WARE MALCOMB

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PRELIMINARY CEQA DRAINAGE STUDY

PDS2021-STP-21-019

FOR THE :

2500 Sweetwater Springs Boulevard
Spring Valley, CA 91978
APN 505-231-35

PREPARED FOR :

Greenlaw Partners
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PREPARED BY :

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Project No: DAL20-5012

DATE PREPARED :

June 10, 2021

REVISION DATE(S):

"The purpose of this drainage study/SWQMP is to show that this project will meet drainage study requirements and MS-4 requirements and provide treatment for the improvements via facilities shown on PDS2021-LDGRMJ-30332. The EOW and applicant are aware that Final Engineering level Review will need to confirm the adequacy of the analysis provided and may require revisions as needed"

Table of Contents

1.0 PROJECT DESCRIPTION

1.1 Purpose of Study

The purpose of this study is to support the design and construction of a distribution facility with site improvements, including driveway entrance and parking stalls.

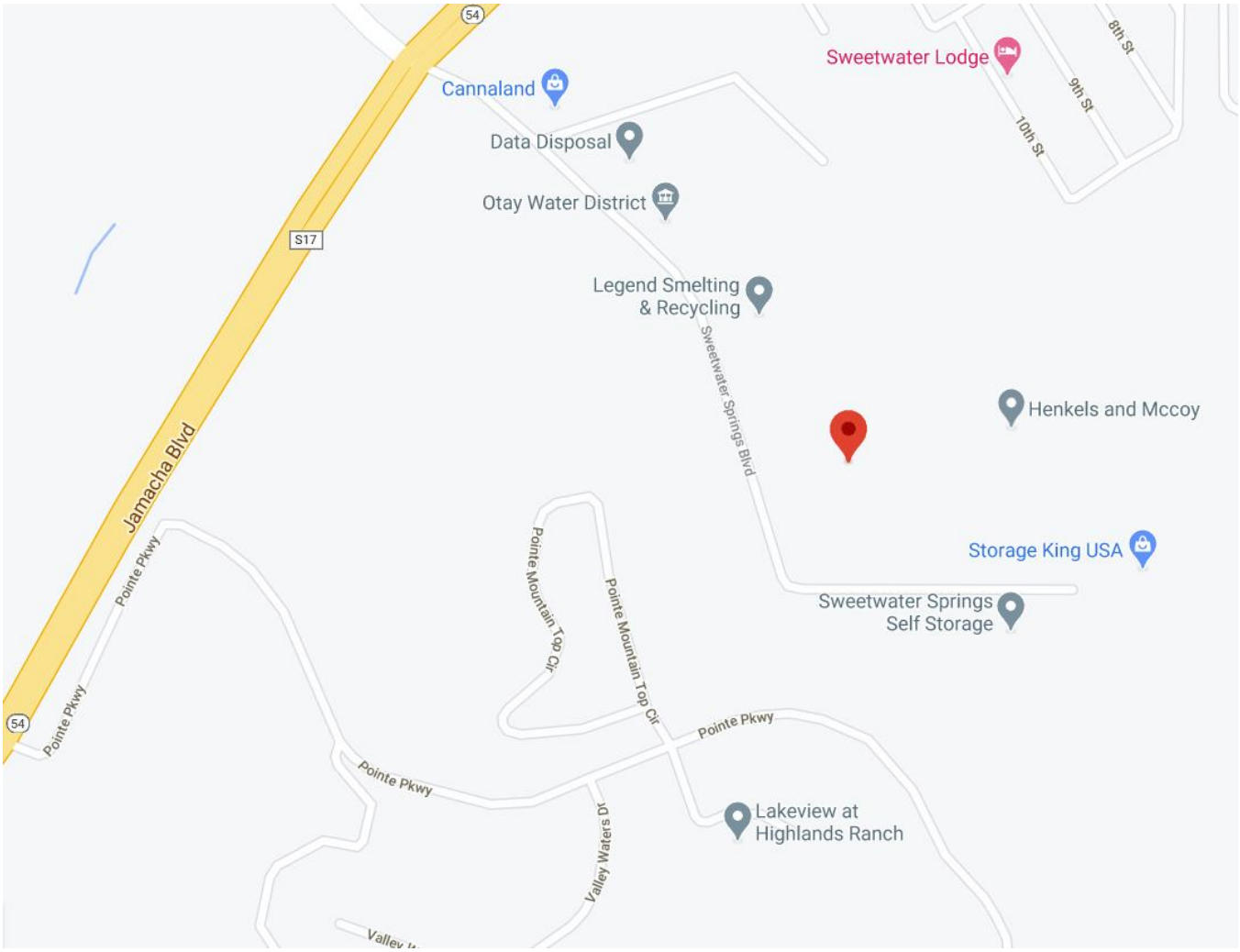
The study will provide sizing of proposed drainage structures, confirm post developed runoff does not exceed pre-developed peak flows, and insure there will be no negative impacts to surrounding and downstream properties

1.2 Project Description

The proposed project is located on the northeast corner of Sweetwater Springs Boulevard and US Elevator Road within the census-designated place (CDP) limits of Spring Valley. The project site consists of a 15.66 acres parcel located on APN 505-231-35 and proposes to include potential development of a triangle shaped parcel located just east of the project site on APN 505-231-03. The existing development consists of two buildings, parking areas, and a cell antenna steel structure. The site will be making interior improvements to the existing 166,886 sq-ft warehouse building and regrading the vehicular and truck/trailer parking areas, constructing loading docks, driveway approaches, retaining walls, hardscape, and landscape. The project proposes the construction of an underground storm drain system that will convey the onsite flows to underground detention chambers and into biofiltration BMPs to treat and mitigate the increase in runoff.

The project is located within a FEMA Zone X, which is not a Special Flood Hazard Area. A Zone X are areas determined to be outside the 0.2% annual chance floodplain.

2.0 VICINITY MAP



3.0 DESCRIPTION OF WATERSHED

3.1 Pre-Development Drainage Pattern

The project area is designated as a Public/Semi-Public Facility Land Use. The project site is surrounded by High Impact Industrial developments. The Southerly and Westerly boundaries of the property are adjacent to Sweetwater Springs Blvd and US Elevator Rd, respectively. The site is located in the Valle de Oro Special Drainage Area (SDA), which is designed as a local or neighborhood land area, where water that flows over the land comes together to a single location.

The existing topography within the project parcel is steep terrain along the north, the east, and the southeast boundaries and gradually reduces to milder slopes along the west and southwest. Slopes range from 1% to 5% on the developed portion of the site and range from 5% to 70% along the boundaries.

Existing drainage pattern for the site consists of four drainage areas. The southwest portion of the onsite, including the southern half of the largest existing building, sheet flows northerly before discharging at a 10-ft wide concrete channel that drains into a drain inlet along the northern boundary. The northeast portion of the onsite, including the northern half of the largest existing building, sheet flows westerly and eventually discharges at the concrete channel. There is approximately 12.60 acres of offsite area that impacts the project site from the east. 9.06 acres of offsite area discharges into an existing brow ditch that is conveyed along the eastern boundary that confluences with an additional 1.98 acres which includes a portion of the triangle project site, APN: 505-231-03. The 11.04 acres of combined offsite area and a portion of the triangle project site ultimately discharge to the existing 10 ft wide concrete channel (POC-A). The remaining 1.56 acres of the easterly offsite area will be conveyed toward the northern boundary via sheet flow and discharge off the property (POC-B).

3.2 Post-Development Drainage Pattern

The project proposes to re-develop 14.23 acres, which consists of APN 505-231-35, an existing industrial development, and APN 505-231-03, an undeveloped lot. The project will maintain drainage patterns consistent to existing conditions and will provide treatment to runoff from all disturbed area.

Approximately 8.61 acres of onsite runoff from the northern and eastern side of the project site will capture and convey runoff to an underground detention system (Detention B), located on the north side of the proposed building Note that this will include disturbed area from APN 505-231-03. Onsite runoff from the southern and western side of the project site will also capture and convey runoff to the other underground detention system (Detention A), located on the west side of the proposed building. Both underground detention systems will be used as

upstream storage as well as pretreatment. The underground detention systems will discharge into biofiltration BMPs for treatment and ultimately into the existing concrete channel.

Emergency overflow structures will be provided for both underground detention systems in case of failure. For the Detention A, flow will back up and bubble out the proposed trench drain along the northwestern driveway. For Detention B, flow will back up into the proposed curb inlet and bubble out north into the existing drainage ditch on the northern boundary of the project site.

Offsite runoff along the eastern property will be retained through proposed retaining walls along the eastern onsite boundary. Drainage ditches will convey the offsite runoff northerly where it is captured through proposed storm drain and conveyed to the existing concrete channel. Offsite runoff will bypass the underground detention system and biofiltration BMPs.

4.0 METHODOLOGY

4.1 Design Standards

The 2003 San Diego County Hydrology Manual and the 2014 San Diego County Hydraulic Design Manual are also used as guidance to design of drainage facilities within this project. For this study. For this study, The County Hydrology Manual will be referred to as the Hydrology Manual and the County Hydraulic Design Manual will be referred to as the Hydraulic manual.

4.2 Hydrology Software

Surface topography and material are analyzed to determine the runoff produced by the proposed development. The values are then entered into the “Rational Hydrology Method, San Diego County (2003 Manual)” module of the CIVILCADD/CIVIL DESIGN Engineering software version 9.1 to determine the amount of runoff produced. For this study the Civil Design software will be referred to as CivilD. The software is also used to develop the hydrographs to assist in determining detention capacity of each proposed detention basin.

4.3 Detention Software

Resulting hydrographs from the hydrology software are used to determine the detention capacities for the underground detention chambers that will be used to mitigate peak flows and for hydromodification measures. This study used the 2020 Hydraflow Hydrograph ACAD extension to determine the peak discharge, time to peak, volume, maximum elevation, and maximum storage.

5.0 CALCULATIONS

5.1 Determination of Watersheds within Project Limits

To determine if the proposed design will have a negative impact to downstream facilities, the analysis ensures the contributing areas to the POC (Point of Compliance) remain approximately identical in pre & post development conditions and the resulting post-development runoff flows remain at or below the pre-development flows.

A single outfall is identified in the pre-developed condition and in the post-developed condition. The outfall (POC-A) discharges to the neighboring property via concrete channel. For this analysis, the discharges will be analyzed for their capacities to discharge to the outfalls and then at the POC for the total discharged produced by the site.

See Attachment 2 for the topographic maps.

5.2 Calculate Runoff Coefficient

Per Web Soil Survey from the USDA, the project impact footprint lays mainly within Hydraulic Soil Group "D".

The Hydrology Manual was utilized to determine the pre and post development C-value. For both the pre-development and post-development conditions, Table 3-1 of the Hydrology Manual was utilized. Per section 3.1.2, second paragraph, "impervious percentage (% Impervious) as given in Table 3-1 for any area, shall govern the selected value for C." Thus, the C value is determined using the percent of impervious and soil type per equation found in section 3.1.2 to the Hydrology Manual:

$$C = 0.90 * (\%Impervious) + C\_p * (1 - \%Impervious)$$

Onsite C-value is calculated as below:

DMA ID	Pervious (sf)	Impervious(sf)	Area (sf)	Area (ac)
1	41,975.02	329,417.40	371,392.42	8.53
2	42,242.06	207,228.90	249,470.96	5.73
3	65,687.17	320.96	66,008.13	1.52
4	39,316.58	-	39,316.58	0.90
Total	189,220.83	536,967.26	726,188.09	16.67

Soil type D	
Cp =	0.35
Ci =	0.9
C-value	0.757

Including potential buildout of northeastern site, the C-value is as calculated below:

DMA ID	Pervious (sf)	Impervious(sf)	Area (sf)	Area (ac)
Onsite	189,220.83	536,967.26	726,188.09	16.67
Offsite Area	4,334.00	38,904.00	43,238.00	0.99
Total	193,554.83	575,871.26	769,426.09	17.66

Soil type D	
Cp =	0.35
Ci =	0.9
C-value	0.762

The C-value has been determined to be 0.762 at it's highest value. However, for to ensure capacity for future build out, the preliminary design C-value of 0.82 (General Commercial in Soil Type D) from Table 3-1 is used.

