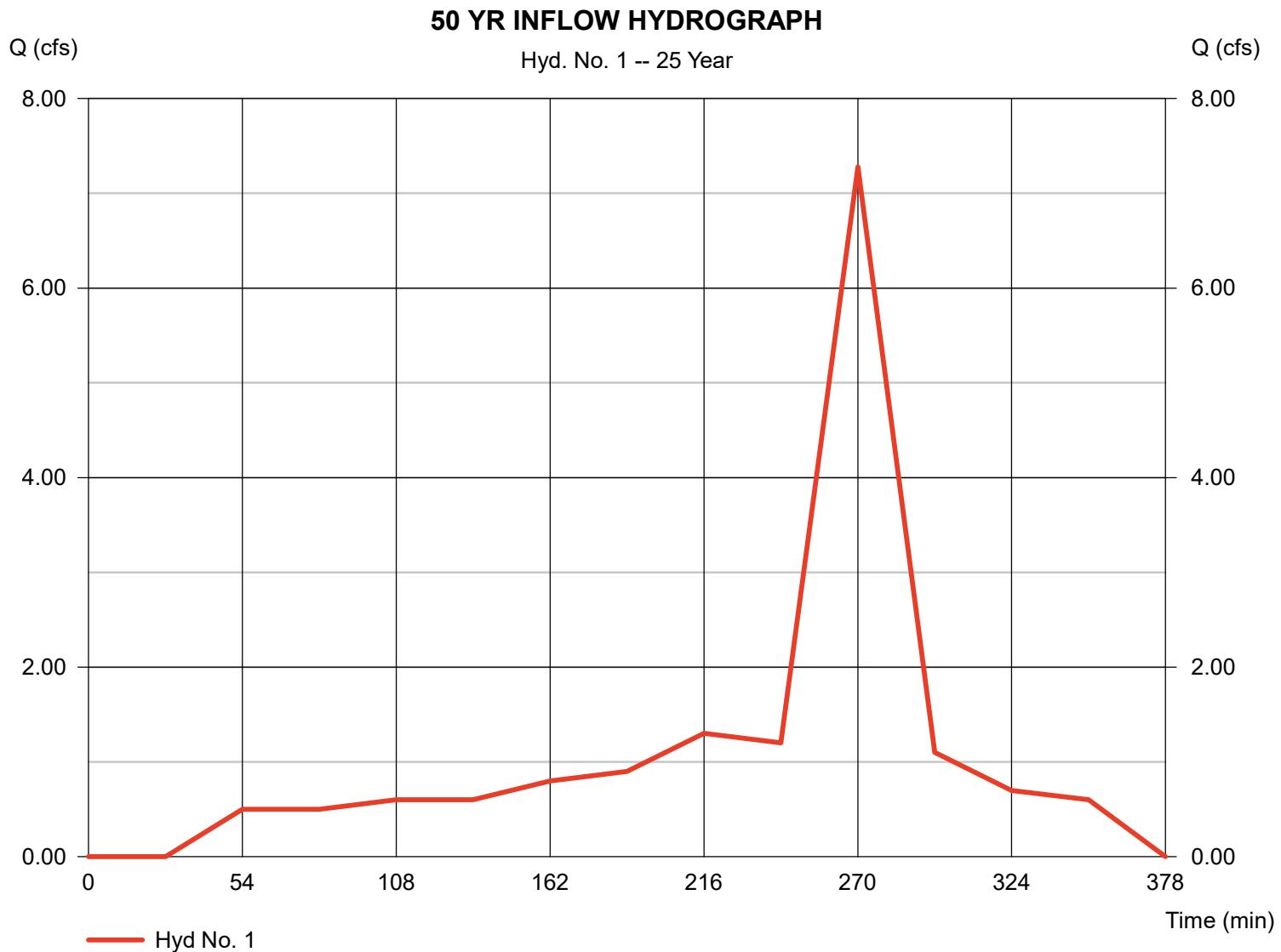
Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YR INFLOW HYDROGRAPH

Hydrograph type = Manual  
Storm frequency = 25 yrs  
Time interval = 27 min

Peak discharge = 7.280 cfs  
Time to peak = 270 min  
Hyd. volume = 26,050 cuft



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

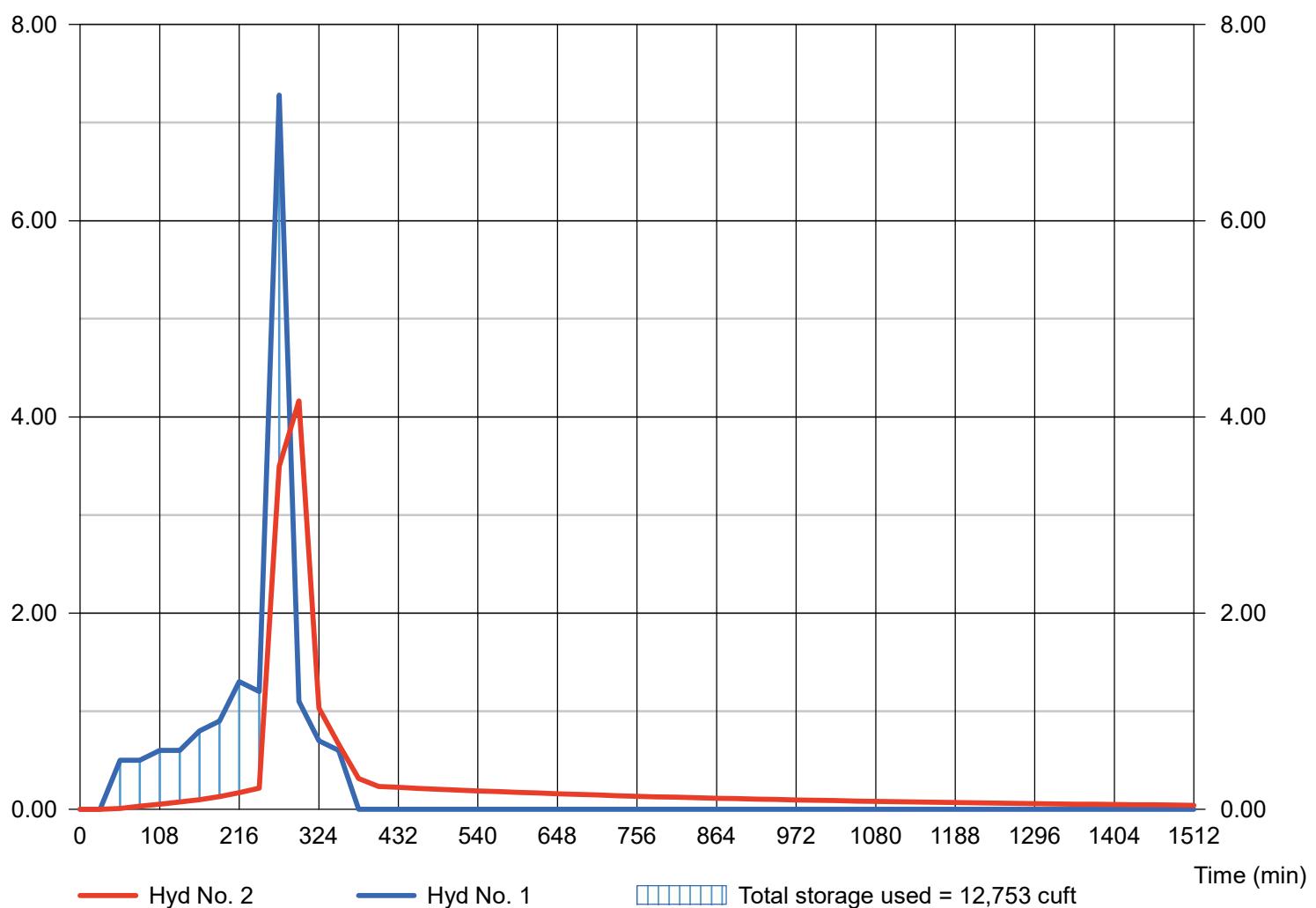
### BMP 1 ROUTING

|                 |                               |                |               |
|-----------------|-------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                   | Peak discharge | = 4.162 cfs   |
| Storm frequency | = 25 yrs                      | Time to peak   | = 297 min     |
| Time interval   | = 27 min                      | Hyd. volume    | = 26,011 cuft |
| Inflow hyd. No. | = 1 - 50 YR INFLOW HYDROGRAPH | Max. Elevation | = 494.32 ft   |
| Reservoir name  | = <New Pond>                  | Max. Storage   | = 12,753 cuft |

Storage Indication method used.

### BMP 1 ROUTING

Hyd. No. 2 -- 25 Year



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

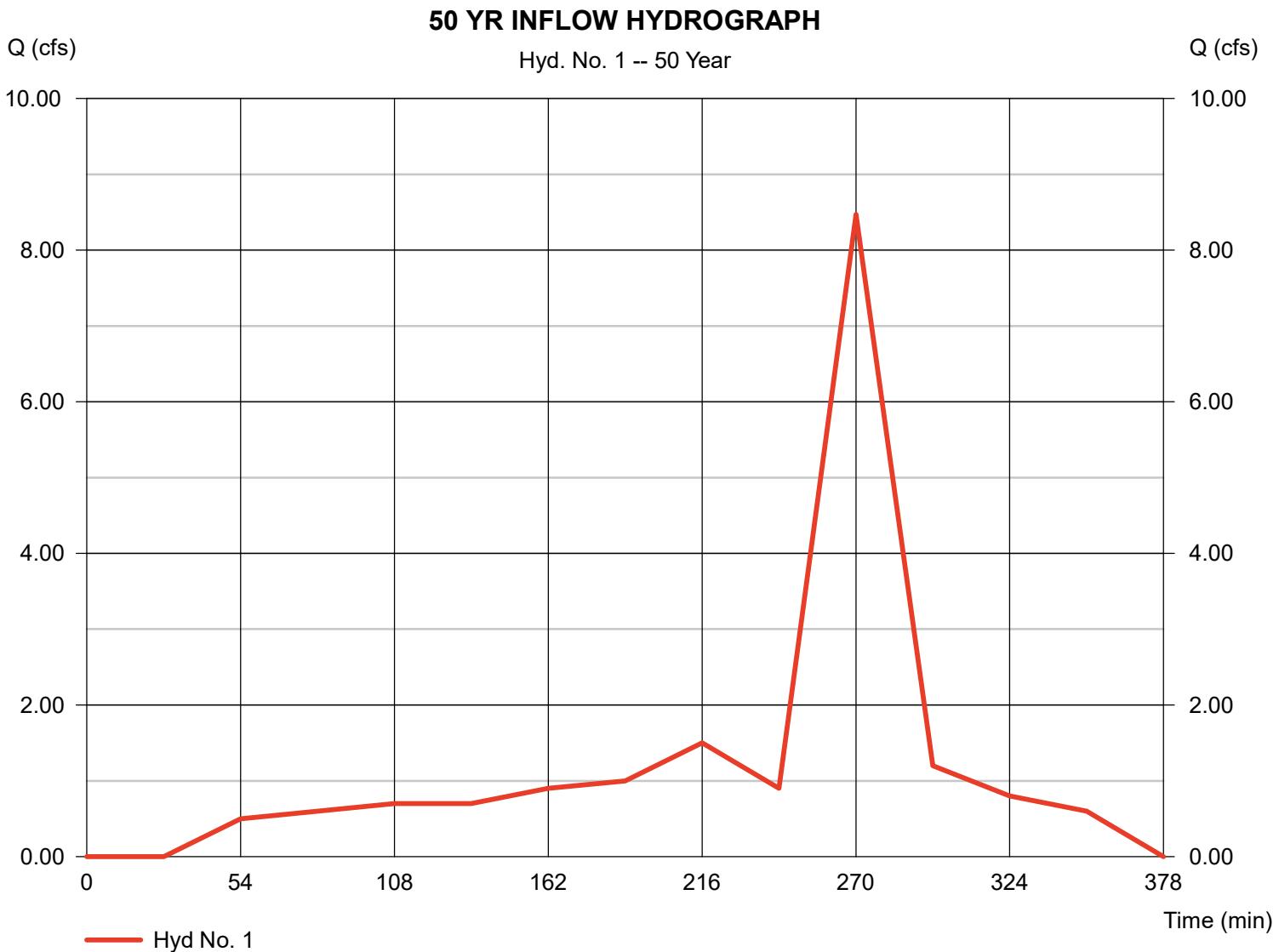
Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YR INFLOW HYDROGRAPH

Hydrograph type = Manual  
Storm frequency = 50 yrs  
Time interval = 27 min

Peak discharge = 8.470 cfs  
Time to peak = 270 min  
Hyd. volume = 28,949 cuft



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

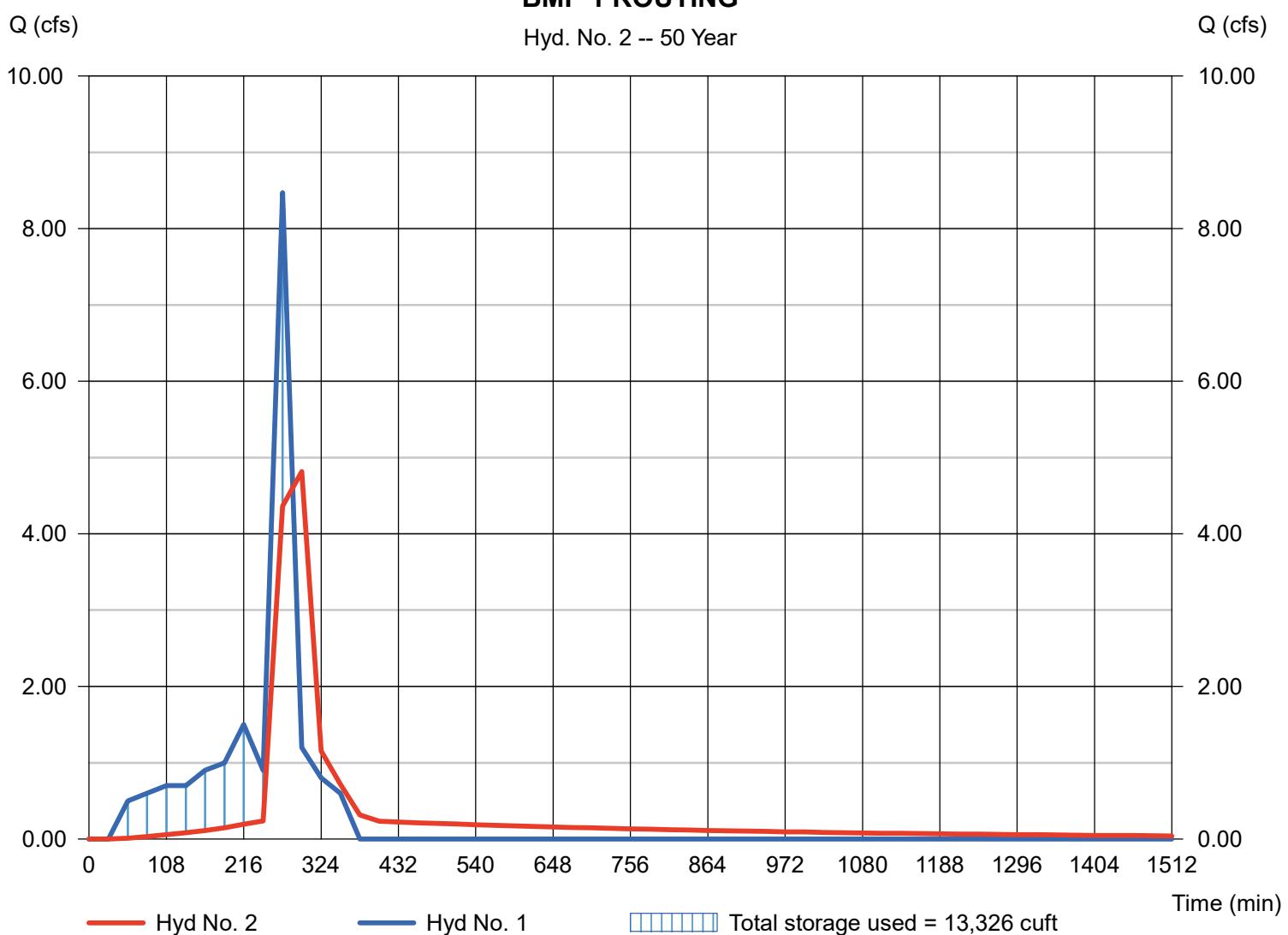
### BMP 1 ROUTING

|                 |                               |                |               |
|-----------------|-------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                   | Peak discharge | = 4.816 cfs   |
| Storm frequency | = 50 yrs                      | Time to peak   | = 297 min     |
| Time interval   | = 27 min                      | Hyd. volume    | = 28,910 cuft |
| Inflow hyd. No. | = 1 - 50 YR INFLOW HYDROGRAPH | Max. Elevation | = 494.37 ft   |
| Reservoir name  | = <New Pond>                  | Max. Storage   | = 13,326 cuft |

Storage Indication method used.

### BMP 1 ROUTING

Hyd. No. 2 -- 50 Year



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YR INFLOW HYDROGRAPH

|                 |          |                |               |
|-----------------|----------|----------------|---------------|
| Hydrograph type | = Manual | Peak discharge | = 5.470 cfs   |
| Storm frequency | = 5 yrs  | Time to peak   | = 270 min     |
| Time interval   | = 27 min | Hyd. volume    | = 20,039 cuft |

### Hydrograph Discharge Table

( Printed values >= 1.00% of Qp.)

#### Time -- Outflow

(min      cfs)

|     |          |
|-----|----------|
| 54  | 0.400    |
| 81  | 0.400    |
| 108 | 0.500    |
| 135 | 0.500    |
| 162 | 0.600    |
| 189 | 0.700    |
| 216 | 1.000    |
| 243 | 1.100    |
| 270 | 5.470 << |
| 297 | 0.800    |
| 324 | 0.500    |
| 351 | 0.400    |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

### BMP 1 ROUTING

|                 |                               |                |               |
|-----------------|-------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                   | Peak discharge | = 3.075 cfs   |
| Storm frequency | = 5 yrs                       | Time to peak   | = 297 min     |
| Time interval   | = 27 min                      | Hyd. volume    | = 20,001 cuft |
| Inflow hyd. No. | = 1 - 50 YR INFLOW HYDROGRAPH | Reservoir name | = <New Pond>  |
| Max. Elevation  | = 494.23 ft                   | Max. Storage   | = 11,798 cuft |

Storage Indication method used.

### Hydrograph Discharge Table

( Printed values &gt;= 1.00% of Qp.)

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 108           | 0.500         | 493.59          | 12.00        | 0.041        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.041          |
| 135           | 0.500         | 493.63          | 17.42        | 0.060        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.060          |
| 162           | 0.600         | 493.67          | 23.19        | 0.080        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.080          |
| 189           | 0.700         | 493.72          | 29.92        | 0.103        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.103          |
| 216           | 1.000         | 493.78          | 34.62        | 0.134        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.134          |
| 243           | 1.100         | 493.86          | 34.62        | 0.173        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.173          |
| 270           | 5.470 <<      | 494.07          | 34.62        | 0.263        | ----         | ----         | 1.363       | ----        | ----        | ----        | ----         | 1.626          |
| 297           | 0.800         | 494.13 <<       | 34.62        | 0.284        | ----         | ----         | 2.790       | ----        | ----        | ----        | ----         | 3.075 <<       |
| 324           | 0.500         | 494.02          | 34.62        | 0.250        | ----         | ----         | 0.497       | ----        | ----        | ----        | ----         | 0.747          |
| 351           | 0.400         | 494.01          | 34.62        | 0.246        | ----         | ----         | 0.216       | ----        | ----        | ----        | ----         | 0.462          |
| 378           | 0.000         | 494.00          | 34.62        | 0.241        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.241          |
| 405           | 0.000         | 493.98          | 34.62        | 0.231        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.231          |
| 432           | 0.000         | 493.96          | 34.62        | 0.221        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.221          |
| 459           | 0.000         | 493.94          | 34.62        | 0.212        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.212          |
| 486           | 0.000         | 493.92          | 34.62        | 0.203        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.203          |
| 513           | 0.000         | 493.90          | 34.62        | 0.195        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.195          |
| 540           | 0.000         | 493.89          | 34.62        | 0.187        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.187          |
| 567           | 0.000         | 493.87          | 34.62        | 0.179        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.179          |
| 594           | 0.000         | 493.86          | 34.62        | 0.171        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.171          |
| 621           | 0.000         | 493.84          | 34.62        | 0.164        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.164          |
| 648           | 0.000         | 493.83          | 34.62        | 0.157        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.157          |
| 675           | 0.000         | 493.81          | 34.62        | 0.151        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.151          |
| 702           | 0.000         | 493.80          | 34.62        | 0.144        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.144          |
| 729           | 0.000         | 493.79          | 34.62        | 0.138        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.138          |
| 756           | 0.000         | 493.78          | 34.62        | 0.132        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.132          |
| 783           | 0.000         | 493.76          | 34.62        | 0.127        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.127          |
| 810           | 0.000         | 493.75          | 34.62        | 0.122        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.122          |
| 837           | 0.000         | 493.74          | 33.75        | 0.117        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.117          |
| 864           | 0.000         | 493.73          | 32.38        | 0.112        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.112          |
| 891           | 0.000         | 493.72          | 31.05        | 0.107        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.107          |
| 918           | 0.000         | 493.72          | 29.79        | 0.103        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.103          |
| 945           | 0.000         | 493.71          | 28.58        | 0.099        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.099          |
| 972           | 0.000         | 493.70          | 27.41        | 0.095        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.095          |
| 999           | 0.000         | 493.69          | 26.30        | 0.091        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.091          |
| 1026          | 0.000         | 493.68          | 25.22        | 0.087        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.087          |
| 1053          | 0.000         | 493.67          | 24.20        | 0.084        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.084          |
| 1080          | 0.000         | 493.67          | 23.21        | 0.080        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.080          |
| 1107          | 0.000         | 493.66          | 22.26        | 0.077        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.077          |
| 1134          | 0.000         | 493.65          | 21.36        | 0.074        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.074          |
| 1161          | 0.000         | 493.65          | 20.49        | 0.071        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.071          |
| 1188          | 0.000         | 493.64          | 19.65        | 0.068        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.068          |
| 1215          | 0.000         | 493.64          | 18.85        | 0.065        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.065          |

Continues on next page...

