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# Winchester Road U-Stor it Drainage Study

South Corner of Winchester Road and Elmhurst Lane, Winchester, CA 92596  
CUP210126

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**Date Prepared:**

April 18, 2025

**Prepared For:**

U-STOR-IT

Attn: Peter Nora

501 W. Broadway Ste. 202

San Diego, CA 92101

Phone: (619) 255-7478

Email: Peter@ccf-llc.com

**Prepared By:**



4320 Viewridge Ave, Suite C

San Diego, CA 92113

Ph: (858) 634-8620

**Declaration of Responsible Charge:**

I hereby declare that I am the engineer of work for this project, that I have exercised responsible charge over the design of the project as defined in section 6703 of the business and professions code, and that the design is consistent with current standards. I understand that the check of the project drawings and specifications by the County of Riverside is confined to a review only and does not relieve me, as an engineer of work, of my responsibilities for project design.

Patric T. de Boer

Registration Expires

RCE 83583

3-31-2027



## Table of Contents

|            |                                                                                 |
|------------|---------------------------------------------------------------------------------|
| <b>1.0</b> | <b>INTRODUCTION</b>                                                             |
| 1.1        | Project Description                                                             |
| 1.2        | Purpose of the Study                                                            |
| <b>2.0</b> | <b>PRE-DEVELOPMENT CONDITION HYDROLOGY</b>                                      |
| 2.1        | Pre-Development Conditions                                                      |
| 2.2        | Methodology of Existing Hydrology Study                                         |
| 2.3        | Hydrology Calculations                                                          |
| 2.4        | Results of Pre-Development Hydrology Calculations                               |
| <b>3.0</b> | <b>POST-DEVELOPMENT CONDITION</b>                                               |
| 3.1        | Post-Development Conditions                                                     |
| 3.2        | Methodology of Proposed Hydrology Study                                         |
| 3.3        | Hydrology Calculations                                                          |
| 3.4        | Results of Post-Development Hydrology Calculations                              |
| <b>4.0</b> | <b>COMPARISON OF POST-DEVELOPMENT AND PRE-DEVELOPMENT HYDROLOGIC CONDITIONS</b> |
| 4.1        | Hydrologic Conditions of Concern                                                |
| 4.2        | Mitigation Measures for Hydrologic Conditions of Concern                        |
| <b>5.0</b> | <b>HYDRAULIC CALCULATIONS</b>                                                   |
| 5.1        | Hydraulic Calculations Methodology                                              |
| <b>6.0</b> | <b>RESULTS OF HYDRAULIC CALCULATIONS</b>                                        |
| <b>7.0</b> | <b>CONCLUSIONS</b>                                                              |
| <b>8.0</b> | <b>EXHIBITS</b>                                                                 |
| Exhibit A  | Location Map                                                                    |
| Exhibit B  | Hydrologic Soil Group Map                                                       |
| Exhibit D  | Pre-Development Hydrology Map                                                   |
| Exhibit E  | Post-Development Hydrology Map                                                  |
| Exhibit F  | Offsite Hydrology Map                                                           |
| <b>9.0</b> | <b>APPENDICES</b>                                                               |
| Appendix 1 | Nomographs from Riverside Hydrology Manual                                      |
| Appendix 2 | Channel Calculations                                                            |
| Appendix 3 | Existing Culvert Capacity Calculations                                          |
| Appendix 4 | BMP Details                                                                     |
| Appendix 5 | Pump Vault Calculations                                                         |
| Appendix 6 | BMP Storage Calculations                                                        |

## 1.0 Introduction

### 1.1 Project Description

This drainage study has been prepared as part of the grading plan set for the project located at the South corner of the intersection of Winchester Road and Elmhurst Lane in Riverside County, California. The project proposes to regrade the entire lot to build a self-storage facility. The proposed design will drain via surface flow and private storm drains to a large biofiltration basin located at the southern corner of the site. The project will include offsite improvements along Coventry Lane.

The site drainage basin is located in the Murrieta Hydrologic Area of the Santa Margarita Hydrologic Unit (902.22). See Figure No. 1 for the vicinity map. See Figure No. 2 for the existing drainage limits. See Figure No. 3 for the proposed drainage limits.

### 1.2 Purpose of the Study

The purpose of this study is to quantify the predeveloped and post developed peak runoff flowrates for the 100-year storm. The study will quantify the peak flowrates at the discharge points to demonstrate that there is no significant increase in peak flowrates discharged from the site to downstream areas during the peak flow conditions.

## 2.0 Pre-Development Condition Hydrology

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### 2.1 Pre-development Conditions

The existing site consists of a rectangular lot with a northwest frontage of Winchester Road and a northeast frontage of Elmhurst Lane. The project is vacant and mostly ungraded. The remains of an old driveway and farmhouse slab remain. Several trees and shrubs are located near the center of the site.

The ground surface conditions consist of poorly vegetated ground cover of seasonal grasses. The underlying hydrologic soil group is Type 'C'. Drainage of the site is overland flow to the southerly corner of the site. The site receives runoff from three distinct locations.

Run-on Point #1 is located at the northerly corner of the site, where a 24" culvert under Elmhurst Lane discharges to an onsite ditch. Run-on Point #1 receives runoff from 58 acres of offsite area. The existing 24" pipe does not have capacity to convey the entire 100-year peak flowrate it receives. Water can pond to a depth of 3 feet above the invert of the inlet before it overtops an adjacent embankment and flows down Elmhurst Lane and to Coventry Lane. The flow tributary to Run-on Point #1 is restricted to the capacity of the culvert when it has 3 feet of ponding at the inlet. Any water in excess of this does not flow to the site.

The excess runoff from the existing 24" culvert drains down to the easterly corner of the site where it bypasses the site. Approximately 135 acres of additional offsite area just north of the site also drains to this point of the project. In addition, a portion of Coventry Lane has been included as it

will be improved on the proposed project. This drainage point is referred to as Discharge Point # 2 in this report.

Run-on Point #2 is a separate 24" culvert that crosses Winchester Road, discharging to an onsite ditch at the midpoint of the northwest boundary. Run-on Point #2 receives runoff from 4.52 acres of offsite area. Stormwater from both run-on points confluences on site and flows through an existing channel running south, discharging onto the southwesterly neighboring lot. This drainage point is referred to as Discharge Point # 1 in this report.

The majority of Coventry Lane, being the portion that connects to Keller Road, drains via surface flow to a drainage ditch just adjacent to Keller Road. Coventry Lane also accepts a portion of offsite runoff just north of the road. The drainage ditch adjacent of Keller Road is referred to as Discharge Point # 3 in this report.

## **2.2 Methodology of Existing Hydrology Study**

This drainage report has been prepared in accordance with current County of Riverside regulations and procedures. The Modified Rational Method was used to compute the anticipated peak runoff flowrates. The peak flowrates were confluence according to the junction equations on Plate D-1 of the Riverside County Hydrology Manual.

Pipe and channel hydraulic properties were determined using the Manning's Equation, via hand calculations. The calculations have been presented in excel spreadsheets. See the attached calculations for particulars.

The following references have been used in preparation of this report:

- (1) Handbook of Hydraulics, E.F. Brater & H.W. King, 6<sup>th</sup> Ed., 1976.
- (2) Modern Sewer Design, American Iron & Steel Institute, 1st Ed., 1980.
- (3) County of Riverside Hydrology Manual, 19

## 2.3 Pre-Developed Hydrology Calculations

| Winchester Road U-Stor It                                                                                                                                                                                                                                                                                                                                                                                  |                    |           |            |                          |                 |                       |                                |         |         |        |         |      |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------|------------|--------------------------|-----------------|-----------------------|--------------------------------|---------|---------|--------|---------|------|--|
| 10-Year Storm Rational Method Hydrology Calculations,Predeveloped Conditions                                                                                                                                                                                                                                                                                                                               |                    |           |            |                          |                 |                       |                                |         |         |        |         |      |  |
| Drainage Area                                                                                                                                                                                                                                                                                                                                                                                              | Soil & Development | A (Acres) | ΣA (Acres) | I <sub>10</sub> (in/hr.) | C <sub>10</sub> | Q <sub>10</sub> (cfs) | Slope                          | Section | V (fps) | L (ft) | T (min) | ΣT   |  |
| O-1                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 55.42     | 19.00      | 1.77                     | 0.73            | 71.60                 |                                |         |         | 2000   | 13.0    | 13.0 |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 1.77                     |                 | 71.60                 |                                |         |         |        | 13.0    | 13.0 |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            |                          |                 | 23.18                 | Restricted Flow by ex. Culvert |         |         |        |         |      |  |
| E-1                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 11.13     | 11.13      | 1.62                     | 0.70            | 12.62                 |                                |         |         | 680    | 15.5    | 15.5 |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 1.62                     |                 | 36.96                 | Confluence Point-1             |         |         |        | 13.0    | 13.0 |  |
| O-2                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 4.31      | 4.31       | 1.74                     | 0.73            | 5.47                  |                                |         |         | 710    | 13.5    | 13.5 |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 1.62                     |                 | 42.06                 | Discharge Point-1              |         |         |        | 13.0    | 13.0 |  |
| Bypass Flow from Ex. Culvert to Coventry Ln                                                                                                                                                                                                                                                                                                                                                                |                    |           |            | 1.54                     |                 | 48.42                 | Bypass Flow                    |         |         | 725    | 17.0    | 17.0 |  |
| O-3                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 5.11      | 5.11       | 1.64                     | 0.70            | 5.86                  |                                |         |         | 980    | 15.0    | 15.0 |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 1.64                     |                 | 53.93                 | Confluence Point-2             |         |         |        | 17.0    | 17.0 |  |
| O-4                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 59.24     | 59.24      | 1.85                     | 0.73            | 80.01                 |                                |         |         | 3000   | 12.0    | 12.0 |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 1.85                     |                 | 118.08                | Confluence Point-3             |         |         |        | 12.0    | 12.0 |  |
| E-2                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 0.55      | 0.55       | 2.44                     | 0.76            | 1.02                  |                                |         |         | 110    | 7.0     | 7.0  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            |                          |                 | 118.853               | Discharge Point-2              |         |         |        |         |      |  |
| O-5                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 4.61      | 4.61       | 2.09                     | 0.77            | 7.41                  |                                |         |         | 910    | 9.5     | 9.5  |  |
| E-3                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 1.02      | 1.02       | 1.54                     | 0.68            | 1.07                  |                                |         |         | 905    | 17.0    | 17.0 |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            |                          |                 | 8.01                  | Discharge Point-3              |         |         |        | 9.5     | 9.5  |  |
| NOTE: Total runon from O-1 is restricted to 23.18 cfs by the 24" culvert under Elmhurst Lane. Headwater at the inlet of the culvert ponds to 3 ft above the invert of the culvert before it overtops the nearby embankment and flows southeast down Elmhurst Lane and ultimately Coventry Lane. A maximum of 23.18 cfs is discharged to the site through the 24" culvert. See culvert calcs for specifics. |                    |           |            |                          |                 |                       |                                |         |         |        |         |      |  |

## 2.3 Pre-Developed Hydrology Calculations

| Winchester Road U-Stor It                                                     |                    |           |            |                           |                  |                                |                    |         |         |        |         |      |
|-------------------------------------------------------------------------------|--------------------|-----------|------------|---------------------------|------------------|--------------------------------|--------------------|---------|---------|--------|---------|------|
| 100-Year Storm Rational Method Hydrology Calculations,Predeveloped Conditions |                    |           |            |                           |                  |                                |                    |         |         |        |         |      |
| Drainage Area                                                                 | Soil & Development | A (Acres) | ΣA (Acres) | I <sub>100</sub> (in/hr.) | C <sub>100</sub> | Q <sub>100</sub> (cfs)         | Slope              | Section | V (fps) | L (ft) | T (min) | ΣT   |
| O-1                                                                           | Type C Soil        | 55.42     | 19.00      | 2.66                      | 0.78             | 114.98                         |                    |         |         | 2000   | 13.0    | 13.0 |
|                                                                               |                    |           |            | 2.66                      |                  | 114.98                         | Confluence Point-1 | 13.0    |         |        | 13.0    |      |
|                                                                               |                    |           |            | 23.18                     |                  | Restricted Flow by ex. Culvert |                    |         |         |        |         |      |
| E-1                                                                           | Type C Soil        | 11.13     | 11.13      | 2.43                      | 0.76             | 20.55                          |                    |         |         | 680    | 15.5    | 15.5 |
|                                                                               |                    |           |            | 2.43                      |                  | 45.67                          | Confluence Point-2 | 13.0    |         |        | 13.0    |      |
| O-2                                                                           | Type C Soil        | 4.31      | 4.31       | 2.61                      | 0.78             | 8.76                           |                    |         |         | 710    | 13.5    | 13.5 |
|                                                                               |                    |           |            | 2.43                      |                  | 53.83                          | Discharge Point-1  | 13.0    |         |        | 13.0    |      |
| Bypass Flow from Ex. Culvert to Coventry Ln                                   |                    |           |            | 2.31                      |                  | 91.80                          | Bypass Flow        |         |         | 725    | 17.0    | 17.0 |
| O-3                                                                           | Type C Soil        | 5.11      | 5.11       | 2.47                      | 0.76             | 9.59                           |                    |         |         | 980    | 15.0    | 15.0 |
|                                                                               |                    |           |            | 2.47                      |                  | 100.77                         | Confluence Point-3 | 17.0    |         |        | 17.0    |      |
| O-4                                                                           | Type C Soil        | 59.24     | 59.24      | 2.77                      | 0.78             | 128.00                         |                    |         |         | 3000   | 12.0    | 12.0 |
|                                                                               |                    |           |            | 2.77                      |                  | 199.13                         | Confluence Point-4 | 12.0    |         |        | 12.0    |      |
| E-2                                                                           | Type C Soil        | 0.55      | 0.55       | 3.67                      | 0.75             | 1.52                           |                    |         |         | 110    | 7.0     | 7.0  |
|                                                                               |                    |           |            |                           |                  | 200.28                         | Discharge Point-2  |         |         |        |         |      |
| O-5                                                                           | Type C Soil        | 4.61      | 4.61       | 3.14                      | 0.81             | 11.72                          |                    |         |         | 910    | 9.5     | 9.5  |
| E-3                                                                           | Type C Soil        | 1.02      | 1.02       | 2.31                      | 0.75             | 1.78                           |                    |         |         | 905    | 17.0    | 17.0 |
|                                                                               |                    |           |            |                           |                  | 11.72                          | Discharge Point-3  | 9.5     |         |        | 9.5     |      |

**NOTE:** Total runoff from O-1 is restricted to 23.18 cfs by the 24" culvert under Elmhurst Lane. Headwater at the inlet of the culvert ponds to 3 ft above the invert of the culvert before it overtops the nearby embankment and flows southeast down Elmhurst Lane and ultimately Coventry Lane. A maximum of 23.18 cfs is discharged to the site through the 24" culvert. See culvert calcs for specifics.