5.3 Calculate manning Roughness Coefficient

Per Hydraulic Design Manual Appendix A, the average Manning Roughness Coefficient of 0.013 is used for smooth finish asphalt pavement and concrete lined channel. An average Manning Roughness Coefficient of 0.035 is assumed for the natural terrain. The average Manning Roughness Coefficient of 0.013 is used for the storm drain pipes.

5.4 Calculate Storm Flows using the Modified Rational Method

100-year peak flow runoff for Pre- & Post-development are calculated in accordance with the Hydrology Manual and utilizing the CivilD software. A single POC is identified to assist in comparison of the pre- & post-development conditions. Within the pre-condition and post conditions, there are three drainage areas identified as Basin 1, 2, and 3. The southwest area is Basin 1, the northeast area is Basin 2, the eastern offsite area is Basin 3. Routing nodes are labeled in the 100's for Basin 1, 200's for Basin 2, and 300's for Basin 3.

Pre-developed flows are routed using topography that is a combination of aerial topo, precise survey, and County 2-foot contours provided by SanGIS. Flows from Basin 1 sheet flow and

drain into a concrete swale that discharges the flow into the 10-ft wide concrete channel that carries the flow into a drain inlet along the northern boundary, which is POC-A. Flow from Basin 2 and Basin 3 flow westerly, mainly overland as sheet flow, and terminate at the POC-A. Offsite flows from Basin 3 comingle with flows onsite due to the existing terrain. The comingled flows from onsite Basin 2 and offsite Basin 3 are conveyed into a concrete channel, eventually discharging to POC-A. Basin 2 offsite, do not comingle with flows onsite and discharge at POC-A via earthen channel.

Onsite flows from Basin 1 will be conveyed to the west underground detention chambers via curb and gutter or underground storm drain system and eventually drain into a proprietary biofiltration BMP, Modular Wetlands, for treatment. A hydrograph was produced for Basin 1. Hydraflow was used to determine the new time of concentration and runoff to account for the reduction in peak flow from the detention chamber. Onsite flows from Basin 2 will be conveyed to the north underground detention chambers via curb and gutter or underground storm drain system before eventually draining into another Modular Wetlands biofiltration BMP. A hydrograph was produced for Basin 2. Basin 3 offsite flows will be conveyed via bypass storm system. The flows at bypass storm system are discharged too and conveyed via concrete channel to POC-A,

During peak flows, the flow from the biofiltration BMPs will outlet into bypass structures for conveyance to the POC.

See Attachment 2 for Pre- & Post-Development Basin Delineation.

Comparison of Pre and Post runoff are shown below. Please note that the Post runoff values account for the reduction due to routing and detention.

SUMMARY: POC-A PEAK 100-YEAR RUNOFF			
ID	TC (MIN)	RUNOFF (CFS)	AREA (AC)
PRE	6.315	107.97	25.56
POST	6.61	76.98	25.82
	DECREASE	30.99	-

SUMMARY: POC-B PEAK 100-YEAR RUNOFF			
ID	TC (MIN)	RUNOFF (CFS)	AREA (AC)
PRE	10.43	2.77	1.56
POST	10.96	2.18	1.26
	DECREASE	0.60	-

5.5 Design / Analyze Proposed Storm Drain Facilities

CivilD provided estimated pipe sizes for routing flows. Storm drain pipes will be designed to handle the 100-year peak flows. Hydraflow provided calculations for the reduction in flows from routing the flow into detention chambers. The underground detention chambers are sized to mitigate the increase in runoff from the 100-year peak flows.

Basin 1's hydrograph was imported as Inflow Det-A and Basin 2's hydrograph was Inflow Det-B.

An elevation of 100' is used as a baseline for both detention vaults. The orifice is designed to be at the base of the vault and the overflow invert elevation is offset from the baseline elevation identical to that shown in the grading plan. The resulting outflow from the detention vault is then utilized in the routing for peak flow analysis.

See Attachment 4 for the Hydraflow results.

The resulting Inflows and Outflows for Det-A and Det-B are shown below:

SUMMARY: DET-A 100-YEAR HYDROGRAPH			
ID	TIME TO PEAK (HR)	PEAK DISCHARGE (CFS)	AREA (ACRE)
INFLOW	4.08	33.85	5.62
OUTFLOW	4.20	28.05	5.62

SUMMARY: DET-B 100-YEAR HYDROGRAPH			
ID	TIME TO PEAK (HR)	PEAK DISCHARGE (CFS)	AREA (ACRE)
INFLOW	4.10	45.10	8.61
OUTFLOW	4.90	9.61	8.61

Basin 1's detention chamber increase the time of concentration by 7.2 minutes and reduces the runoff by 5.80 cfs. Basin 2's detention chamber increase the time of concentration by 48 minutes and reduces the runoff by 35.49 cfs.

All proposed inlets will be sized to intercept the entirety of the 100-year storm. Please refer to Attachment 4 for inlet calculations.

6.0 CONCLUSION

Flood mitigating facilities, underground detention chambers and bypasses, will be utilized to mitigate the peak flows for POC-A. This study and resulting data indicate that the project will be significantly decreasing the 100-year peak runoff at POC-A and POC-B

It can therefore be concluded that this project will result in no negative impact on the existing downstream storm drain facilities or adjacent and downstream properties. Because the project is not located within or discharges to navigable waters, water of the United States, or Federal jurisdictional wetlands, as defined by the Clean Water Act, no 401/404 permit is required. In conclusion, the project has met the County of San Diego minimum requirements for the peak flow control.

7.0 REFERENCES

County of San Diego, Department of Public Works, Flood Control Section, June2003 San Diego County Hydrology Manual

County of San Diego, Department of Public Works, Flood Control Section, September 2014 San Diego County Hydraulic Design Manual

8.0 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 codes, and that the design is consistent with current design.

I understand that the check of the project drawings and specifications by the County of San Diego is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

ENGINEER OF WORK

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Tel: 858.638.7277
Fax: 858.683.7277

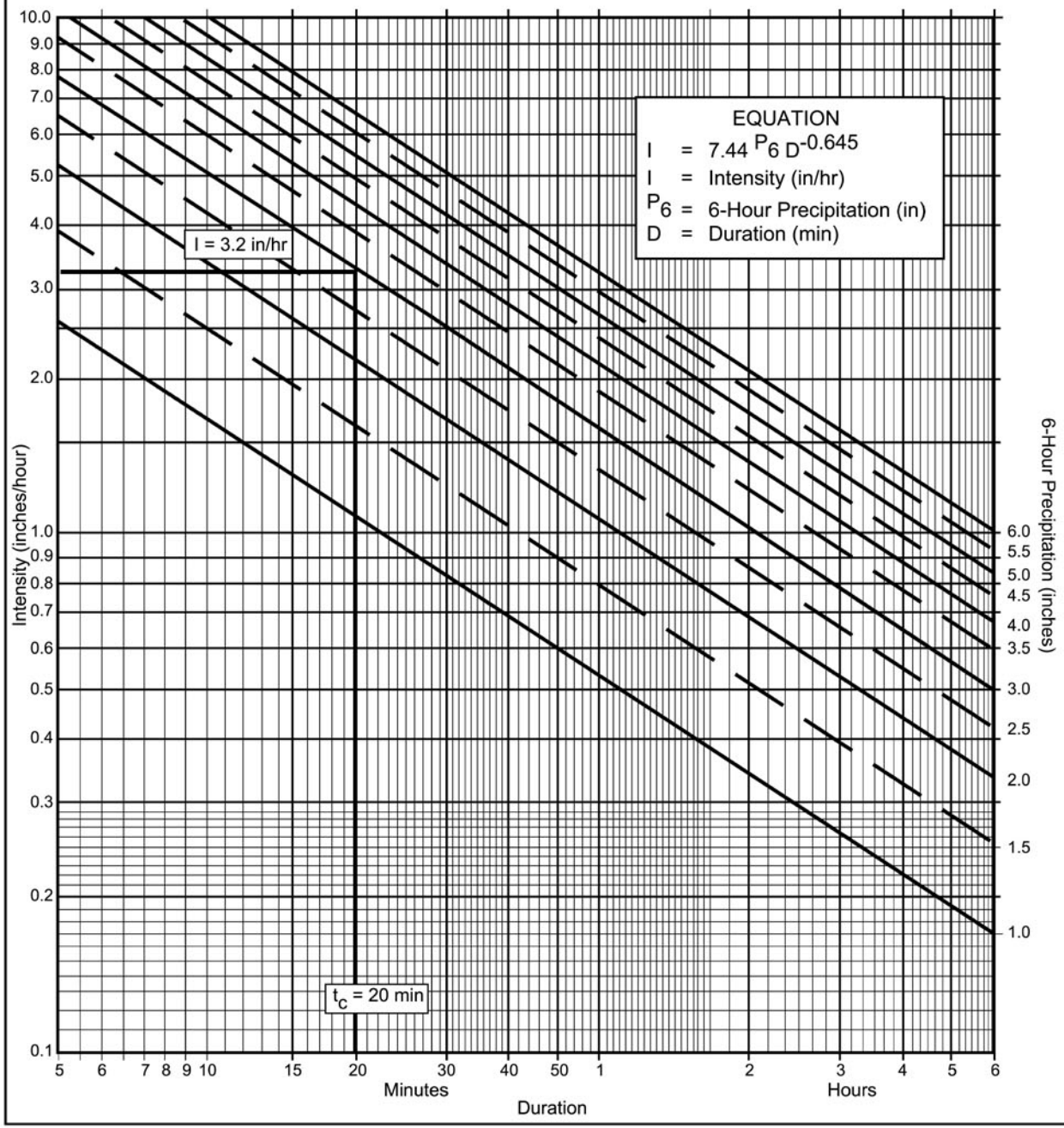
Project Number: DAL20-5012

7/27/2021

Samuel Bellomio, RCE 90818 — Date
Registration Expire: December 31, 2021

9.0 Attachments

Attachment 1 – Figures & Tables



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 3.10 in., P_{24} = 6.00, $\frac{P_6}{P_{24}}$ = 51.7 %(2)

(c) Adjusted P_6(2) = 3.10 in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