BMP 1 ROUTING

**Hydrograph Discharge Table**

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 1242          | 0.000         | 493.63          | 18.08        | 0.062        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.062          |
| 1269          | 0.000         | 493.63          | 17.34        | 0.060        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.060          |
| 1296          | 0.000         | 493.62          | 16.64        | 0.057        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.057          |
| 1323          | 0.000         | 493.62          | 15.96        | 0.055        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.055          |
| 1350          | 0.000         | 493.61          | 15.31        | 0.053        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.053          |
| 1377          | 0.000         | 493.61          | 14.68        | 0.051        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.051          |
| 1404          | 0.000         | 493.60          | 14.08        | 0.049        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.049          |
| 1431          | 0.000         | 493.60          | 13.51        | 0.047        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.047          |
| 1458          | 0.000         | 493.59          | 12.96        | 0.045        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.045          |
| 1485          | 0.000         | 493.59          | 12.43        | 0.043        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.043          |
| 1512          | 0.000         | 493.59          | 11.92        | 0.041        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.041          |
| 1539          | 0.000         | 493.58          | 11.44        | 0.040        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.040          |
| 1566          | 0.000         | 493.58          | 10.97        | 0.038        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.038          |
| 1593          | 0.000         | 493.58          | 10.53        | 0.036        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.036          |
| 1620          | 0.000         | 493.57          | 10.10        | 0.035        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.035          |
| 1647          | 0.000         | 493.57          | 9.685        | 0.033        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.033          |
| 1674          | 0.000         | 493.57          | 9.292        | 0.032        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.032          |
| 1701          | 0.000         | 493.56          | 8.912        | 0.031        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.031          |

*...End*

# Pond Report

4

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Pond No. 1 - <New Pond>

### Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 493.50 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|------------|----------------|---------------------|----------------------|----------------------|
| 0.00       | 493.50         | 15,044              | 0                    | 0                    |
| 2.50       | 496.00         | 22,208              | 46,565               | 46,565               |

### Culvert / Orifice Structures

### Weir Structures

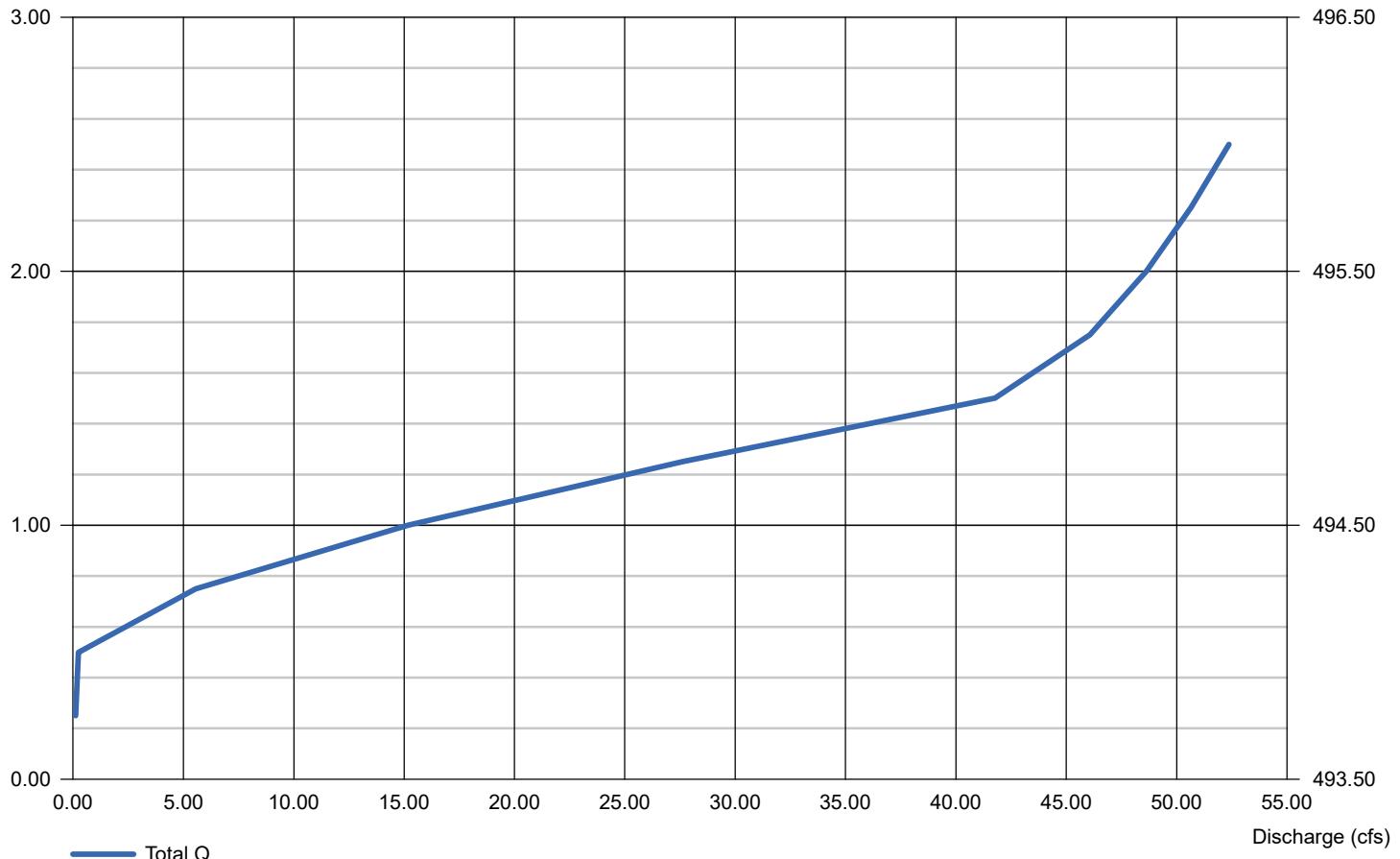
|                 | [A]      | [B]    | [C]  | [PrfRsr] |                | [A]                   | [B]  | [C]  | [D]  |
|-----------------|----------|--------|------|----------|----------------|-----------------------|------|------|------|
| Rise (in)       | = 30.00  | 4.00   | 0.00 | 0.00     | Crest Len (ft) | = 12.56               | 0.00 | 0.00 | 0.00 |
| Span (in)       | = 30.00  | 4.00   | 0.00 | 0.00     | Crest El. (ft) | = 494.00              | 0.00 | 0.00 | 0.00 |
| No. Barrels     | = 1      | 1      | 0    | 0        | Weir Coeff.    | = 3.33                | 3.33 | 3.33 | 3.33 |
| Invert El. (ft) | = 489.80 | 493.50 | 0.00 | 0.00     | Weir Type      | = Riser               | ---  | ---  | ---  |
| Length (ft)     | = 20.00  | 0.00   | 0.00 | 0.00     | Multi-Stage    | = Yes                 | No   | No   | No   |
| Slope (%)       | = 0.50   | 0.00   | 0.00 | n/a      | Exfil.(in/hr)  | = 0.000 (by Wet area) |      |      |      |
| N-Value         | = .013   | .013   | .013 | n/a      | TW Elev. (ft)  | = 0.00                |      |      |      |
| Orifice Coeff.  | = 0.60   | 0.60   | 0.60 | 0.60     |                |                       |      |      |      |
| Multi-Stage     | = n/a    | No     | No   | No       |                |                       |      |      |      |

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

Stage (ft)

### Stage / Discharge

Elev (ft)



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YR INFLOW HYDROGRAPH

|                 |          |                |               |
|-----------------|----------|----------------|---------------|
| Hydrograph type | = Manual | Peak discharge | = 6.460 cfs   |
| Storm frequency | = 10 yrs | Time to peak   | = 270 min     |
| Time interval   | = 27 min | Hyd. volume    | = 23,101 cuft |

### Hydrograph Discharge Table

( Printed values >= 1.00% of Qp.)

#### Time -- Outflow (min      cfs)

|     |          |
|-----|----------|
| 54  | 0.400    |
| 81  | 0.500    |
| 108 | 0.500    |
| 135 | 0.600    |
| 162 | 0.700    |
| 189 | 0.800    |
| 216 | 1.200    |
| 243 | 1.100    |
| 270 | 6.460 << |
| 297 | 0.900    |
| 324 | 0.600    |
| 351 | 0.500    |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

### BMP 1 ROUTING

|                 |                               |                |               |
|-----------------|-------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                   | Peak discharge | = 3.637 cfs   |
| Storm frequency | = 10 yrs                      | Time to peak   | = 297 min     |
| Time interval   | = 27 min                      | Hyd. volume    | = 23,062 cuft |
| Inflow hyd. No. | = 1 - 50 YR INFLOW HYDROGRAPH | Reservoir name | = <New Pond>  |
| Max. Elevation  | = 494.28 ft                   | Max. Storage   | = 12,292 cuft |

Storage Indication method used.

### Hydrograph Discharge Table

( Printed values &gt;= 1.00% of Qp.)

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 108           | 0.500         | 493.60          | 13.16        | 0.045        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.045          |
| 135           | 0.600         | 493.64          | 19.12        | 0.066        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.066          |
| 162           | 0.700         | 493.69          | 26.00        | 0.090        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.090          |
| 189           | 0.800         | 493.74          | 33.79        | 0.117        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.117          |
| 216           | 1.200         | 493.82          | 34.62        | 0.154        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.154          |
| 243           | 1.100         | 493.90          | 34.62        | 0.195        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.195          |
| 270           | 6.460 <<      | 494.11          | 34.62        | 0.277        | ----         | ----         | 2.326       | ----        | ----        | ----        | ----         | 2.603          |
| 297           | 0.900         | 494.16 <<       | 34.62        | 0.293        | ----         | ----         | 3.344       | ----        | ----        | ----        | ----         | 3.637 <<       |
| 324           | 0.600         | 494.03          | 34.62        | 0.252        | ----         | ----         | 0.614       | ----        | ----        | ----        | ----         | 0.866          |
| 351           | 0.500         | 494.02          | 34.62        | 0.247        | ----         | ----         | 0.315       | ----        | ----        | ----        | ----         | 0.563          |
| 378           | 0.000         | 494.00          | 34.62        | 0.243        | ----         | ----         | 0.020       | ----        | ----        | ----        | ----         | 0.263          |
| 405           | 0.000         | 493.98          | 34.62        | 0.232        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.232          |
| 432           | 0.000         | 493.96          | 34.62        | 0.223        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.223          |
| 459           | 0.000         | 493.94          | 34.62        | 0.213        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.213          |
| 486           | 0.000         | 493.92          | 34.62        | 0.204        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.204          |
| 513           | 0.000         | 493.91          | 34.62        | 0.196        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.196          |
| 540           | 0.000         | 493.89          | 34.62        | 0.188        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.188          |
| 567           | 0.000         | 493.87          | 34.62        | 0.180        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.180          |
| 594           | 0.000         | 493.86          | 34.62        | 0.172        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.172          |
| 621           | 0.000         | 493.84          | 34.62        | 0.165        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.165          |
| 648           | 0.000         | 493.83          | 34.62        | 0.158        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.158          |
| 675           | 0.000         | 493.81          | 34.62        | 0.152        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.152          |
| 702           | 0.000         | 493.80          | 34.62        | 0.145        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.145          |
| 729           | 0.000         | 493.79          | 34.62        | 0.139        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.139          |
| 756           | 0.000         | 493.78          | 34.62        | 0.133        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.133          |
| 783           | 0.000         | 493.77          | 34.62        | 0.128        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.128          |
| 810           | 0.000         | 493.76          | 34.62        | 0.122        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.122          |
| 837           | 0.000         | 493.75          | 33.95        | 0.117        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.117          |
| 864           | 0.000         | 493.74          | 32.56        | 0.112        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.112          |
| 891           | 0.000         | 493.73          | 31.23        | 0.108        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.108          |
| 918           | 0.000         | 493.72          | 29.96        | 0.104        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.104          |
| 945           | 0.000         | 493.71          | 28.74        | 0.099        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.099          |
| 972           | 0.000         | 493.70          | 27.57        | 0.095        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.095          |
| 999           | 0.000         | 493.69          | 26.45        | 0.091        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.091          |
| 1026          | 0.000         | 493.68          | 25.37        | 0.088        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.088          |
| 1053          | 0.000         | 493.68          | 24.33        | 0.084        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.084          |
| 1080          | 0.000         | 493.67          | 23.34        | 0.081        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.081          |
| 1107          | 0.000         | 493.66          | 22.39        | 0.077        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.077          |
| 1134          | 0.000         | 493.66          | 21.48        | 0.074        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.074          |
| 1161          | 0.000         | 493.65          | 20.60        | 0.071        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.071          |
| 1188          | 0.000         | 493.64          | 19.76        | 0.068        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.068          |
| 1215          | 0.000         | 493.64          | 18.96        | 0.065        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.065          |

Continues on next page...

BMP 1 ROUTING

**Hydrograph Discharge Table**

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 1242          | 0.000         | 493.63          | 18.19        | 0.063        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.063          |
| 1269          | 0.000         | 493.63          | 17.44        | 0.060        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.060          |
| 1296          | 0.000         | 493.62          | 16.73        | 0.058        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.058          |
| 1323          | 0.000         | 493.62          | 16.05        | 0.055        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.055          |
| 1350          | 0.000         | 493.61          | 15.40        | 0.053        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.053          |
| 1377          | 0.000         | 493.61          | 14.77        | 0.051        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.051          |
| 1404          | 0.000         | 493.60          | 14.17        | 0.049        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.049          |
| 1431          | 0.000         | 493.60          | 13.59        | 0.047        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.047          |
| 1458          | 0.000         | 493.59          | 13.04        | 0.045        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.045          |
| 1485          | 0.000         | 493.59          | 12.50        | 0.043        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.043          |
| 1512          | 0.000         | 493.59          | 12.00        | 0.041        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.041          |
| 1539          | 0.000         | 493.58          | 11.51        | 0.040        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.040          |
| 1566          | 0.000         | 493.58          | 11.04        | 0.038        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.038          |
| 1593          | 0.000         | 493.58          | 10.59        | 0.037        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.037          |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YR INFLOW HYDROGRAPH

|                 |          |                |               |
|-----------------|----------|----------------|---------------|
| Hydrograph type | = Manual | Peak discharge | = 7.280 cfs   |
| Storm frequency | = 25 yrs | Time to peak   | = 270 min     |
| Time interval   | = 27 min | Hyd. volume    | = 26,050 cuft |

### Hydrograph Discharge Table

( Printed values >= 1.00% of Qp.)

#### Time -- Outflow

(min      cfs)

|     |          |
|-----|----------|
| 54  | 0.500    |
| 81  | 0.500    |
| 108 | 0.600    |
| 135 | 0.600    |
| 162 | 0.800    |
| 189 | 0.900    |
| 216 | 1.300    |
| 243 | 1.200    |
| 270 | 7.280 << |
| 297 | 1.100    |
| 324 | 0.700    |
| 351 | 0.600    |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

### BMP 1 ROUTING

|                 |                               |                |               |
|-----------------|-------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                   | Peak discharge | = 4.162 cfs   |
| Storm frequency | = 25 yrs                      | Time to peak   | = 297 min     |
| Time interval   | = 27 min                      | Hyd. volume    | = 26,011 cuft |
| Inflow hyd. No. | = 1 - 50 YR INFLOW HYDROGRAPH | Reservoir name | = <New Pond>  |
| Max. Elevation  | = 494.32 ft                   | Max. Storage   | = 12,753 cuft |

Storage Indication method used.

### Hydrograph Discharge Table

( Printed values &gt;= 1.00% of Qp.)

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 108           | 0.600         | 493.61          | 14.86        | 0.051        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.051          |
| 135           | 0.600         | 493.65          | 21.33        | 0.074        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.074          |
| 162           | 0.800         | 493.71          | 28.72        | 0.099        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.099          |
| 189           | 0.900         | 493.77          | 34.62        | 0.130        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.130          |
| 216           | 1.300         | 493.85          | 34.62        | 0.171        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.171          |
| 243           | 1.200         | 493.95          | 34.62        | 0.216        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.216          |
| 270           | 7.280 <<      | 494.15          | 34.62        | 0.291        | ----         | ----         | 3.205       | ----        | ----        | ----        | ----         | 3.496          |
| 297           | 1.100         | 494.18 <<       | 34.62        | 0.300        | ----         | ----         | 3.862       | ----        | ----        | ----        | ----         | 4.162 <<       |
| 324           | 0.700         | 494.04          | 34.62        | 0.254        | ----         | ----         | 0.776       | ----        | ----        | ----        | ----         | 1.031          |
| 351           | 0.600         | 494.02          | 34.62        | 0.249        | ----         | ----         | 0.417       | ----        | ----        | ----        | ----         | 0.665          |
| 378           | 0.000         | 494.00          | 34.62        | 0.244        | ----         | ----         | 0.071       | ----        | ----        | ----        | ----         | 0.315          |
| 405           | 0.000         | 493.98          | 34.62        | 0.233        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.233          |
| 432           | 0.000         | 493.96          | 34.62        | 0.223        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.223          |
| 459           | 0.000         | 493.94          | 34.62        | 0.213        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.213          |
| 486           | 0.000         | 493.92          | 34.62        | 0.205        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.205          |
| 513           | 0.000         | 493.91          | 34.62        | 0.196        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.196          |
| 540           | 0.000         | 493.89          | 34.62        | 0.188        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.188          |
| 567           | 0.000         | 493.87          | 34.62        | 0.180        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.180          |
| 594           | 0.000         | 493.86          | 34.62        | 0.172        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.172          |
| 621           | 0.000         | 493.84          | 34.62        | 0.165        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.165          |
| 648           | 0.000         | 493.83          | 34.62        | 0.158        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.158          |
| 675           | 0.000         | 493.82          | 34.62        | 0.152        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.152          |
| 702           | 0.000         | 493.80          | 34.62        | 0.145        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.145          |
| 729           | 0.000         | 493.79          | 34.62        | 0.139        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.139          |
| 756           | 0.000         | 493.78          | 34.62        | 0.133        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.133          |
| 783           | 0.000         | 493.77          | 34.62        | 0.128        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.128          |
| 810           | 0.000         | 493.76          | 34.62        | 0.122        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.122          |
| 837           | 0.000         | 493.75          | 33.96        | 0.117        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.117          |
| 864           | 0.000         | 493.74          | 32.57        | 0.113        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.113          |
| 891           | 0.000         | 493.73          | 31.25        | 0.108        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.108          |
| 918           | 0.000         | 493.72          | 29.97        | 0.104        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.104          |
| 945           | 0.000         | 493.71          | 28.75        | 0.099        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.099          |
| 972           | 0.000         | 493.70          | 27.58        | 0.095        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.095          |
| 999           | 0.000         | 493.69          | 26.46        | 0.091        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.091          |
| 1026          | 0.000         | 493.68          | 25.38        | 0.088        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.088          |
| 1053          | 0.000         | 493.68          | 24.34        | 0.084        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.084          |
| 1080          | 0.000         | 493.67          | 23.35        | 0.081        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.081          |
| 1107          | 0.000         | 493.66          | 22.40        | 0.077        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.077          |
| 1134          | 0.000         | 493.66          | 21.49        | 0.074        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.074          |
| 1161          | 0.000         | 493.65          | 20.61        | 0.071        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.071          |
| 1188          | 0.000         | 493.64          | 19.77        | 0.068        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.068          |
| 1215          | 0.000         | 493.64          | 18.96        | 0.066        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.066          |

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BMP 1 ROUTING

**Hydrograph Discharge Table**

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 1242          | 0.000         | 493.63          | 18.19        | 0.063        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.063          |
| 1269          | 0.000         | 493.63          | 17.45        | 0.060        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.060          |
| 1296          | 0.000         | 493.62          | 16.74        | 0.058        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.058          |
| 1323          | 0.000         | 493.62          | 16.06        | 0.055        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.055          |
| 1350          | 0.000         | 493.61          | 15.40        | 0.053        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.053          |
| 1377          | 0.000         | 493.61          | 14.78        | 0.051        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.051          |
| 1404          | 0.000         | 493.60          | 14.17        | 0.049        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.049          |
| 1431          | 0.000         | 493.60          | 13.59        | 0.047        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.047          |
| 1458          | 0.000         | 493.59          | 13.04        | 0.045        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.045          |
| 1485          | 0.000         | 493.59          | 12.51        | 0.043        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.043          |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YR INFLOW HYDROGRAPH

|                 |          |                |               |
|-----------------|----------|----------------|---------------|
| Hydrograph type | = Manual | Peak discharge | = 8.470 cfs   |
| Storm frequency | = 50 yrs | Time to peak   | = 270 min     |
| Time interval   | = 27 min | Hyd. volume    | = 28,949 cuft |

### Hydrograph Discharge Table

( Printed values >= 1.00% of Qp.)