## **2.4 Results of Pre-Developed Hydrology Calculations**

The pre-developed Hydrology calculations determine the peak flow rate for the drainage areas.

The 100-year peak flowrate for Discharge Point # 1, 2 and 3 are 52.43 cfs, 192.01 cfs and 11.72 cfs, respectively.

## **3.0 Post-Development Condition Hydrology**

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### **3.1 Post-development Conditions**

The project proposes to regrade the entire site and build a self-storage facility with RV/Trailer parking. The storage buildings will be located on the northwest half of the site, and the RV/Trailer parking will be located on the southeast half of the site.

The proposed development will increase the impervious area of the site from 0% to 53%. Onsite drainage patterns will be modified, but the ultimate discharge point will remain the same.

Offsite stormwater that enters the site at Run-on Point 1 through the existing 24" culvert will be intercepted by a proposed concrete channel, thence to an existing earthen swale that conveys the stormwater along the southwesterly corner of the site, to another proposed concrete channel, to discharge to the neighboring lot at the same point as the existing conditions. The offsite runoff from Run-On Point 2 will confluence the stormwater from Run-On Point 1. As the neighboring lot does not have a well-defined channel to accept concentrated flow, the project will construct a flow spreader structure consisting of a rock filled gabion wall that will slow down runoff and spread it into a wide sheet of flow prior to discharging to the neighboring lot.

The restricted runoff from the existing northerly 24" culvert drains down towards the brow ditch parallel to the northerly property line and continues draining towards the east where it bypasses the site. Approximately 135 acres of additional offsite area just north of the site also drains to this point of the project. This point is referred to as Discharge Point # 2 in this report. A portion of the improvements on Coventry Lane is also included on Discharge Point # 2.

Coventry Lane will be improved by paving the entire road up to Keller Road. Along with paving Coventry Lane, ditches with check dams will be constructed parallel to the paved road. The road will drain to a drainage ditch just adjacent to Keller Road.

### **3.2 Methodology of Existing Hydrology Study**

The methodology used in the Post-Development Hydrology calculations is the same as in the Pre-Development calculations. See Section 1.2

## 2.4 Pre-Developed Hydrology Calculations

| Winchester Road U-Stor It                                                                                                                                                                                                                                                                                                                                                                                  |                    |           |            |              |      |           |                                |         |                   |        |                   |      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------|------------|--------------|------|-----------|--------------------------------|---------|-------------------|--------|-------------------|------|
| 10-Year Storm Rational Method Hydrology Calculations,Postdeveloped Conditions                                                                                                                                                                                                                                                                                                                              |                    |           |            |              |      |           |                                |         |                   |        |                   |      |
| Drainage Area                                                                                                                                                                                                                                                                                                                                                                                              | Soil & Development | A (Acres) | ΣA (Acres) | I10 (in/hr.) | C10  | Q10 (cfs) | Slope                          | Section | V (fps)           | L (ft) | T (min)           | ΣT   |
| O-1                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 55.42     | 19.00      | 1.77         | 0.73 | 71.60     |                                |         |                   | 2000   | 13.0              | 13.0 |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 1.77         |      | 71.60     |                                |         |                   | 13.0   | 13.0              |      |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            |              |      | 23.18     | Restricted Flow by ex. Culvert |         |                   |        |                   |      |
| P-2                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 2.37      | 2.37       | 1.45         | 0.68 | 2.34      |                                |         |                   | 1225   | 19.0              | 19.0 |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 1.45         |      | 25.52     | Confluence Point-1             |         |                   | 13.0   | 13.0              |      |
| O-2                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 4.31      | 4.31       | 1.74         | 0.73 | 5.47      |                                |         |                   | 710    | 13.5              | 13.5 |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 1.45         |      | 30.07     | Confluence Point-2             |         |                   | 13.0   | 13.0              |      |
| P-1                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 8.75      | 8.75       | 1.62         | 0.82 | 0.36      | Pumped Flow                    |         |                   | 1000   | 15.5              | 15.5 |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            |              |      |           |                                |         |                   | 30.40  | Discharge Point-1 |      |
| Bypass Flow from Ex. Culvert to Coventry Ln                                                                                                                                                                                                                                                                                                                                                                |                    |           |            | 1.54         |      | 48.42     | Bypass Flow                    |         |                   | 725    | 17.0              | 17.0 |
| O-3                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 5.11      | 5.11       | 1.64         | 0.70 | 5.86      |                                |         |                   | 980    | 15.0              | 15.0 |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 1.64         |      | 53.93     | Confluence Point-3             |         |                   | 17.0   | 17.0              |      |
| O-4                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 59.24     | 59.24      | 1.85         | 0.73 | 80.01     |                                |         |                   | 3000   | 12.0              | 12.0 |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 1.85         |      | 118.08    | Confluence Point-4             |         |                   | 12.0   | 12.0              |      |
| P-3                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 0.40      | 0.40       | 2.28         | 0.89 | 0.81      |                                |         |                   | 265    | 8.0               | 8.0  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 1.85         |      | 118.73    | Confluence Point-5             |         |                   | 12.0   | 12.0              |      |
| P-4                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 0.34      | 0.34       | 2.65         | 0.85 | 0.77      |                                |         |                   | 290    | 6.0               | 6.0  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            |              |      |           |                                | 119.27  | Discharge Point-2 |        |                   |      |
| O-5                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 4.61      | 4.61       | 2.09         | 0.77 | 7.41      |                                |         |                   | 910    | 9.5               | 9.5  |
| P-5                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 1.02      | 1.02       | 2.15         | 0.82 | 1.80      |                                |         |                   | 895    | 9.0               | 9.0  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            |              |      |           |                                | 9.16    | Discharge Point-3 |        |                   | 9.5  |
| NOTE: Total runon from O-1 is restricted to 23.18 cfs by the 24" culvert under Elmhurst Lane. Headwater at the inlet of the culvert ponds to 3 ft above the invert of the culvert before it overtops the nearby embankment and flows southeast down Elmhurst Lane and ultimately Coventry Lane. A maximum of 23.18 cfs is discharged to the site through the 24" culvert. See culvert calcs for specifics. |                    |           |            |              |      |           |                                |         |                   |        |                   |      |

## 2.4 Pre-Developed Hydrology Calculations

| Winchester Road U-Stor It                                                                                                                                                                                                                                                                                                                                                                                  |                    |           |            |                                      |                  |                        |                    |         |         |        |         |      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------|------------|--------------------------------------|------------------|------------------------|--------------------|---------|---------|--------|---------|------|
| 100-Year Storm Rational Method Hydrology Calculations,Postdeveloped Conditions                                                                                                                                                                                                                                                                                                                             |                    |           |            |                                      |                  |                        |                    |         |         |        |         |      |
| Drainage Area                                                                                                                                                                                                                                                                                                                                                                                              | Soil & Development | A (Acres) | ΣA (Acres) | I <sub>100</sub> (in/hr.)            | C <sub>100</sub> | Q <sub>100</sub> (cfs) | Slope              | Section | V (fps) | L (ft) | T (min) | ΣT   |
| O-1                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 55.42     | 19.00      | 2.66                                 | 0.78             | 114.98                 |                    |         |         | 2000   | 13.0    | 13.0 |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 2.66                                 |                  | 114.98                 |                    |         |         |        | 13.0    | 13.0 |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 23.18 Restricted Flow by ex. Culvert |                  |                        |                    |         |         |        |         |      |
| P-2                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 2.37      | 2.37       | 2.18                                 | 0.75             | 3.88                   |                    |         |         | 1225   | 19.0    | 19.0 |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 2.66                                 |                  | 25.83                  | Confluence Point-2 |         |         |        | 13.0    | 13.0 |
| O-2                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 4.31      | 4.31       | 2.61                                 | 0.78             | 8.76                   |                    |         |         | 710    | 13.5    | 13.5 |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 2.66                                 |                  | 34.76                  | Confluence Point-3 |         |         |        | 13.0    | 13.0 |
| P-1                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 8.75      | 8.75       | 2.43                                 | 0.83             | 0.36                   | Pumped Flow        |         |         | 1000   | 15.5    | 15.5 |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 35.16 Discharge Point-1              |                  |                        |                    |         |         |        |         |      |
| Bypass Flow from Ex. Culvert to Coventry Ln                                                                                                                                                                                                                                                                                                                                                                |                    |           |            | 2.31                                 |                  | 91.80                  | Bypass Flow        |         |         | 725    | 17.0    | 17.0 |
| O-3                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 5.11      | 5.11       | 2.47                                 | 0.76             | 9.59                   |                    |         |         | 980    | 15.0    | 15.0 |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 2.47                                 |                  | 100.77                 | Confluence Point-4 |         |         |        | 17.0    | 17.0 |
| O-4                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 59.24     | 59.24      | 2.77                                 | 0.78             | 128.00                 |                    |         |         | 3000   | 12.0    | 12.0 |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 2.77                                 |                  | 199.13                 | Confluence Point-5 |         |         |        | 12.0    | 12.0 |
| P-3                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 0.40      | 0.40       | 3.42                                 | 0.89             | 1.21                   |                    |         |         | 265    | 8.0     | 8.0  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 2.77                                 |                  | 200.11                 | Confluence Point-6 |         |         |        | 12.0    | 12.0 |
| P-4                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 0.34      | 0.34       | 3.97                                 | 0.86             | 1.16                   |                    |         |         | 290    | 6.0     | 6.0  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 200.92 Discharge Point-2             |                  |                        |                    |         |         |        |         |      |
| O-5                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 4.61      | 4.61       | 3.14                                 | 0.81             | 11.72                  |                    |         |         | 910    | 9.5     | 9.5  |
| P-5                                                                                                                                                                                                                                                                                                                                                                                                        | Type C Soil        | 1.02      | 1.02       | 3.22                                 | 0.85             | 2.80                   |                    |         |         | 895    | 9.0     | 9.0  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                    |           |            | 14.44 Discharge Point-3              |                  |                        |                    |         |         |        |         |      |
| NOTE: Total runon from O-1 is restricted to 23.18 cfs by the 24" culvert under Elmhurst Lane. Headwater at the inlet of the culvert ponds to 3 ft above the invert of the culvert before it overtops the nearby embankment and flows southeast down Elmhurst Lane and ultimately Coventry Lane. A maximum of 23.18 cfs is discharged to the site through the 24" culvert. See culvert calcs for specifics. |                    |           |            |                                      |                  |                        |                    |         |         |        |         |      |

### **3.4 Results of Post-Developed Hydrology Calculations**

The post-developed Hydrology calculations determine the peak flow rate for the drainage areas. The 100-year peak flowrate for Discharge Point # 1, 2 and 3 are 35.16 cfs, 200.92 cfs and 14.44 cfs, respectively.

## **4.0 Comparison of Pre-Development & Post-Development Hydrologic Conditions**

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### **4.1 Hydrologic Conditions Comparison**

The proposed development will result in a decrease in peak flowrate discharged to Discharge Point # 1 for the 100-year storm. The pre-developed site discharges 53.83 cfs to the neighboring lot. The post-developed site discharges 35.16 cfs. This is a decrease of 18.66 cfs, or 35% under the predeveloped flow. This is possible due to the retention of the 100-year, 3-hour storm within the proposed bioretention basin along the southerly corner of the site.

The bioretention basin has sized to retain the 100-year, 3-hour storm event volume without discharging any flow from that storm event. The 100-year, 3-hour storm volume generated by the site is approximately 70,810 cf (Flood Volume = Effective Rain x Area; Flood Volume= 2.33 inches \* 36,684 sf \* 1 ft/12 inches = 70,810 cf) while the proposed bioretention basin will provide approximately 110,196 cf (See Appendix 6).

The onsite bioretention basin will retain the 100-year, 3-hour storm event with zero discharge. The only discharge from the onsite storm drain system will be via a pump vault that will be within the bioretention basin for hydromodification purposes. If clogging occurs and the pump fails, the stormwater will discharge via an overflow spillway along the west portion of the proposed bioretention basin. This spillway will discharge to the adjacent concrete channel and ultimately to the discharge point of the site.

## **5.0 Hydraulic Calculations**

---

### **5.1 Hydraulic Calculations Methodology**

The hydraulic calculations for the proposed storm drains and channels were performed using Manning's Equation, via hand calculations. The calculations are presented in an excel spreadsheet. See the attached calculations for particulars.

The proposed pump vault will discharge at a rate of approximately 0.36 cfs. The pump vault calculations are presented in an excel spreadsheet. The pump vault will drain down the 100-year, 3-hour storm volume in approximately 55 hours. See calcs below:

100-year, 3-hour storm Volume = 70,810 cf

Pump Discharge Flowrate = 0.36 cfs

$$\begin{aligned}\text{Total Drawdown Time} &= (70,810 \text{ cf} / 0.36 \text{ cfs}) \times (1 \text{ hr} / 3600 \text{ sec}) \\ &= 55 \text{ hours}\end{aligned}$$

## 7.0 Conclusions

---

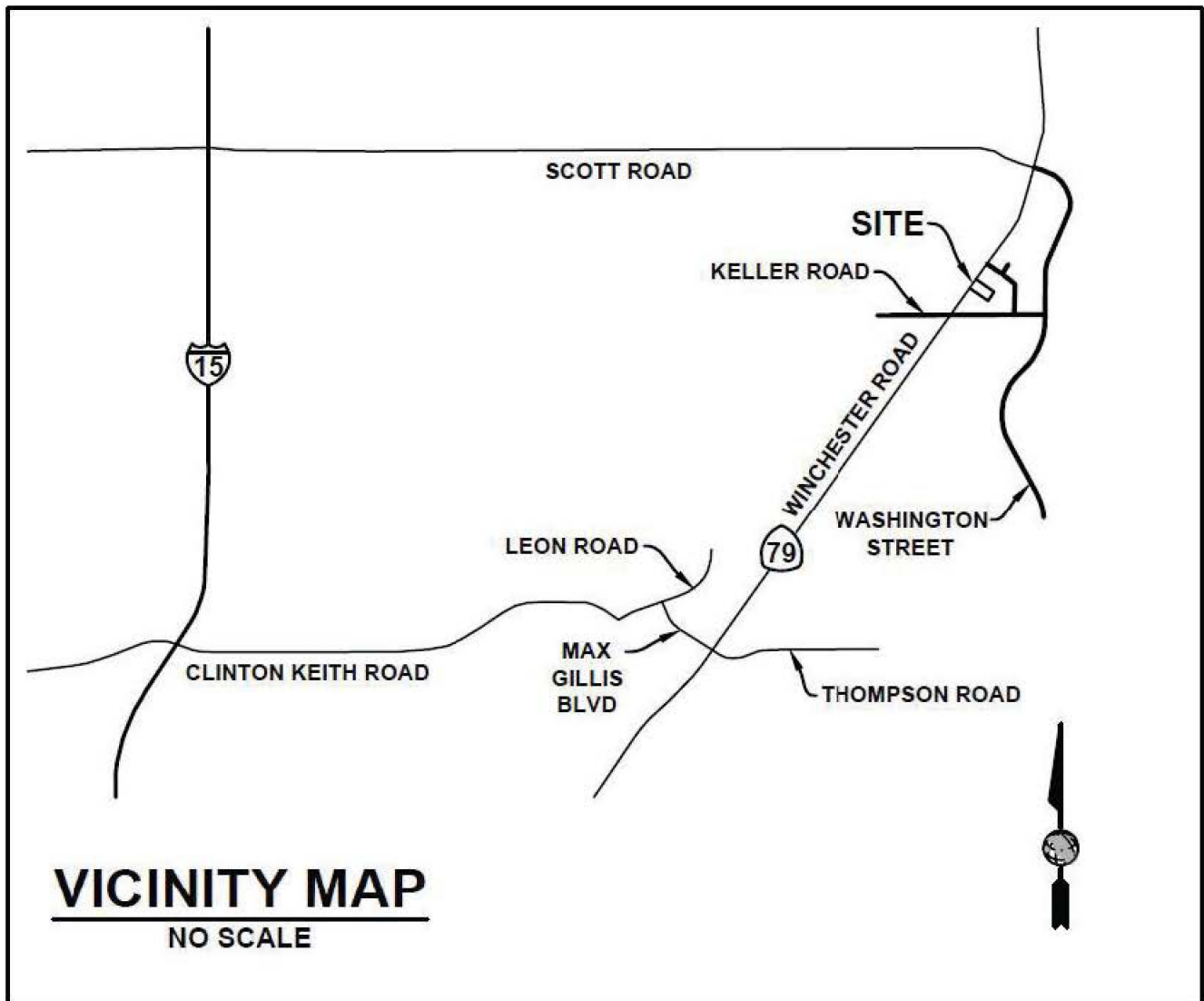
The project will increase the impervious footprint of the site from 0 to 53%. The peak flowrate discharged from the site and the tributary offsite areas will decrease by 18.66 cfs for Discharge Point # 1.