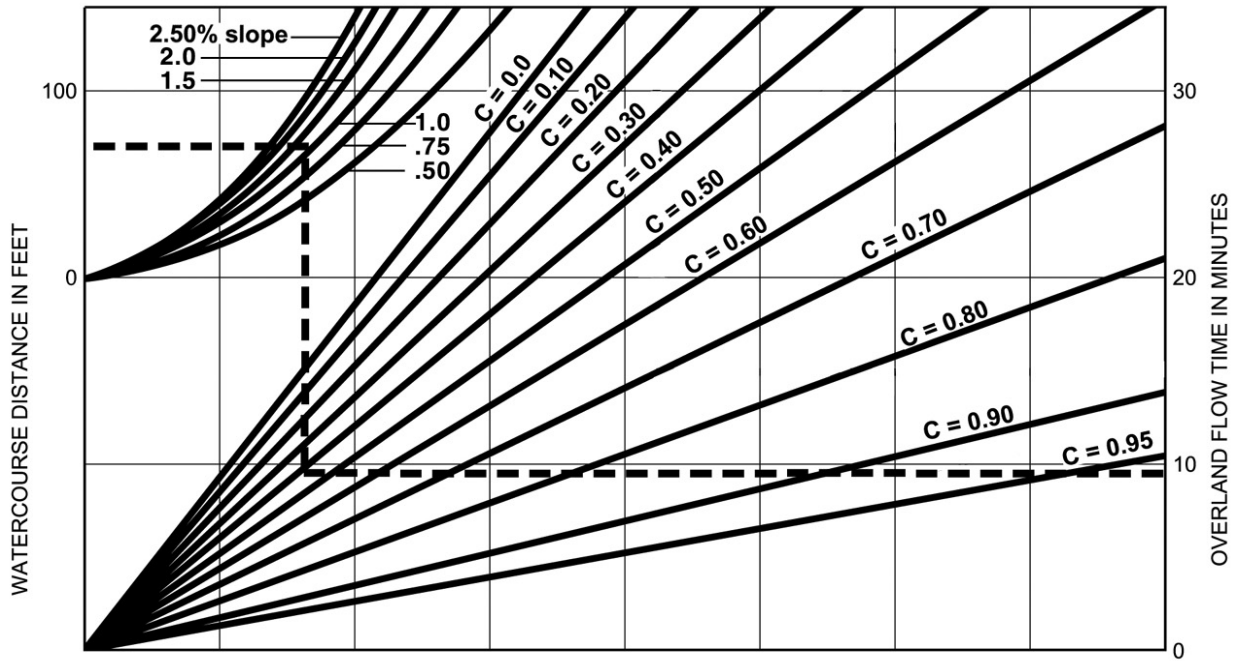
Intensity-Duration Design Chart - Example

FIGURE 3-2

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE 3-3

Rational Formula - Overland Time of Flow Nomograph

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

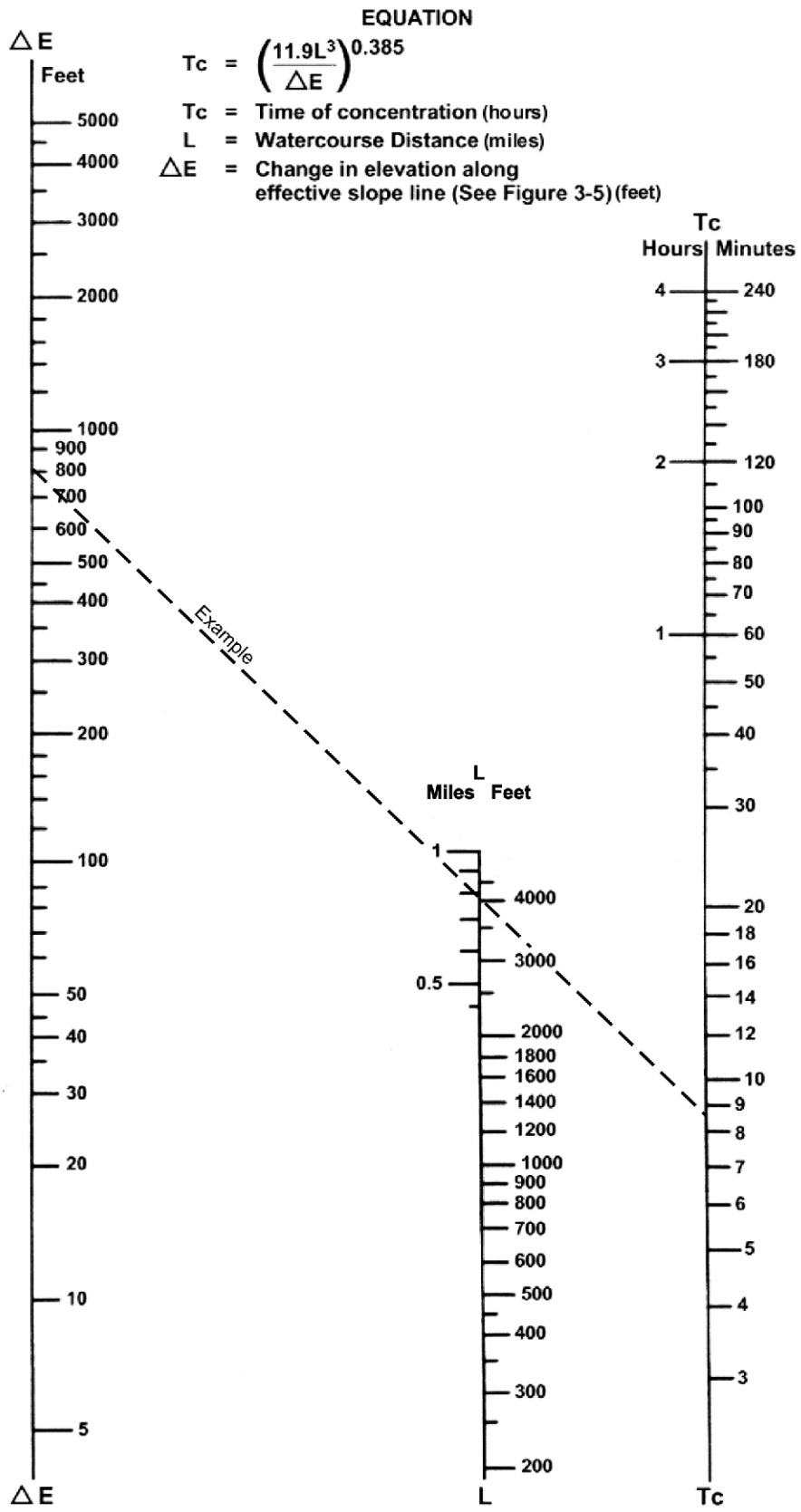
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M)
& INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

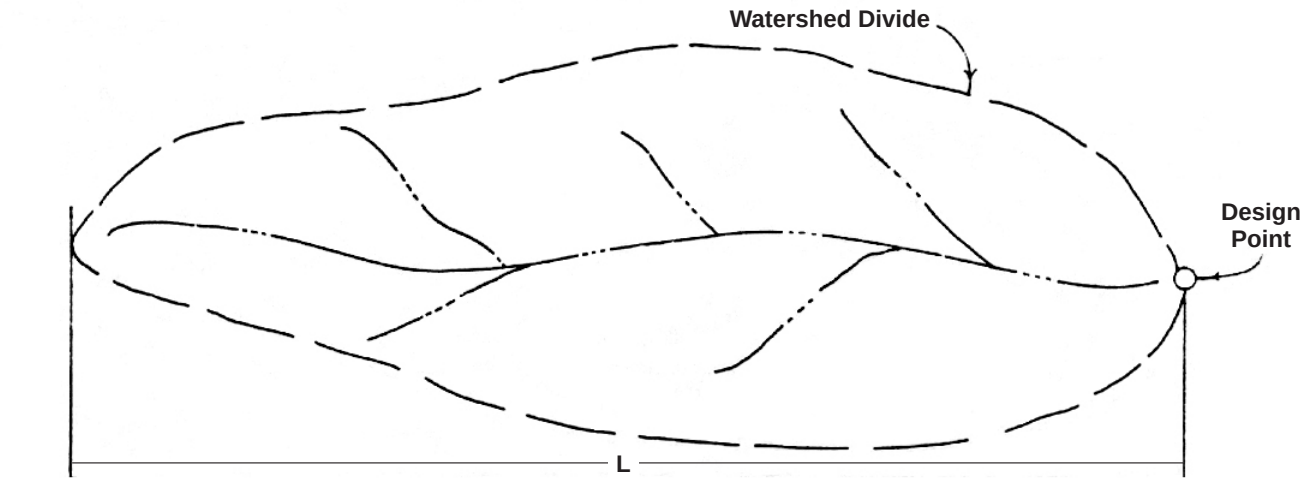
*See Table 3-1 for more detailed description

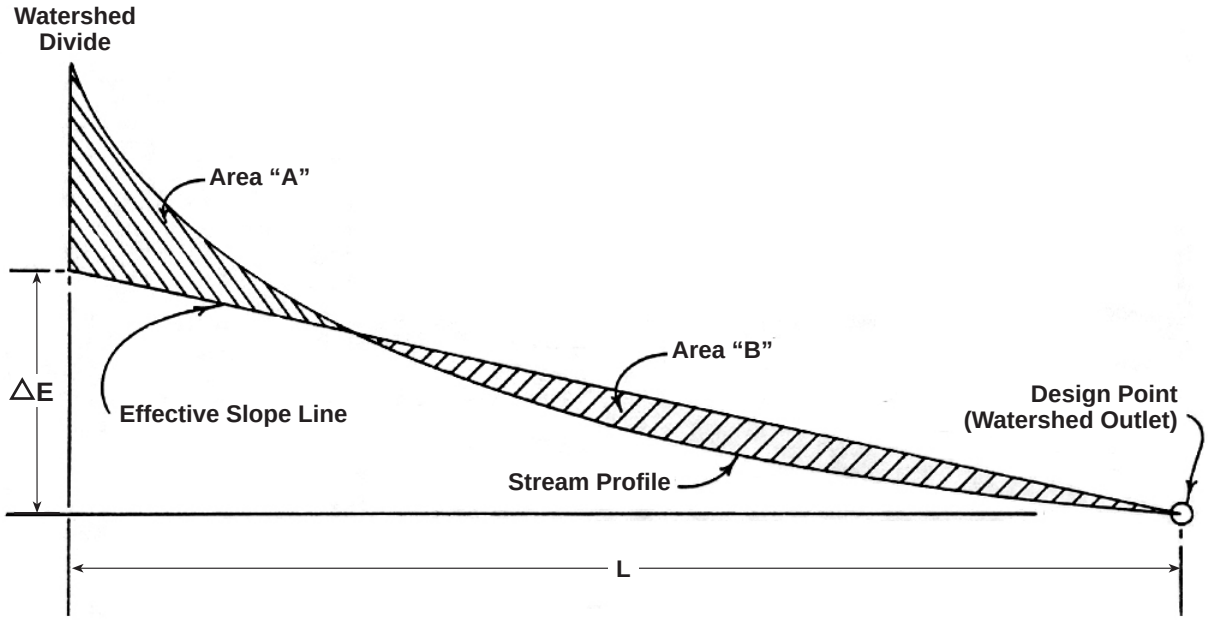


SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE 3-4

Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds





Area "A" = Area "B"

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

FIGURE

Computation of Effective Slope for Natural Watersheds

3-5

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

P6 = 3.1"

OCEANSIDE

CARLSBAD

ENCINITAS

SOLANA BEACH

DEL MAR

ESCONDIDO

POWAY

S.D. COUNTY

SANTEE

SAN DIEGO

EL CAJON

LA MESA

LEMON GROVE

CORONADO

CHULA VISTA

IMPERIAL BEACH

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'

33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

P24 = 6"

Orange County

Riverside County

Imperial County

Mexico

Pacific Ocean

OCEANSIDE

VISTA

CARLSBAD

ESCONDIDO

ENCINITAS

SOLANA BEACH

DEL MAR

POWAY

S.D. COUNTY

SANTEE

SAN DIEGO

EL CAJON

LA MESA

LEMON GROVE

CORONADO

SD

CHULA VISTA

IMPERIAL BEACH

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'

33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for San Diego County Area, California

July 26, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,840 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 15, May 27, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 18, 2018—Aug 22, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FxG	Friant rocky fine sandy loam, 30 to 70 percent slopes	18.0	100.0%
Totals for Area of Interest		**18.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

San Diego County Area, California

FxG—Friant rocky fine sandy loam, 30 to 70 percent slopes

Map Unit Setting

National map unit symbol: hbc5
Elevation: 500 to 5,800 feet
Mean annual precipitation: 8 to 25 inches
Mean annual air temperature: 45 to 64 degrees F
Frost-free period: 110 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