#### Time -- Outflow (min      cfs)

|     |          |
|-----|----------|
| 54  | 0.500    |
| 81  | 0.600    |
| 108 | 0.700    |
| 135 | 0.700    |
| 162 | 0.900    |
| 189 | 1.000    |
| 216 | 1.500    |
| 243 | 0.900    |
| 270 | 8.470 << |
| 297 | 1.200    |
| 324 | 0.800    |
| 351 | 0.600    |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

### BMP 1 ROUTING

|                 |                               |                |               |
|-----------------|-------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                   | Peak discharge | = 4.816 cfs   |
| Storm frequency | = 50 yrs                      | Time to peak   | = 297 min     |
| Time interval   | = 27 min                      | Hyd. volume    | = 28,910 cuft |
| Inflow hyd. No. | = 1 - 50 YR INFLOW HYDROGRAPH | Reservoir name | = <New Pond>  |
| Max. Elevation  | = 494.37 ft                   | Max. Storage   | = 13,326 cuft |

Storage Indication method used.

### Hydrograph Discharge Table

( Printed values &gt;= 1.00% of Qp.)

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 108           | 0.700         | 493.62          | 16.61        | 0.057        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.057          |
| 135           | 0.700         | 493.67          | 24.19        | 0.084        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.084          |
| 162           | 0.900         | 493.74          | 32.64        | 0.113        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.113          |
| 189           | 1.000         | 493.81          | 34.62        | 0.148        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.148          |
| 216           | 1.500         | 493.90          | 34.62        | 0.194        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.194          |
| 243           | 0.900         | 493.99          | 34.62        | 0.236        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.236          |
| 270           | 8.470 <<      | 494.19          | 34.62        | 0.303        | ----         | ----         | 4.059       | ----        | ----        | ----        | ----         | 4.362          |
| 297           | 1.200         | 494.22 <<       | 34.62        | 0.310        | ----         | ----         | 4.506       | ----        | ----        | ----        | ----         | 4.816 <<       |
| 324           | 0.800         | 494.04          | 34.62        | 0.256        | ----         | ----         | 0.897       | ----        | ----        | ----        | ----         | 1.153          |
| 351           | 0.600         | 494.02          | 34.62        | 0.250        | ----         | ----         | 0.468       | ----        | ----        | ----        | ----         | 0.718          |
| 378           | 0.000         | 494.00          | 34.62        | 0.244        | ----         | ----         | 0.073       | ----        | ----        | ----        | ----         | 0.317          |
| 405           | 0.000         | 493.98          | 34.62        | 0.233        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.233          |
| 432           | 0.000         | 493.96          | 34.62        | 0.223        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.223          |
| 459           | 0.000         | 493.94          | 34.62        | 0.213        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.213          |
| 486           | 0.000         | 493.92          | 34.62        | 0.205        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.205          |
| 513           | 0.000         | 493.91          | 34.62        | 0.196        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.196          |
| 540           | 0.000         | 493.89          | 34.62        | 0.188        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.188          |
| 567           | 0.000         | 493.87          | 34.62        | 0.180        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.180          |
| 594           | 0.000         | 493.86          | 34.62        | 0.172        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.172          |
| 621           | 0.000         | 493.84          | 34.62        | 0.165        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.165          |
| 648           | 0.000         | 493.83          | 34.62        | 0.158        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.158          |
| 675           | 0.000         | 493.82          | 34.62        | 0.152        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.152          |
| 702           | 0.000         | 493.80          | 34.62        | 0.145        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.145          |
| 729           | 0.000         | 493.79          | 34.62        | 0.139        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.139          |
| 756           | 0.000         | 493.78          | 34.62        | 0.133        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.133          |
| 783           | 0.000         | 493.77          | 34.62        | 0.128        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.128          |
| 810           | 0.000         | 493.76          | 34.62        | 0.122        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.122          |
| 837           | 0.000         | 493.75          | 33.96        | 0.117        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.117          |
| 864           | 0.000         | 493.74          | 32.57        | 0.113        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.113          |
| 891           | 0.000         | 493.73          | 31.25        | 0.108        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.108          |
| 918           | 0.000         | 493.72          | 29.98        | 0.104        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.104          |
| 945           | 0.000         | 493.71          | 28.75        | 0.099        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.099          |
| 972           | 0.000         | 493.70          | 27.58        | 0.095        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.095          |
| 999           | 0.000         | 493.69          | 26.46        | 0.091        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.091          |
| 1026          | 0.000         | 493.68          | 25.38        | 0.088        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.088          |
| 1053          | 0.000         | 493.68          | 24.34        | 0.084        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.084          |
| 1080          | 0.000         | 493.67          | 23.35        | 0.081        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.081          |
| 1107          | 0.000         | 493.66          | 22.40        | 0.077        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.077          |
| 1134          | 0.000         | 493.66          | 21.49        | 0.074        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.074          |
| 1161          | 0.000         | 493.65          | 20.61        | 0.071        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.071          |
| 1188          | 0.000         | 493.64          | 19.77        | 0.068        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.068          |
| 1215          | 0.000         | 493.64          | 18.96        | 0.066        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.066          |

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BMP 1 ROUTING

**Hydrograph Discharge Table**

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 1242          | 0.000         | 493.63          | 18.19        | 0.063        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.063          |
| 1269          | 0.000         | 493.63          | 17.45        | 0.060        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.060          |
| 1296          | 0.000         | 493.62          | 16.74        | 0.058        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.058          |
| 1323          | 0.000         | 493.62          | 16.06        | 0.055        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.055          |
| 1350          | 0.000         | 493.61          | 15.40        | 0.053        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.053          |
| 1377          | 0.000         | 493.61          | 14.78        | 0.051        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.051          |
| 1404          | 0.000         | 493.60          | 14.17        | 0.049        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.049          |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 1

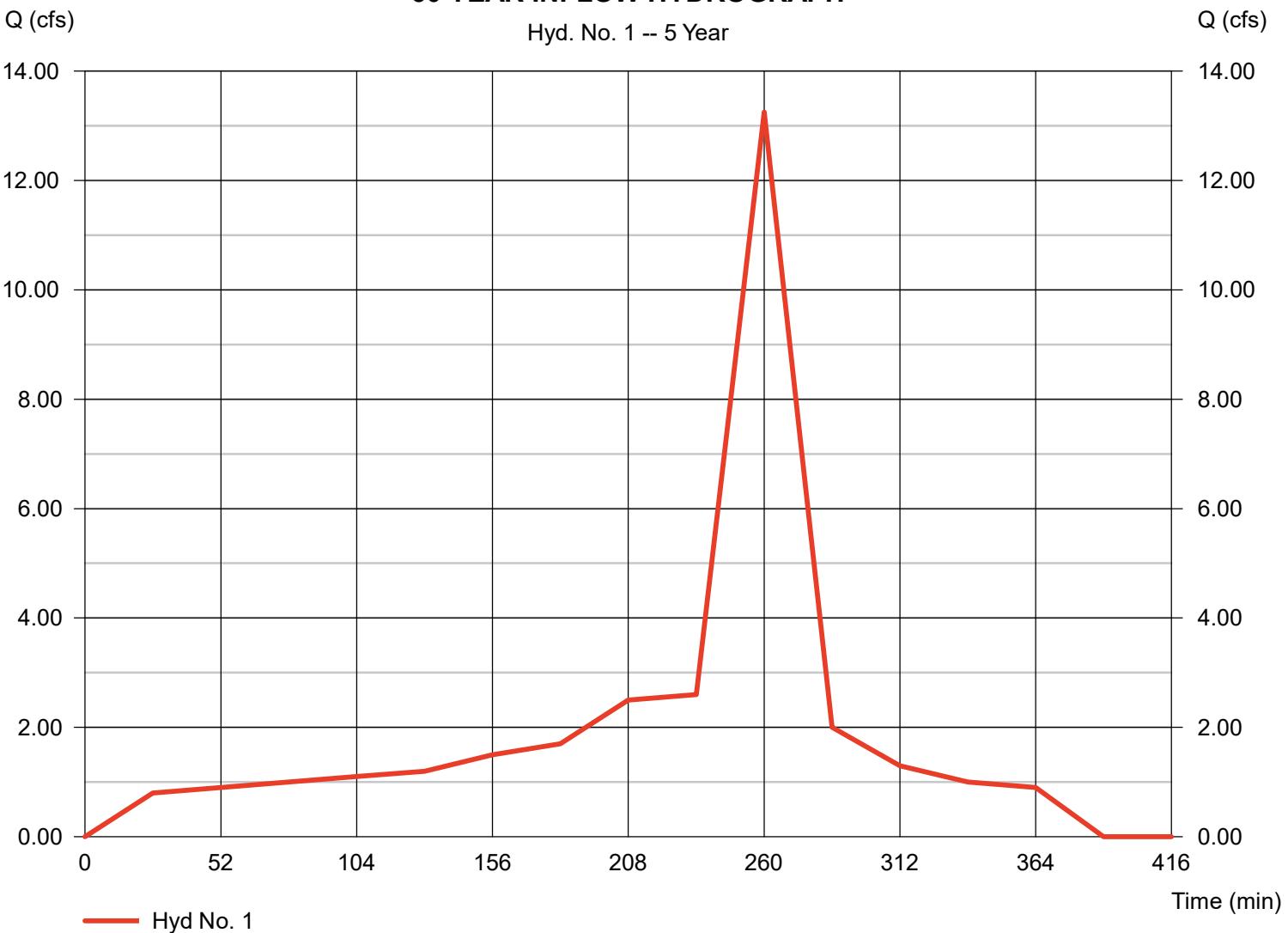
### 50 YEAR INFLOW HYDROGRAPH

Hydrograph type = Manual  
Storm frequency = 5 yrs  
Time interval = 26 min

Peak discharge = 13.25 cfs  
Time to peak = 260 min  
Hyd. volume = 49,530 cuft

### 50 YEAR INFLOW HYDROGRAPH

Hyd. No. 1 -- 5 Year



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

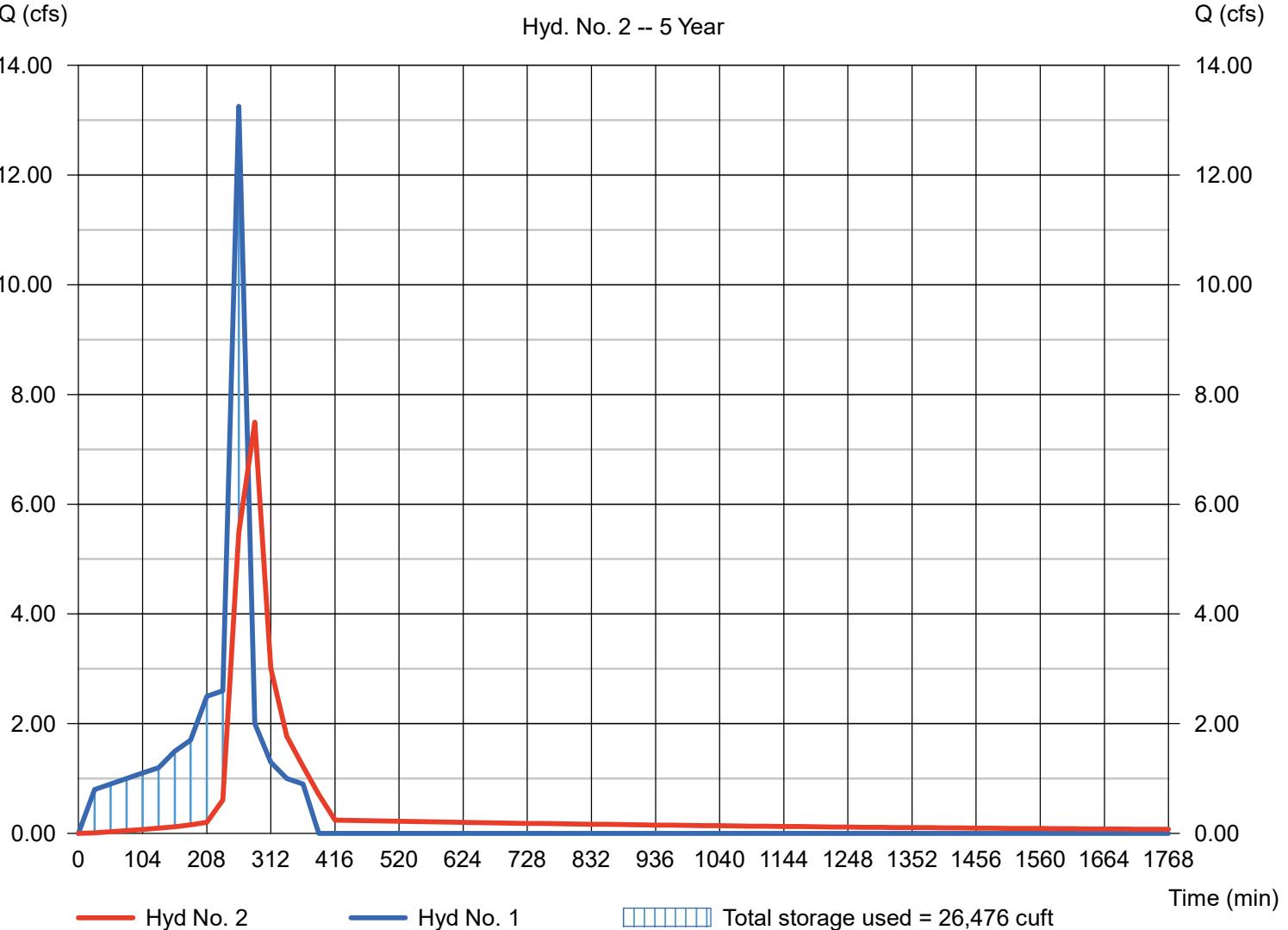
### BMP 2 ROUTING

|                 |                                 |                |               |
|-----------------|---------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                     | Peak discharge | = 7.497 cfs   |
| Storm frequency | = 5 yrs                         | Time to peak   | = 286 min     |
| Time interval   | = 26 min                        | Hyd. volume    | = 49,461 cuft |
| Inflow hyd. No. | = 1 - 50 YEAR INFLOW HYDROGRAPH | Max. Elevation | = 496.93 ft   |
| Reservoir name  | = <New Pond>                    | Max. Storage   | = 26,476 cuft |

Storage Indication method used.

### BMP 2 ROUTING

Hyd. No. 2 -- 5 Year



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

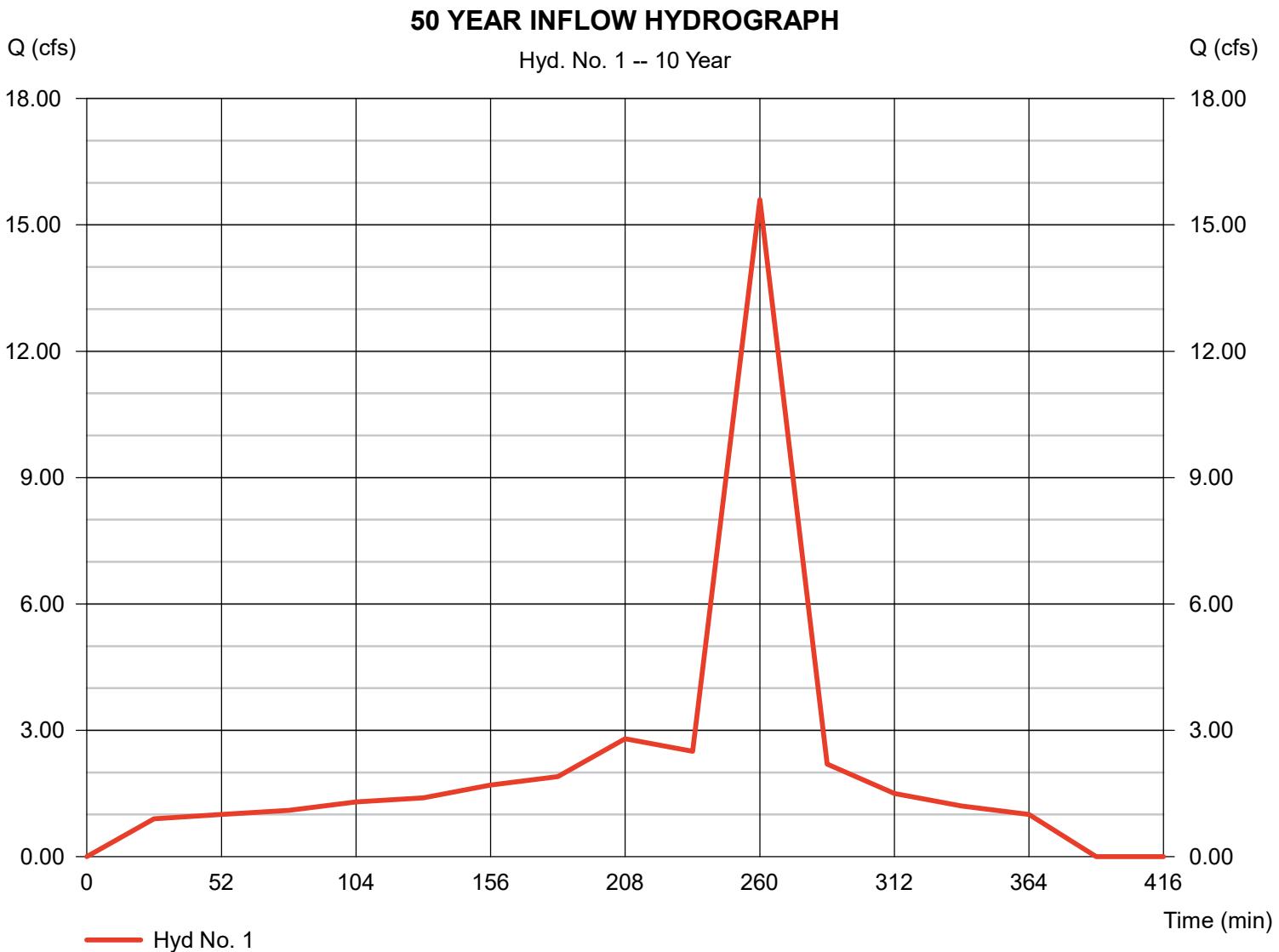
Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YEAR INFLOW HYDROGRAPH

Hydrograph type = Manual  
Storm frequency = 10 yrs  
Time interval = 26 min

Peak discharge = 15.60 cfs  
Time to peak = 260 min  
Hyd. volume = 56,316 cuft



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

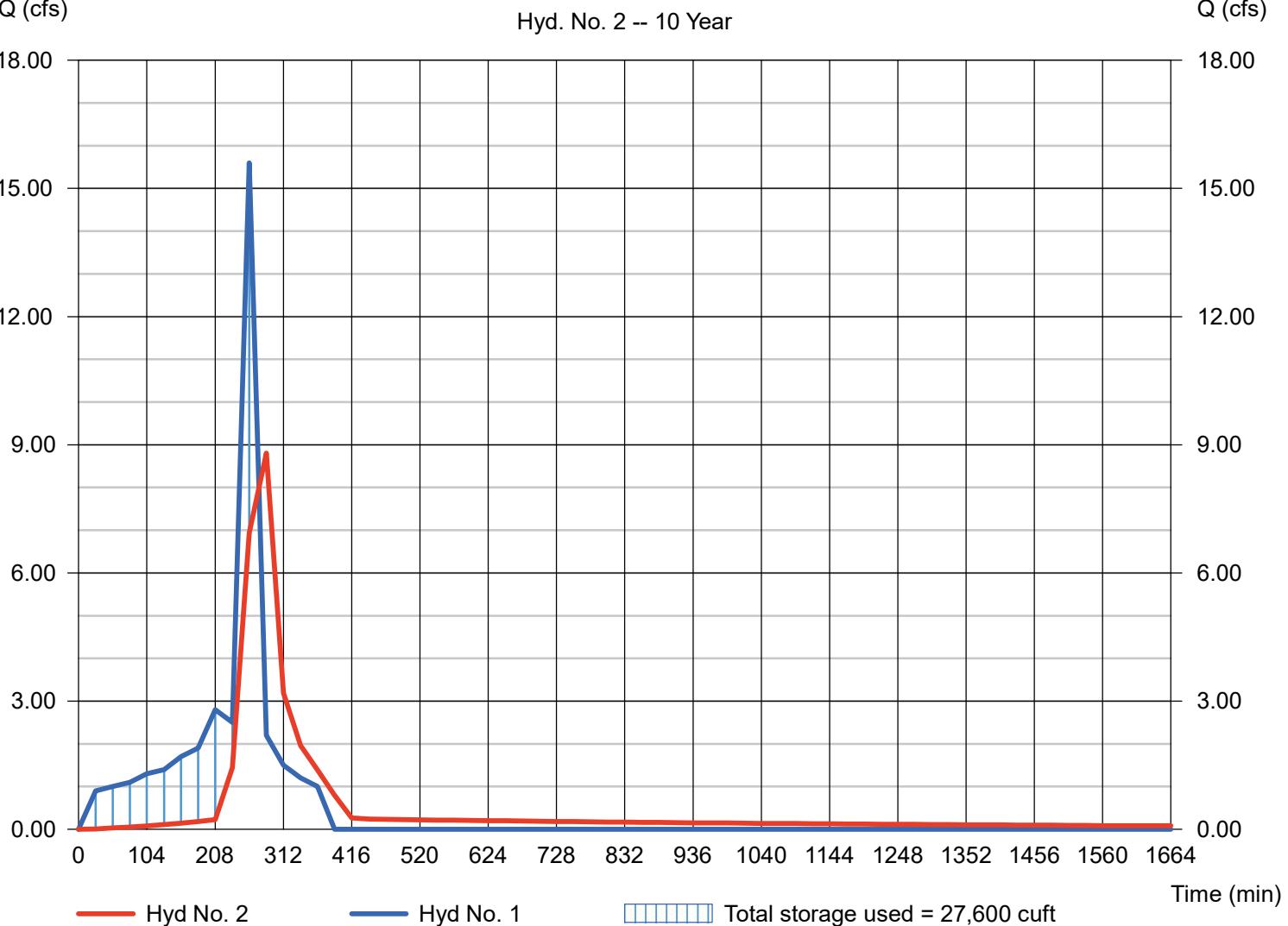
### BMP 2 ROUTING

|                 |                                 |                |               |
|-----------------|---------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                     | Peak discharge | = 8.805 cfs   |
| Storm frequency | = 10 yrs                        | Time to peak   | = 286 min     |
| Time interval   | = 26 min                        | Hyd. volume    | = 56,247 cuft |
| Inflow hyd. No. | = 1 - 50 YEAR INFLOW HYDROGRAPH | Max. Elevation | = 496.99 ft   |
| Reservoir name  | = <New Pond>                    | Max. Storage   | = 27,600 cuft |

Storage Indication method used.