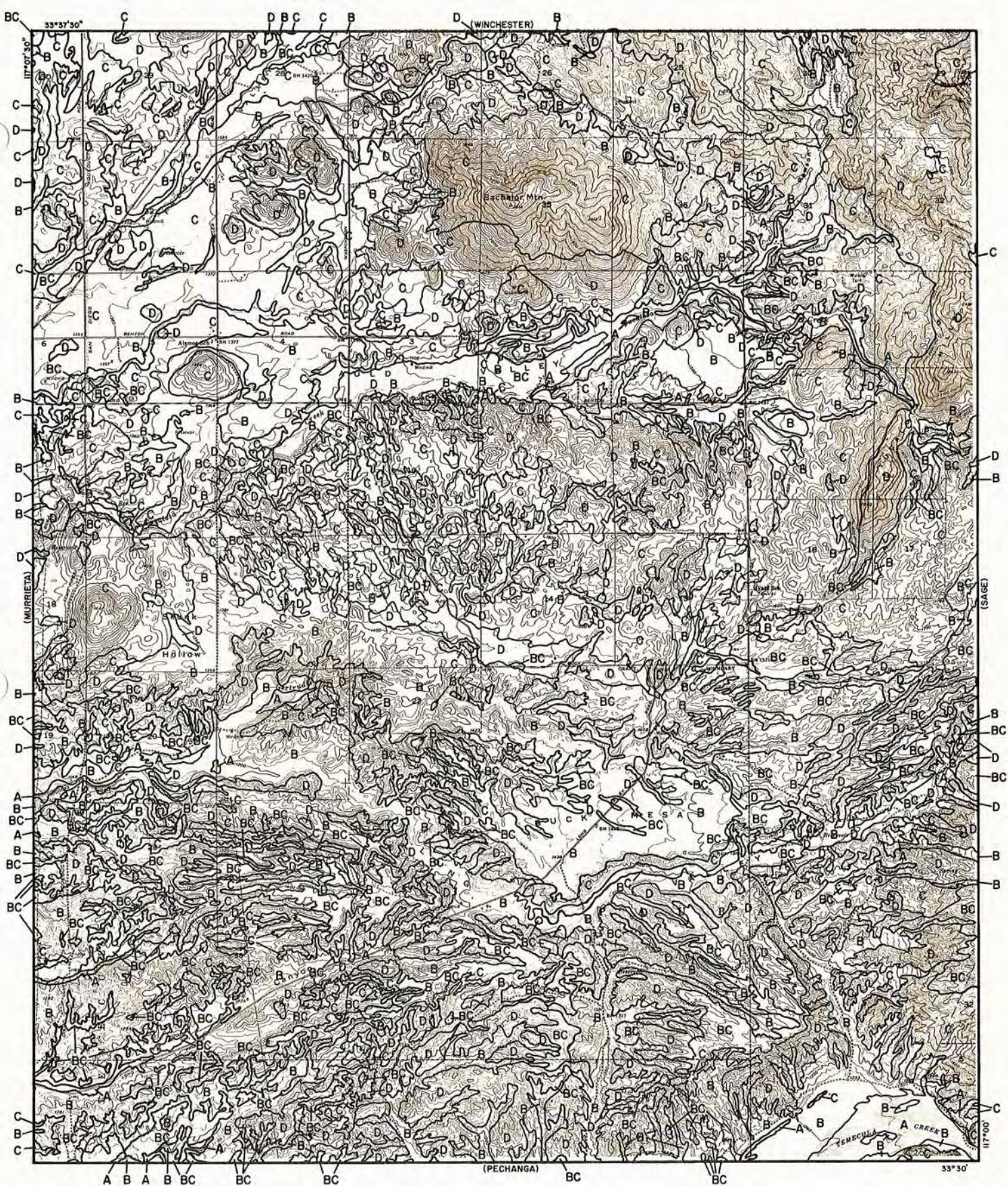
The peak flowrate discharged to Discharge Point # 2 and 3 will increase slightly on the proposed conditions. We do not anticipate the increase in flow on those discharge locations to cause adverse effects on downstream parcels.

It is the opinion of Omega Engineering Consultants that the proposed project will not result in the over-capacitation of downstream stormwater conveyances and waterways during the 100-year storm. A separate Hydromodification Analysis has been prepared to address the issues of flow increases for storms in the range of 10% of the 2-year through the 10-year storm.

## 8.0 Exhibits

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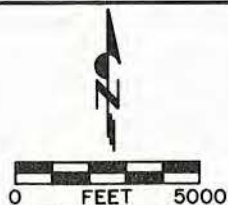




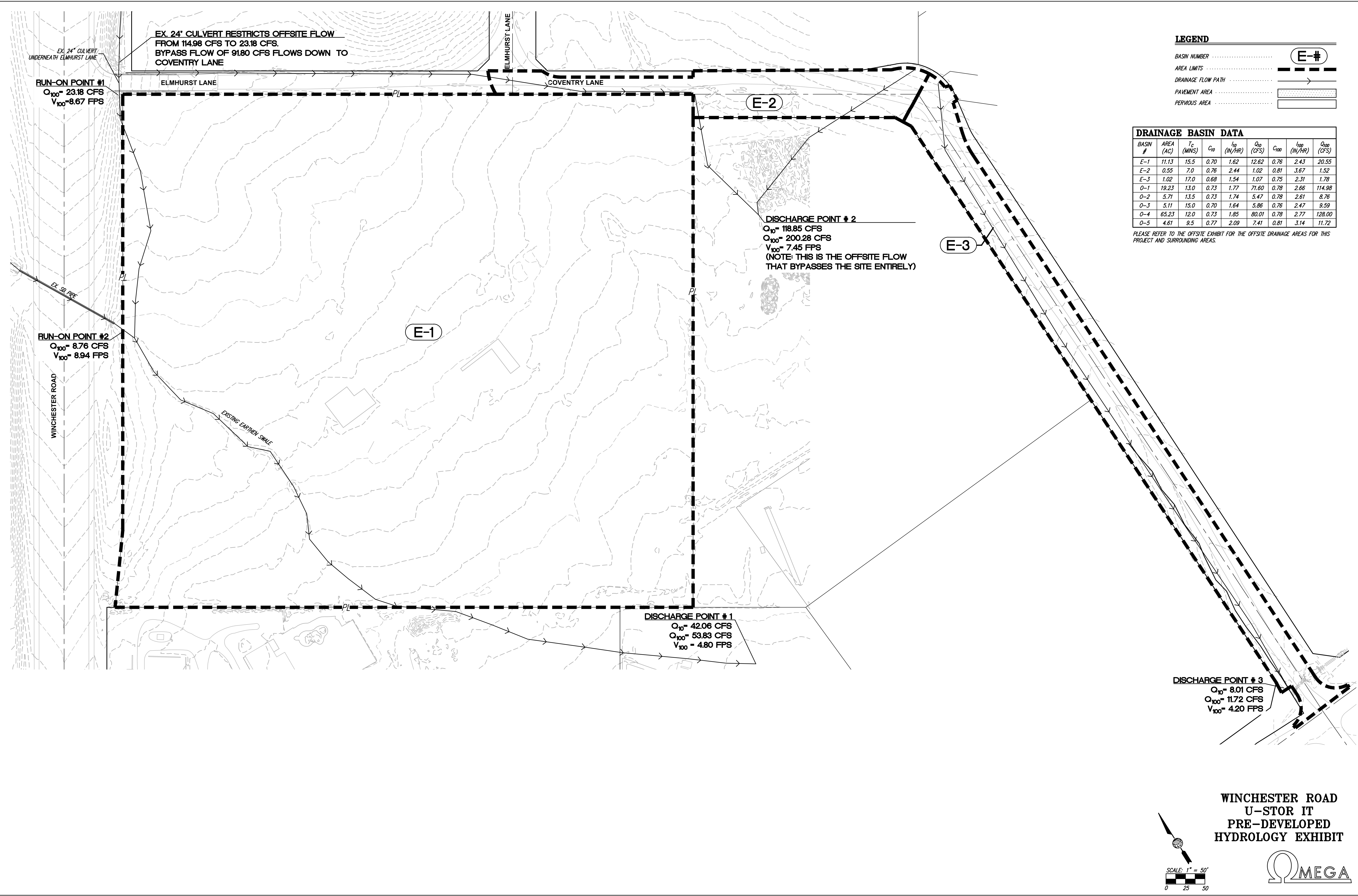
# **LEGEND**

- SOILS GROUP BOUNDARY
- A SOILS GROUP DESIGNATION

**RCFC & WCD**  
HYDROLOGY MANUAL



**HYDROLOGIC SOILS GROUP MAP  
FOR  
BACHELOR MTN.**



LEGEND

- BASIN NUMBER
AREA LIMITS
DRAINAGE FLOW PATH
PAVEMENT AREA
PERVIOUS AREA

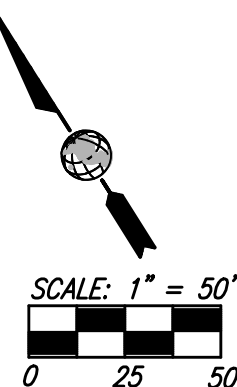
DRAINAGE BASIN DATA

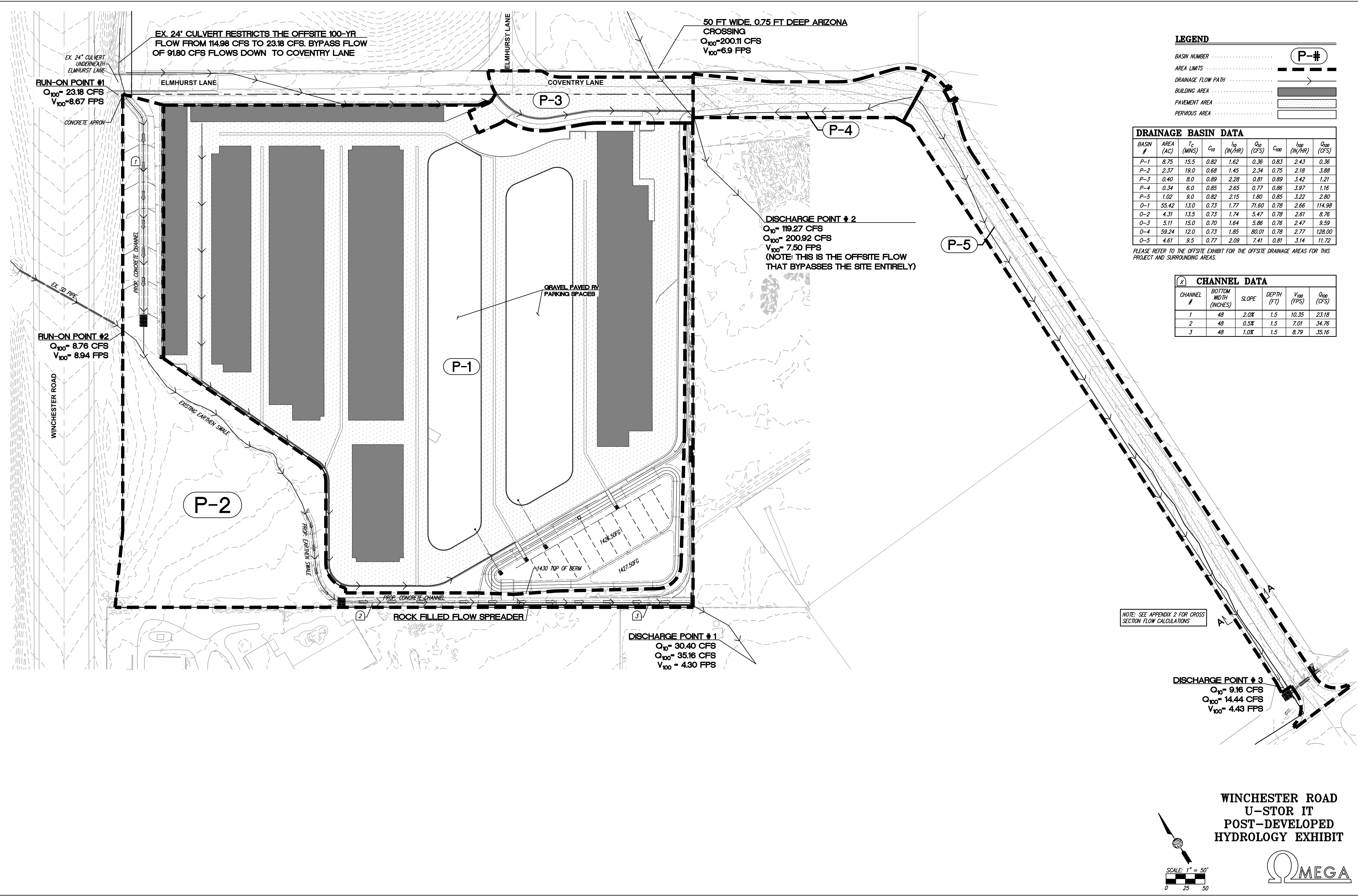
Table with 10 columns: BASIN #, AREA (AC), Tc (MINS), C10, I10 (IN/HR), Q10 (CFS), C100, I100 (IN/HR), Q100 (CFS). Rows include basins E-1, E-2, E-3 and O-1 through O-5.