Friant and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Friant

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from metasedimentary rock

Typical profile

H1 - 0 to 3 inches: fine sandy loam
H2 - 3 to 12 inches: sandy loam, fine sandy loam
H2 - 3 to 12 inches: unweathered bedrock
H3 - 12 to 16 inches:

Properties and qualities

Slope: 30 to 70 percent
Depth to restrictive feature: 6 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R019XD060CA - SHALLOW LOAMY (1975)
Hydric soil rating: No

Minor Components

Exchequer

Percent of map unit: 10 percent

Hydric soil rating: No

Rock outcrop

Percent of map unit: 2 percent
Hydric soil rating: No

Cieneba

Percent of map unit: 2 percent
Hydric soil rating: No

Escondido

Percent of map unit: 1 percent
Hydric soil rating: No

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Attachment 2 – Watershed Information

CAUTION: IF THIS SHEET IS NOT 24"x36" IT IS A REDUCED PRINT

LEGEND

NAME	SYMBOL
NODE NUMBER & ELEVATION	604 EL=128.02
EXISTING MAJOR CONTOUR	
EXISTING MINOR CONTOUR	
ROUTING FLOW PATH	
BASIN DELINEATION	
SUB AREA DELINEATION	

EL=485.87 403
POC-B
Q100=2.77 CFS
V100=1.90 FPS

L=481LF
A=1.552 AC

201 EL=553.00

L=129LF
A=0.139 AC

EL=549.00 202

L=662LF
A=0.891 AC

303 EL=516.84

206 EL=515.40

L=648LF
A=6.732 AC

L=673LF
A=1.929 AC

L=39LF
A=0.007 AC

EL=549.00 402

EL=553.00 401

EL=489.50 203
POC-A
Q100=107.97 CFS
V100=40.27 FPS

L=40LF

207 EL=509.02

EL=596.00 305

L=80LF
A=0.049 AC

EL=604.00 304

L=1232LF
A=6.319 AC

L=41LF
A=0.436 AC

101 EL=516.49

EL=514.39 102

L=1304LF
A=9.039 AC

EL = 671.00 302

L=60LF
A=0.023 AC

EL = 691.00 301

0 30 60 120
SCALE: 1" = 60'

WARE MALCOMB
LEADING DESIGN FOR COMMERCIAL REAL ESTATE

3911 sorrento valley blvd.
suite 120
san diego, ca 92121
p 858.638.7277
waremalcomb.com

REGISTERED PROFESSIONAL ENGINEER
LUCAS A. CORISDEL
No. 72588
CIVIL
STATE OF CALIFORNIA
Jul 26, 2021

FOR AND ON BEHALF
OF WARE MALCOMB

PRE-HYDROLOGY MAP

PRE-CONDITIONS

NO.	DATE	REMARKS

JOB NO.:	DAL20-5012
PA / PM:	SMB
DRAWN BY:	SMB
DATE:	01/15/21
PLOT DATE:	

SHEET 1
Sheet 1 of 1

CAUTION: IF THIS SHEET IS NOT 24"x36" IT IS A REDUCED PRINT

LEGEND

NAME	SYMBOL
NODE NUMBER & ELEVATION	604 EL=128.02
EXISTING MAJOR CONTOUR	
EXISTING MINOR CONTOUR	
PROPOSED MAJOR CONTOUR	
PROPOSED MINOR CONTOUR	
ROUTING FLOW PATH	
BASIN DELINEATION	
SUB AREA DELINEATION	

EL=485.87 403
POC-B
Q100=2.18 CFS
V100=1.76 FPS

222 EL=501.15
L=412LF
A=1.117 AC
L=130LF
A=0.041 AC
EL=501.02 223
EL=527.15 202
L=502LF
A=1.257 AC
L=33LF
A=0.013 AC
EL=529.80 201
L=662LF
A=0.848AC
EL=513.73 203
IE=509.33
EL=514.98 303
IE=510.48
SD PIPE
L=248LF
SD PIPE
L=253LF
L=321LF
A=1.287 AC
L=45LF
A=0.076 AC
L=636LF
A=1.299 AC
EL=514.00 206
EL=511.85 204
IE=506.86
EL=549.00 402
L=39LF
A=0.007 AC
EL=553.00 401
EL=515.16 205
EL=513.20 309
IE=508.75
SD PIPE
L=50LF
308 EL=517.86
IE=509.69
SD PIPE
L=368LF
L=507LF
A=1.933 AC
L=67LF
A=0.067 AC
208 EL=516.92
EL=514.15 209
EL=596.00 305
L=80LF
A=0.049 AC
EL=604.00 304
EL=489.50 224
POC-A
Q100=76.98 cfs
V100=19.24 fps
EL=510.00 210
IE=506.68
SD PIPE
L=67LF
EL=503.00 221
L=35LF
SD PIPE
L=34LF
SD PIPE
L=81LF
207 EL=510.50
IE=504.19
EL=511.63 220
IE=503.28
DET-B
SD PIPE
L=230LF
SD PIPE
L=53LF
SD PIPE
L=296LF
213 EL=513.53
IE=507.48
EL=513.57 216
IE=509.56
219 EL=514.37
IE=507.19
SD PIPE
L=732LF
EL=512.33 112
SD PIPE
L=345LF
L=65LF
A=0.224 AC
L=37LF
A=0.029 AC
EL=509.68 110
IE=506.23
111 EL=513.61
L=166LF
A=1.103 AC
L=280LF
A=0.638 AC
SD PIPE
L=66LF
113 EL=510.74
IE=505.49
DET-A
EL=510.47 107
IE=506.03
215 EL = 515.88
L=50LF
A=0.025 AC
218 EL = 515.88
L=50LF
A=0.024 AC
SD PIPE
L=21LF
L=211LF
A=0.382 AC
214 EL = 516.38
217 EL = 516.38
L=606LF
A=0.376 AC
L=462LF
A=2.277 AC
L=1304LF
A=8.945 AC
109 EL=513.78
SD PIPE
L=235LF
L=31LF
A=0.006 AC
212 EL=516.06
L=42LF
A=0.048 AC
103 EL=511.56
IE=508.32
211 EL=516.71
EL=514.55 104
IE=507.44
108 EL=514.84
L=449LF
A=2.502 AC
101 EL=516.49
EL=515.39 102
L=41LF
A=0.173 AC
SD PIPE
L=714LF
EL=517.25 106
L=284LF
A=2.202 AC
307 EL=543.21
L=32LF
A=0.011 AC
L=78LF
A=0.103 AC
105 EL=519.11
306 EL=553.31
EL = 671.00 302
L=60LF
A=0.023 AC
EL = 691.00 301

0 30 60 120
SCALE: 1" = 60'

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FOR AND ON BEHALF
OF WARE MALCOMB

POST-HYDROLOGY MAP

POST-CONDITIONS

NO.	DATE	REMARKS

JOB NO.:	DAL20-5012
PA / PM:	SMB
DRAWN BY:	SMB
DATE:	11/18/20
PLOT DATE:	

SHEET

Sheet of

NOT FOR CONSTRUCTION

Attachment 3 – Pre & Post Development Calculations

CIVILD ANALYSIS
PRE-DEVELOPED CONDITIONS
POC-A

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               San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 07/26/21
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PRE DEVELOPMENT - POC-A
100 YEAR - RATIONAL METHOD ANALYSIS
BY WARE MALCOMB
file:PREA.rsd3
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 *********   Hydrology Study Control Information **********

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Program License Serial Number 6491

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

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.100
24 hour precipitation(inches) =  6.000
P6/P24 =    51.7%
San Diego hydrology manual 'C' values used


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Process from Point/Station      101.000 to Point/Station      102.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Initial subarea total flow distance  =   41.000(Ft.)
Highest elevation =  516.490(Ft.)
Lowest elevation =  514.390(Ft.)
Elevation difference =    2.100(Ft.) Slope =  5.122 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   5.12 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.77 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8200)*(  90.000^.5)/(   5.122^(1/3)]=   2.77
Calculated TC of    2.774 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =      2.920(CFS)
Total initial stream area =        0.436(Ac.)


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Process from Point/Station      102.000 to Point/Station      207.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     13.532(CFS)
Depth of flow =   0.264(Ft.), Average velocity =   1.948(Ft/s)
       ******* Irregular Channel Data ***********
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------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
       3            100.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =     13.532(CFS)
  '     '       flow top width =     52.715(Ft.)
  '     '    velocity=    1.948(Ft/s)
  '     '       area =      6.947(Sq.Ft)
  '     '       Froude number =     0.946

Upstream point elevation =   514.390(Ft.)
Downstream point elevation =   509.020(Ft.)
Flow length =  1232.000(Ft.)
Travel time  =   10.54 min.
Time of concentration =   13.32 min.
Depth of flow =   0.264(Ft.)
Average velocity =   1.948(Ft/s)
Total irregular channel flow =    13.532(CFS)
Irregular channel normal depth above invert elev. =   0.264(Ft.)
Average velocity of channel(s) =   1.948(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.342(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity =      4.342(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.820  CA =      5.539
Subarea runoff =     21.133(CFS) for      6.319(Ac.)
Total runoff =     24.053(CFS)        Total area =       6.755(Ac.)
Depth of flow =   0.327(Ft.), Average velocity =   2.249(Ft/s)


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Process from Point/Station      207.000 to Point/Station      207.000
**** CONFLUENCE OF MAIN STREAMS ****
__________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      6.755(Ac.)
Runoff from this stream =     24.053(CFS)
Time of concentration =   13.32 min.
Rainfall intensity =     4.342(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      304.000 to Point/Station      305.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =   80.000(Ft.)
Highest elevation =  604.000(Ft.)
Lowest elevation =  596.000(Ft.)
Elevation difference =    8.000(Ft.) Slope = 10.000 %
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INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  10.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.27 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  10.000^(1/3)]=   6.27
Rainfall intensity (I) =      7.061(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.121(CFS)
Total initial stream area =        0.049(Ac.)


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Process from Point/Station      305.000 to Point/Station      206.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.691(CFS)
Depth of flow =   0.094(Ft.), Average velocity =   1.914(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1             0.00              0.50
       2            50.00              0.00
       3           100.00              0.50
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =      1.691(CFS)
  '     '       flow top width =     18.802(Ft.)
  '     '    velocity=    1.914(Ft/s)
  '     '       area =      0.884(Sq.Ft)
  '     '       Froude number =     1.555

Upstream point elevation =   596.000(Ft.)
Downstream point elevation =   515.400(Ft.)
Flow length =   673.000(Ft.)
Travel time  =    5.86 min.
Time of concentration =   12.13 min.
Depth of flow =   0.094(Ft.)
Average velocity =   1.914(Ft/s)
Total irregular channel flow =     1.691(CFS)
Irregular channel normal depth above invert elev. =   0.094(Ft.)
Average velocity of channel(s) =   1.914(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.612(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      4.612(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.692
Subarea runoff =      3.072(CFS) for      1.929(Ac.)
Total runoff =      3.193(CFS)        Total area =       1.978(Ac.)
Depth of flow =   0.119(Ft.), Average velocity =   2.243(Ft/s)


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Process from Point/Station      206.000 to Point/Station      206.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.978(Ac.)
Runoff from this stream =      3.193(CFS)
Time of concentration =   12.13 min.
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Rainfall intensity =     4.612(In/Hr)


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Process from Point/Station      301.000 to Point/Station      302.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Initial subarea total flow distance  =   60.000(Ft.)
Highest elevation =  691.000(Ft.)
Lowest elevation =  671.000(Ft.)
Elevation difference =   20.000(Ft.) Slope = 33.333 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  33.33 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   1.57 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8200)*( 100.000^.5)/(  33.333^(1/3)]=   1.57
Calculated TC of    1.566 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =      0.154(CFS)
Total initial stream area =        0.023(Ac.)