### BMP 2 ROUTING

Hyd. No. 2 -- 10 Year



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 1

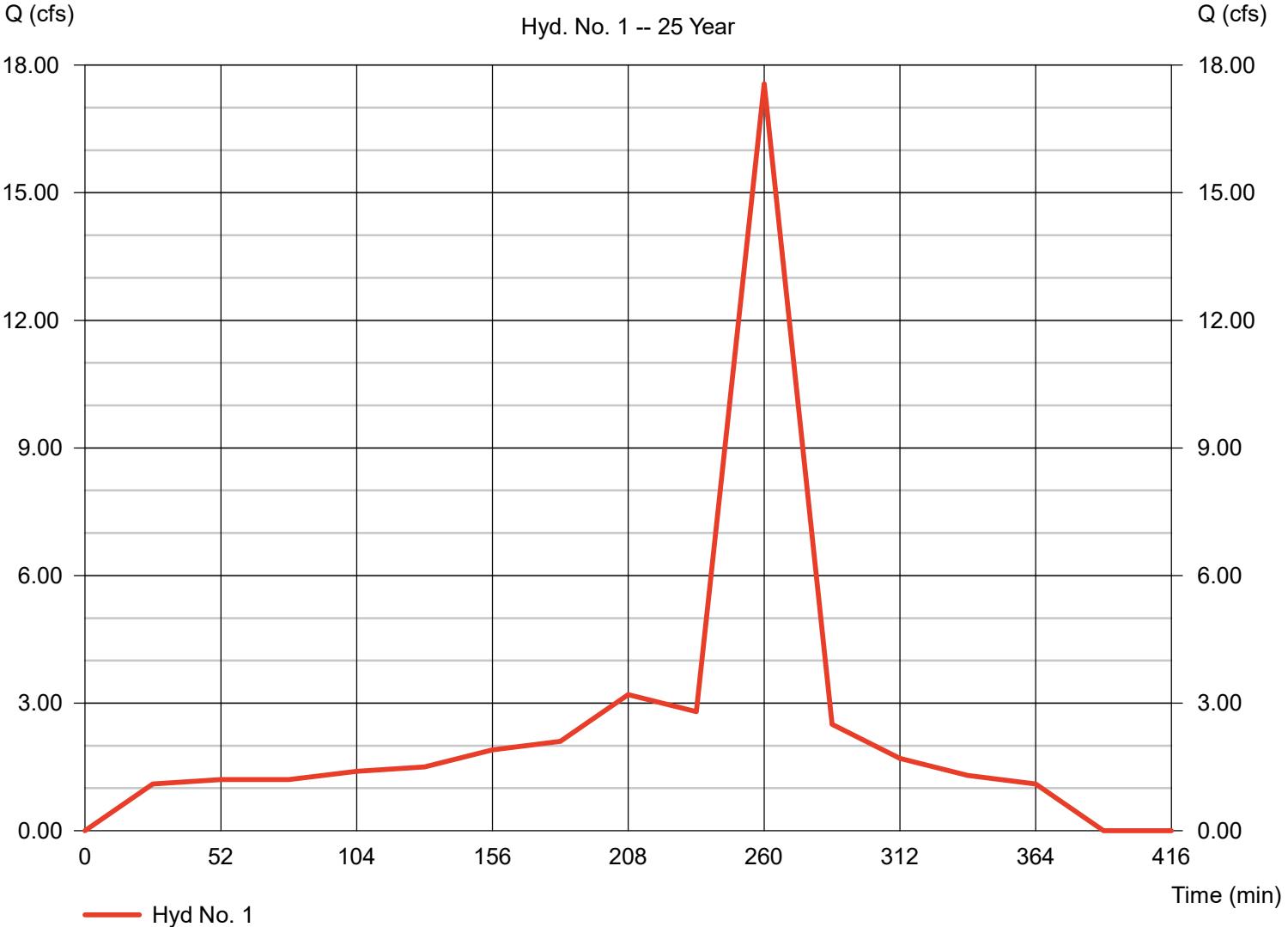
### 50 YEAR INFLOW HYDROGRAPH

Hydrograph type = Manual  
Storm frequency = 25 yrs  
Time interval = 26 min

Peak discharge = 17.56 cfs  
Time to peak = 260 min  
Hyd. volume = 63,274 cuft

### 50 YEAR INFLOW HYDROGRAPH

Hyd. No. 1 -- 25 Year



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

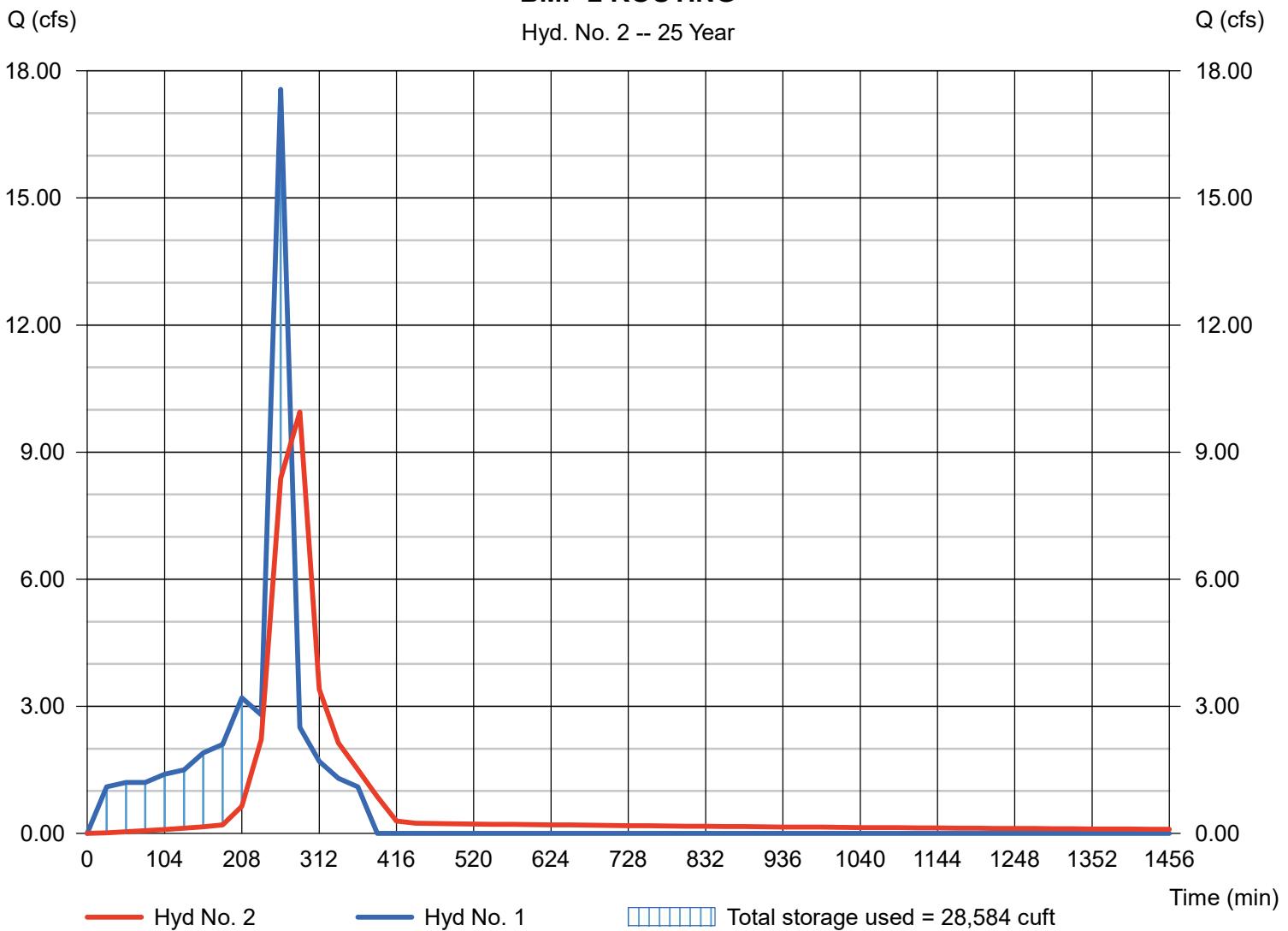
### BMP 2 ROUTING

|                 |                                 |                |               |
|-----------------|---------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                     | Peak discharge | = 9.950 cfs   |
| Storm frequency | = 25 yrs                        | Time to peak   | = 286 min     |
| Time interval   | = 26 min                        | Hyd. volume    | = 63,204 cuft |
| Inflow hyd. No. | = 1 - 50 YEAR INFLOW HYDROGRAPH | Max. Elevation | = 497.04 ft   |
| Reservoir name  | = <New Pond>                    | Max. Storage   | = 28,584 cuft |

Storage Indication method used.

### BMP 2 ROUTING

Hyd. No. 2 -- 25 Year



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

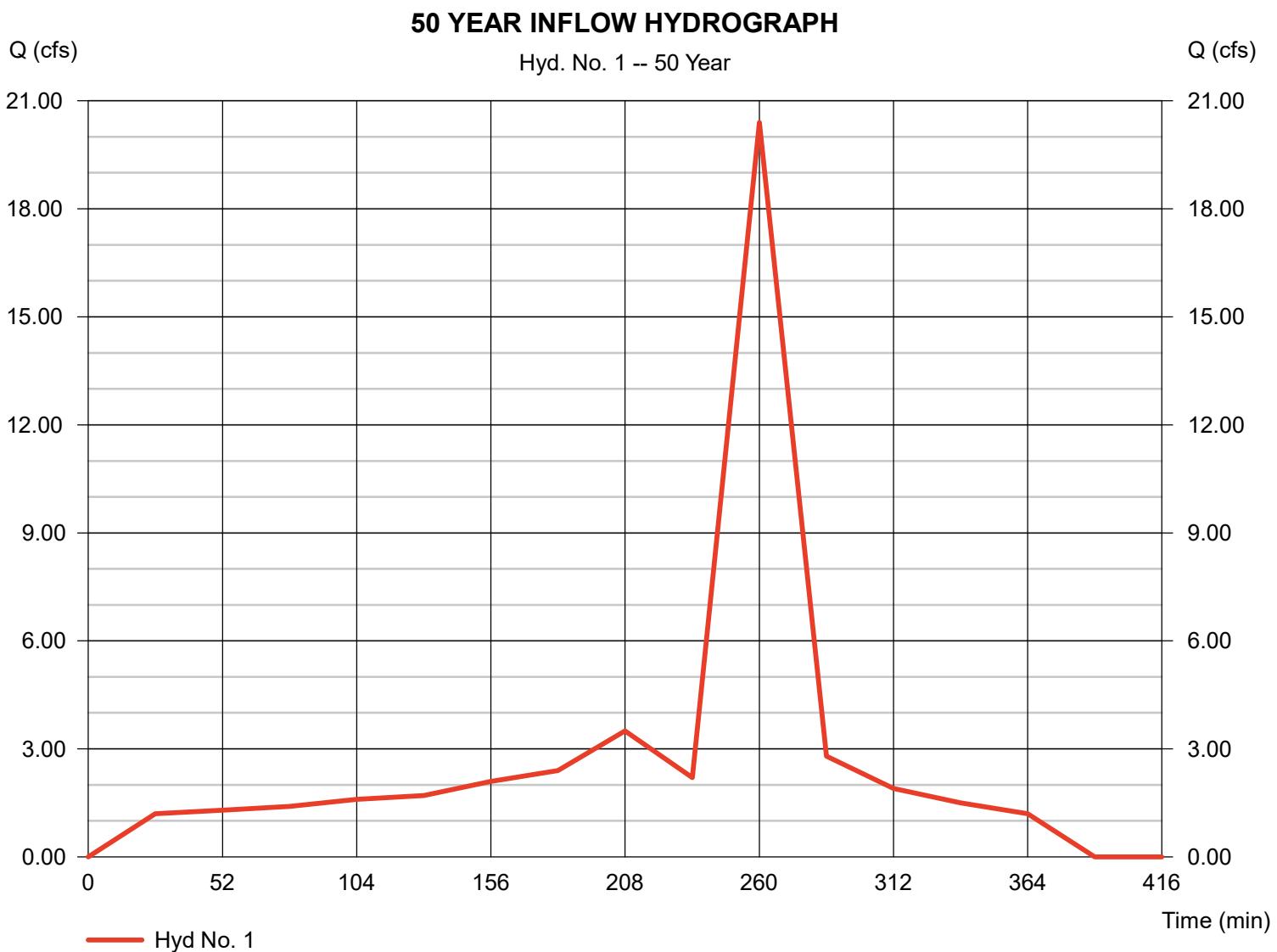
Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YEAR INFLOW HYDROGRAPH

Hydrograph type = Manual  
Storm frequency = 50 yrs  
Time interval = 26 min

Peak discharge = 20.40 cfs  
Time to peak = 260 min  
Hyd. volume = 70,512 cuft



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

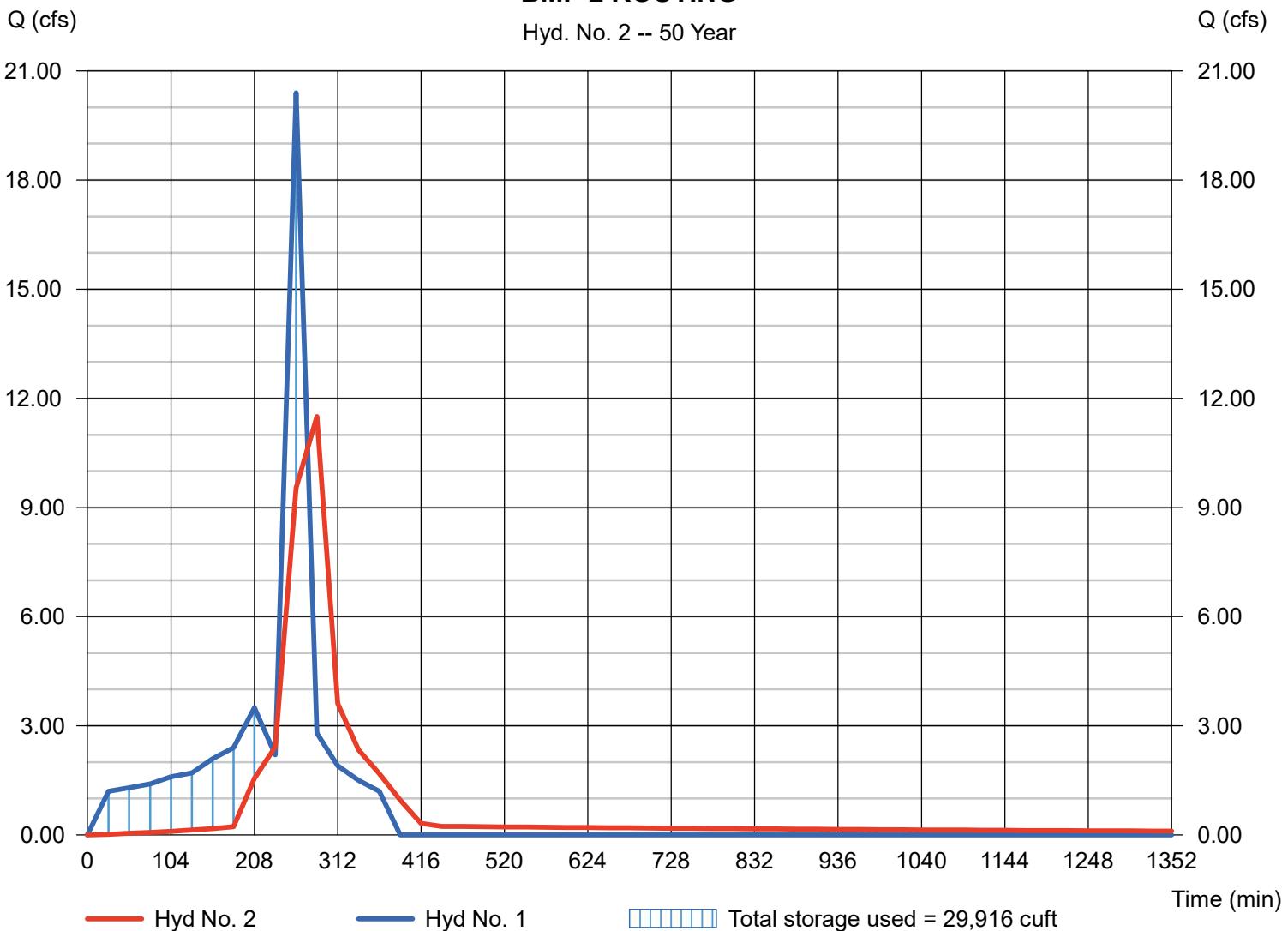
### BMP 2 ROUTING

|                 |                                 |                |               |
|-----------------|---------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                     | Peak discharge | = 11.50 cfs   |
| Storm frequency | = 50 yrs                        | Time to peak   | = 286 min     |
| Time interval   | = 26 min                        | Hyd. volume    | = 70,443 cuft |
| Inflow hyd. No. | = 1 - 50 YEAR INFLOW HYDROGRAPH | Max. Elevation | = 497.11 ft   |
| Reservoir name  | = <New Pond>                    | Max. Storage   | = 29,916 cuft |

Storage Indication method used.

### BMP 2 ROUTING

Hyd. No. 2 -- 50 Year



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YEAR INFLOW HYDROGRAPH

|                 |          |                |               |
|-----------------|----------|----------------|---------------|
| Hydrograph type | = Manual | Peak discharge | = 13.25 cfs   |
| Storm frequency | = 5 yrs  | Time to peak   | = 260 min     |
| Time interval   | = 26 min | Hyd. volume    | = 49,530 cuft |

### Hydrograph Discharge Table

( Printed values >= 1.00% of Qp.)

#### Time -- Outflow

(min      cfs)

|     |          |
|-----|----------|
| 26  | 0.800    |
| 52  | 0.900    |
| 78  | 1.000    |
| 104 | 1.100    |
| 130 | 1.200    |
| 156 | 1.500    |
| 182 | 1.700    |
| 208 | 2.500    |
| 234 | 2.600    |
| 260 | 13.25 << |
| 286 | 2.000    |
| 312 | 1.300    |
| 338 | 1.000    |
| 364 | 0.900    |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

### BMP 2 ROUTING

|                 |                                 |                |               |
|-----------------|---------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                     | Peak discharge | = 7,497 cfs   |
| Storm frequency | = 5 yrs                         | Time to peak   | = 286 min     |
| Time interval   | = 26 min                        | Hyd. volume    | = 49,461 cuft |
| Inflow hyd. No. | = 1 - 50 YEAR INFLOW HYDROGRAPH | Reservoir name | = <New Pond>  |
| Max. Elevation  | = 496.93 ft                     | Max. Storage   | = 26,476 cuft |

Storage Indication method used.