PLEASE REFER TO THE OFFSITE EXHIBIT FOR THE OFFSITE DRAINAGE AREAS FOR THIS PROJECT AND SURROUNDING AREAS.

DISCHARGE POINT # 3
Q10= 8.01 CFS
Q100= 11.72 CFS
V100= 4.20 FPS

WINCHESTER ROAD
U-STOR IT
PRE-DEVELOPED
HYDROLOGY EXHIBIT





**LEGEND**

BASIN NUMBER ..... **P-#**

AREA LIMITS .....

DRAINAGE FLOW PATH .....

BUILDING AREA .....

PAVEMENT AREA .....

PERVIOUS AREA .....

| DRAINAGE BASIN DATA |           |                       |                 |                         |                       |                  |                          |                        |
|---------------------|-----------|-----------------------|-----------------|-------------------------|-----------------------|------------------|--------------------------|------------------------|
| BASIN #             | AREA (AC) | T <sub>c</sub> (MINS) | C <sub>10</sub> | I <sub>10</sub> (IN/HR) | Q <sub>10</sub> (CFS) | C <sub>100</sub> | I <sub>100</sub> (IN/HR) | Q <sub>100</sub> (CFS) |
| P-1                 | 8.75      | 15.5                  | 0.82            | 1.62                    | 0.36                  | 0.83             | 2.43                     | 0.36                   |
| P-2                 | 2.37      | 19.0                  | 0.68            | 1.45                    | 2.34                  | 0.75             | 2.18                     | 3.88                   |
| P-3                 | 0.40      | 8.0                   | 0.89            | 2.28                    | 0.81                  | 0.89             | 3.42                     | 1.21                   |
| P-4                 | 0.34      | 6.0                   | 0.85            | 2.65                    | 0.77                  | 0.86             | 3.97                     | 1.16                   |
| P-5                 | 1.02      | 9.0                   | 0.82            | 2.15                    | 1.80                  | 0.85             | 3.22                     | 2.80                   |
| O-1                 | 55.42     | 13.0                  | 0.73            | 1.77                    | 71.60                 | 0.78             | 2.66                     | 114.98                 |
| O-2                 | 4.31      | 13.5                  | 0.73            | 1.74                    | 5.47                  | 0.78             | 2.61                     | 8.76                   |
| O-3                 | 5.11      | 15.0                  | 0.70            | 1.64                    | 5.86                  | 0.76             | 2.47                     | 9.59                   |
| O-4                 | 59.24     | 12.0                  | 0.73            | 1.85                    | 80.01                 | 0.78             | 2.77                     | 128.00                 |
| O-5                 | 4.61      | 9.5                   | 0.77            | 2.09                    | 7.41                  | 0.81             | 3.14                     | 11.72                  |

PLEASE REFER TO THE OFFSITE EXHIBIT FOR THE OFFSITE DRAINAGE AREAS FOR THIS PROJECT AND SURROUNDING AREAS.

| CHANNEL DATA |                       |       |            |                        |                        |
|--------------|-----------------------|-------|------------|------------------------|------------------------|
| CHANNEL #    | BOTTOM WIDTH (INCHES) | SLOPE | DEPTH (FT) | V <sub>100</sub> (FPS) | Q <sub>100</sub> (CFS) |
| 1            | 48                    | 2.0%  | 1.5        | 10.35                  | 23.18                  |
| 2            | 48                    | 0.5%  | 1.5        | 7.01                   | 34.76                  |
| 3            | 48                    | 1.0%  | 1.5        | 8.79                   | 35.16                  |

NOTE: SEE APPENDIX 2 FOR CROSS SECTION FLOW CALCULATIONS

DISCHARGE POINT # 3  
Q<sub>10</sub>= 9.16 CFS  
Q<sub>100</sub>= 14.44 CFS  
V<sub>100</sub>= 4.43 FPS

WINCHESTER ROAD  
U-STOR IT  
POST-DEVELOPED  
HYDROLOGY EXHIBIT

SCALE: 1" = 50'

0 25 50

OMEGA



Q10=7.41 CFS  
Q100=11.44 CFS

Q10=2.29 CFS  
Q100=8.76 CFS

Q10=5.86 CFS  
Q100=9.59 CFS

Q10=55.79 CFS  
Q100=89.19 CFS

Q10=54.61 CFS  
Q100=87.31 CFS

O-1

O-2

O-4

O-3

O-5

Q<sub>10</sub>= 71.80 CFS  
Q<sub>100</sub>= 114.98 CFS

Q<sub>10</sub>= 5.47 CFS  
Q<sub>100</sub>= 8.76 CFS

Q<sub>10</sub>= 5.86 CFS  
Q<sub>100</sub>= 9.59 CFS

Q<sub>10</sub>= 80.01 CFS  
Q<sub>100</sub>= 128.00 CFS

Q<sub>10</sub>= 7.41 CFS  
Q<sub>100</sub>= 11.72 CFS

EX. 80 CULVERT SIZE  
UNKNOWN

PROJECT SITE

LEGEND

- BASIN NUMBER ..... O-#
- AREA LIMITS ..... - - - - -
- DRAINAGE FLOW PATH ..... →
- PERVIOUS AREA ..... [ ]

| DRAINAGE BASIN DATA |           |                       |                 |                         |                       |                  |                          |                        |  |
|---------------------|-----------|-----------------------|-----------------|-------------------------|-----------------------|------------------|--------------------------|------------------------|--|
| BASIN #             | AREA (AC) | T <sub>c</sub> (MINS) | C <sub>10</sub> | I <sub>10</sub> (IN/HR) | Q <sub>10</sub> (CFS) | C <sub>100</sub> | I <sub>100</sub> (IN/HR) | Q <sub>100</sub> (CFS) |  |
| O-1                 | 53.42     | 13.0                  | 0.73            | 1.77                    | 71.80                 | 0.78             | 2.66                     | 114.98                 |  |
| O-2                 | 4.31      | 13.5                  | 0.73            | 1.74                    | 5.47                  | 0.78             | 2.61                     | 8.76                   |  |
| O-3                 | 5.11      | 15.0                  | 0.70            | 1.64                    | 5.86                  | 0.76             | 2.47                     | 9.59                   |  |
| O-4                 | 58.24     | 12.0                  | 0.73            | 1.85                    | 80.01                 | 0.78             | 2.77                     | 128.00                 |  |
| O-5                 | 4.61      | 9.5                   | 0.77            | 2.09                    | 7.41                  | 0.81             | 3.14                     | 11.72                  |  |

SCALE: 1" = 250'

0 125 250

WINCHESTER ROAD  
U-STOR IT  
OFFSITE HYDROLOGY  
EXHIBIT

OFFSITE HYDROLOGY EXHIBIT

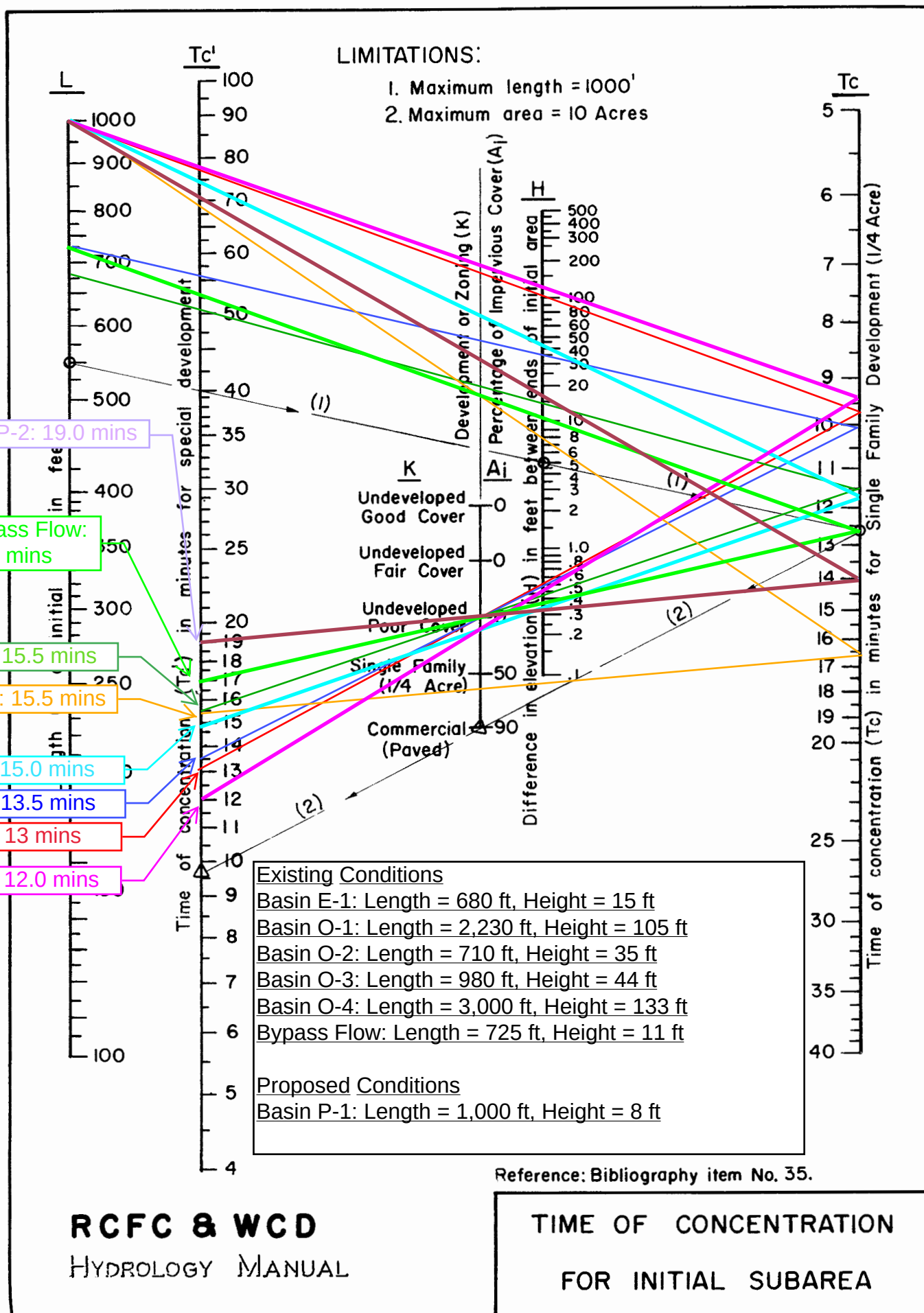
## 9.0 Appendices

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## Appendix 1

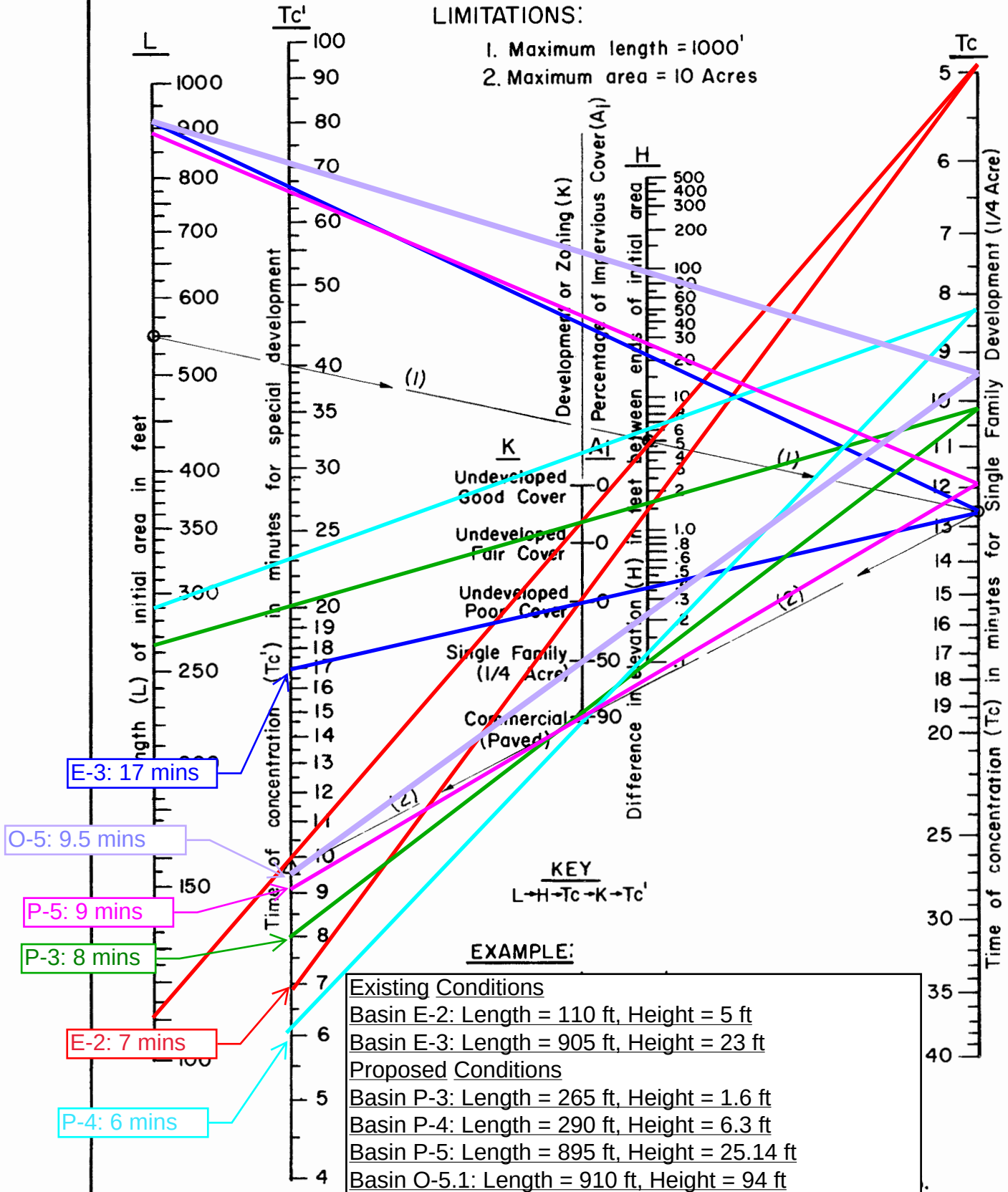
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| Basin #     | Area (sf) | Area (ac) | Impervious Area (sf) | Pervious Area (sf) | Impervious % | Pervious % | Length (ft) | Slope | Tc (mins) | I <sub>10</sub> (in/hr) | C <sub>10</sub> | Q <sub>10</sub> (cfs) | I <sub>100</sub> (in/hr) | C <sub>100</sub> | Q <sub>100</sub> (cfs) |
|-------------|-----------|-----------|----------------------|--------------------|--------------|------------|-------------|-------|-----------|-------------------------|-----------------|-----------------------|--------------------------|------------------|------------------------|
| O-1         | 2413943   | 55.42     | 0                    | 2413943            | 0%           | 100%       | 2000        | 6.7%  | 13.0      | 1.77                    | 0.73            | 71.60                 | 2.66                     | 0.78             | 114.98                 |
| O-2         | 187531    | 4.31      | 17820                | 169711             | 10%          | 90%        | 710         | 5.0%  | 13.5      | 1.74                    | 0.73            | 5.47                  | 2.61                     | 0.78             | 8.76                   |
| O-3         | 222538    | 5.11      | 22772                | 199766             | 10%          | 90%        | 980         | 4.5%  | 15.0      | 1.64                    | 0.70            | 5.86                  | 2.47                     | 0.76             | 9.59                   |
| O-4         | 2580660   | 59.24     | 207157               | 2373503            | 8%           | 92%        | 3000        | 4.4%  | 12.0      | 1.85                    | 0.73            | 80.01                 | 2.77                     | 0.78             | 128.00                 |
| O-5         | 200644    | 4.61      | 6019                 | 194625             | 3%           | 97%        | 910         | 10.3% | 9.5       | 2.09                    | 0.77            | 7.41                  | 3.14                     | 0.81             | 11.72                  |
| Bypass Flow | -         | -         | -                    | -                  | -            | -          | 725         | 1.5%  | 17.0      | 1.54                    | 0.68            | 48.42                 | 2.31                     | 0.75             | 91.80                  |
| E-1         | 484619    | 11.13     | 0                    | 484619             | 0%           | 100%       | 680         | 2.3%  | 15.5      | 1.62                    | 0.70            | 12.62                 | 2.43                     | 0.76             | 20.55                  |
| E-2         | 24026     | 0.55      | 0                    | 24026              | 0%           | 100%       | 110         | 4.5%  | 7.0       | 2.44                    | 0.76            | 1.02                  | 3.67                     | 0.81             | 1.52                   |
| E-3         | 44631     | 1.02      | 0                    | 44631              | 0%           | 100%       | 905         | 2.5%  | 17.0      | 1.54                    | 0.68            | 1.07                  | 2.31                     | 0.75             | 1.78                   |
|             |           |           |                      |                    |              |            |             |       |           |                         |                 |                       |                          |                  |                        |
| P-1         | 381351    | 8.75      | 257975               | 123376             | 68%          | 32%        | 1000        | 1.0%  | 15.5      | 1.62                    | 0.82            | 0.36                  | 2.43                     | 0.83             | 0.36                   |
| P-2         | 103268    | 2.37      | 0                    | 103268             | 0%           | 100%       | 1225        | 1.5%  | 19.0      | 1.45                    | 0.68            | 2.34                  | 2.18                     | 0.75             | 3.88                   |
| P-3         | 17282     | 0.40      | 15524                | 1758               | 90%          | 10%        | 265         | 0.6%  | 8.0       | 2.28                    | 0.89            | 0.81                  | 3.42                     | 0.89             | 1.21                   |
| P-4         | 14854     | 0.34      | 9112                 | 5742               | 61%          | 39%        | 290         | 2.2%  | 6.0       | 2.65                    | 0.85            | 0.77                  | 3.97                     | 0.86             | 1.16                   |
| P-5         | 44498     | 1.02      | 24356                | 20142              | 55%          | 45%        | 895         | 2.8%  | 9.0       | 2.15                    | 0.82            | 1.80                  | 3.22                     | 0.85             | 2.80                   |