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Process from Point/Station      302.000 to Point/Station      303.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     30.423(CFS)
Depth of flow =   0.192(Ft.), Average velocity =   8.243(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             50.00              0.00
       3            100.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =     30.424(CFS)
  '     '       flow top width =     38.423(Ft.)
  '     '    velocity=    8.243(Ft/s)
  '     '       area =      3.691(Sq.Ft)
  '     '       Froude number =     4.687

Upstream point elevation =   671.000(Ft.)
Downstream point elevation =   516.840(Ft.)
Flow length =  1304.000(Ft.)
Travel time  =    2.64 min.
Time of concentration =    4.20 min.
Depth of flow =   0.192(Ft.)
Average velocity =   8.243(Ft/s)
Total irregular channel flow =    30.423(CFS)
Irregular channel normal depth above invert elev. =   0.192(Ft.)
Average velocity of channel(s) =   8.243(Ft/s)
 Adding area flow to channel
Calculated TC of    4.203 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.820  CA =      7.431
Subarea runoff =     60.539(CFS) for      9.039(Ac.)
Total runoff =     60.693(CFS)        Total area =       9.062(Ac.)
Depth of flow =   0.249(Ft.), Average velocity =   9.796(Ft/s)


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Process from Point/Station      206.000 to Point/Station      303.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      9.062(Ac.)
Runoff from this stream =     60.693(CFS)
Time of concentration =    4.20 min.
Rainfall intensity =     8.168(In/Hr)
Summary of stream data:

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


1        3.193     12.13               4.612
2       60.693      4.20               8.168
Qmax(1) =
          1.000 *    1.000 *     3.193) +
          0.565 *    1.000 *    60.693) + =      37.465
Qmax(2) =
          1.000 *    0.347 *     3.193) +
          1.000 *    1.000 *    60.693) + =      61.799

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.193      60.693
Maximum flow rates at confluence using above data:
       37.465       61.799
Area of streams before confluence:
        1.978        9.062
Results of confluence:
Total flow rate =     61.799(CFS)
Time of concentration =     4.203 min.
Effective stream area after confluence =     11.040(Ac.)


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Process from Point/Station      206.000 to Point/Station      207.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
!!Warning: Water is above left or right bank elevations
!!Warning: Water is above left or right bank elevations
!!Warning: Water is above left or right bank elevations
!!Warning: Water is above left or right bank elevations
!!Warning: Water is above left or right bank elevations
!!Warning: Water is above left or right bank elevations
!!Warning: Water is above left or right bank elevations
Estimated mean flow rate at midpoint of channel =     78.945(CFS)
Depth of flow =   0.556(Ft.), Average velocity =   5.154(Ft/s)
!!Warning: Water is above left or right bank elevations
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
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       2             25.00              0.00
       3             50.00              0.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =     78.945(CFS)
  '     '       flow top width =     50.000(Ft.)
  '     '    velocity=    5.154(Ft/s)
  '     '       area =     15.318(Sq.Ft)
  '     '       Froude number =     1.641

Upstream point elevation =   515.400(Ft.)
Downstream point elevation =   509.020(Ft.)
Flow length =   648.000(Ft.)
Travel time  =    2.10 min.
Time of concentration =    6.30 min.
Depth of flow =   0.556(Ft.)
Average velocity =   5.154(Ft/s)
Total irregular channel flow =    78.945(CFS)
Irregular channel normal depth above invert elev. =   0.556(Ft.)
Average velocity of channel(s) =   5.154(Ft/s)
!!Warning: Water is above left or right bank elevations
 Adding area flow to channel
Rainfall intensity (I) =      7.038(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity =      7.038(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.768  CA =     13.643
Subarea runoff =     34.221(CFS) for      6.732(Ac.)
Total runoff =     96.020(CFS)        Total area =      17.772(Ac.)
Depth of flow =   0.595(Ft.), Average velocity =   5.574(Ft/s)
!!Warning: Water is above left or right bank elevations


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Process from Point/Station      207.000 to Point/Station      207.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     17.772(Ac.)
Runoff from this stream =     96.020(CFS)
Time of concentration =    6.30 min.
Rainfall intensity =     7.038(In/Hr)
Summary of stream data:

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


1       24.053     13.32               4.342
2       96.020      6.30               7.038
Qmax(1) =
          1.000 *    1.000 *    24.053) +
          0.617 *    1.000 *    96.020) + =      83.298
Qmax(2) =
          1.000 *    0.473 *    24.053) +
          1.000 *    1.000 *    96.020) + =     107.398

Total of 2 main streams to confluence:
Flow rates before confluence point:
      24.053      96.020
Maximum flow rates at confluence using above data:
       83.298      107.398
Area of streams before confluence:
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        6.755       17.772


Results of confluence:
Total flow rate =    107.398(CFS)
Time of concentration =     6.298 min.
Effective stream area after confluence  =     24.527(Ac.)


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Process from Point/Station      207.000 to Point/Station      203.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   0.730(Ft.), Average velocity =  40.267(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2              5.00              0.00
       3             10.00              1.00
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =    107.398(CFS)
  '     '       flow top width =      7.304(Ft.)
  '     '    velocity=   40.267(Ft/s)
  '     '       area =      2.667(Sq.Ft)
  '     '       Froude number =    11.743

Upstream point elevation =   509.020(Ft.)
Downstream point elevation =   489.500(Ft.)
Flow length =    40.000(Ft.)
Travel time  =    0.02 min.
Time of concentration =    6.31 min.
Depth of flow =   0.730(Ft.)
Average velocity =  40.267(Ft/s)
Total irregular channel flow =   107.398(CFS)
Irregular channel normal depth above invert elev. =   0.730(Ft.)
Average velocity of channel(s) =  40.267(Ft/s)


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Process from Point/Station      203.000 to Point/Station      203.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     24.527(Ac.)
Runoff from this stream =    107.398(CFS)
Time of concentration =    6.31 min.
Rainfall intensity =     7.026(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      201.000 to Point/Station      202.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  129.000(Ft.)
Highest elevation =  553.000(Ft.)
Lowest elevation =  549.000(Ft.)
Elevation difference =    4.000(Ft.) Slope =  3.101 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
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The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   3.10 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   9.26 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(   3.101^(1/3)]=   9.26
Rainfall intensity (I) =      5.490(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.267(CFS)
Total initial stream area =        0.139(Ac.)


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Process from Point/Station      202.000 to Point/Station      203.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.879(CFS)
Depth of flow =   0.101(Ft.), Average velocity =   1.735(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1             0.00              0.50
       2            25.00              0.00
       3            50.00              0.50
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =      0.879(CFS)
  '     '       flow top width =     10.066(Ft.)
  '     '    velocity=    1.735(Ft/s)
  '     '       area =      0.507(Sq.Ft)
  '     '       Froude number =     1.363

Upstream point elevation =   549.000(Ft.)
Downstream point elevation =   489.500(Ft.)
Flow length =   662.000(Ft.)
Travel time  =    6.36 min.
Time of concentration =   15.62 min.
Depth of flow =   0.101(Ft.)
Average velocity =   1.735(Ft/s)
Total irregular channel flow =     0.879(CFS)
Irregular channel normal depth above invert elev. =   0.101(Ft.)
Average velocity of channel(s) =   1.735(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      3.918(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      3.918(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.360
Subarea runoff =      1.145(CFS) for      0.891(Ac.)
Total runoff =      1.412(CFS)       Total area =       1.030(Ac.)
Depth of flow =   0.120(Ft.), Average velocity =   1.953(Ft/s)


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Process from Point/Station      203.000 to Point/Station      203.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.030(Ac.)
Runoff from this stream =      1.412(CFS)
Time of concentration =   15.62 min.
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Rainfall intensity =     3.918(In/Hr)
Summary of stream data:

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


1      107.398      6.31               7.026
2        1.412     15.62               3.918
Qmax(1) =
          1.000 *    1.000 *   107.398) +
          1.000 *    0.404 *     1.412) + =     107.969
Qmax(2) =
          0.558 *    1.000 *   107.398) +
          1.000 *    1.000 *     1.412) + =      61.301

Total of 2 main streams to confluence:
Flow rates before confluence point:
     107.398       1.412
Maximum flow rates at confluence using above data:
      107.969       61.301
Area of streams before confluence:
       24.527        1.030


Results of confluence:
Total flow rate =    107.969(CFS)
Time of concentration =     6.315 min.
Effective stream area after confluence  =     25.557(Ac.)
End of computations, total study area =          25.557 (Ac.)
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CIVILD ANALYSIS
PRE-DEVELOPED CONDITIONS
POC-B

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study   Date: 07/26/21

PRE DEVELOPMENT - POC-B
100 YEAR - RATIONAL METHOD ANALYSIS
BY WARE MALCOMB
file:PREB.rsd3

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

Program License Serial Number 6491

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

Map data precipitation entered:
6 hour, precipitation(inches) = 3.100
24 hour precipitation(inches) = 6.000
P6/P24 =   51.7%
San Diego hydrology manual 'C' values used

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Process from Point/Station   401.000 to Point/Station   402.000
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN   ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance =   39.000(Ft.)
Highest elevation = 553.000(Ft.)
Lowest elevation = 549.000(Ft.)
Elevation difference =   4.000(Ft.) Slope = 10.256 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 10.26 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.21 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*(100.000^.5)/(10.256^(1/3)]=   6.21
Rainfall intensity (I) =   7.100(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =   0.017(CFS)
Total initial stream area =   0.007(Ac.)

++
Process from Point/Station   402.000 to Point/Station   403.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____
Estimated mean flow rate at midpoint of channel =   1.436(CFS)
Depth of flow =   0.087(Ft.), Average velocity =   1.901(Ft/s)
       ******* Irregular Channel Data ***********

Information entered for subchannel number 1 :

```
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             50.00              0.00
       3            100.00              0.50
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =      1.436(CFS)
  '     '       flow top width =     17.383(Ft.)
  '     '    velocity=    1.901(Ft/s)
  '     '       area =      0.755(Sq.Ft)
  '     '       Froude number =     1.607

Upstream point elevation =   549.000(Ft.)
Downstream point elevation =   485.870(Ft.)
Flow length =   481.000(Ft.)
Travel time  =    4.22 min.
Time of concentration =   10.43 min.
Depth of flow =   0.087(Ft.)
Average velocity =   1.901(Ft/s)
Total irregular channel flow =     1.436(CFS)
Irregular channel normal depth above invert elev. =   0.087(Ft.)
Average velocity of channel(s) =   1.901(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.083(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      5.083(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.546
Subarea runoff =      2.756(CFS) for      1.552(Ac.)
Total runoff =      2.774(CFS)       Total area =       1.559(Ac.)
Depth of flow =   0.111(Ft.), Average velocity =   2.241(Ft/s)
End of computations, total study area =           1.559 (Ac.)
```