### Hydrograph Discharge Table

( Printed values &gt;= 1.00% of Qp.)

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 130           | 1.200         | 496.20          | 26.34        | 0.095        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.095          |
| 156           | 1.500         | 496.26          | 33.26        | 0.123        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.123          |
| 182           | 1.700         | 496.33          | 33.26        | 0.157        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.157          |
| 208           | 2.500         | 496.42          | 33.26        | 0.201        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.201          |
| 234           | 2.600         | 496.52          | 33.26        | 0.248        | ----         | ----         | 0.361       | ----        | ----        | ----        | ----         | 0.609          |
| 260           | 13.25 <<      | 496.75          | 33.26        | 0.320        | ----         | 5.171        | ----        | ----        | ----        | ----        | ----         | 5.490          |
| 286           | 2.000         | 496.80 <<       | 33.26        | 0.334        | ----         | 7.163        | ----        | ----        | ----        | ----        | ----         | 7.497 <<       |
| 312           | 1.300         | 496.63          | 33.26        | 0.283        | ----         | 2.730        | ----        | ----        | ----        | ----        | ----         | 3.013          |
| 338           | 1.000         | 496.57          | 33.26        | 0.265        | ----         | 1.505        | ----        | ----        | ----        | ----        | ----         | 1.770          |
| 364           | 0.900         | 496.55          | 33.26        | 0.257        | ----         | 0.966        | ----        | ----        | ----        | ----        | ----         | 1.223          |
| 390           | 0.000         | 496.52          | 33.26        | 0.249        | ----         | 0.458        | ----        | ----        | ----        | ----        | ----         | 0.707          |
| 416           | 0.000         | 496.50          | 33.26        | 0.242        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.242          |
| 442           | 0.000         | 496.49          | 33.26        | 0.237        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.237          |
| 468           | 0.000         | 496.48          | 33.26        | 0.231        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.231          |
| 494           | 0.000         | 496.47          | 33.26        | 0.226        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.226          |
| 520           | 0.000         | 496.46          | 33.26        | 0.221        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.221          |
| 546           | 0.000         | 496.45          | 33.26        | 0.216        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.216          |
| 572           | 0.000         | 496.44          | 33.26        | 0.211        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.211          |
| 598           | 0.000         | 496.43          | 33.26        | 0.206        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.206          |
| 624           | 0.000         | 496.42          | 33.26        | 0.201        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.201          |
| 650           | 0.000         | 496.41          | 33.26        | 0.197        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.197          |
| 676           | 0.000         | 496.40          | 33.26        | 0.192        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.192          |
| 702           | 0.000         | 496.39          | 33.26        | 0.188        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.188          |
| 728           | 0.000         | 496.38          | 33.26        | 0.183        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.183          |
| 754           | 0.000         | 496.37          | 33.26        | 0.179        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.179          |
| 780           | 0.000         | 496.36          | 33.26        | 0.175        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.175          |
| 806           | 0.000         | 496.35          | 33.26        | 0.171        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.171          |
| 832           | 0.000         | 496.35          | 33.26        | 0.167        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.167          |
| 858           | 0.000         | 496.34          | 33.26        | 0.163        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.163          |
| 884           | 0.000         | 496.33          | 33.26        | 0.160        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.160          |
| 910           | 0.000         | 496.32          | 33.26        | 0.156        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.156          |
| 936           | 0.000         | 496.32          | 33.26        | 0.152        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.152          |
| 962           | 0.000         | 496.31          | 33.26        | 0.149        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.149          |
| 988           | 0.000         | 496.30          | 33.26        | 0.145        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.145          |
| 1014          | 0.000         | 496.30          | 33.26        | 0.142        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.142          |
| 1040          | 0.000         | 496.29          | 33.26        | 0.139        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.139          |
| 1066          | 0.000         | 496.28          | 33.26        | 0.136        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.136          |
| 1092          | 0.000         | 496.28          | 33.26        | 0.133        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.133          |
| 1118          | 0.000         | 496.27          | 33.26        | 0.129        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.130          |
| 1144          | 0.000         | 496.26          | 33.26        | 0.127        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.127          |
| 1170          | 0.000         | 496.26          | 33.26        | 0.124        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.124          |
| 1196          | 0.000         | 496.25          | 33.26        | 0.121        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.121          |

Continues on next page...

BMP 2 ROUTING

**Hydrograph Discharge Table**

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 1222          | 0.000         | 496.25          | 32.83        | 0.118        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.118          |
| 1248          | 0.000         | 496.24          | 32.10        | 0.115        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.115          |
| 1274          | 0.000         | 496.24          | 31.39        | 0.113        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.113          |
| 1300          | 0.000         | 496.23          | 30.68        | 0.110        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.110          |
| 1326          | 0.000         | 496.23          | 30.00        | 0.108        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.108          |
| 1352          | 0.000         | 496.22          | 29.33        | 0.105        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.105          |
| 1378          | 0.000         | 496.22          | 28.67        | 0.103        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.103          |
| 1404          | 0.000         | 496.21          | 28.04        | 0.101        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.101          |
| 1430          | 0.000         | 496.21          | 27.41        | 0.099        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.099          |
| 1456          | 0.000         | 496.20          | 26.80        | 0.096        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.096          |
| 1482          | 0.000         | 496.20          | 26.20        | 0.094        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.094          |
| 1508          | 0.000         | 496.19          | 25.62        | 0.092        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.092          |
| 1534          | 0.000         | 496.19          | 25.04        | 0.090        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.090          |
| 1560          | 0.000         | 496.18          | 24.48        | 0.088        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.088          |
| 1586          | 0.000         | 496.18          | 23.94        | 0.086        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.086          |
| 1612          | 0.000         | 496.18          | 23.40        | 0.084        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.084          |
| 1638          | 0.000         | 496.17          | 22.88        | 0.082        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.082          |
| 1664          | 0.000         | 496.17          | 22.37        | 0.080        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.080          |
| 1690          | 0.000         | 496.16          | 21.87        | 0.079        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.079          |
| 1716          | 0.000         | 496.16          | 21.38        | 0.077        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.077          |
| 1742          | 0.000         | 496.16          | 20.91        | 0.075        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.075          |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YEAR INFLOW HYDROGRAPH

|                 |          |                |               |
|-----------------|----------|----------------|---------------|
| Hydrograph type | = Manual | Peak discharge | = 15.60 cfs   |
| Storm frequency | = 10 yrs | Time to peak   | = 260 min     |
| Time interval   | = 26 min | Hyd. volume    | = 56,316 cuft |

### Hydrograph Discharge Table

( Printed values >= 1.00% of Qp.)

#### Time -- Outflow

(min      cfs)

|     |          |
|-----|----------|
| 26  | 0.900    |
| 52  | 1.000    |
| 78  | 1.100    |
| 104 | 1.300    |
| 130 | 1.400    |
| 156 | 1.700    |
| 182 | 1.900    |
| 208 | 2.800    |
| 234 | 2.500    |
| 260 | 15.60 << |
| 286 | 2.200    |
| 312 | 1.500    |
| 338 | 1.200    |
| 364 | 1.000    |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

### BMP 2 ROUTING

|                 |                                 |                |               |
|-----------------|---------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                     | Peak discharge | = 8.805 cfs   |
| Storm frequency | = 10 yrs                        | Time to peak   | = 286 min     |
| Time interval   | = 26 min                        | Hyd. volume    | = 56,247 cuft |
| Inflow hyd. No. | = 1 - 50 YEAR INFLOW HYDROGRAPH | Reservoir name | = <New Pond>  |
| Max. Elevation  | = 496.99 ft                     | Max. Storage   | = 27,600 cuft |

Storage Indication method used.

### Hydrograph Discharge Table

( Printed values &gt;= 1.00% of Qp.)

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 130           | 1.400         | 496.23          | 29.94        | 0.108        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.108          |
| 156           | 1.700         | 496.29          | 33.26        | 0.140        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.140          |
| 182           | 1.900         | 496.37          | 33.26        | 0.179        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.179          |
| 208           | 2.800         | 496.47          | 33.26        | 0.228        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.228          |
| 234           | 2.500         | 496.56          | 33.26        | 0.260        | ----         | ----         | 1.184       | ----        | ----        | ----        | ----         | 1.444          |
| 260           | 15.60 <<      | 496.79          | 33.26        | 0.330        | ----         | ----         | 6.603       | ----        | ----        | ----        | ----         | 6.932          |
| 286           | 2.200         | 496.83 <<       | 33.26        | 0.342        | ----         | ----         | 8.463       | ----        | ----        | ----        | ----         | 8.805 <<       |
| 312           | 1.500         | 496.64          | 33.26        | 0.286        | ----         | ----         | 2.905       | ----        | ----        | ----        | ----         | 3.191          |
| 338           | 1.200         | 496.58          | 33.26        | 0.268        | ----         | ----         | 1.695       | ----        | ----        | ----        | ----         | 1.963          |
| 364           | 1.000         | 496.55          | 33.26        | 0.259        | ----         | ----         | 1.128       | ----        | ----        | ----        | ----         | 1.387          |
| 390           | 0.000         | 496.53          | 33.26        | 0.251        | ----         | ----         | 0.544       | ----        | ----        | ----        | ----         | 0.795          |
| 416           | 0.000         | 496.50          | 33.26        | 0.243        | ----         | ----         | 0.022       | ----        | ----        | ----        | ----         | 0.265          |
| 442           | 0.000         | 496.49          | 33.26        | 0.237        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.237          |
| 468           | 0.000         | 496.48          | 33.26        | 0.232        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.232          |
| 494           | 0.000         | 496.47          | 33.26        | 0.226        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.226          |
| 520           | 0.000         | 496.46          | 33.26        | 0.221        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.221          |
| 546           | 0.000         | 496.45          | 33.26        | 0.216        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.216          |
| 572           | 0.000         | 496.44          | 33.26        | 0.211        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.211          |
| 598           | 0.000         | 496.43          | 33.26        | 0.206        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.206          |
| 624           | 0.000         | 496.42          | 33.26        | 0.202        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.202          |
| 650           | 0.000         | 496.41          | 33.26        | 0.197        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.197          |
| 676           | 0.000         | 496.40          | 33.26        | 0.193        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.193          |
| 702           | 0.000         | 496.39          | 33.26        | 0.188        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.188          |
| 728           | 0.000         | 496.38          | 33.26        | 0.184        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.184          |
| 754           | 0.000         | 496.37          | 33.26        | 0.180        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.180          |
| 780           | 0.000         | 496.36          | 33.26        | 0.175        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.175          |
| 806           | 0.000         | 496.36          | 33.26        | 0.171        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.171          |
| 832           | 0.000         | 496.35          | 33.26        | 0.168        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.168          |
| 858           | 0.000         | 496.34          | 33.26        | 0.164        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.164          |
| 884           | 0.000         | 496.33          | 33.26        | 0.160        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.160          |
| 910           | 0.000         | 496.32          | 33.26        | 0.156        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.156          |
| 936           | 0.000         | 496.32          | 33.26        | 0.153        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.153          |
| 962           | 0.000         | 496.31          | 33.26        | 0.149        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.149          |
| 988           | 0.000         | 496.30          | 33.26        | 0.146        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.146          |
| 1014          | 0.000         | 496.30          | 33.26        | 0.142        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.142          |
| 1040          | 0.000         | 496.29          | 33.26        | 0.139        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.139          |
| 1066          | 0.000         | 496.28          | 33.26        | 0.136        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.136          |
| 1092          | 0.000         | 496.28          | 33.26        | 0.133        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.133          |
| 1118          | 0.000         | 496.27          | 33.26        | 0.130        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.130          |
| 1144          | 0.000         | 496.26          | 33.26        | 0.127        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.127          |
| 1170          | 0.000         | 496.26          | 33.26        | 0.124        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.124          |
| 1196          | 0.000         | 496.25          | 33.26        | 0.121        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.121          |

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BMP 2 ROUTING

**Hydrograph Discharge Table**

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 1222          | 0.000         | 496.25          | 32.90        | 0.118        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.118          |
| 1248          | 0.000         | 496.24          | 32.17        | 0.116        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.116          |
| 1274          | 0.000         | 496.24          | 31.45        | 0.113        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.113          |
| 1300          | 0.000         | 496.23          | 30.74        | 0.111        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.111          |
| 1326          | 0.000         | 496.23          | 30.06        | 0.108        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.108          |
| 1352          | 0.000         | 496.22          | 29.39        | 0.106        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.106          |
| 1378          | 0.000         | 496.22          | 28.73        | 0.103        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.103          |
| 1404          | 0.000         | 496.21          | 28.09        | 0.101        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.101          |
| 1430          | 0.000         | 496.21          | 27.46        | 0.099        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.099          |
| 1456          | 0.000         | 496.20          | 26.85        | 0.097        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.097          |
| 1482          | 0.000         | 496.20          | 26.25        | 0.094        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.094          |
| 1508          | 0.000         | 496.19          | 25.67        | 0.092        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.092          |
| 1534          | 0.000         | 496.19          | 25.09        | 0.090        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.090          |
| 1560          | 0.000         | 496.18          | 24.53        | 0.088        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.088          |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YEAR INFLOW HYDROGRAPH

|                 |          |                |               |
|-----------------|----------|----------------|---------------|
| Hydrograph type | = Manual | Peak discharge | = 17.56 cfs   |
| Storm frequency | = 25 yrs | Time to peak   | = 260 min     |
| Time interval   | = 26 min | Hyd. volume    | = 63,274 cuft |

### Hydrograph Discharge Table

( Printed values >= 1.00% of Qp.)

#### Time -- Outflow (min      cfs)

|     |          |
|-----|----------|
| 26  | 1.100    |
| 52  | 1.200    |
| 78  | 1.200    |
| 104 | 1.400    |
| 130 | 1.500    |
| 156 | 1.900    |
| 182 | 2.100    |
| 208 | 3.200    |
| 234 | 2.800    |
| 260 | 17.56 << |
| 286 | 2.500    |
| 312 | 1.700    |
| 338 | 1.300    |
| 364 | 1.100    |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

### BMP 2 ROUTING

|                 |                                 |                |               |
|-----------------|---------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                     | Peak discharge | = 9.950 cfs   |
| Storm frequency | = 25 yrs                        | Time to peak   | = 286 min     |
| Time interval   | = 26 min                        | Hyd. volume    | = 63,204 cuft |
| Inflow hyd. No. | = 1 - 50 YEAR INFLOW HYDROGRAPH | Reservoir name | = <New Pond>  |
| Max. Elevation  | = 497.04 ft                     | Max. Storage   | = 28,584 cuft |

Storage Indication method used.

### Hydrograph Discharge Table

( Printed values &gt;= 1.00% of Qp.)

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 130           | 1.500         | 496.25          | 33.26        | 0.122        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.122          |
| 156           | 1.900         | 496.33          | 33.26        | 0.158        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.158          |
| 182           | 2.100         | 496.41          | 33.26        | 0.200        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.200          |
| 208           | 3.200         | 496.52          | 33.26        | 0.248        | ----         | ----         | 0.391       | ----        | ----        | ----        | ----         | 0.640          |
| 234           | 2.800         | 496.59          | 33.26        | 0.272        | ----         | ----         | 1.943       | ----        | ----        | ----        | ----         | 2.215          |
| 260           | 17.56 <<      | 496.82          | 33.26        | 0.339        | ----         | ----         | 8.034       | ----        | ----        | ----        | ----         | 8.374          |
| 286           | 2.500         | 496.86 <<       | 33.26        | 0.350        | ----         | ----         | 9.600       | ----        | ----        | ----        | ----         | 9.950 <<       |
| 312           | 1.700         | 496.65          | 33.26        | 0.289        | ----         | ----         | 3.108       | ----        | ----        | ----        | ----         | 3.397          |
| 338           | 1.300         | 496.59          | 33.26        | 0.270        | ----         | ----         | 1.861       | ----        | ----        | ----        | ----         | 2.131          |
| 364           | 1.100         | 496.56          | 33.26        | 0.261        | ----         | ----         | 1.248       | ----        | ----        | ----        | ----         | 1.510          |
| 390           | 0.000         | 496.53          | 33.26        | 0.252        | ----         | ----         | 0.618       | ----        | ----        | ----        | ----         | 0.869          |
| 416           | 0.000         | 496.50          | 33.26        | 0.243        | ----         | ----         | 0.046       | ----        | ----        | ----        | ----         | 0.289          |
| 442           | 0.000         | 496.49          | 33.26        | 0.238        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.238          |
| 468           | 0.000         | 496.48          | 33.26        | 0.232        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.232          |
| 494           | 0.000         | 496.47          | 33.26        | 0.227        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.227          |
| 520           | 0.000         | 496.46          | 33.26        | 0.222        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.222          |
| 546           | 0.000         | 496.45          | 33.26        | 0.216        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.216          |
| 572           | 0.000         | 496.44          | 33.26        | 0.212        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.212          |
| 598           | 0.000         | 496.43          | 33.26        | 0.207        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.207          |
| 624           | 0.000         | 496.42          | 33.26        | 0.202        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.202          |
| 650           | 0.000         | 496.41          | 33.26        | 0.197        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.197          |
| 676           | 0.000         | 496.40          | 33.26        | 0.193        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.193          |
| 702           | 0.000         | 496.39          | 33.26        | 0.188        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.188          |
| 728           | 0.000         | 496.38          | 33.26        | 0.184        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.184          |
| 754           | 0.000         | 496.37          | 33.26        | 0.180        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.180          |
| 780           | 0.000         | 496.36          | 33.26        | 0.176        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.176          |
| 806           | 0.000         | 496.36          | 33.26        | 0.172        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.172          |
| 832           | 0.000         | 496.35          | 33.26        | 0.168        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.168          |
| 858           | 0.000         | 496.34          | 33.26        | 0.164        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.164          |
| 884           | 0.000         | 496.33          | 33.26        | 0.160        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.160          |
| 910           | 0.000         | 496.32          | 33.26        | 0.156        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.156          |
| 936           | 0.000         | 496.32          | 33.26        | 0.153        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.153          |
| 962           | 0.000         | 496.31          | 33.26        | 0.149        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.149          |
| 988           | 0.000         | 496.30          | 33.26        | 0.146        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.146          |
| 1014          | 0.000         | 496.30          | 33.26        | 0.143        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.143          |
| 1040          | 0.000         | 496.29          | 33.26        | 0.139        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.139          |
| 1066          | 0.000         | 496.28          | 33.26        | 0.136        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.136          |
| 1092          | 0.000         | 496.28          | 33.26        | 0.133        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.133          |
| 1118          | 0.000         | 496.27          | 33.26        | 0.130        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.130          |
| 1144          | 0.000         | 496.27          | 33.26        | 0.127        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.127          |
| 1170          | 0.000         | 496.26          | 33.26        | 0.124        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.124          |
| 1196          | 0.000         | 496.25          | 33.26        | 0.121        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.121          |

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BMP 2 ROUTING

**Hydrograph Discharge Table**

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 1222          | 0.000         | 496.25          | 32.94        | 0.118        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.118          |
| 1248          | 0.000         | 496.24          | 32.20        | 0.116        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.116          |
| 1274          | 0.000         | 496.24          | 31.48        | 0.113        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.113          |
| 1300          | 0.000         | 496.23          | 30.78        | 0.111        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.111          |
| 1326          | 0.000         | 496.23          | 30.09        | 0.108        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.108          |
| 1352          | 0.000         | 496.22          | 29.42        | 0.106        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.106          |
| 1378          | 0.000         | 496.22          | 28.77        | 0.103        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.103          |
| 1404          | 0.000         | 496.21          | 28.13        | 0.101        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.101          |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YEAR INFLOW HYDROGRAPH

|                 |          |                |               |
|-----------------|----------|----------------|---------------|
| Hydrograph type | = Manual | Peak discharge | = 20.40 cfs   |
| Storm frequency | = 50 yrs | Time to peak   | = 260 min     |
| Time interval   | = 26 min | Hyd. volume    | = 70,512 cuft |

### Hydrograph Discharge Table

( Printed values >= 1.00% of Qp.)

#### Time -- Outflow (min      cfs)

|     |          |
|-----|----------|
| 26  | 1.200    |
| 52  | 1.300    |
| 78  | 1.400    |
| 104 | 1.600    |
| 130 | 1.700    |
| 156 | 2.100    |
| 182 | 2.400    |
| 208 | 3.500    |
| 234 | 2.200    |
| 260 | 20.40 << |
| 286 | 2.800    |
| 312 | 1.900    |
| 338 | 1.500    |
| 364 | 1.200    |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

### BMP 2 ROUTING

|                 |                                 |                |               |
|-----------------|---------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                     | Peak discharge | = 11.50 cfs   |
| Storm frequency | = 50 yrs                        | Time to peak   | = 286 min     |
| Time interval   | = 26 min                        | Hyd. volume    | = 70,443 cuft |
| Inflow hyd. No. | = 1 - 50 YEAR INFLOW HYDROGRAPH | Reservoir name | = <New Pond>  |
| Max. Elevation  | = 497.11 ft                     | Max. Storage   | = 29,916 cuft |

Storage Indication method used.

### Hydrograph Discharge Table

( Printed values &gt;= 1.00% of Qp.)