# LIMITATIONS:

1. Maximum length = 1000'
2. Maximum area = 10 Acres



**RCFC & WCD**  
HYDROLOGY MANUAL

**TIME OF CONCENTRATION**  
**FOR INITIAL SUBAREA**

HYDROLOGY MANUAL  
**RCFC & WCD**  
 STANDARD  
 INTENSITY - DURATION  
 CURVES DATA

O-4  
 $T=12.0$   
 $I_{10}=1.85$

P-4  
 $T=6.0$   
 $I_{10}=2.65$

O-1  
 $T=13.0$   
 $I_{10}=1.77$

O-2  
 $T=13.5$   
 $I_{10}=1.74$  (interpolated)

O-3  
 $T=15.0$   
 $I_{10}=1.64$

E-1 & P-1  
 $T=15.5$   
 $I_{10}=1.62$  (interpolated)

P-2  
 $T=19.0$   
 $I_{10}=1.45$

Bypass Flow  
 & E-3  
 $T=17.0$   
 $I_{10}=1.54$

RAINFALL INTENSITY - INCHES PER HOUR

| PACIFIC             |            |             | HIGHGROVE           |            |             | WINCHESTER          |            |             | IDYLLWILD           |            |             | LAKEVIEW            |            |             |
|---------------------|------------|-------------|---------------------|------------|-------------|---------------------|------------|-------------|---------------------|------------|-------------|---------------------|------------|-------------|
| DURATION<br>MINUTES | FREQUENCY  |             | DURATION<br>MINUTES | FREQUENCY  |             | DURATION<br>MINUTES | FREQUENCY  |             | DURATION<br>MINUTES | FREQUENCY  |             | DURATION<br>MINUTES | FREQUENCY  |             |
|                     | 10<br>YEAR | 100<br>YEAR |                     | 10<br>YEAR | 100<br>YEAR |                     | 10<br>YEAR | 100<br>YEAR |                     | 10<br>YEAR | 100<br>YEAR |                     | 10<br>YEAR | 100<br>YEAR |
| 5                   | 2.84       | 4.40        | 5                   | 3.02       | 4.37        | 5                   | 2.91       | 4.37        | 5                   | 4.91       | 7.28        | 5                   | 2.77       | 4.16        |
| 6                   | 2.58       | 4.00        | 6                   | 2.75       | 3.97        | 6                   |            | 3.97        | 6                   | 4.47       | 6.62        | 6                   | 2.53       | 3.79        |
| 7                   | 2.37       | 3.68        | 7                   | 2.54       | 3.87        | 7                   |            | 3.87        | 7                   | 4.13       | 6.11        | 7                   | 2.34       | 3.51        |
| 8                   | 2.21       | 3.43        | 8                   | 2.37       | 3.42        | 8                   |            | 3.42        | 8                   | 3.85       | 5.70        | 8                   | 2.19       | 3.29        |
| 9                   | 2.08       | 3.23        | 9                   | 2.23       | 3.22        | 9                   |            | 3.22        | 9                   | 3.62       | 5.36        | 9                   | 2.07       | 3.10        |
| 10                  | 1.96       | 3.05        | 10                  | 2.11       | 3.05        | 10                  |            | 3.05        | 10                  | 3.43       | 5.08        | 10                  | 1.96       | 2.94        |
| 11                  | 1.87       | 2.90        | 11                  | 2.01       | 2.90        | 11                  |            | 2.90        | 11                  | 3.26       | 4.83        | 11                  | 1.87       | 2.80        |
| 12                  | 1.78       | 2.77        | 12                  | 1.92       | 2.77        | 12                  |            | 2.77        | 12                  | 3.12       | 4.62        | 12                  | 1.79       | 2.68        |
| 13                  | 1.71       | 2.65        | 13                  | 1.84       | 2.66        | 13                  |            | 2.66        | 13                  | 2.99       | 4.43        | 13                  | 1.72       | 2.58        |
| 14                  | 1.64       | 2.55        | 14                  | 1.77       | 2.56        | 14                  |            | 2.56        | 14                  | 2.88       | 4.26        | 14                  | 1.66       | 2.48        |
| 15                  | 1.58       | 2.46        | 15                  | 1.71       | 2.47        | 15                  |            | 2.47        | 15                  | 2.78       | 4.11        | 15                  | 1.60       | 2.40        |
| 16                  | 1.53       | 2.38        | 16                  | 1.65       | 2.39        | 16                  |            | 2.39        | 16                  | 2.68       | 3.98        | 16                  | 1.55       | 2.32        |
| 17                  | 1.48       |             | 17                  | 1.60       | 2.31        | 17                  |            | 2.31        | 17                  | 2.60       | 3.85        | 17                  | 1.50       | 2.25        |
|                     | 1.44       |             |                     | 1.55       | 2.24        |                     |            | 2.24        | 18                  | 2.52       | 3.74        | 18                  | 1.46       | 2.19        |
|                     | 1.40       |             |                     | 1.51       | 2.18        |                     |            | 2.18        | 19                  | 2.45       | 3.64        | 19                  | 1.42       | 2.13        |
|                     | 1.36       |             |                     | 1.47       | 2.12        |                     |            | 2.12        | 20                  | 2.39       | 3.54        | 20                  | 1.39       | 2.08        |
|                     | 1.33       |             |                     | 1.40       | 2.02        |                     |            | 2.02        | 22                  | 2.27       | 3.37        | 22                  | 1.32       | 1.98        |
|                     | 1.30       |             |                     | 1.34       | 1.93        |                     |            | 1.93        | 24                  | 2.17       | 3.22        | 24                  | 1.26       | 1.90        |
|                     | 1.28       |             |                     | 1.28       | 1.85        |                     |            | 1.85        | 26                  | 2.09       | 3.09        | 26                  | 1.22       | 1.82        |
|                     | 1.24       |             |                     | 1.23       | 1.78        |                     |            | 1.78        | 28                  | 2.01       | 2.97        | 28                  | 1.17       | 1.76        |
|                     | 1.10       |             |                     | 1.19       | 1.72        |                     |            | 1.72        | 30                  | 1.94       | 2.87        | 30                  | 1.13       | 1.70        |
|                     | 1.06       |             |                     | 1.15       | 1.66        |                     |            | 1.66        | 32                  | 1.87       | 2.77        | 32                  | 1.10       | 1.64        |
|                     | 1.03       |             |                     | 1.12       | 1.61        |                     |            | 1.61        | 34                  | 1.81       | 2.69        | 34                  | 1.06       | 1.59        |
|                     | 1.00       |             |                     | 1.08       | 1.57        |                     |            | 1.57        | 36                  | 1.76       | 2.61        | 36                  | 1.03       | 1.55        |
|                     | 0.97       |             |                     | 1.05       | 1.52        |                     |            | 1.52        | 38                  | 1.71       | 2.54        | 38                  | 1.01       | 1.51        |
|                     | 0.94       |             |                     | 1.02       | 1.48        |                     |            | 1.48        | 40                  | 1.67       | 2.47        | 40                  | 0.98       | 1.47        |
|                     | 0.89       | 1.37        |                     | 0.96       | 1.39        |                     |            | 1.39        | 45                  | 1.57       | 2.32        | 45                  | 0.92       | 1.39        |
| 50                  | 0.84       | 1.30        | 50                  | 0.91       | 1.32        | 50                  | 0.88       | 1.32        | 50                  | 1.48       | 2.20        | 50                  | 0.88       | 1.31        |
| 55                  | 0.80       | 1.24        | 55                  | 0.87       | 1.26        | 55                  | 0.84       | 1.26        | 55                  | 1.41       | 2.09        | 55                  | 0.84       | 1.25        |
| 60                  | 0.76       | 1.18        | 60                  | 0.83       | 1.20        | 60                  | 0.80       | 1.20        | 60                  | 1.35       | 2.00        | 60                  | 0.80       | 1.20        |
| 65                  | 0.73       | 1.13        | 65                  | 0.80       | 1.15        | 65                  | 0.77       | 1.15        | 65                  | 1.29       | 1.92        | 65                  | 0.77       | 1.15        |
| 70                  | 0.70       | 1.09        | 70                  | 0.77       | 1.11        | 70                  | 0.74       | 1.11        | 70                  | 1.25       | 1.85        | 70                  | 0.74       | 1.11        |
| 75                  | 0.68       | 1.05        | 75                  | 0.74       | 1.07        | 75                  | 0.71       | 1.07        | 75                  | 1.20       | 1.78        | 75                  | 0.72       | 1.07        |
| 80                  | 0.65       | 1.01        | 80                  | 0.71       | 1.03        | 80                  | 0.69       | 1.03        | 80                  | 1.16       | 1.72        | 80                  | 0.69       | 1.04        |
| 85                  | 0.63       | 0.98        | 85                  | 0.69       | 1.00        | 85                  | 0.67       | 1.00        | 85                  | 1.13       | 1.67        | 85                  | 0.67       | 1.01        |
| SLOPE = .530        |            |             | SLOPE = .520        |            |             | SLOPE = .520        |            |             | SLOPE = .520        |            |             | SLOPE = .500        |            |             |

# STANDARD INTENSITY - DURATION CURVES DATA RCFC & WCD HYDROLOGY MANUAL

P-4  
T=6.0  
I<sub>100</sub>=3.1

O-5  
T=9.5  
I<sub>100</sub>=3.1

Bypass Flow  
& E-3  
T=17.0  
I<sub>100</sub>=2.31

O-4  
T=12.0  
I<sub>100</sub>=2.77

O-1  
T=13.0  
I<sub>100</sub>=2.66

O-2  
T=13.5  
I<sub>100</sub>=2.61 (interpolated)