CIVILD ANALYSIS
POST-DEVELOPED CONDITIONS
DETENTION A

```
              San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 07/20/21
--------------------------------------------------------------------------
POST DEVELOPMENT - Detention Chamber A
100 YEAR - RATIONAL METHOD ANALYSIS
BY WARE MALCOMB
file:DetA.rsd3
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 6491

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

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.100
24 hour precipitation(inches) =  6.000
P6/P24 =    51.7%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Initial subarea total flow distance  =   41.000(Ft.)
Highest elevation =  516.490(Ft.)
Lowest elevation =  515.390(Ft.)
Elevation difference =    1.100(Ft.) Slope =  2.683 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   2.68 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.34 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8200)*(  85.000^.5)/(   2.683^(1/3)]=   3.34
Calculated TC of    3.344 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =      1.159(CFS)
Total initial stream area =        0.173(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      8.533(CFS)
Depth of flow =   0.232(Ft.), Average velocity =   3.160(Ft/s)
       ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             25.00              0.00
       3             50.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      8.533(CFS)
  '     '       flow top width =     23.238(Ft.)
  '     '    velocity=    3.160(Ft/s)
  '     '       area =      2.700(Sq.Ft)
  '     '       Froude number =     1.634

Upstream point elevation =   515.390(Ft.)
Downstream point elevation =   511.560(Ft.)
Flow length =   284.000(Ft.)
Travel time  =    1.50 min.
Time of concentration =    4.84 min.
Depth of flow =   0.232(Ft.)
Average velocity =   3.160(Ft/s)
Total irregular channel flow =     8.533(CFS)
Irregular channel normal depth above invert elev. =   0.232(Ft.)
Average velocity of channel(s) =   3.160(Ft/s)
 Adding area flow to channel
Calculated TC of    4.842 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.820  CA =      1.947
Subarea runoff =     14.748(CFS) for      2.202(Ac.)
Total runoff =     15.907(CFS)        Total area =       2.375(Ac.)
Depth of flow =   0.294(Ft.), Average velocity =   3.693(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      113.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   508.320(Ft.)
Downstream point/station elevation =   505.490(Ft.)
Pipe length  =   714.00(Ft.) Slope =   0.0040  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.907(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    15.907(CFS)
Normal flow depth in pipe =   18.54(In.)
Flow top width inside pipe =   25.05(In.)
Critical Depth =   16.69(In.)
Pipe flow velocity =      5.47(Ft/s)
Travel time through pipe =    2.18 min.
Time of concentration (TC) =     7.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      113.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.375(Ac.)
Runoff from this stream =     15.907(CFS)
Time of concentration =    7.02 min.
```

```
Rainfall intensity =     6.563(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Initial subarea total flow distance  =   78.000(Ft.)
Highest elevation =  519.110(Ft.)
Lowest elevation =  517.250(Ft.)
Elevation difference =    1.860(Ft.) Slope =  2.385 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 75.00 (Ft)
for the top area slope value of   2.38 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.27 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8200)*(  75.000^.5)/(   2.385^(1/3)]=   3.27
Calculated TC of    3.267 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =      0.690(CFS)
Total initial stream area =        0.103(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      104.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      7.701(CFS)
Depth of flow =   0.260(Ft.), Average velocity =   2.275(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             25.00              0.00
       3             50.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      7.701(CFS)
  '     '       flow top width =     26.017(Ft.)
  '     '    velocity=    2.275(Ft/s)
  '     '       area =      3.384(Sq.Ft)
  '     '       Froude number =     1.112

Upstream point elevation =   517.250(Ft.)
Downstream point elevation =   514.550(Ft.)
Flow length =   449.000(Ft.)
Travel time  =    3.29 min.
Time of concentration =    6.56 min.
Depth of flow =   0.260(Ft.)
Average velocity =   2.275(Ft/s)
Total irregular channel flow =     7.701(CFS)
Irregular channel normal depth above invert elev. =   0.260(Ft.)
Average velocity of channel(s) =   2.275(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.858(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity =      6.858(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.820  CA =      2.136
Subarea runoff =     13.960(CFS) for      2.502(Ac.)
Total runoff =     14.650(CFS)        Total area =       2.605(Ac.)
Depth of flow =   0.331(Ft.), Average velocity =   2.672(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      113.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   507.440(Ft.)
Downstream point/station elevation =   505.490(Ft.)
Pipe length  =   235.00(Ft.) Slope =   0.0083  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.650(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    14.650(CFS)
Normal flow depth in pipe =   14.95(In.)
Flow top width inside pipe =   23.26(In.)
Critical Depth =   16.56(In.)
Pipe flow velocity =      7.12(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =     7.11 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      113.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.605(Ac.)
Runoff from this stream =     14.650(CFS)
Time of concentration =    7.11 min.
Rainfall intensity =     6.511(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Initial subarea total flow distance  =   31.000(Ft.)
Highest elevation =  514.840(Ft.)
Lowest elevation =  513.780(Ft.)
Elevation difference =    1.060(Ft.) Slope =  3.419 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   3.42 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.08 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8200)*(  85.000^.5)/(   3.419^(1/3)]=   3.08
Calculated TC of    3.084 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
```

```
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =      0.040(CFS)
Total initial stream area =        0.006(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      107.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.319(CFS)
Depth of flow =   0.112(Ft.), Average velocity =   2.112(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             25.00              0.00
       3             50.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      1.319(CFS)
  '     '       flow top width =     11.179(Ft.)
  '     '    velocity=    2.112(Ft/s)
  '     '       area =      0.625(Sq.Ft)
  '     '       Froude number =     1.574

Upstream point elevation =   513.780(Ft.)
Downstream point elevation =   510.410(Ft.)
Flow length =   211.000(Ft.)
Travel time  =    1.67 min.
Time of concentration =    4.75 min.
Depth of flow =   0.112(Ft.)
Average velocity =   2.112(Ft/s)
Total irregular channel flow =     1.319(CFS)
Irregular channel normal depth above invert elev. =   0.112(Ft.)
Average velocity of channel(s) =   2.112(Ft/s)
 Adding area flow to channel
Calculated TC of    4.750 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.820  CA =      0.318
Subarea runoff =      2.558(CFS) for      0.382(Ac.)
Total runoff =      2.599(CFS)       Total area =       0.388(Ac.)
Depth of flow =   0.144(Ft.), Average velocity =   2.501(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      113.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   506.030(Ft.)
Downstream point/station elevation =   505.490(Ft.)
Pipe length  =    21.00(Ft.) Slope =   0.0257  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.599(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.599(CFS)
Normal flow depth in pipe =    7.22(In.)
Flow top width inside pipe =    7.17(In.)
Critical Depth =    8.39(In.)
Pipe flow velocity =      6.84(Ft/s)
```

```
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     4.80 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      113.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      0.388(Ac.)
Runoff from this stream =      2.599(CFS)
Time of concentration =    4.80 min.
Rainfall intensity =     8.168(In/Hr)
Program is now starting with Main Stream No. 4


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      112.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Initial subarea total flow distance  =   37.000(Ft.)
Highest elevation =  513.610(Ft.)
Lowest elevation =  512.330(Ft.)
Elevation difference =    1.280(Ft.) Slope =  3.459 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   3.46 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.07 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8200)*(  85.000^.5)/(   3.459^(1/3)]=   3.07
Calculated TC of    3.072 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =      0.194(CFS)
Total initial stream area =        0.029(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      110.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.944(CFS)
Depth of flow =   0.083(Ft.), Average velocity =   2.760(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             25.00              0.00
       3             50.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      0.944(CFS)
  '     '       flow top width =      8.272(Ft.)
  '     '    velocity=    2.760(Ft/s)
  '     '       area =      0.342(Sq.Ft)
  '     '       Froude number =     2.392

Upstream point elevation =   512.330(Ft.)
```

```
Downstream point elevation =   509.680(Ft.)
Flow length =    65.000(Ft.)
Travel time  =    0.39 min.
Time of concentration =    3.47 min.
Depth of flow =   0.083(Ft.)
Average velocity =   2.760(Ft/s)
Total irregular channel flow =     0.944(CFS)
Irregular channel normal depth above invert elev. =   0.083(Ft.)
Average velocity of channel(s) =   2.760(Ft/s)
 Adding area flow to channel
Calculated TC of    3.465 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.820  CA =      0.207
Subarea runoff =      1.500(CFS) for      0.224(Ac.)
Total runoff =      1.694(CFS)        Total area =       0.253(Ac.)
Depth of flow =   0.103(Ft.), Average velocity =   3.194(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      113.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   506.230(Ft.)
Downstream point/station elevation =   505.490(Ft.)
Pipe length  =    66.00(Ft.) Slope =   0.0112  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.694(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.694(CFS)
Normal flow depth in pipe =    7.13(In.)
Flow top width inside pipe =    7.31(In.)
Critical Depth =    7.17(In.)
Pipe flow velocity =      4.52(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     3.71 min.


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Process from Point/Station      113.000 to Point/Station      113.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =      0.253(Ac.)
Runoff from this stream =      1.694(CFS)
Time of concentration =    3.71 min.
Rainfall intensity =     8.168(In/Hr)
Summary of stream data:

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


1       15.907      7.02               6.563
2       14.650      7.11               6.511
3        2.599      4.80               8.168
4        1.694      3.71               8.168
Qmax(1) =
          1.000 *    1.000 *    15.907) +
          1.000 *    0.988 *    14.650) +
          0.804 *    1.000 *     2.599) +
```

```
          0.804 *    1.000 *     1.694) + =      33.826
Qmax(2) =
          0.992 *    1.000 *    15.907) +
          1.000 *    1.000 *    14.650) +
          0.797 *    1.000 *     2.599) +
          0.797 *    1.000 *     1.694) + =      33.853
Qmax(3) =
          1.000 *    0.684 *    15.907) +
          1.000 *    0.676 *    14.650) +
          1.000 *    1.000 *     2.599) +
          1.000 *    1.000 *     1.694) + =      25.073
Qmax(4) =
          1.000 *    0.528 *    15.907) +
          1.000 *    0.522 *    14.650) +
          1.000 *    0.772 *     2.599) +
          1.000 *    1.000 *     1.694) + =      19.753

Total of 4 main streams to confluence:
Flow rates before confluence point:
      15.907      14.650       2.599       1.694
Maximum flow rates at confluence using above data:
       33.826       33.853       25.073       19.753
Area of streams before confluence:
        2.375        2.605        0.388        0.253


Results of confluence:
Total flow rate =     33.853(CFS)
Time of concentration =     7.106 min.
Effective stream area after confluence  =      5.621(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      113.000
**** 6 HOUR HYDROGRAPH ****
________________________________________________________________________
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Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003


Time of Concentration =   7.11
Basin Area =     5.62 Acres
6 Hour Rainfall =  3.100 Inches
Runoff Coefficient =  0.820
Peak Discharge =    33.85 CFS
     Time (Min)     Discharge (CFS)
       0               0.000
       7               0.857
       14               0.868
       21               0.892
       28               0.904
       35               0.930
       42               0.944
       49               0.973
       56               0.988
       63               1.021
       70               1.039
       77               1.076
       84               1.096
       91               1.139
       98               1.162
       105               1.213
       112               1.240
       119               1.299
       126               1.332
       133               1.404
       140               1.444
       147               1.533
       154               1.584
       161               1.698
       168               1.764
```

175	1.917
182	2.008
189	2.227
196	2.362
203	2.707
210	2.935
217	3.588
224	4.086
231	6.000
238	8.454
245	33.853
252	4.812
259	3.220
266	2.519
273	2.110
280	1.837
287	1.638
294	1.487
301	1.367
308	1.269
315	1.187
322	1.117
329	1.057
336	1.004
343	0.958
350	0.917
357	0.880
364	0.846