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 130           | 1.700         | 496.29          | 33.26        | 0.137        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.137          |
| 156           | 2.100         | 496.37          | 33.26        | 0.178        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.178          |
| 182           | 2.400         | 496.46          | 33.26        | 0.225        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.225          |
| 208           | 3.500         | 496.56          | 33.26        | 0.262        | ----         | ----         | 1.290       | ----        | ----        | ----        | ----         | 1.552          |
| 234           | 2.200         | 496.60          | 33.26        | 0.275        | ----         | ----         | 2.144       | ----        | ----        | ----        | ----         | 2.418          |
| 260           | 20.40 <<      | 496.85          | 33.26        | 0.347        | ----         | ----         | 9.190       | ----        | ----        | ----        | ----         | 9.536          |
| 286           | 2.800         | 496.90 <<       | 33.26        | 0.360        | ----         | ----         | 11.14       | ----        | ----        | ----        | ----         | 11.50 <<       |
| 312           | 1.900         | 496.66          | 33.26        | 0.292        | ----         | ----         | 3.324       | ----        | ----        | ----        | ----         | 3.616          |
| 338           | 1.500         | 496.60          | 33.26        | 0.273        | ----         | ----         | 2.064       | ----        | ----        | ----        | ----         | 2.338          |
| 364           | 1.200         | 496.57          | 33.26        | 0.264        | ----         | ----         | 1.415       | ----        | ----        | ----        | ----         | 1.679          |
| 390           | 0.000         | 496.53          | 33.26        | 0.253        | ----         | ----         | 0.706       | ----        | ----        | ----        | ----         | 0.959          |
| 416           | 0.000         | 496.50          | 33.26        | 0.244        | ----         | ----         | 0.075       | ----        | ----        | ----        | ----         | 0.319          |
| 442           | 0.000         | 496.49          | 33.26        | 0.238        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.238          |
| 468           | 0.000         | 496.48          | 33.26        | 0.232        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.232          |
| 494           | 0.000         | 496.47          | 33.26        | 0.227        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.227          |
| 520           | 0.000         | 496.46          | 33.26        | 0.222        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.222          |
| 546           | 0.000         | 496.45          | 33.26        | 0.217        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.217          |
| 572           | 0.000         | 496.44          | 33.26        | 0.212        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.212          |
| 598           | 0.000         | 496.43          | 33.26        | 0.207        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.207          |
| 624           | 0.000         | 496.42          | 33.26        | 0.202        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.202          |
| 650           | 0.000         | 496.41          | 33.26        | 0.198        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.198          |
| 676           | 0.000         | 496.40          | 33.26        | 0.193        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.193          |
| 702           | 0.000         | 496.39          | 33.26        | 0.189        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.189          |
| 728           | 0.000         | 496.38          | 33.26        | 0.184        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.184          |
| 754           | 0.000         | 496.37          | 33.26        | 0.180        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.180          |
| 780           | 0.000         | 496.36          | 33.26        | 0.176        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.176          |
| 806           | 0.000         | 496.36          | 33.26        | 0.172        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.172          |
| 832           | 0.000         | 496.35          | 33.26        | 0.168        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.168          |
| 858           | 0.000         | 496.34          | 33.26        | 0.164        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.164          |
| 884           | 0.000         | 496.33          | 33.26        | 0.160        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.160          |
| 910           | 0.000         | 496.33          | 33.26        | 0.157        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.157          |
| 936           | 0.000         | 496.32          | 33.26        | 0.153        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.153          |
| 962           | 0.000         | 496.31          | 33.26        | 0.150        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.150          |
| 988           | 0.000         | 496.30          | 33.26        | 0.146        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.146          |
| 1014          | 0.000         | 496.30          | 33.26        | 0.143        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.143          |
| 1040          | 0.000         | 496.29          | 33.26        | 0.139        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.139          |
| 1066          | 0.000         | 496.28          | 33.26        | 0.136        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.136          |
| 1092          | 0.000         | 496.28          | 33.26        | 0.133        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.133          |
| 1118          | 0.000         | 496.27          | 33.26        | 0.130        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.130          |
| 1144          | 0.000         | 496.27          | 33.26        | 0.127        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.127          |
| 1170          | 0.000         | 496.26          | 33.26        | 0.124        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.124          |
| 1196          | 0.000         | 496.25          | 33.26        | 0.121        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.121          |

Continues on next page...

BMP 2 ROUTING

**Hydrograph Discharge Table**

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 1222          | 0.000         | 496.25          | 32.99        | 0.119        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.119          |
| 1248          | 0.000         | 496.24          | 32.25        | 0.116        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.116          |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YEAR INFLOW HYDROGRAPH

|                 |          |                |               |
|-----------------|----------|----------------|---------------|
| Hydrograph type | = Manual | Peak discharge | = 13.25 cfs   |
| Storm frequency | = 5 yrs  | Time to peak   | = 260 min     |
| Time interval   | = 26 min | Hyd. volume    | = 49,530 cuft |

### Hydrograph Discharge Table

( Printed values >= 1.00% of Qp.)

#### Time -- Outflow

(min      cfs)

|     |          |
|-----|----------|
| 26  | 0.800    |
| 52  | 0.900    |
| 78  | 1.000    |
| 104 | 1.100    |
| 130 | 1.200    |
| 156 | 1.500    |
| 182 | 1.700    |
| 208 | 2.500    |
| 234 | 2.600    |
| 260 | 13.25 << |
| 286 | 2.000    |
| 312 | 1.300    |
| 338 | 1.000    |
| 364 | 0.900    |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

### BMP 2 ROUTING

|                 |                                 |                |               |
|-----------------|---------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                     | Peak discharge | = 7,497 cfs   |
| Storm frequency | = 5 yrs                         | Time to peak   | = 286 min     |
| Time interval   | = 26 min                        | Hyd. volume    | = 49,461 cuft |
| Inflow hyd. No. | = 1 - 50 YEAR INFLOW HYDROGRAPH | Reservoir name | = <New Pond>  |
| Max. Elevation  | = 496.93 ft                     | Max. Storage   | = 26,476 cuft |

Storage Indication method used.

### Hydrograph Discharge Table

( Printed values &gt;= 1.00% of Qp.)

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 130           | 1.200         | 496.20          | 26.34        | 0.095        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.095          |
| 156           | 1.500         | 496.26          | 33.26        | 0.123        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.123          |
| 182           | 1.700         | 496.33          | 33.26        | 0.157        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.157          |
| 208           | 2.500         | 496.42          | 33.26        | 0.201        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.201          |
| 234           | 2.600         | 496.52          | 33.26        | 0.248        | ----         | ----         | 0.361       | ----        | ----        | ----        | ----         | 0.609          |
| 260           | 13.25 <<      | 496.75          | 33.26        | 0.320        | ----         | 5.171        | ----        | ----        | ----        | ----        | ----         | 5.490          |
| 286           | 2.000         | 496.80 <<       | 33.26        | 0.334        | ----         | 7.163        | ----        | ----        | ----        | ----        | ----         | 7.497 <<       |
| 312           | 1.300         | 496.63          | 33.26        | 0.283        | ----         | 2.730        | ----        | ----        | ----        | ----        | ----         | 3.013          |
| 338           | 1.000         | 496.57          | 33.26        | 0.265        | ----         | 1.505        | ----        | ----        | ----        | ----        | ----         | 1.770          |
| 364           | 0.900         | 496.55          | 33.26        | 0.257        | ----         | 0.966        | ----        | ----        | ----        | ----        | ----         | 1.223          |
| 390           | 0.000         | 496.52          | 33.26        | 0.249        | ----         | 0.458        | ----        | ----        | ----        | ----        | ----         | 0.707          |
| 416           | 0.000         | 496.50          | 33.26        | 0.242        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.242          |
| 442           | 0.000         | 496.49          | 33.26        | 0.237        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.237          |
| 468           | 0.000         | 496.48          | 33.26        | 0.231        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.231          |
| 494           | 0.000         | 496.47          | 33.26        | 0.226        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.226          |
| 520           | 0.000         | 496.46          | 33.26        | 0.221        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.221          |
| 546           | 0.000         | 496.45          | 33.26        | 0.216        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.216          |
| 572           | 0.000         | 496.44          | 33.26        | 0.211        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.211          |
| 598           | 0.000         | 496.43          | 33.26        | 0.206        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.206          |
| 624           | 0.000         | 496.42          | 33.26        | 0.201        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.201          |
| 650           | 0.000         | 496.41          | 33.26        | 0.197        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.197          |
| 676           | 0.000         | 496.40          | 33.26        | 0.192        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.192          |
| 702           | 0.000         | 496.39          | 33.26        | 0.188        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.188          |
| 728           | 0.000         | 496.38          | 33.26        | 0.183        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.183          |
| 754           | 0.000         | 496.37          | 33.26        | 0.179        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.179          |
| 780           | 0.000         | 496.36          | 33.26        | 0.175        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.175          |
| 806           | 0.000         | 496.35          | 33.26        | 0.171        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.171          |
| 832           | 0.000         | 496.35          | 33.26        | 0.167        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.167          |
| 858           | 0.000         | 496.34          | 33.26        | 0.163        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.163          |
| 884           | 0.000         | 496.33          | 33.26        | 0.160        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.160          |
| 910           | 0.000         | 496.32          | 33.26        | 0.156        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.156          |
| 936           | 0.000         | 496.32          | 33.26        | 0.152        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.152          |
| 962           | 0.000         | 496.31          | 33.26        | 0.149        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.149          |
| 988           | 0.000         | 496.30          | 33.26        | 0.145        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.145          |
| 1014          | 0.000         | 496.30          | 33.26        | 0.142        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.142          |
| 1040          | 0.000         | 496.29          | 33.26        | 0.139        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.139          |
| 1066          | 0.000         | 496.28          | 33.26        | 0.136        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.136          |
| 1092          | 0.000         | 496.28          | 33.26        | 0.133        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.133          |
| 1118          | 0.000         | 496.27          | 33.26        | 0.129        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.130          |
| 1144          | 0.000         | 496.26          | 33.26        | 0.127        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.127          |
| 1170          | 0.000         | 496.26          | 33.26        | 0.124        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.124          |
| 1196          | 0.000         | 496.25          | 33.26        | 0.121        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.121          |

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BMP 2 ROUTING

**Hydrograph Discharge Table**

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 1222          | 0.000         | 496.25          | 32.83        | 0.118        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.118          |
| 1248          | 0.000         | 496.24          | 32.10        | 0.115        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.115          |
| 1274          | 0.000         | 496.24          | 31.39        | 0.113        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.113          |
| 1300          | 0.000         | 496.23          | 30.68        | 0.110        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.110          |
| 1326          | 0.000         | 496.23          | 30.00        | 0.108        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.108          |
| 1352          | 0.000         | 496.22          | 29.33        | 0.105        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.105          |
| 1378          | 0.000         | 496.22          | 28.67        | 0.103        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.103          |
| 1404          | 0.000         | 496.21          | 28.04        | 0.101        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.101          |
| 1430          | 0.000         | 496.21          | 27.41        | 0.099        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.099          |
| 1456          | 0.000         | 496.20          | 26.80        | 0.096        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.096          |
| 1482          | 0.000         | 496.20          | 26.20        | 0.094        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.094          |
| 1508          | 0.000         | 496.19          | 25.62        | 0.092        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.092          |
| 1534          | 0.000         | 496.19          | 25.04        | 0.090        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.090          |
| 1560          | 0.000         | 496.18          | 24.48        | 0.088        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.088          |
| 1586          | 0.000         | 496.18          | 23.94        | 0.086        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.086          |
| 1612          | 0.000         | 496.18          | 23.40        | 0.084        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.084          |
| 1638          | 0.000         | 496.17          | 22.88        | 0.082        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.082          |
| 1664          | 0.000         | 496.17          | 22.37        | 0.080        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.080          |
| 1690          | 0.000         | 496.16          | 21.87        | 0.079        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.079          |
| 1716          | 0.000         | 496.16          | 21.38        | 0.077        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.077          |
| 1742          | 0.000         | 496.16          | 20.91        | 0.075        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.075          |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YEAR INFLOW HYDROGRAPH

|                 |          |                |               |
|-----------------|----------|----------------|---------------|
| Hydrograph type | = Manual | Peak discharge | = 15.60 cfs   |
| Storm frequency | = 10 yrs | Time to peak   | = 260 min     |
| Time interval   | = 26 min | Hyd. volume    | = 56,316 cuft |

### Hydrograph Discharge Table

( Printed values >= 1.00% of Qp.)

#### Time -- Outflow (min      cfs)

|     |          |
|-----|----------|
| 26  | 0.900    |
| 52  | 1.000    |
| 78  | 1.100    |
| 104 | 1.300    |
| 130 | 1.400    |
| 156 | 1.700    |
| 182 | 1.900    |
| 208 | 2.800    |
| 234 | 2.500    |
| 260 | 15.60 << |
| 286 | 2.200    |
| 312 | 1.500    |
| 338 | 1.200    |
| 364 | 1.000    |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

### BMP 2 ROUTING

|                 |                                 |                |               |
|-----------------|---------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                     | Peak discharge | = 8.805 cfs   |
| Storm frequency | = 10 yrs                        | Time to peak   | = 286 min     |
| Time interval   | = 26 min                        | Hyd. volume    | = 56,247 cuft |
| Inflow hyd. No. | = 1 - 50 YEAR INFLOW HYDROGRAPH | Reservoir name | = <New Pond>  |
| Max. Elevation  | = 496.99 ft                     | Max. Storage   | = 27,600 cuft |

Storage Indication method used.

### Hydrograph Discharge Table

( Printed values &gt;= 1.00% of Qp.)

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 130           | 1.400         | 496.23          | 29.94        | 0.108        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.108          |
| 156           | 1.700         | 496.29          | 33.26        | 0.140        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.140          |
| 182           | 1.900         | 496.37          | 33.26        | 0.179        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.179          |
| 208           | 2.800         | 496.47          | 33.26        | 0.228        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.228          |
| 234           | 2.500         | 496.56          | 33.26        | 0.260        | ----         | ----         | 1.184       | ----        | ----        | ----        | ----         | 1.444          |
| 260           | 15.60 <<      | 496.79          | 33.26        | 0.330        | ----         | ----         | 6.603       | ----        | ----        | ----        | ----         | 6.932          |
| 286           | 2.200         | 496.83 <<       | 33.26        | 0.342        | ----         | ----         | 8.463       | ----        | ----        | ----        | ----         | 8.805 <<       |
| 312           | 1.500         | 496.64          | 33.26        | 0.286        | ----         | ----         | 2.905       | ----        | ----        | ----        | ----         | 3.191          |
| 338           | 1.200         | 496.58          | 33.26        | 0.268        | ----         | ----         | 1.695       | ----        | ----        | ----        | ----         | 1.963          |
| 364           | 1.000         | 496.55          | 33.26        | 0.259        | ----         | ----         | 1.128       | ----        | ----        | ----        | ----         | 1.387          |
| 390           | 0.000         | 496.53          | 33.26        | 0.251        | ----         | ----         | 0.544       | ----        | ----        | ----        | ----         | 0.795          |
| 416           | 0.000         | 496.50          | 33.26        | 0.243        | ----         | ----         | 0.022       | ----        | ----        | ----        | ----         | 0.265          |
| 442           | 0.000         | 496.49          | 33.26        | 0.237        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.237          |
| 468           | 0.000         | 496.48          | 33.26        | 0.232        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.232          |
| 494           | 0.000         | 496.47          | 33.26        | 0.226        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.226          |
| 520           | 0.000         | 496.46          | 33.26        | 0.221        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.221          |
| 546           | 0.000         | 496.45          | 33.26        | 0.216        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.216          |
| 572           | 0.000         | 496.44          | 33.26        | 0.211        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.211          |
| 598           | 0.000         | 496.43          | 33.26        | 0.206        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.206          |
| 624           | 0.000         | 496.42          | 33.26        | 0.202        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.202          |
| 650           | 0.000         | 496.41          | 33.26        | 0.197        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.197          |
| 676           | 0.000         | 496.40          | 33.26        | 0.193        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.193          |
| 702           | 0.000         | 496.39          | 33.26        | 0.188        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.188          |
| 728           | 0.000         | 496.38          | 33.26        | 0.184        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.184          |
| 754           | 0.000         | 496.37          | 33.26        | 0.180        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.180          |
| 780           | 0.000         | 496.36          | 33.26        | 0.175        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.175          |
| 806           | 0.000         | 496.36          | 33.26        | 0.171        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.171          |
| 832           | 0.000         | 496.35          | 33.26        | 0.168        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.168          |
| 858           | 0.000         | 496.34          | 33.26        | 0.164        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.164          |
| 884           | 0.000         | 496.33          | 33.26        | 0.160        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.160          |
| 910           | 0.000         | 496.32          | 33.26        | 0.156        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.156          |
| 936           | 0.000         | 496.32          | 33.26        | 0.153        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.153          |
| 962           | 0.000         | 496.31          | 33.26        | 0.149        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.149          |
| 988           | 0.000         | 496.30          | 33.26        | 0.146        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.146          |
| 1014          | 0.000         | 496.30          | 33.26        | 0.142        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.142          |
| 1040          | 0.000         | 496.29          | 33.26        | 0.139        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.139          |
| 1066          | 0.000         | 496.28          | 33.26        | 0.136        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.136          |
| 1092          | 0.000         | 496.28          | 33.26        | 0.133        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.133          |
| 1118          | 0.000         | 496.27          | 33.26        | 0.130        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.130          |
| 1144          | 0.000         | 496.26          | 33.26        | 0.127        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.127          |
| 1170          | 0.000         | 496.26          | 33.26        | 0.124        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.124          |
| 1196          | 0.000         | 496.25          | 33.26        | 0.121        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.121          |

Continues on next page...

BMP 2 ROUTING

**Hydrograph Discharge Table**

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 1222          | 0.000         | 496.25          | 32.90        | 0.118        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.118          |
| 1248          | 0.000         | 496.24          | 32.17        | 0.116        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.116          |
| 1274          | 0.000         | 496.24          | 31.45        | 0.113        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.113          |
| 1300          | 0.000         | 496.23          | 30.74        | 0.111        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.111          |
| 1326          | 0.000         | 496.23          | 30.06        | 0.108        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.108          |
| 1352          | 0.000         | 496.22          | 29.39        | 0.106        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.106          |
| 1378          | 0.000         | 496.22          | 28.73        | 0.103        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.103          |
| 1404          | 0.000         | 496.21          | 28.09        | 0.101        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.101          |
| 1430          | 0.000         | 496.21          | 27.46        | 0.099        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.099          |
| 1456          | 0.000         | 496.20          | 26.85        | 0.097        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.097          |
| 1482          | 0.000         | 496.20          | 26.25        | 0.094        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.094          |
| 1508          | 0.000         | 496.19          | 25.67        | 0.092        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.092          |
| 1534          | 0.000         | 496.19          | 25.09        | 0.090        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.090          |
| 1560          | 0.000         | 496.18          | 24.53        | 0.088        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.088          |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YEAR INFLOW HYDROGRAPH

|                 |          |                |               |
|-----------------|----------|----------------|---------------|
| Hydrograph type | = Manual | Peak discharge | = 17.56 cfs   |
| Storm frequency | = 25 yrs | Time to peak   | = 260 min     |
| Time interval   | = 26 min | Hyd. volume    | = 63,274 cuft |

### Hydrograph Discharge Table

( Printed values >= 1.00% of Qp.)

#### Time -- Outflow (min      cfs)

|     |          |
|-----|----------|
| 26  | 1.100    |
| 52  | 1.200    |
| 78  | 1.200    |
| 104 | 1.400    |
| 130 | 1.500    |
| 156 | 1.900    |
| 182 | 2.100    |
| 208 | 3.200    |
| 234 | 2.800    |
| 260 | 17.56 << |
| 286 | 2.500    |
| 312 | 1.700    |
| 338 | 1.300    |
| 364 | 1.100    |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

### BMP 2 ROUTING

|                 |                                 |                |               |
|-----------------|---------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                     | Peak discharge | = 9.950 cfs   |
| Storm frequency | = 25 yrs                        | Time to peak   | = 286 min     |
| Time interval   | = 26 min                        | Hyd. volume    | = 63,204 cuft |
| Inflow hyd. No. | = 1 - 50 YEAR INFLOW HYDROGRAPH | Reservoir name | = <New Pond>  |
| Max. Elevation  | = 497.04 ft                     | Max. Storage   | = 28,584 cuft |

Storage Indication method used.

### Hydrograph Discharge Table

( Printed values &gt;= 1.00% of Qp.)