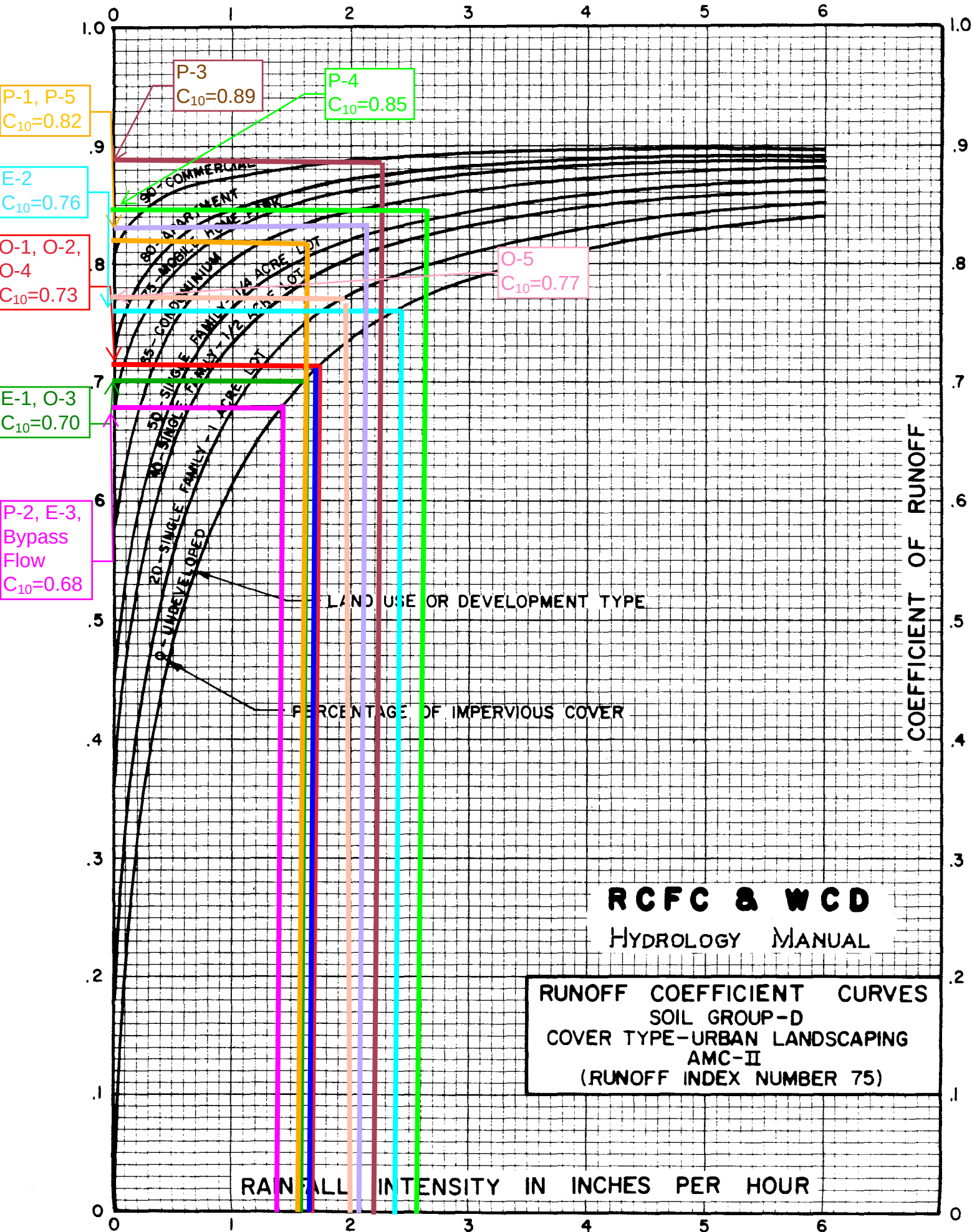
O-3  
T=15.0  
I<sub>100</sub>=2.47

E-1 & P-1  
T=15.5  
I<sub>100</sub>=2.43 (interpolated)

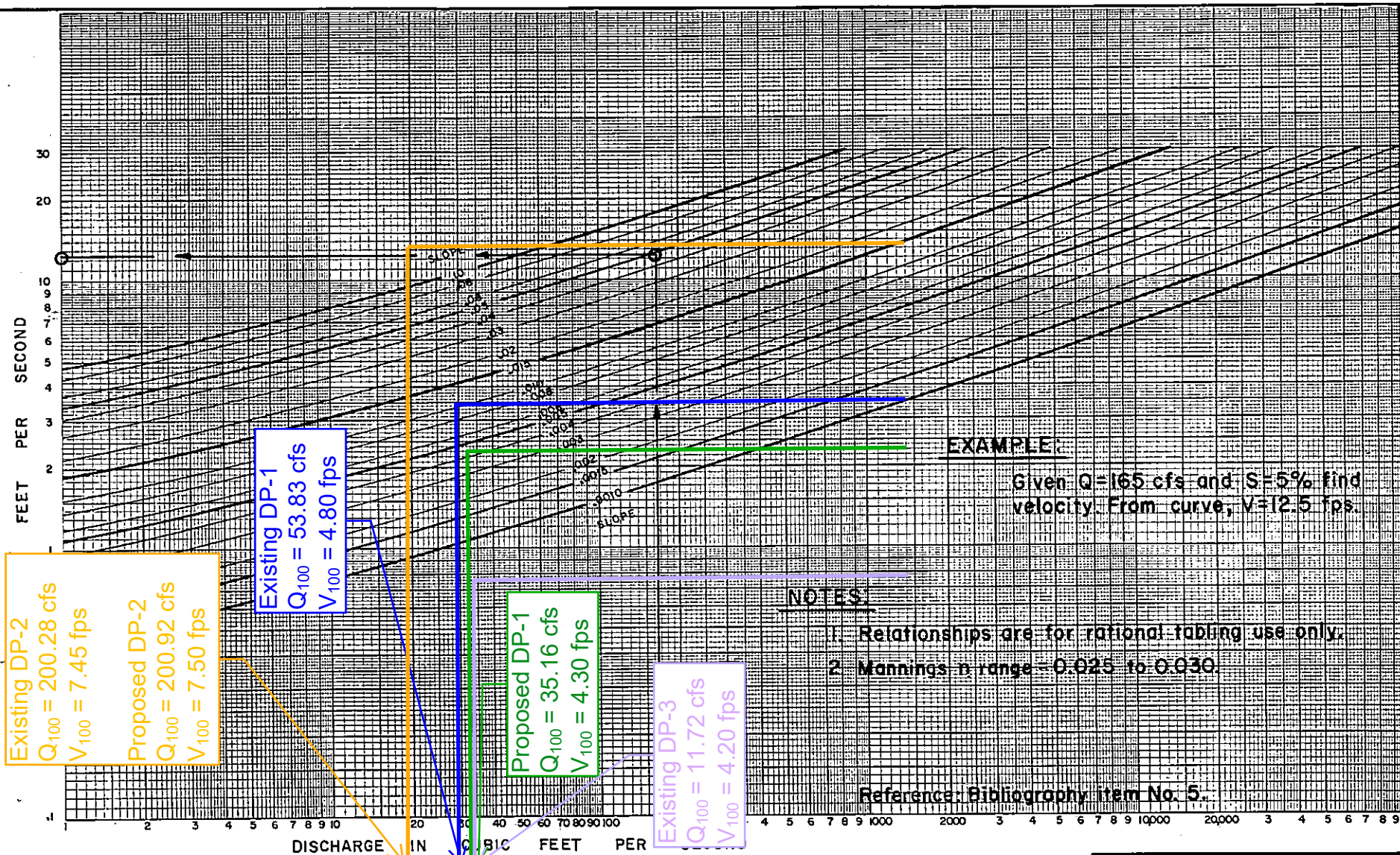
P-2  
T=19.0  
I<sub>100</sub>=2.18

## RAINFALL INTENSITY - INCHES PER HOUR

| HEMET               |                         |             | HIGHGROVE           |                         |             | WINCHESTER          |                         |             | IDYLLWILD           |                         |             | LAKEVIEW            |                         |             |
|---------------------|-------------------------|-------------|---------------------|-------------------------|-------------|---------------------|-------------------------|-------------|---------------------|-------------------------|-------------|---------------------|-------------------------|-------------|
| DURATION<br>MINUTES | FREQUENCY<br>10<br>YEAR | 100<br>YEAR | DURATION<br>MINUTES | FREQUENCY<br>10<br>YEAR | 100<br>YEAR | DURATION<br>MINUTES | FREQUENCY<br>10<br>YEAR | 100<br>YEAR | DURATION<br>MINUTES | FREQUENCY<br>10<br>YEAR | 100<br>YEAR | DURATION<br>MINUTES | FREQUENCY<br>10<br>YEAR | 100<br>YEAR |
| 5                   | 2.84                    | 4.40        | 5                   | 3.02                    | 4.37        | 5                   | 2.91                    | 4.37        | 5                   | 4.91                    | 7.28        | 5                   | 2.77                    | 4.16        |
| 6                   | 2.58                    | 4.00        | 6                   | 2.75                    | 3.97        | 6                   | 2.65                    | 3.97        | 6                   | 4.47                    | 6.62        | 6                   | 2.53                    | 3.79        |
| 7                   | 2.37                    | 3.68        | 7                   | 2.54                    | 3.67        | 7                   | 2.44                    | 3.67        | 7                   | 4.13                    | 6.11        | 7                   | 2.34                    | 3.51        |
| 8                   | 2.21                    | 3.43        | 8                   | 2.37                    | 3.42        | 8                   | 2.28                    | 3.42        | 8                   | 3.85                    | 5.70        | 8                   | 2.19                    | 3.29        |
| 9                   | 2.08                    | 3.23        | 9                   | 2.23                    | 3.22        | 9                   | 2.15                    | 3.22        | 9                   | 3.62                    | 5.36        | 9                   | 2.07                    | 3.10        |
| 10                  | 1.96                    | 3.05        | 10                  | 2.11                    | 3.05        | 10                  | 2.03                    | 3.05        | 10                  | 3.43                    | 5.08        | 10                  | 1.96                    | 2.94        |
| 11                  | 1.87                    | 2.90        | 11                  | 2.01                    | 2.90        | 11                  | 1.93                    | 2.90        | 11                  | 3.26                    | 4.83        | 11                  | 1.87                    | 2.80        |
| 12                  | 1.78                    | 2.77        | 12                  | 1.92                    | 2.77        | 12                  | 1.85                    | 2.77        | 12                  | 3.12                    | 4.62        | 12                  | 1.79                    | 2.68        |
| 13                  | 1.71                    | 2.65        | 13                  | 1.84                    | 2.66        | 13                  | 1.77                    | 2.66        | 13                  | 2.99                    | 4.43        | 13                  | 1.72                    | 2.58        |
| 14                  | 1.64                    | 2.55        | 14                  | 1.77                    | 2.56        | 14                  | 1.70                    | 2.56        | 14                  | 2.88                    | 4.26        | 14                  | 1.66                    | 2.48        |
| 15                  | 1.58                    | 2.46        | 15                  | 1.71                    | 2.47        | 15                  | 1.63                    | 2.47        | 15                  | 2.78                    | 4.11        | 15                  | 1.60                    | 2.40        |
| 16                  | 1.53                    | 2.38        | 16                  | 1.65                    | 2.39        | 16                  | 1.57                    | 2.39        | 16                  | 2.68                    | 3.98        | 16                  | 1.55                    | 2.32        |
| 17                  | 1.48                    | 2.30        | 17                  | 1.60                    | 2.31        | 17                  | 1.52                    | 2.31        | 17                  | 2.60                    | 3.85        | 17                  | 1.50                    | 2.25        |
| 18                  | 1.44                    | 2.24        | 18                  | 1.55                    | 2.24        | 18                  | 1.47                    | 2.24        | 18                  | 2.52                    | 3.74        | 18                  | 1.46                    | 2.19        |
| 19                  | 1.40                    | 2.18        | 19                  | 1.51                    | 2.18        | 19                  | 1.43                    | 2.18        | 19                  | 2.45                    | 3.64        | 19                  | 1.42                    | 2.13        |
| 20                  | 1.36                    | 2.12        | 20                  | 1.47                    | 2.12        | 20                  | 1.42                    | 2.12        | 20                  | 2.39                    | 3.54        | 20                  | 1.39                    | 2.08        |
| 22                  | 1.29                    | 2.02        | 22                  | 1.40                    | 2.02        | 22                  | 1.35                    | 2.02        | 22                  | 2.27                    | 3.37        | 22                  | 1.32                    | 1.98        |
| 24                  | 1.24                    | 1.93        | 24                  | 1.34                    | 1.93        | 24                  | 1.29                    | 1.93        | 24                  | 2.17                    | 3.22        | 24                  | 1.26                    | 1.90        |
| 26                  | 1.18                    | 1.85        | 26                  | 1.28                    | 1.85        | 26                  | 1.24                    | 1.85        | 26                  | 2.09                    | 3.09        | 26                  | 1.22                    | 1.82        |
| 28                  | 1.14                    | 1.78        | 28                  | 1.23                    | 1.78        | 28                  | 1.19                    | 1.78        | 28                  | 2.01                    | 2.97        | 28                  | 1.17                    | 1.76        |
| 30                  | 1.10                    | 1.72        | 30                  | 1.19                    | 1.72        | 30                  | 1.15                    | 1.72        | 30                  | 1.94                    | 2.87        | 30                  | 1.13                    | 1.70        |
| 32                  | 1.06                    | 1.66        | 32                  | 1.15                    | 1.66        | 32                  | 1.11                    | 1.66        | 32                  | 1.87                    | 2.77        | 32                  | 1.10                    | 1.64        |
| 34                  | 1.03                    | 1.61        | 34                  | 1.12                    | 1.61        | 34                  | 1.07                    | 1.61        | 34                  | 1.81                    | 2.69        | 34                  | 1.06                    | 1.59        |
| 36                  | 1.00                    | 1.57        | 36                  | 1.08                    | 1.57        | 36                  | 1.04                    | 1.57        | 36                  | 1.76                    | 2.61        | 36                  | 1.03                    | 1.55        |
| 38                  | 0.97                    | 1.52        | 38                  | 1.05                    | 1.52        | 38                  | 1.01                    | 1.52        | 38                  | 1.71                    | 2.54        | 38                  | 1.01                    | 1.51        |
| 40                  | 0.94                    | 1.48        | 40                  | 1.02                    | 1.48        | 40                  | 0.99                    | 1.48        | 40                  | 1.67                    | 2.47        | 40                  | 0.98                    | 1.47        |
| 45                  | 0.89                    | 1.39        | 45                  | 0.96                    | 1.39        | 45                  | 0.93                    | 1.39        | 45                  | 1.57                    | 2.32        | 45                  | 0.92                    | 1.39        |
| 50                  | 0.84                    | 1.32        | 50                  | 0.91                    | 1.32        | 50                  | 0.88                    | 1.32        | 50                  | 1.48                    | 2.20        | 50                  | 0.88                    | 1.31        |
| 55                  | 0.80                    | 1.26        | 55                  | 0.87                    | 1.26        | 55                  | 0.84                    | 1.26        | 55                  | 1.41                    | 2.09        | 55                  | 0.84                    | 1.25        |
| 60                  | 0.76                    | 1.20        | 60                  | 0.83                    | 1.20        | 60                  | 0.80                    | 1.20        | 60                  | 1.35                    | 2.00        | 60                  | 0.80                    | 1.20        |
| 65                  | 0.73                    | 1.15        | 65                  | 0.80                    | 1.15        | 65                  | 0.77                    | 1.15        | 65                  | 1.29                    | 1.92        | 65                  | 0.77                    | 1.15        |
| 70                  | 0.70                    | 1.11        | 70                  | 0.77                    | 1.11        | 70                  | 0.74                    | 1.11        | 70                  | 1.25                    | 1.85        | 70                  | 0.74                    | 1.11        |
| 75                  | 0.68                    | 1.07        | 75                  | 0.74                    | 1.07        | 75                  | 0.71                    | 1.07        | 75                  | 1.20                    | 1.78        | 75                  | 0.72                    | 1.07        |
| 80                  | 0.65                    | 1.03        | 80                  | 0.71                    | 1.03        | 80                  | 0.69                    | 1.03        | 80                  | 1.16                    | 1.72        | 80                  | 0.69                    | 1.04        |
| 85                  | 0.63                    | 1.00        | 85                  | 0.69                    | 1.00        | 85                  | 0.67                    | 1.00        | 85                  | 1.13                    | 1.67        | 85                  | 0.67                    | 1.01        |
| SLOPE = .530        |                         |             | SLOPE = .520        |                         |             | SLOPE = .520        |                         |             | SLOPE = .520        |                         |             | SLOPE = .500        |                         |             |