++

6 - H O U R S T O R M

R u n o f f H y d r o g r a p h

Hydrograph in 1 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	8.5	16.9	25.4	33.9
0+ 0	0.0000	0.00	Q	|	|	|	|
0+ 1	0.0002	0.12	Q	|	|	|	|
0+ 2	0.0005	0.24	Q	|	|	|	|
0+ 3	0.0010	0.37	Q	|	|	|	|
0+ 4	0.0017	0.49	Q	|	|	|	|
0+ 5	0.0025	0.61	Q	|	|	|	|
0+ 6	0.0035	0.73	Q	|	|	|	|
0+ 7	0.0047	0.86	VQ	|	|	|	|
0+ 8	0.0059	0.86	VQ	|	|	|	|
0+ 9	0.0071	0.86	VQ	|	|	|	|
0+10	0.0083	0.86	VQ	|	|	|	|
0+11	0.0095	0.86	VQ	|	|	|	|
0+12	0.0107	0.87	VQ	|	|	|	|
0+13	0.0119	0.87	VQ	|	|	|	|
0+14	0.0130	0.87	VQ	|	|	|	|
0+15	0.0143	0.87	VQ	|	|	|	|
0+16	0.0155	0.88	VQ	|	|	|	|
0+17	0.0167	0.88	VQ	|	|	|	|
0+18	0.0179	0.88	VQ	|	|	|	|
0+19	0.0191	0.89	VQ	|	|	|	|
0+20	0.0203	0.89	VQ	|	|	|	|
0+21	0.0216	0.89	VQ	|	|	|	|
0+22	0.0228	0.89	VQ	|	|	|	|
0+23	0.0240	0.90	VQ	|	|	|	|
0+24	0.0253	0.90	VQ	|	|	|	|
0+25	0.0265	0.90	VQ	|	|	|	|
0+26	0.0277	0.90	VQ	|	|	|	|
0+27	0.0290	0.90	VQ	|	|	|	|
0+28	0.0302	0.90	VQ	|	|	|	|
0+29	0.0315	0.91	|Q	|	|	|	|
0+30	0.0327	0.91	|Q	|	|	|	|
0+31	0.0340	0.92	|Q	|	|	|	|
0+32	0.0352	0.92	|Q	|	|	|	|
0+33	0.0365	0.92	|Q	|	|	|	|

0+34	0.0378	0.93	|Q	|	|	|	|
0+35	0.0391	0.93	|Q	|	|	|	|
0+36	0.0404	0.93	|Q	|	|	|	|
0+37	0.0416	0.93	|Q	|	|	|	|
0+38	0.0429	0.94	|Q	|	|	|	|
0+39	0.0442	0.94	|Q	|	|	|	|
0+40	0.0455	0.94	|Q	|	|	|	|
0+41	0.0468	0.94	|Q	|	|	|	|
0+42	0.0481	0.94	|Q	|	|	|	|
0+43	0.0494	0.95	|Q	|	|	|	|
0+44	0.0507	0.95	|Q	|	|	|	|
0+45	0.0521	0.96	|Q	|	|	|	|
0+46	0.0534	0.96	|Q	|	|	|	|
0+47	0.0547	0.96	|Q	|	|	|	|
0+48	0.0560	0.97	|Q	|	|	|	|
0+49	0.0574	0.97	|Q	|	|	|	|
0+50	0.0587	0.98	|Q	|	|	|	|
0+51	0.0601	0.98	|Q	|	|	|	|
0+52	0.0614	0.98	|QV	|	|	|	|
0+53	0.0628	0.98	|QV	|	|	|	|
0+54	0.0641	0.98	|QV	|	|	|	|
0+55	0.0655	0.99	|QV	|	|	|	|
0+56	0.0668	0.99	|QV	|	|	|	|
0+57	0.0682	0.99	|QV	|	|	|	|
0+58	0.0696	1.00	|QV	|	|	|	|
0+59	0.0710	1.00	|QV	|	|	|	|
1+ 0	0.0724	1.01	|QV	|	|	|	|
1+ 1	0.0738	1.01	|QV	|	|	|	|
1+ 2	0.0752	1.02	|QV	|	|	|	|
1+ 3	0.0766	1.02	|QV	|	|	|	|
1+ 4	0.0780	1.02	|QV	|	|	|	|
1+ 5	0.0794	1.03	|QV	|	|	|	|
1+ 6	0.0808	1.03	|QV	|	|	|	|
1+ 7	0.0822	1.03	|QV	|	|	|	|
1+ 8	0.0836	1.03	|QV	|	|	|	|
1+ 9	0.0851	1.04	|QV	|	|	|	|
1+10	0.0865	1.04	|QV	|	|	|	|
1+11	0.0879	1.04	|QV	|	|	|	|
1+12	0.0894	1.05	|QV	|	|	|	|
1+13	0.0908	1.05	|QV	|	|	|	|
1+14	0.0923	1.06	|Q V	|	|	|	|
1+15	0.0938	1.07	|Q V	|	|	|	|
1+16	0.0952	1.07	|Q V	|	|	|	|
1+17	0.0967	1.08	|Q V	|	|	|	|
1+18	0.0982	1.08	|Q V	|	|	|	|
1+19	0.0997	1.08	|Q V	|	|	|	|
1+20	0.1012	1.08	|Q V	|	|	|	|
1+21	0.1027	1.09	|Q V	|	|	|	|
1+22	0.1042	1.09	|Q V	|	|	|	|
1+23	0.1057	1.09	|Q V	|	|	|	|
1+24	0.1072	1.10	|Q V	|	|	|	|
1+25	0.1087	1.10	|Q V	|	|	|	|
1+26	0.1102	1.11	|Q V	|	|	|	|
1+27	0.1118	1.11	|Q V	|	|	|	|
1+28	0.1133	1.12	|Q V	|	|	|	|
1+29	0.1149	1.13	|Q V	|	|	|	|
1+30	0.1164	1.13	|Q V	|	|	|	|
1+31	0.1180	1.14	|Q V	|	|	|	|
1+32	0.1196	1.14	|Q V	|	|	|	|
1+33	0.1212	1.15	|Q V	|	|	|	|
1+34	0.1227	1.15	|Q V	|	|	|	|
1+35	0.1243	1.15	|Q V	|	|	|	|
1+36	0.1259	1.16	|Q V	|	|	|	|
1+37	0.1275	1.16	|Q V	|	|	|	|
1+38	0.1291	1.16	|Q V	|	|	|	|
1+39	0.1307	1.17	|Q V	|	|	|	|
1+40	0.1324	1.18	|Q V	|	|	|	|
1+41	0.1340	1.18	|Q V	|	|	|	|
1+42	0.1356	1.19	|Q V	|	|	|	|
1+43	0.1373	1.20	|Q V	|	|	|	|
1+44	0.1389	1.21	|Q V	|	|	|	|

1+45	0.1406	1.21	|Q V |	|	|	|
1+46	0.1423	1.22	|Q V |	|	|	|
1+47	0.1440	1.22	|Q V |	|	|	|
1+48	0.1456	1.22	|Q V |	|	|	|
1+49	0.1473	1.23	|Q V |	|	|	|
1+50	0.1490	1.23	|Q V |	|	|	|
1+51	0.1507	1.24	|Q V |	|	|	|
1+52	0.1524	1.24	|Q V |	|	|	|
1+53	0.1542	1.25	|Q V |	|	|	|
1+54	0.1559	1.26	|Q V |	|	|	|
1+55	0.1576	1.27	|Q V |	|	|	|
1+56	0.1594	1.27	|Q V |	|	|	|
1+57	0.1612	1.28	|Q V |	|	|	|
1+58	0.1629	1.29	|Q V |	|	|	|
1+59	0.1647	1.30	|Q V |	|	|	|
2+ 0	0.1665	1.30	|Q V |	|	|	|
2+ 1	0.1683	1.31	|Q V |	|	|	|
2+ 2	0.1701	1.31	|Q V |	|	|	|
2+ 3	0.1720	1.32	|Q V |	|	|	|
2+ 4	0.1738	1.32	|Q V |	|	|	|
2+ 5	0.1756	1.33	|Q V |	|	|	|
2+ 6	0.1774	1.33	|Q V |	|	|	|
2+ 7	0.1793	1.34	|Q V |	|	|	|
2+ 8	0.1811	1.35	|Q V |	|	|	|
2+ 9	0.1830	1.36	|Q V |	|	|	|
2+10	0.1849	1.37	|Q V |	|	|	|
2+11	0.1868	1.38	|Q V |	|	|	|
2+12	0.1887	1.39	|Q V |	|	|	|
2+13	0.1907	1.40	|Q V |	|	|	|
2+14	0.1926	1.41	|Q V |	|	|	|
2+15	0.1946	1.42	|Q V |	|	|	|
2+16	0.1965	1.42	|Q V |	|	|	|
2+17	0.1985	1.43	|Q V |	|	|	|
2+18	0.2005	1.43	|Q V |	|	|	|
2+19	0.2024	1.44	|Q V |	|	|	|
2+20	0.2044	1.44	|Q V |	|	|	|
2+21	0.2064	1.46	|Q V |	|	|	|
2+22	0.2085	1.47	|Q V |	|	|	|
2+23	0.2105	1.48	|Q V |	|	|	|
2+24	0.2126	1.50	|Q V |	|	|	|
2+25	0.2146	1.51	|Q V |	|	|	|
2+26	0.2167	1.52	|Q V |	|	|	|
2+27	0.2188	1.53	|Q V |	|	|	|
2+28	0.2210	1.54	|Q V |	|	|	|
2+29	0.2231	1.55	|Q V |	|	|	|
2+30	0.2252	1.55	|Q V |	|	|	|
2+31	0.2274	1.56	|Q V |	|	|	|
2+32	0.2296	1.57	|Q V |	|	|	|
2+33	0.2317	1.58	|Q V |	|	|	|
2+34	0.2339	1.58	|Q V |	|	|	|
2+35	0.2361	1.60	|Q V |	|	|	|
2+36	0.2383	1.62	|Q V |	|	|	|
2+37	0.2406	1.63	|Q V |	|	|	|
2+38	0.2429	1.65	|Q V |	|	|	|
2+39	0.2452	1.67	|Q V |	|	|	|
2+40	0.2475	1.68	|Q V |	|	|	|
2+41	0.2498	1.70	| Q V |	|	|	|
2+42	0.2522	1.71	| Q V |	|	|	|
2+43	0.2545	1.72	| Q V |	|	|	|
2+44	0.2569	1.73	| Q V |	|	|	|
2+45	0.2593	1.74	| Q V |	|	|	|
2+46	0.2617	1.75	| Q V |	|	|	|
2+47	0.2641	1.75	| Q V |	|	|	|
2+48	0.2665	1.76	| Q V |	|	|	|
2+49	0.2690	1.79	| Q V |	|	|	|
2+50	0.2715	1.81	| Q V |	|	|	|
2+51	0.2740	1.83	| Q V |	|	|	|
2+52	0.2766	1.85	| Q V|	|	|	|
2+53	0.2792	1.87	| Q V|	|	|	|
2+54	0.2818	1.90	| Q V|	|	|	|
2+55	0.2844	1.92	| Q V|	|	|	|