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 130           | 1.500         | 496.25          | 33.26        | 0.122        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.122          |
| 156           | 1.900         | 496.33          | 33.26        | 0.158        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.158          |
| 182           | 2.100         | 496.41          | 33.26        | 0.200        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.200          |
| 208           | 3.200         | 496.52          | 33.26        | 0.248        | ----         | ----         | 0.391       | ----        | ----        | ----        | ----         | 0.640          |
| 234           | 2.800         | 496.59          | 33.26        | 0.272        | ----         | ----         | 1.943       | ----        | ----        | ----        | ----         | 2.215          |
| 260           | 17.56 <<      | 496.82          | 33.26        | 0.339        | ----         | ----         | 8.034       | ----        | ----        | ----        | ----         | 8.374          |
| 286           | 2.500         | 496.86 <<       | 33.26        | 0.350        | ----         | ----         | 9.600       | ----        | ----        | ----        | ----         | 9.950 <<       |
| 312           | 1.700         | 496.65          | 33.26        | 0.289        | ----         | ----         | 3.108       | ----        | ----        | ----        | ----         | 3.397          |
| 338           | 1.300         | 496.59          | 33.26        | 0.270        | ----         | ----         | 1.861       | ----        | ----        | ----        | ----         | 2.131          |
| 364           | 1.100         | 496.56          | 33.26        | 0.261        | ----         | ----         | 1.248       | ----        | ----        | ----        | ----         | 1.510          |
| 390           | 0.000         | 496.53          | 33.26        | 0.252        | ----         | ----         | 0.618       | ----        | ----        | ----        | ----         | 0.869          |
| 416           | 0.000         | 496.50          | 33.26        | 0.243        | ----         | ----         | 0.046       | ----        | ----        | ----        | ----         | 0.289          |
| 442           | 0.000         | 496.49          | 33.26        | 0.238        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.238          |
| 468           | 0.000         | 496.48          | 33.26        | 0.232        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.232          |
| 494           | 0.000         | 496.47          | 33.26        | 0.227        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.227          |
| 520           | 0.000         | 496.46          | 33.26        | 0.222        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.222          |
| 546           | 0.000         | 496.45          | 33.26        | 0.216        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.216          |
| 572           | 0.000         | 496.44          | 33.26        | 0.212        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.212          |
| 598           | 0.000         | 496.43          | 33.26        | 0.207        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.207          |
| 624           | 0.000         | 496.42          | 33.26        | 0.202        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.202          |
| 650           | 0.000         | 496.41          | 33.26        | 0.197        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.197          |
| 676           | 0.000         | 496.40          | 33.26        | 0.193        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.193          |
| 702           | 0.000         | 496.39          | 33.26        | 0.188        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.188          |
| 728           | 0.000         | 496.38          | 33.26        | 0.184        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.184          |
| 754           | 0.000         | 496.37          | 33.26        | 0.180        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.180          |
| 780           | 0.000         | 496.36          | 33.26        | 0.176        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.176          |
| 806           | 0.000         | 496.36          | 33.26        | 0.172        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.172          |
| 832           | 0.000         | 496.35          | 33.26        | 0.168        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.168          |
| 858           | 0.000         | 496.34          | 33.26        | 0.164        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.164          |
| 884           | 0.000         | 496.33          | 33.26        | 0.160        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.160          |
| 910           | 0.000         | 496.32          | 33.26        | 0.156        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.156          |
| 936           | 0.000         | 496.32          | 33.26        | 0.153        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.153          |
| 962           | 0.000         | 496.31          | 33.26        | 0.149        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.149          |
| 988           | 0.000         | 496.30          | 33.26        | 0.146        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.146          |
| 1014          | 0.000         | 496.30          | 33.26        | 0.143        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.143          |
| 1040          | 0.000         | 496.29          | 33.26        | 0.139        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.139          |
| 1066          | 0.000         | 496.28          | 33.26        | 0.136        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.136          |
| 1092          | 0.000         | 496.28          | 33.26        | 0.133        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.133          |
| 1118          | 0.000         | 496.27          | 33.26        | 0.130        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.130          |
| 1144          | 0.000         | 496.27          | 33.26        | 0.127        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.127          |
| 1170          | 0.000         | 496.26          | 33.26        | 0.124        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.124          |
| 1196          | 0.000         | 496.25          | 33.26        | 0.121        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.121          |

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BMP 2 ROUTING

**Hydrograph Discharge Table**

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 1222          | 0.000         | 496.25          | 32.94        | 0.118        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.118          |
| 1248          | 0.000         | 496.24          | 32.20        | 0.116        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.116          |
| 1274          | 0.000         | 496.24          | 31.48        | 0.113        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.113          |
| 1300          | 0.000         | 496.23          | 30.78        | 0.111        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.111          |
| 1326          | 0.000         | 496.23          | 30.09        | 0.108        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.108          |
| 1352          | 0.000         | 496.22          | 29.42        | 0.106        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.106          |
| 1378          | 0.000         | 496.22          | 28.77        | 0.103        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.103          |
| 1404          | 0.000         | 496.21          | 28.13        | 0.101        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.101          |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 1

### 50 YEAR INFLOW HYDROGRAPH

|                 |          |                |               |
|-----------------|----------|----------------|---------------|
| Hydrograph type | = Manual | Peak discharge | = 20.40 cfs   |
| Storm frequency | = 50 yrs | Time to peak   | = 260 min     |
| Time interval   | = 26 min | Hyd. volume    | = 70,512 cuft |

### Hydrograph Discharge Table

( Printed values >= 1.00% of Qp.)

#### Time -- Outflow

(min      cfs)

|     |          |
|-----|----------|
| 26  | 1.200    |
| 52  | 1.300    |
| 78  | 1.400    |
| 104 | 1.600    |
| 130 | 1.700    |
| 156 | 2.100    |
| 182 | 2.400    |
| 208 | 3.500    |
| 234 | 2.200    |
| 260 | 20.40 << |
| 286 | 2.800    |
| 312 | 1.900    |
| 338 | 1.500    |
| 364 | 1.200    |

*...End*

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Thursday, Dec 16, 2021

## Hyd. No. 2

### BMP 2 ROUTING

|                 |                                 |                |               |
|-----------------|---------------------------------|----------------|---------------|
| Hydrograph type | = Reservoir                     | Peak discharge | = 11.50 cfs   |
| Storm frequency | = 50 yrs                        | Time to peak   | = 286 min     |
| Time interval   | = 26 min                        | Hyd. volume    | = 70,443 cuft |
| Inflow hyd. No. | = 1 - 50 YEAR INFLOW HYDROGRAPH | Reservoir name | = <New Pond>  |
| Max. Elevation  | = 497.11 ft                     | Max. Storage   | = 29,916 cuft |

Storage Indication method used.

### Hydrograph Discharge Table

( Printed values &gt;= 1.00% of Qp.)

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 130           | 1.700         | 496.29          | 33.26        | 0.137        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.137          |
| 156           | 2.100         | 496.37          | 33.26        | 0.178        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.178          |
| 182           | 2.400         | 496.46          | 33.26        | 0.225        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.225          |
| 208           | 3.500         | 496.56          | 33.26        | 0.262        | ----         | ----         | 1.290       | ----        | ----        | ----        | ----         | 1.552          |
| 234           | 2.200         | 496.60          | 33.26        | 0.275        | ----         | ----         | 2.144       | ----        | ----        | ----        | ----         | 2.418          |
| 260           | 20.40 <<      | 496.85          | 33.26        | 0.347        | ----         | ----         | 9.190       | ----        | ----        | ----        | ----         | 9.536          |
| 286           | 2.800         | 496.90 <<       | 33.26        | 0.360        | ----         | ----         | 11.14       | ----        | ----        | ----        | ----         | 11.50 <<       |
| 312           | 1.900         | 496.66          | 33.26        | 0.292        | ----         | ----         | 3.324       | ----        | ----        | ----        | ----         | 3.616          |
| 338           | 1.500         | 496.60          | 33.26        | 0.273        | ----         | ----         | 2.064       | ----        | ----        | ----        | ----         | 2.338          |
| 364           | 1.200         | 496.57          | 33.26        | 0.264        | ----         | ----         | 1.415       | ----        | ----        | ----        | ----         | 1.679          |
| 390           | 0.000         | 496.53          | 33.26        | 0.253        | ----         | ----         | 0.706       | ----        | ----        | ----        | ----         | 0.959          |
| 416           | 0.000         | 496.50          | 33.26        | 0.244        | ----         | ----         | 0.075       | ----        | ----        | ----        | ----         | 0.319          |
| 442           | 0.000         | 496.49          | 33.26        | 0.238        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.238          |
| 468           | 0.000         | 496.48          | 33.26        | 0.232        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.232          |
| 494           | 0.000         | 496.47          | 33.26        | 0.227        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.227          |
| 520           | 0.000         | 496.46          | 33.26        | 0.222        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.222          |
| 546           | 0.000         | 496.45          | 33.26        | 0.217        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.217          |
| 572           | 0.000         | 496.44          | 33.26        | 0.212        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.212          |
| 598           | 0.000         | 496.43          | 33.26        | 0.207        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.207          |
| 624           | 0.000         | 496.42          | 33.26        | 0.202        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.202          |
| 650           | 0.000         | 496.41          | 33.26        | 0.198        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.198          |
| 676           | 0.000         | 496.40          | 33.26        | 0.193        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.193          |
| 702           | 0.000         | 496.39          | 33.26        | 0.189        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.189          |
| 728           | 0.000         | 496.38          | 33.26        | 0.184        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.184          |
| 754           | 0.000         | 496.37          | 33.26        | 0.180        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.180          |
| 780           | 0.000         | 496.36          | 33.26        | 0.176        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.176          |
| 806           | 0.000         | 496.36          | 33.26        | 0.172        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.172          |
| 832           | 0.000         | 496.35          | 33.26        | 0.168        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.168          |
| 858           | 0.000         | 496.34          | 33.26        | 0.164        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.164          |
| 884           | 0.000         | 496.33          | 33.26        | 0.160        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.160          |
| 910           | 0.000         | 496.33          | 33.26        | 0.157        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.157          |
| 936           | 0.000         | 496.32          | 33.26        | 0.153        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.153          |
| 962           | 0.000         | 496.31          | 33.26        | 0.150        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.150          |
| 988           | 0.000         | 496.30          | 33.26        | 0.146        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.146          |
| 1014          | 0.000         | 496.30          | 33.26        | 0.143        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.143          |
| 1040          | 0.000         | 496.29          | 33.26        | 0.139        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.139          |
| 1066          | 0.000         | 496.28          | 33.26        | 0.136        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.136          |
| 1092          | 0.000         | 496.28          | 33.26        | 0.133        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.133          |
| 1118          | 0.000         | 496.27          | 33.26        | 0.130        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.130          |
| 1144          | 0.000         | 496.27          | 33.26        | 0.127        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.127          |
| 1170          | 0.000         | 496.26          | 33.26        | 0.124        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.124          |
| 1196          | 0.000         | 496.25          | 33.26        | 0.121        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.121          |

Continues on next page...

BMP 2 ROUTING

**Hydrograph Discharge Table**

| Time<br>(min) | Inflow<br>cfs | Elevation<br>ft | Clv A<br>cfs | Clv B<br>cfs | Clv C<br>cfs | PfRsr<br>cfs | Wr A<br>cfs | Wr B<br>cfs | Wr C<br>cfs | Wr D<br>cfs | Exfil<br>cfs | Outflow<br>cfs |
|---------------|---------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|----------------|
| 1222          | 0.000         | 496.25          | 32.99        | 0.119        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.119          |
| 1248          | 0.000         | 496.24          | 32.25        | 0.116        | ----         | ----         | ----        | ----        | ----        | ----        | ----         | 0.116          |

*...End*

APPENDIX A – TABLES AND CHARTS

## APPENDIX A: RATIONAL METHOD AND MODIFIED RATIONAL METHOD

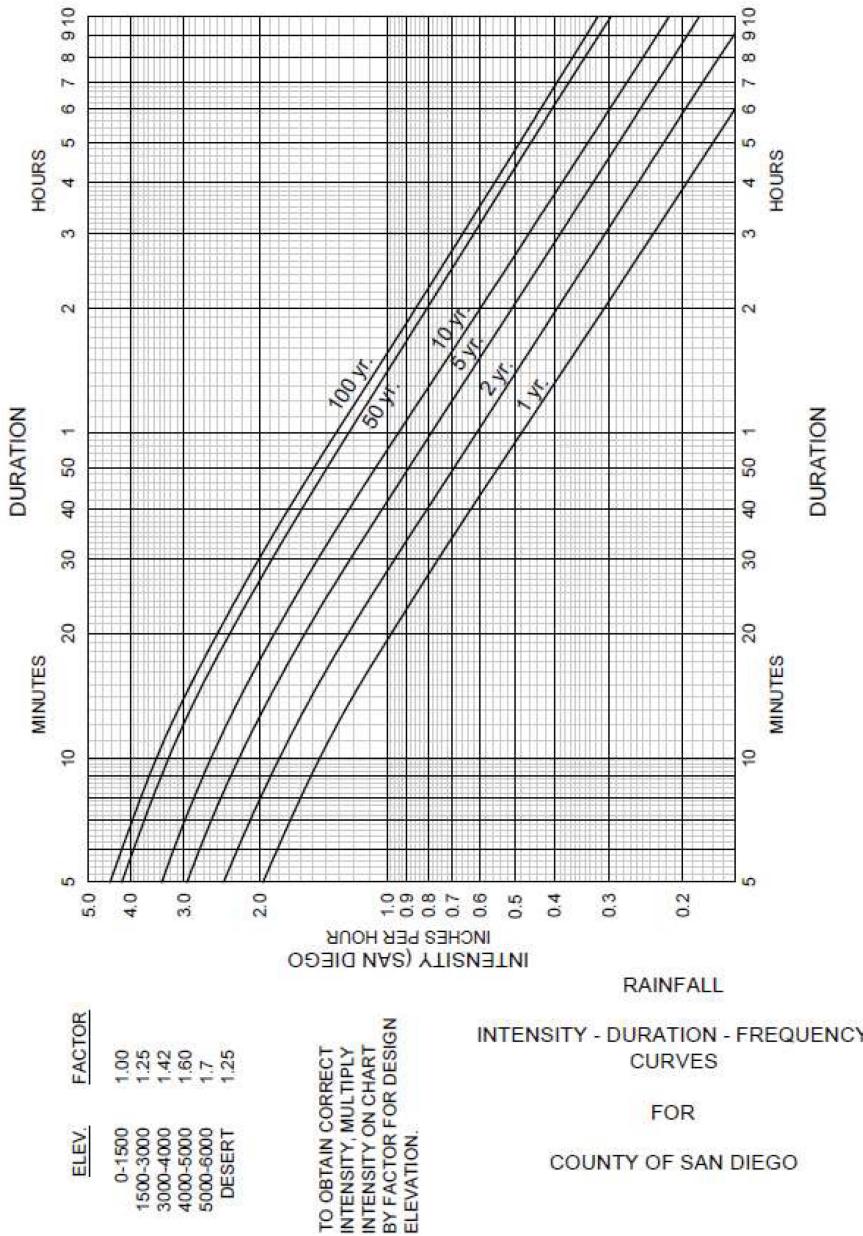
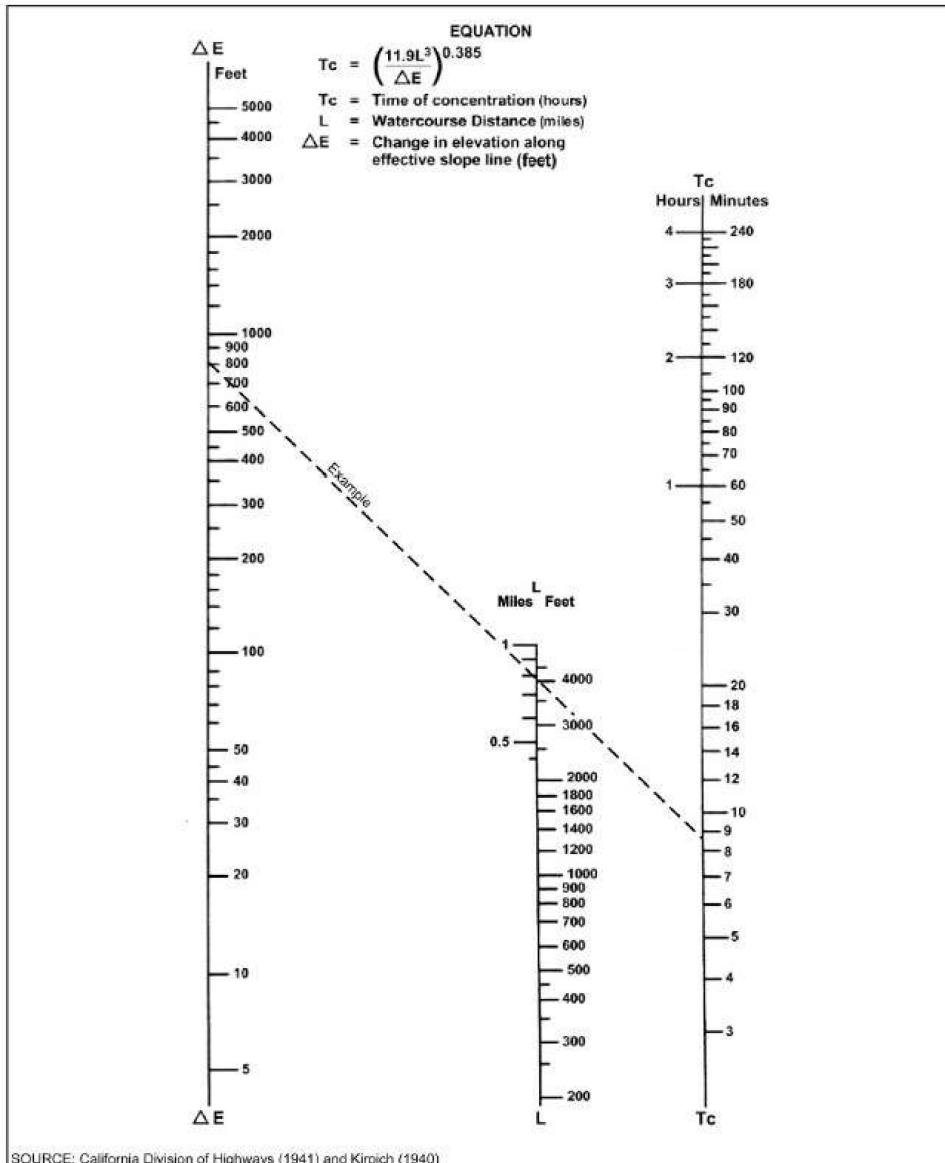


Figure A-1. Intensity-Duration-Frequency Design Chart

## APPENDIX A: RATIONAL METHOD AND MODIFIED RATIONAL METHOD

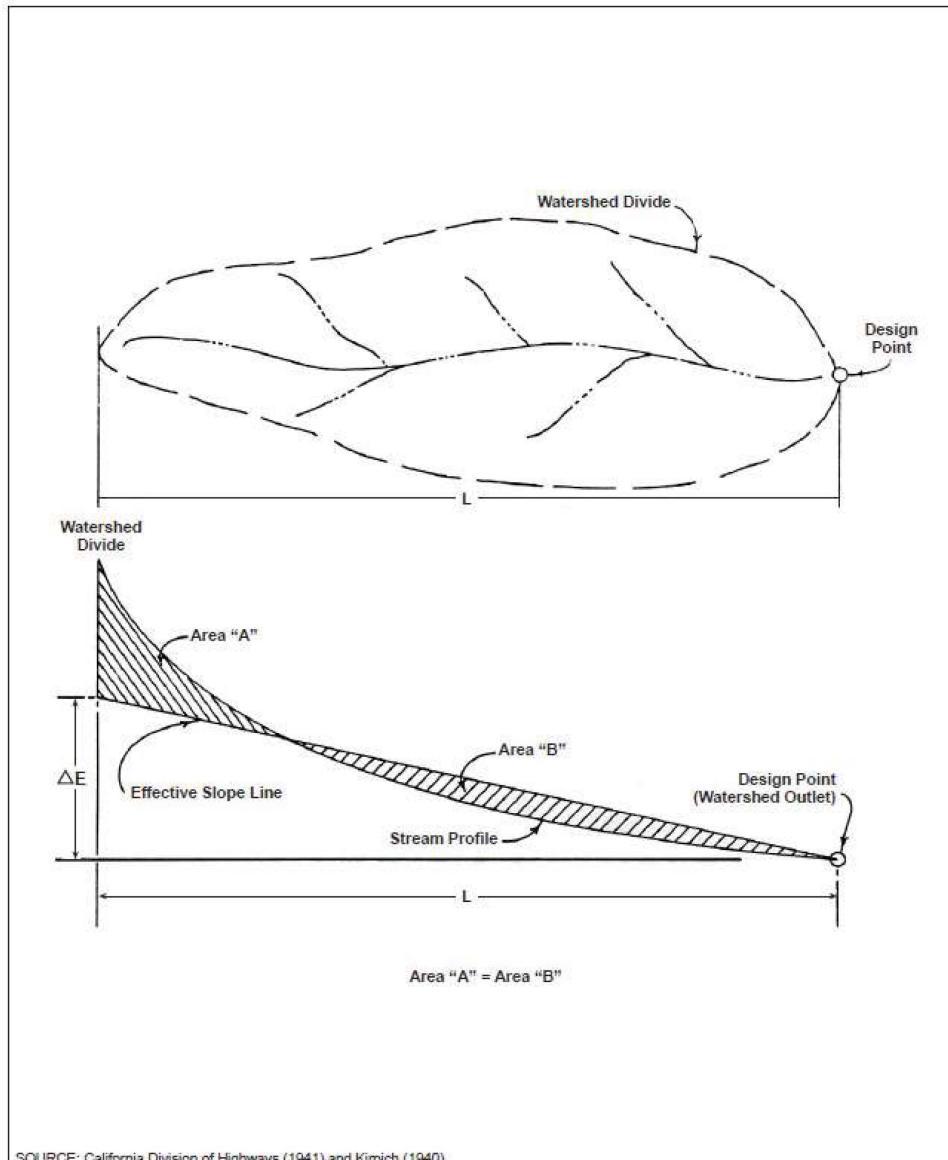


SOURCE: California Division of Highways (1941) and Kirpich (1940)