**RCFC & WCD** HYDROLOGY MANUAL

VELOCITY-DISCHARGE-SLOPE  
 RELATIONSHIPS  
 NATURAL VALLEY CHANNELS

## Appendix 2

---

### Trapezoidal Channel Sizing Calculation

K'= Discharge Factor

n= Mannings coefficient

D=depth of water in channel

b=width of bottom of channel (ft)

Q= Discharge (cfs)

$$Q = (K'/n) * b^{8/3} * s^{0.5}$$

s=Pipe Slope (ft/ft)

n= 0.013

| Channel # | Q per conduit (cfs) | S (%) | Width (in) | K'     | D/b  | Depth of water in conduit (in) | Cross sectional area of flow (sf) | Velocity (ft/ sec) |
|-----------|---------------------|-------|------------|--------|------|--------------------------------|-----------------------------------|--------------------|
| 1         | 23.18               | 2.00  | 48         | 0.0528 | 0.14 | 6.72                           | 2.24                              | 10.35              |
| 2         | 34.76               | 0.50  | 48         | 0.1585 | 0.31 | 14.88                          | 4.96                              | 7.01               |
| 3         | 35.16               | 1.00  | 48         | 0.1134 | 0.25 | 12.00                          | 4.00                              | 8.79               |

Table 7-11. Values of  $K'$  in Formula  $Q = \frac{K'}{n} b^{8/3} s^{1/2}$  for

Trapezoidal Channels

D = depth of water b = bottom width of channel

| $\frac{D}{b}$ | Side slopes of channel, ratio of horizontal to vertical |                 |                 |                 |        |                  |        |                  |        |        |
|---------------|---------------------------------------------------------|-----------------|-----------------|-----------------|--------|------------------|--------|------------------|--------|--------|
|               | Ver-tical                                               | $\frac{1}{4}-1$ | $\frac{1}{2}-1$ | $\frac{3}{4}-1$ | 1-1    | $1\frac{1}{2}-1$ | 2-1    | $2\frac{1}{2}-1$ | 3-1    | 4-1    |
| .01           | .00068                                                  | .00068          | .00069          | .00069          | .00069 | .00069           | .00069 | .00069           | .00070 | .00070 |
| .02           | .00213                                                  | .00215          | .00216          | .00217          | .00218 | .00220           | .00221 | .00222           | .00223 | .00225 |
| .03           | .00414                                                  | .00419          | .00423          | .00426          | .00428 | .00433           | .00436 | .00439           | .00443 | .00449 |
| .04           | .00660                                                  | .00670          | .00679          | .00685          | .00691 | .00700           | .00708 | .00716           | .00723 | .00736 |
| .05           | .00946                                                  | .00964          | .00979          | .00991          | .01002 | .01019           | .01033 | .01047           | .01060 | .01086 |
| .06           | .0127                                                   | .0130           | .0132           | .0134           | .0136  | .0138            | .0141  | .0143            | .0145  | .0150  |
| .07           | .0162                                                   | .0166           | .0170           | .0173           | .0175  | .0180            | .0183  | .0187            | .0190  | .0197  |
| .08           | .0200                                                   | .0206           | .0211           | .0215           | .0219  | .0225            | .0231  | .0236            | .0240  | .0250  |
| .09           | .0241                                                   | .0249           | .0256           | .0262           | .0267  | .0275            | .0282  | .0289            | .0296  | .0310  |
| .10           | .0284                                                   | .0294           | .0304           | .0311           | .0318  | .0329            | .0339  | .0348            | .0358  | .0376  |
| .11           | .0329                                                   | .0343           | .0354           | .0364           | .0373  | .0387            | .0400  | .0413            | .0424  | .0448  |
| .12           | .0376                                                   | .0393           | .0408           | .0420           | .0431  | .0450            | .0466  | .0482            | .0497  | .0527  |
| .13           | .0425                                                   | .0446           | .0464           | .0480           | .0493  | .0516            | .0537  | .0556            | .0575  | .0613  |
| .14           | .0476                                                   | .0502           | .0524           | .0542           | .0559  | .0587            | .0612  | .0636            | .0659  | .0706  |
| .15           | .0528                                                   | .0559           | .0585           | .0608           | .0627  | .0662            | .0692  | .0721            | .0749  | .0805  |
| .16           | .0582                                                   | .0619           | .0650           | .0676           | .0700  | .0740            | .0777  | .0811            | .0845  | .0912  |
| .17           | .0638                                                   | .0680           | .0716           | .0748           | .0775  | .0823            | .0866  | .0907            | .0947  | .1026  |
| .18           | .0695                                                   | .0744           | .0786           | .0822           | .0854  | .0910            | .0960  | .1008            | .1055  | .1148  |
| .19           | .0753                                                   | .0809           | .0857           | .0899           | .0936  | .1001            | .1059  | .1115            | .1169  | .1277  |
| .20           | .0812                                                   | .0876           | .0931           | .0979           | .1021  | .1096            | .1163  | .1227            | .1290  | .1414  |
| .21           | .0873                                                   | .0945           | .101            | .106            | .111   | .120             | .127   | .135             | .142   | .156   |
| .22           | .0934                                                   | .1015           | .109            | .115            | .120   | .130             | .139   | .147             | .155   | .171   |
| .23           | .0997                                                   | .1087           | .117            | .124            | .130   | .141             | .150   | .160             | .169   | .187   |
| .24           | .1061                                                   | .1161           | .125            | .133            | .140   | .152             | .163   | .173             | .184   | .204   |
| .25           | .1125                                                   | .1236           | .133            | .142            | .150   | .163             | .176   | .188             | .199   | .222   |
| .26           | .119                                                    | .131            | .142            | .152            | .160   | .175             | .189   | .202             | .215   | .241   |
| .27           | .126                                                    | .139            | .151            | .162            | .171   | .188             | .203   | .218             | .232   | .260   |
| .28           | .132                                                    | .147            | .160            | .172            | .182   | .201             | .217   | .234             | .249   | .281   |
| .29           | .139                                                    | .155            | .170            | .182            | .194   | .214             | .232   | .250             | .268   | .302   |
| .30           | .146                                                    | .163            | .179            | .193            | .205   | .228             | .248   | .267             | .287   | .324   |
| .31           | .153                                                    | .172            | .189            | .204            | .218   | .242             | .264   | .285             | .306   | .347   |
| .32           | .160                                                    | .180            | .199            | .215            | .230   | .256             | .281   | .304             | .327   | .371   |
| .33           | .167                                                    | .189            | .209            | .227            | .243   | .271             | .298   | .323             | .348   | .396   |
| .34           | .174                                                    | .198            | .219            | .238            | .256   | .287             | .316   | .343             | .370   | .423   |
| .35           | .181                                                    | .207            | .230            | .251            | .269   | .303             | .334   | .363             | .392   | .450   |
| .36           | .189                                                    | .216            | .241            | .263            | .283   | .319             | .353   | .385             | .416   | .478   |
| .37           | .196                                                    | .225            | .252            | .275            | .297   | .336             | .372   | .406             | .440   | .507   |
| .38           | .203                                                    | .234            | .263            | .288            | .312   | .353             | .392   | .429             | .465   | .537   |
| .39           | .211                                                    | .244            | .274            | .301            | .326   | .371             | .413   | .452             | .491   | .568   |
| .40           | .218                                                    | .253            | .286            | .315            | .341   | .389             | .434   | .476             | .518   | .600   |
| .41           | .226                                                    | .263            | .297            | .328            | .357   | .408             | .456   | .501             | .546   | .633   |
| .42           | .233                                                    | .273            | .309            | .342            | .373   | .427             | .478   | .526             | .574   | .668   |
| .43           | .241                                                    | .283            | .321            | .357            | .389   | .447             | .501   | .553             | .603   | .703   |
| .44           | .248                                                    | .293            | .334            | .371            | .405   | .467             | .525   | .580             | .633   | .740   |
| .45           | .256                                                    | .303            | .346            | .386            | .422   | .488             | .549   | .607             | .664   | .777   |

# Channel Report

## Coventry Lane Flow Capacity

### User-defined

Invert Elev (ft) = 9.00  
Slope (%) = 0.50  
N-Value = 0.013

### Calculations

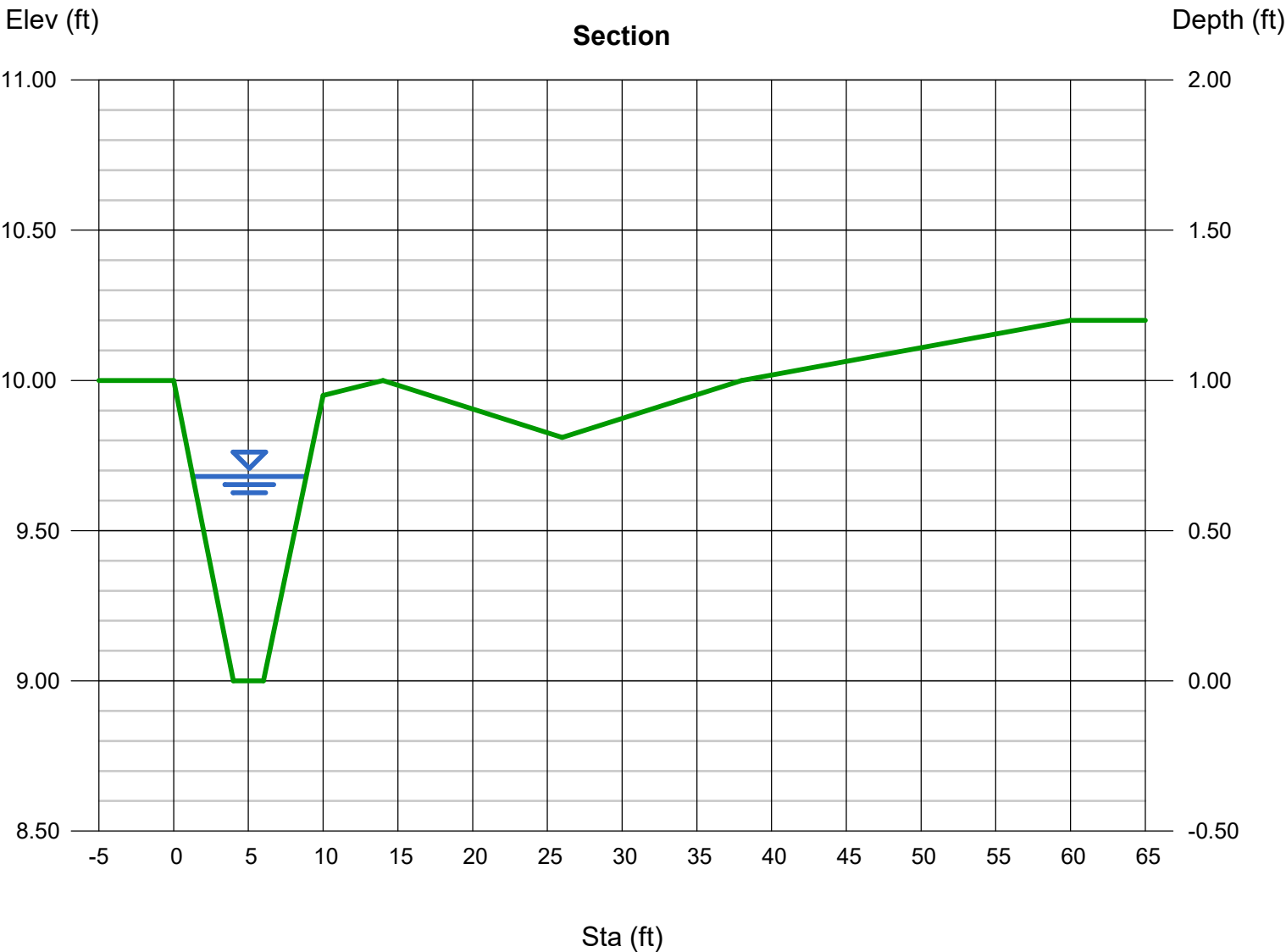
Compute by: Known Q  
Known Q (cfs) = 14.44

### Highlighted

Depth (ft) = 0.68  
Q (cfs) = 14.44  
Area (sqft) = 3.26  
Velocity (ft/s) = 4.43  
Wetted Perim (ft) = 7.75  
Crit Depth, Yc (ft) = 0.75  
Top Width (ft) = 7.58  
EGL (ft) = 0.99

### (Sta, El, n)-(Sta, El, n)...

( 0.00, 10.00)-(4.00, 9.00, 0.013)-(6.00, 9.00, 0.013)-(10.00, 9.95, 0.013)-(14.00, 10.00, 0.013)-(26.00, 9.81, 0.013)-(38.00, 10.00, 0.013)  
-(60.00, 10.20, 0.013)



# Channel Report

## 50 ft wide Arizona Crossing

### User-defined

Invert Elev (ft) = 99.25  
Slope (%) = 1.00  
N-Value = 0.015

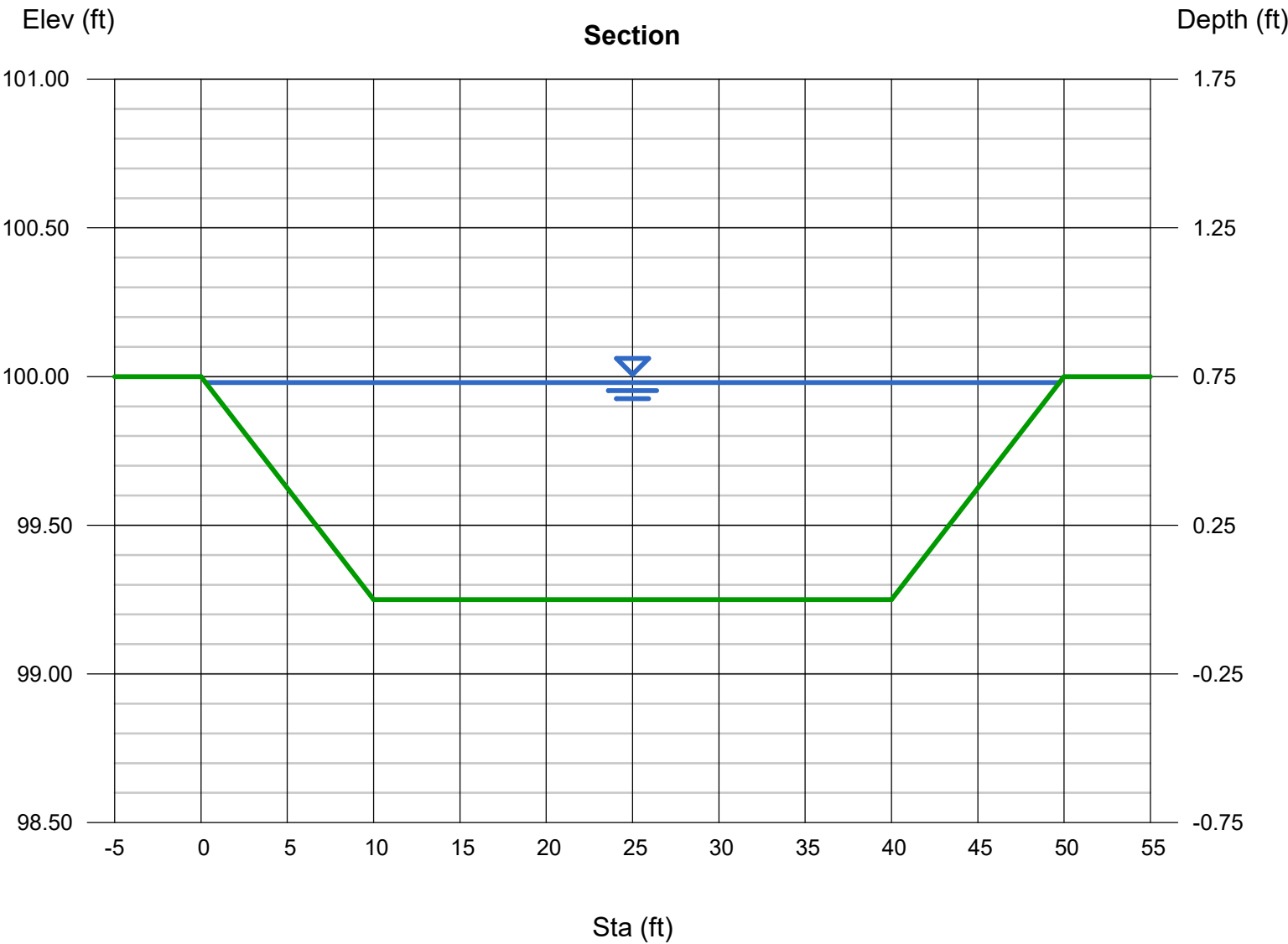
### Calculations

Compute by: Known Q  
Known Q (cfs) = 200.11

### Highlighted

Depth (ft) = 0.73  
Q (cfs) = 200.11  
Area (sqft) = 29.01  
Velocity (ft/s) = 6.90  
Wetted Perim (ft) = 49.52  
Crit Depth, Yc (ft) = 0.75  
Top Width (ft) = 49.47  
EGL (ft) = 1.47

(Sta, El, n)-(Sta, El, n)...  
( 0.00, 100.00)-(10.00, 99.25, 0.015)-(40.00, 99.25, 0.015)-(50.00, 100.00, 0.015)



## Appendix 3

---

### Existing Culvert Capacity Calculation

$$Q = C \times A \sqrt{2gd}$$

**C= Orifice Coefficient (short tube)**

**A= Orifice area**

**g= Gravitational constant (32.2 ft/s<sup>2</sup>)**

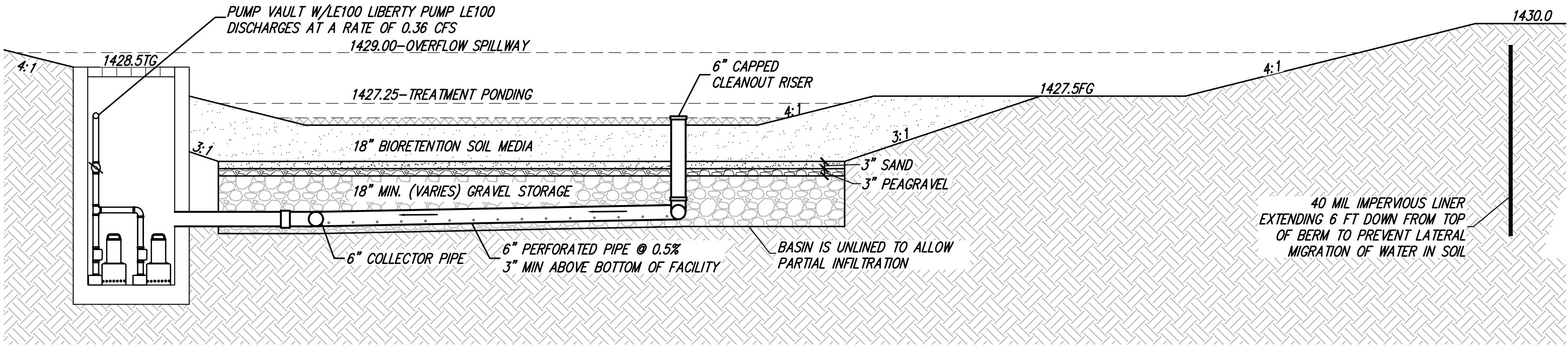
**d=Head above centerline of orifice**

| Total head (to flowline) | Diameter (in) | Orifice Coefficient, <b>C</b> | Area, <b>A</b> | Total head - radius, <b>d</b> | <b>Q<sub>ORIFICE</sub></b> |
|--------------------------|---------------|-------------------------------|----------------|-------------------------------|----------------------------|
| 3                        | 24.000        | 0.650                         | 3.142          | 2.000                         | 23.18                      |

## Appendix 4

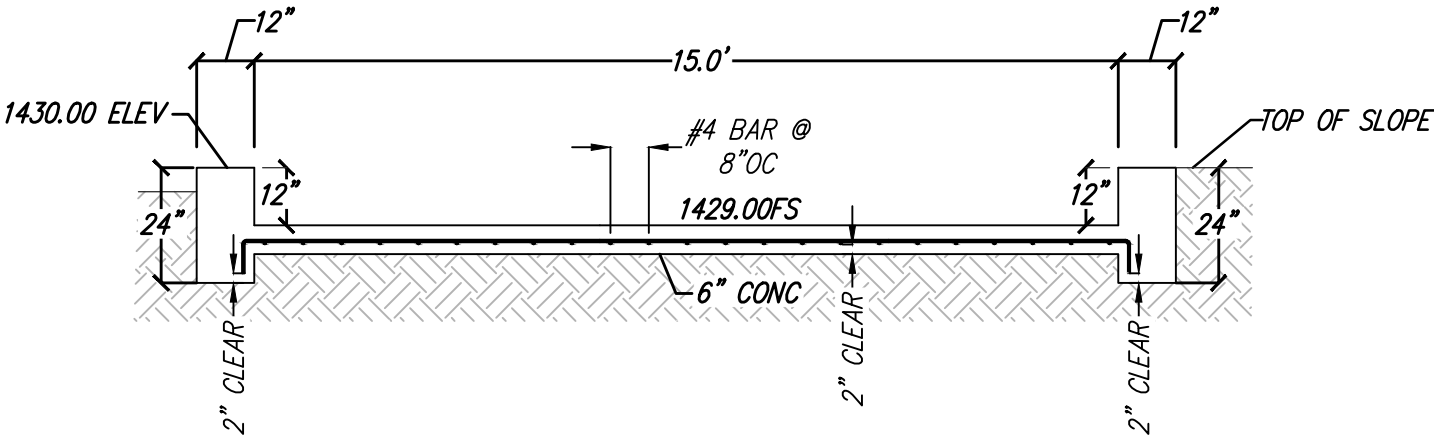
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BMP DETAILS



**BMP-1, BIOFILTRATION W/ PARTIAL INFILTRATION BASIN CROSS SECTION**

NOT TO SCALE



**OVERFLOW SPILLWAY DETAIL**

NOT TO SCALE

## Appendix 5

---

## Size a Pump

|           |                       |         |           |       |         |
|-----------|-----------------------|---------|-----------|-------|---------|
| CLIENT:   | U-Stor-It; Peter Nora | COUNTY: | Riverside | DATE: | 2/17/25 |
| DSN BY:   | Patric de Boer        | CHK BY: |           | DATE: |         |
| COMMENTS: |                       |         |           |       |         |

|                            |         |    |
|----------------------------|---------|----|
| Elevation at Highest Point | 1430.04 | ft |
| Elevation at Low Point     | 1420.84 | ft |

CLEAR  
CELLS

### DISCHARGE PIPE

|                                    |       |                        |
|------------------------------------|-------|------------------------|
| Discharge Pipe Length              | 170.0 | ft                     |
| Equivalent Length of Pipe Fittings | 15.5  | ft (see tables) =====> |
| Discharge Pipe Inside Diameter     | 4.00  | in                     |
| Hazen-Williams Roughness, C        | 130   | =====>                 |
| Other Losses                       | 0.0   | ft                     |

|                             |       |                                             |
|-----------------------------|-------|---------------------------------------------|
| Static Head                 | 9.2   | ft                                          |
| Total Discharge Pipe Length | 185.5 | ft (includes equivalent length of fittings) |

| Hazen-Williams |     |
|----------------|-----|
| Material       | C   |
| Brass          | 130 |
| Cast Iron      | 100 |
| Concrete       | 100 |
| Copper         | 130 |
| Fiberglass     | 150 |
| PE, no joints  | 150 |
| PVC            | 130 |
| Steel, Smooth  | 100 |
| Steel, Spiral  | 90  |
| Steel, CMP     | 60  |

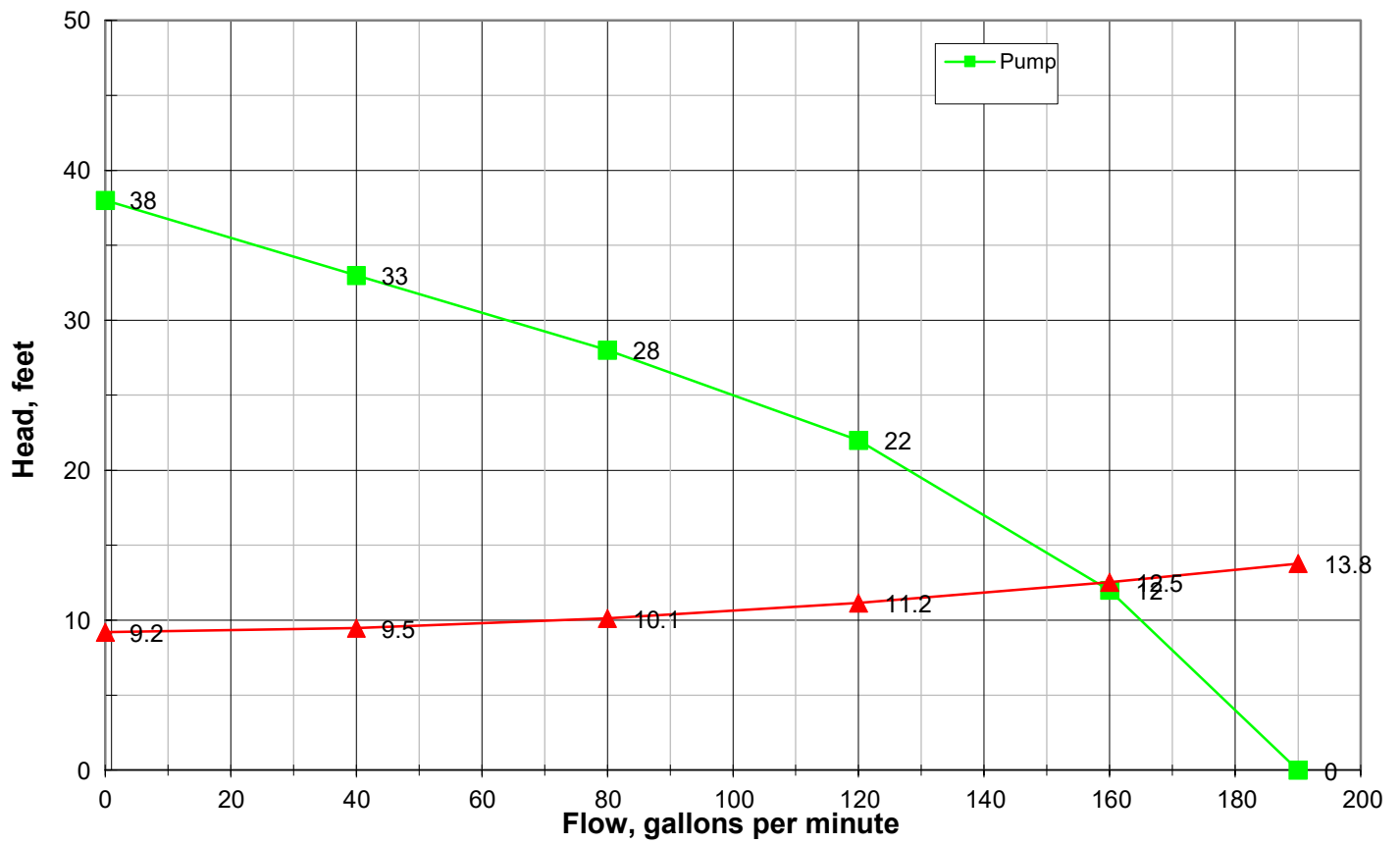
|                   |                               |
|-------------------|-------------------------------|
| Pump Manufacturer | Liberty Pumps                 |
| Pump Model #      | LE100-Series 1 hp Sewage Pump |

| Pump Curve  |                  | System Curve |                    |
|-------------|------------------|--------------|--------------------|
| Flow<br>GPM | Pump<br>Head, ft | Flow<br>GPM  | System<br>Head, ft |
| 0           | 38               | 0            | 9.2                |
| 40          | 33               | 40           | 9.5                |
| 80          | 28               | 80           | 10.1               |
| 120         | 22               | 120          | 11.2               |
| 160         | 12               | 160          | 12.5               |
| 190         | 0                | 190          | 13.8               |
|             |                  | 0            | 9.2                |

|                         |      |                                               |
|-------------------------|------|-----------------------------------------------|
| Head at Operating Point | 12.5 | ft (Intersection of curves from graph below)  |
| Flow at Operating Point | 160  | gpm (Intersection of curves from graph below) |
|                         | 0.36 | cfs                                           |
| Operating Velocity      | 4.1  | feet/sec                                      |
| Operating Pressure      | 5.4  | psi                                           |

Note: Velocity will increase as static head pressure (acting against the pump) decreases

**Pump & System Curves**



## Appendix 6

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### Biofiltration w/partial infiltration Storage Capacity

| Basin Shaped BMP (Bottom Stage 1st) |        |              |          |
|-------------------------------------|--------|--------------|----------|
| Bottom Stage                        |        | H= 0.0'      | SS= 4 :1 |
| Top Area                            |        | Bottom Area  |          |
| Width                               | 50.5   | Width        | 50.5 FT  |
| Length                              | 250    | Length       | 250 FT   |
| area = 12625                        |        | area = 12625 |          |
| Top Stage                           |        | H= 3.5'      | SS= 4 :1 |
| Top Area                            |        | Bottom Area  |          |
| Width                               | 108.25 | Width        | 80.25 FT |
| Length                              | 348    | Length       | 320 FT   |
| area = 37671                        |        | area = 25680 |          |
| Prop. Top Stg. Vol. =               |        | 110,196      | FT3      |
| Prop Bottom Stg Vol =               |        | -            | FT3      |
| Total Prop. Volume <sup>1</sup> =   |        | 110,196      | FT3      |

[illegible]