**Figure A-2. Nomograph for Determination of  $T_c$  for Natural Watersheds**

**Note:** Add ten minutes to the computed time of concentration from Figure A-2.

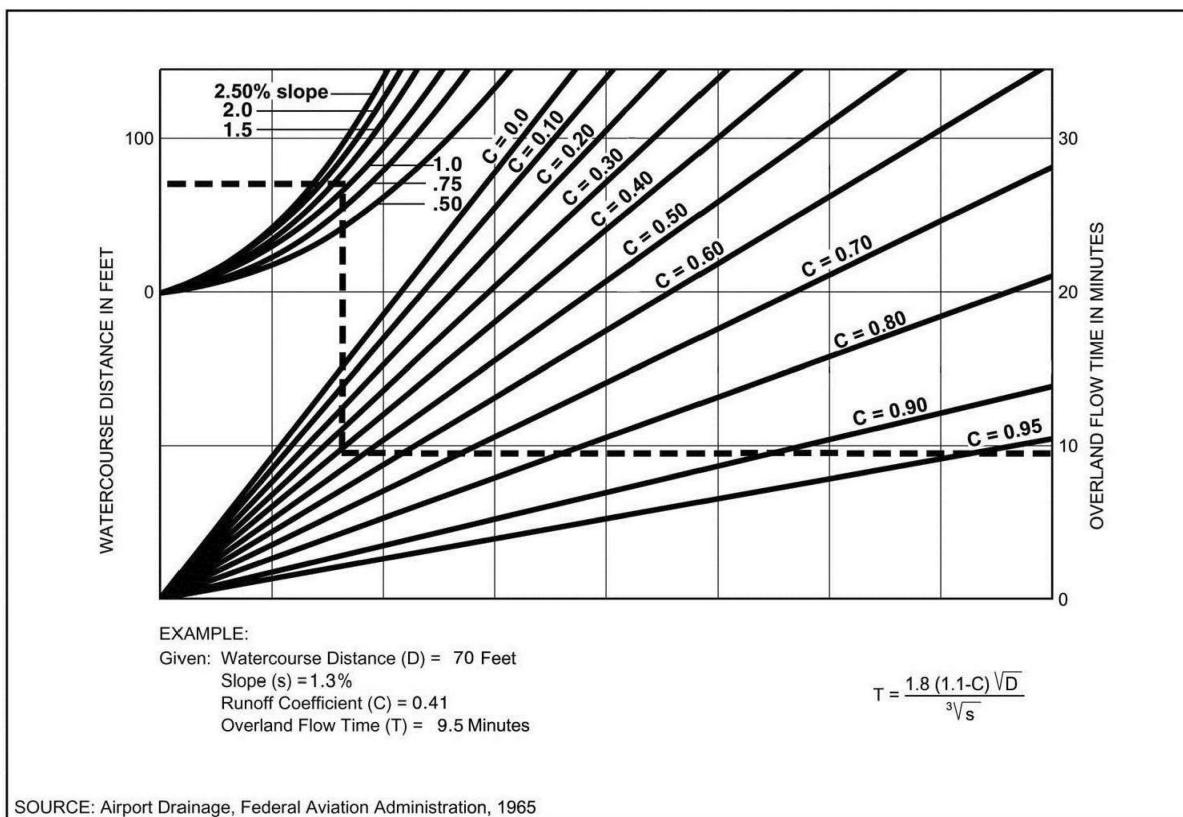
## APPENDIX A: RATIONAL METHOD AND MODIFIED RATIONAL METHOD



SOURCE: California Division of Highways (1941) and Kirpich (1940)

**Figure A-3. Computation of Effective Slope for Natural Watersheds**

## APPENDIX A: RATIONAL METHOD AND MODIFIED RATIONAL METHOD



**Figure A-4. Rational Formula - Overland Time of Flow Nomograph**

**Note:** Use formula for watercourse distances in excess of 100 feet.

## Ernest F. Brater and Horace Williams King

# HANDBOOK OF HYDRAULICS

## For the Solution of Hydraulic Engineering Problems

Table 7-14. Values of K' for Circular Channels in the Formula

$$Q = \frac{K'}{n} d^{8/3} s^{1/2}$$

D = depth of water

d = diameter of channel

## APPENDIX A: RATIONAL METHOD AND MODIFIED RATIONAL METHOD

**Table A-1. Runoff Coefficients for Rational Method**

| Land Use                           | Runoff Coefficient (C)   |
|------------------------------------|--------------------------|
|                                    | Soil Type <sup>(1)</sup> |
| <b>Residential:</b>                |                          |
| Single Family                      | 0.55                     |
| Multi-Units                        | 0.70                     |
| Mobile Homes                       | 0.65                     |
| Rural (lots greater than 1/2 acre) | 0.45                     |
| <b>Commercial <sup>(2)</sup></b>   |                          |
| 80% Impervious                     | 0.85                     |
| <b>Industrial <sup>(2)</sup></b>   |                          |
| 90% Impervious                     | 0.95                     |

**Note:**

<sup>(1)</sup> Type D soil to be used for all areas.

<sup>(2)</sup> Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

$$\begin{array}{lcl} \text{Actual imperviousness} & = & 50\% \\ \text{Tabulated imperviousness} & = & 80\% \\ \text{Revised C} & = & (50/80) \times 0.85 = 0.53 \end{array}$$

The values in Table A-1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

### A.1.3. Rainfall Intensity

The rainfall intensity ( $I$ ) is the rainfall in inches per hour (in/hr.) for a duration equal to the  $T_c$  for a selected storm frequency. Once a particular storm frequency has been selected for design and a  $T_c$  calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).

## Manning Roughness Coefficients

The Manning roughness coefficient ( $n$ ) is used to represent flow resistance in open-channel hydraulic computations. This Appendix offers a compilation of Manning roughness coefficients that may be used in the hydraulic design and evaluation of drainage facilities.

These values serve only as a basic guide. The procedure for selecting appropriate values for Manning roughness coefficient, especially in natural channel systems, is subjective and requires judgment and skill that is primarily developed through experience. For work where very accurate determination of water surface profile is necessary, the design engineer should consult the governing Agency to obtain data regarding roughness coefficient values applicable to specific streams. The design engineer may also examine Flood Insurance Study data, or one of several references for more specific information on determining roughness coefficient.

**Table C-1. Average Manning Roughness Coefficients for Pavement and Gutters<sup>(1)</sup>**

| Material  | Manning Roughness Coefficient ( $n$ ) |
|---|---------------------------------------|
| Concrete Gutter <sup>(2)</sup>  | 0.015                                 |
| Concrete Pavement<br>Float Finish<br>Broom Finish                       | 0.014<br>0.016                        |
| Concrete Gutter with Asphalt Pavement<br>Smooth Finish<br>Rough Texture | 0.013<br>0.015                        |
| Asphalt Pavement<br>Smooth Finish<br>Rough Texture                      | 0.013<br>0.016                        |

Based on FHWA HEC-22.

<sup>(1)</sup> Based on materials and workmanship required by standard specifications.

<sup>(2)</sup> Increase roughness coefficient in gutters with mild slopes where sediment might accumulate by 0.020.

## APPENDIX C: MANNING ROUGHNESS COEFFICIENTS

**Table C-2. Average Manning Roughness Coefficients for Closed Conduits<sup>(1)</sup>**

| Conduit  | Manning Roughness Coefficient (n) |
|--|-----------------------------------|
| Reinforced Concrete Pipe (RCP)                                       | 0.013                             |
| Corrugated Metal Pipe and Pipe Arch<br>2-3/8 x 1/2 inch Corrugations | 0.024                             |
| Unlined  | 0.024                             |
| Half Lined   |                                   |
| Full Flow  | 0.018                             |
| d/D>=0.60  | 0.016                             |
| d/D<0.60   | 0.013                             |
| Fully Lined  | 0.013                             |
| 3x1 inch Corrugations  | 0.027                             |
| 6x2 inch Corrugations  | 0.032                             |
| Spiral Rib Pipe  | 0.013                             |
| Helically Wound Pipe   |                                   |
| 18-inch  | 0.015                             |
| 24-inch  | 0.017                             |
| 30-inch  | 0.019                             |
| 36-inch  | 0.021                             |
| 42-inch  | 0.022                             |
| 48-inch  | 0.023                             |
| Plastic Pipe (HPDE and PVC)  |                                   |
| Smooth   | 0.013                             |
| Corrugated   | 0.024                             |
| Vitrified Clay Pipe  | 0.014                             |
| Cast-Iron Pipe (Uncoated)  | 0.013                             |
| Steel Pipe   | 0.011                             |
| Brick  | 0.017                             |
| Cast-In-Place Concrete Pipe  |                                   |
| Rough Wood Forms   | 0.017                             |
| Smooth Wood or Steel Forms   | 0.014                             |

<sup>(1)</sup> Based on materials and workmanship required by standard specifications.

## APPENDIX C: MANNING ROUGHNESS COEFFICIENTS

**Table C-3. Average Manning Roughness Coefficients for Small Open Channels Conveying Less than 50 cfs<sup>(1)</sup>**

| Lining Type        | Design Flow Depth                                  |              |          |
|--------------------|--|--------------|----------|
|                    | 0 – 0.5 ft   | 0.5 – 2.0 ft | > 2.0 ft |
| Concrete (Poured)  | 0.015  | 0.013        | 0.013    |
| Air Blown Concrete | 0.023  | 0.019        | 0.016    |
| Grouted Riprap     | 0.040  | 0.030        | 0.028    |
| Stone Masonry      | 0.042  | 0.032        | 0.030    |
| Soil Cement        | 0.025  | 0.022        | 0.020    |
| Bare Soil          | 0.023  | 0.020        | 0.020    |
| Rock Cut           | 0.045  | 0.035        | 0.025    |
| Rock Riprap        | Based on Rock Size (See Chapter 7, Section 7.6.17) |              |          |

<sup>(1)</sup> Based on materials and workmanship required by standard specifications.

**Table C-4. Average Manning Roughness Coefficients for Larger Open Channels**

| Channel   | Manning Roughness Coefficient(n) |
|---|----------------------------------|
| Unlined Channels<br>Clay Loam<br>Sand   | 0.023<br>0.020                   |
| Lined Channels<br>Grass Lined (well maintained)<br>Grass Lined (not maintained) | 0.035<br>0.045                   |
| Wetland-Bottom Channels (New Channel)   | 0.023                            |
| Wetland-Bottom Channels (Mature Channel)  | See Table A-5                    |
| Riprap-Lined Channels   | See Chapter 7, Section 7.6.17    |
| Concrete (Poured)   | 0.014                            |
| Air Blown Mortar (Gunite or Shotcrete) <sup>(1)</sup>                           | 0.016                            |
| Asphaltic Concrete or Bituminous Plant Mix                                      | 0.018                            |

<sup>(1)</sup> For air blown concrete, use n=0.012 (if troweled) and n=0.025 if purposely roughened.

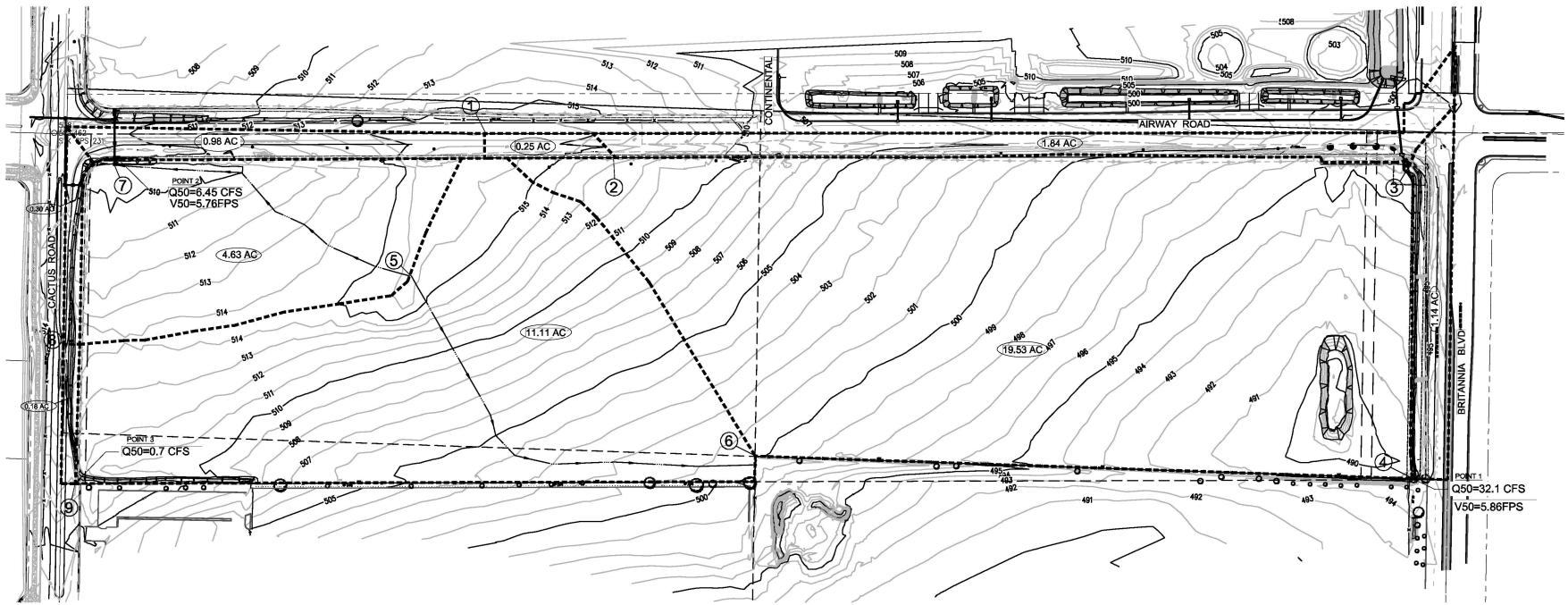
Note: For channels with revetments or multiple lining types, use composite Manning roughness coefficient based on component lining materials.

## APPENDIX C: MANNING ROUGHNESS COEFFICIENTS

**Table C-5. Average Manning Roughness Coefficients for Natural Channels**

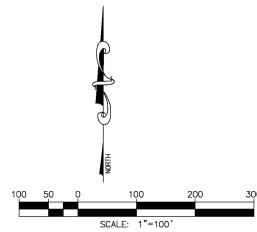
| Channel   | Manning Roughness Coefficient (n) |
|---|-----------------------------------|
| <b>Minor Streams (Surface Width at Flood Stage &lt; 100 ft)</b> |                                   |
| Fairly Regular Section  |                                   |
| (A) Some Grass and Weeds, Little or No Brush                    | 0.030                             |
| (B) Dense Growth of Weeds, Depth of Flow Materially             |                                   |
| Greater than Weed Height  |                                   |
| (C) Some Weeds, Light Brush on Banks                            | 0.040                             |
| (D) Some Weeds, Heavy Brush on Banks                            | 0.040                             |
| (E) For Trees within Channel with Branches Submerged at         | 0.060                             |
| High Stage, Increase all above values by:                       |                                   |
| Irregular Section, with Pools, Slight Channel Meander           | 0.015                             |
| Channels (A) through (E) above, Increase all Values by:         |                                   |
| Mountain Streams; No Vegetation in Channel, Banks Usually       | 0.015                             |
| Steep, Trees and Brush along Banks Submerged at High Stage      |                                   |
| (A) Bottom, Gravel, Cobbles and Few Boulders                    | 0.050                             |
| (B) Bottom, Cobbles with Large Boulders                         | 0.060                             |
| <b>Flood Plains (Adjacent to Natural Streams)</b>               |                                   |
| Pasture, No Brush   |                                   |
| (A) Short Grass   | 0.030                             |
| (B) High Grass  | 0.040                             |
| Cultivated Areas  |                                   |
| (A) No Crop   | 0.040                             |
| (B) Mature Row Crops  | 0.040                             |
| (C) Mature Field Crops  | 0.050                             |
| Heavy Weeds, Scattered Brush                                    | 0.050                             |
| Light Brush and Trees   | 0.060                             |
| Medium-to-Dense Brush   | 0.090                             |
| Dense Willows   | 0.170                             |
| Cleared Land with Tree Stumps, 100–150 per Acre                 | 0.060                             |
| Heavy Stand of Timber, Little Undergrowth                       |                                   |
| (A) Flood Depth below Branches                                  | 0.110                             |
| (B) Flood Depth Reaches Branches                                | 0.140                             |

APPENDIX B – DRAINAGE EXHIBIT

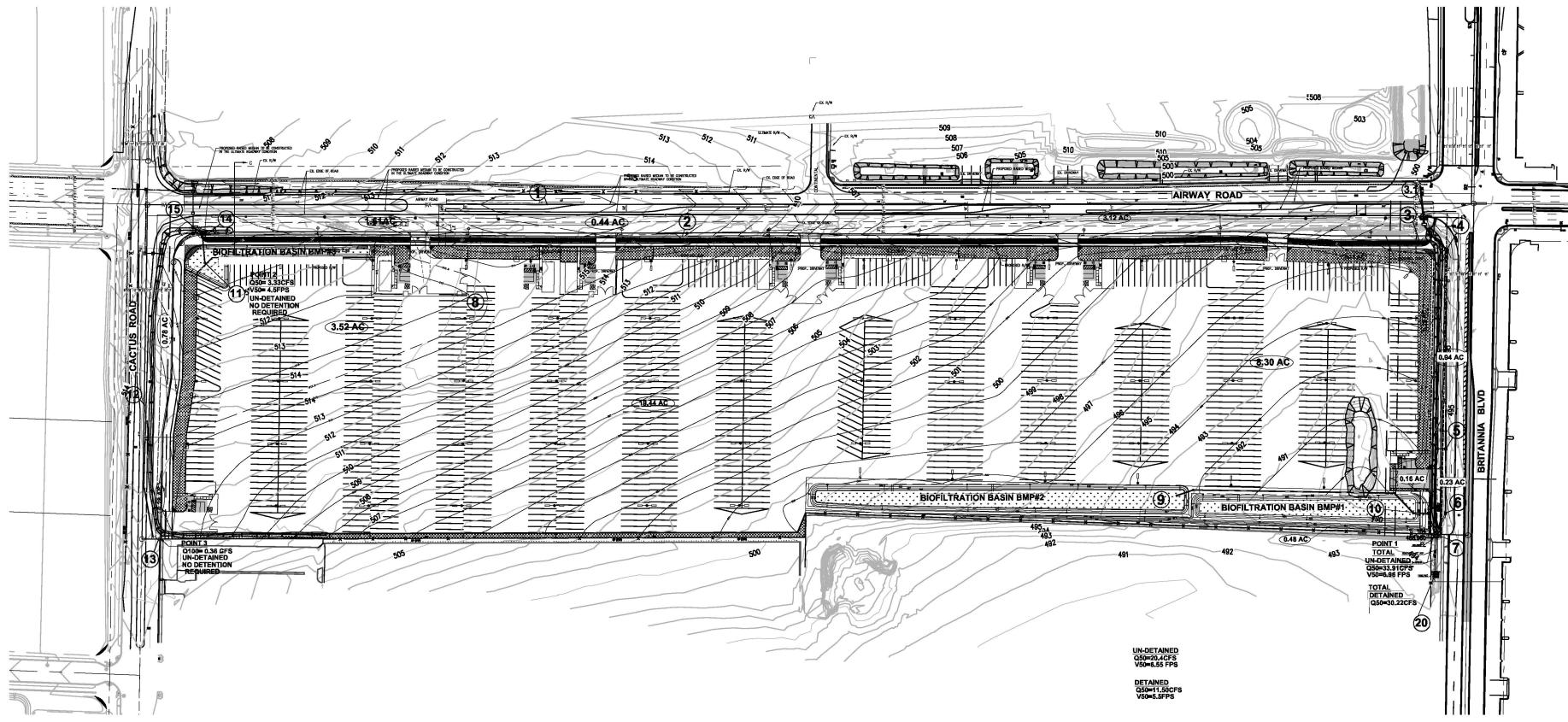


#### LEGEND

| FEATURE               | SYMBOL   |
|-----------------------|----------|
| NODE NUMBER           | ①        |
| HYDROLOGIC BASIN AREA | 19.53 AC |
| SUBAREA BOUNDARY      | ---      |
| DIRECTION OF FLOW     | →        |



**EXISTING CONDITION  
HYDROLOGY MAP  
BRITANNIA AIRWAY LOGISTICS CENTER**



**PROPOSED CONDITION**  
**HYDROLOGY MAP**  
**BRITANNIA AIRWAY LOGISTICS CENTER**