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2+56       0.2871      1.93  | Q      V|         |         |         |
2+57       0.2897      1.94  | Q      V|         |         |         |
2+58       0.2924      1.96  | Q      V|         |         |         |
2+59       0.2951      1.97  | Q      V|         |         |         |
3+ 0       0.2979      1.98  | Q      V|         |         |         |
3+ 1       0.3006      1.99  | Q      V|         |         |         |
3+ 2       0.3034      2.01  | Q      V|         |         |         |
3+ 3       0.3062      2.04  | Q       V         |         |         |
3+ 4       0.3090      2.07  | Q       V         |         |         |
3+ 5       0.3119      2.10  | Q       V         |         |         |
3+ 6       0.3149      2.13  | Q       V         |         |         |
3+ 7       0.3179      2.16  | Q       V         |         |         |
3+ 8       0.3209      2.20  | Q       V         |         |         |
3+ 9       0.3240      2.23  | Q       V         |         |         |
3+10       0.3270      2.25  | Q       V         |         |         |
3+11       0.3302      2.27  | Q       V         |         |         |
3+12       0.3333      2.28  | Q       V         |         |         |
3+13       0.3365      2.30  | Q       |V         |         |         |
3+14       0.3397      2.32  | Q       |V         |         |         |
3+15       0.3429      2.34  | Q       |V         |         |         |
3+16       0.3462      2.36  | Q       |V         |         |         |
3+17       0.3495      2.41  | Q       |V         |         |         |
3+18       0.3529      2.46  | Q       |V         |         |         |
3+19       0.3563      2.51  | Q       |V         |         |         |
3+20       0.3599      2.56  |  Q      |V         |         |         |
3+21       0.3635      2.61  |  Q      |V         |         |         |
3+22       0.3671      2.66  |  Q      | V        |         |         |
3+23       0.3708      2.71  |  Q      | V        |         |         |
3+24       0.3746      2.74  |  Q      | V        |         |         |
3+25       0.3784      2.77  |  Q      | V        |         |         |
3+26       0.3823      2.80  |  Q      | V        |         |         |
3+27       0.3862      2.84  |  Q      | V        |         |         |
3+28       0.3902      2.87  |  Q      | V        |         |         |
3+29       0.3942      2.90  |  Q      | V        |         |         |
3+30       0.3982      2.94  |  Q      |  V       |         |         |
3+31       0.4024      3.03  |  Q      |  V       |         |         |
3+32       0.4067      3.12  |  Q      |  V       |         |         |
3+33       0.4111      3.21  |  Q      |  V       |         |         |
3+34       0.4157      3.31  |  Q      |  V       |         |         |
3+35       0.4203      3.40  |   Q     |  V       |         |         |
3+36       0.4252      3.49  |   Q     |  V       |         |         |
3+37       0.4301      3.59  |   Q     |   V      |         |         |
3+38       0.4351      3.66  |   Q     |   V      |         |         |
3+39       0.4403      3.73  |   Q     |   V      |         |         |
3+40       0.4455      3.80  |   Q     |   V      |         |         |
3+41       0.4508      3.87  |   Q     |   V      |         |         |
3+42       0.4563      3.94  |   Q     |   V      |         |         |
3+43       0.4618      4.02  |   Q     |    V     |         |         |
3+44       0.4674      4.09  |   Q     |    V     |         |         |
3+45       0.4734      4.36  |    Q    |    V     |         |         |
3+46       0.4798      4.63  |    Q    |    V     |         |         |
3+47       0.4866      4.91  |    Q    |    V     |         |         |
3+48       0.4937      5.18  |     Q   |     V    |         |         |
3+49       0.5012      5.45  |     Q   |     V    |         |         |
3+50       0.5091      5.73  |     Q   |     V    |         |         |
3+51       0.5174      6.00  |      Q  |     V    |         |         |
3+52       0.5261      6.35  |      Q  |      V   |         |         |
3+53       0.5354      6.70  |      Q  |      V   |         |         |
3+54       0.5451      7.05  |       Q |      V   |         |         |
3+55       0.5553      7.40  |       Q |       V  |         |         |
3+56       0.5659      7.75  |        Q|       V  |         |         |
3+57       0.5771      8.10  |        Q|       V  |         |         |
3+58       0.5887      8.45  |        Q|        V|         |         |
3+59       0.6054     12.08  |         |   Q    V|         |         |
4+ 0       0.6270     15.71  |         |       Q V        |         |
4+ 1       0.6537     19.34  |         |         |VQ      |         |
4+ 2       0.6853     22.97  |         |         | V    Q |         |
4+ 3       0.7219     26.60  |         |         |  V      |Q        |
4+ 4       0.7636     30.22  |         |         |    V    |    Q    |
4+ 5       0.8102     33.85  |         |         |     V   |        Q|
4+ 6       0.8511     29.70  |         |         |      V  |    Q    |
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4+ 7	0.8863	25.56	|	|	|	VQ	|
4+ 8	0.9158	21.41	|	|	| Q	V	|
4+ 9	0.9396	17.26	|	|	Q	V	|
4+10	0.9576	13.11	|	Q	|	|V	|
4+11	0.9700	8.96	|	Q	|	|V	|
4+12	0.9766	4.81	| Q	|	|	| V	|
4+13	0.9829	4.58	| Q	|	|	| V	|
4+14	0.9889	4.36	| Q	|	|	| V	|
4+15	0.9946	4.13	| Q	|	|	| V	|
4+16	1.0000	3.90	| Q	|	|	| V	|
4+17	1.0050	3.67	| Q	|	|	| V	|
4+18	1.0098	3.45	| Q	|	|	| V	|
4+19	1.0142	3.22	| Q	|	|	| V	|
4+20	1.0185	3.12	| Q	|	|	| V	|
4+21	1.0227	3.02	| Q	|	|	| V	|
4+22	1.0267	2.92	| Q	|	|	| V	|
4+23	1.0306	2.82	| Q	|	|	| V	|
4+24	1.0343	2.72	| Q	|	|	| V	|
4+25	1.0379	2.62	| Q	|	|	| V	|
4+26	1.0414	2.52	| Q	|	|	| V	|
4+27	1.0448	2.46	| Q	|	|	| V	|
4+28	1.0481	2.40	| Q	|	|	| V	|
4+29	1.0513	2.34	| Q	|	|	| V	|
4+30	1.0545	2.29	| Q	|	|	| V	|
4+31	1.0576	2.23	| Q	|	|	| V	|
4+32	1.0605	2.17	| Q	|	|	| V	|
4+33	1.0634	2.11	| Q	|	|	| V	|
4+34	1.0663	2.07	| Q	|	|	| V	|
4+35	1.0691	2.03	| Q	|	|	| V	|
4+36	1.0718	1.99	| Q	|	|	| V	|
4+37	1.0745	1.95	| Q	|	|	| V	|
4+38	1.0772	1.91	| Q	|	|	| V	|
4+39	1.0798	1.88	| Q	|	|	| V	|
4+40	1.0823	1.84	| Q	|	|	| V	|
4+41	1.0848	1.81	| Q	|	|	| V	|
4+42	1.0872	1.78	| Q	|	|	| V	|
4+43	1.0896	1.75	| Q	|	|	| V	|
4+44	1.0920	1.72	| Q	|	|	| V	|
4+45	1.0943	1.70	| Q	|	|	| V	|
4+46	1.0966	1.67	|Q	|	|	| V	|
4+47	1.0989	1.64	|Q	|	|	| V	|
4+48	1.1011	1.62	|Q	|	|	| V	|
4+49	1.1033	1.60	|Q	|	|	| V	|
4+50	1.1055	1.57	|Q	|	|	| V	|
4+51	1.1076	1.55	|Q	|	|	| V	|
4+52	1.1097	1.53	|Q	|	|	| V	|
4+53	1.1118	1.51	|Q	|	|	| V	|
4+54	1.1139	1.49	|Q	|	|	| V	|
4+55	1.1159	1.47	|Q	|	|	| V	|
4+56	1.1179	1.45	|Q	|	|	| V	|
4+57	1.1199	1.44	|Q	|	|	| V	|
4+58	1.1218	1.42	|Q	|	|	| V	|
4+59	1.1238	1.40	|Q	|	|	| V	|
5+ 0	1.1257	1.38	|Q	|	|	| V	|
5+ 1	1.1275	1.37	|Q	|	|	| V	|
5+ 2	1.1294	1.35	|Q	|	|	| V	|
5+ 3	1.1312	1.34	|Q	|	|	| V	|
5+ 4	1.1331	1.32	|Q	|	|	| V	|
5+ 5	1.1349	1.31	|Q	|	|	| V	|
5+ 6	1.1367	1.30	|Q	|	|	| V	|
5+ 7	1.1384	1.28	|Q	|	|	| V	|
5+ 8	1.1402	1.27	|Q	|	|	| V	|
5+ 9	1.1419	1.26	|Q	|	|	| V	|
5+10	1.1436	1.25	|Q	|	|	| V	|
5+11	1.1453	1.23	|Q	|	|	| V	|
5+12	1.1470	1.22	|Q	|	|	| V	|
5+13	1.1487	1.21	|Q	|	|	| V	|
5+14	1.1503	1.20	|Q	|	|	| V	|
5+15	1.1520	1.19	|Q	|	|	| V	|
5+16	1.1536	1.18	|Q	|	|	| V	|
5+17	1.1552	1.17	|Q	|	|	| V	|

```
    5+18       1.1568      1.16  |Q        |         |         |      V  |
    5+19       1.1584      1.15  |Q        |         |         |       V |
    5+20       1.1599      1.14  |Q        |         |         |       V |
    5+21       1.1615      1.13  |Q        |         |         |       V |
    5+22       1.1630      1.12  |Q        |         |         |       V |
    5+23       1.1645      1.11  |Q        |         |         |       V |
    5+24       1.1661      1.10  |Q        |         |         |       V |
    5+25       1.1676      1.09  |Q        |         |         |       V |
    5+26       1.1691      1.08  |Q        |         |         |       V |
    5+27       1.1705      1.07  |Q        |         |         |       V |
    5+28       1.1720      1.07  |Q        |         |         |       V |
    5+29       1.1735      1.06  |Q        |         |         |       V |
    5+30       1.1749      1.05  |Q        |         |         |       V |
    5+31       1.1763      1.04  |Q        |         |         |       V |
    5+32       1.1778      1.03  |Q        |         |         |       V |
    5+33       1.1792      1.03  |Q        |         |         |       V |
    5+34       1.1806      1.02  |Q        |         |         |       V |
    5+35       1.1820      1.01  |Q        |         |         |       V |
    5+36       1.1834      1.00  |Q        |         |         |       V |
    5+37       1.1847      1.00  |Q        |         |         |       V |
    5+38       1.1861      0.99  |Q        |         |         |       V |
    5+39       1.1875      0.98  |Q        |         |         |       V |
    5+40       1.1888      0.98  |Q        |         |         |        V|
    5+41       1.1901      0.97  |Q        |         |         |        V|
    5+42       1.1915      0.96  |Q        |         |         |        V|
    5+43       1.1928      0.96  |Q        |         |         |        V|
    5+44       1.1941      0.95  |Q        |         |         |        V|
    5+45       1.1954      0.95  |Q        |         |         |        V|
    5+46       1.1967      0.94  |Q        |         |         |        V|
    5+47       1.1980      0.93  |Q        |         |         |        V|
    5+48       1.1993      0.93  |Q        |         |         |        V|
    5+49       1.2005      0.92  |Q        |         |         |        V|
    5+50       1.2018      0.92  |Q        |         |         |        V|
    5+51       1.2031      0.91  |Q        |         |         |        V|
    5+52       1.2043      0.91  |Q        |         |         |        V|
    5+53       1.2055      0.90  |Q        |         |         |        V|
    5+54       1.2068      0.90  |Q        |         |         |        V|
    5+55       1.2080      0.89  |Q        |         |         |        V|
    5+56       1.2092      0.89  |Q        |         |         |        V|
    5+57       1.2104      0.88  |Q        |         |         |        V|
    5+58       1.2116      0.88  |Q        |         |         |        V|
    5+59       1.2128      0.87  |Q        |         |         |        V|
    6+ 0       1.2140      0.87  |Q        |         |         |        V|
    6+ 1       1.2152      0.86  |Q        |         |         |        V|
    6+ 2       1.2164      0.86  |Q        |         |         |        V|
    6+ 3       1.2176      0.85  |Q        |         |         |        V|
    6+ 4       1.2187      0.85  |Q        |         |         |         V
--------------------------------------------------------------------------


        End of computations, total study area =          5.621 (Ac.)
```

CIVILD ANALYSIS
POST-DEVELOPED CONDITIONS
DETENTION B

```
              San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 07/26/21
--------------------------------------------------------------------------
POST DEVELOPMENT - Detention Chamber B
100 YEAR - RATIONAL METHOD ANALYSIS
BY WARE MALCOMB
file:DetB.rsd3
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 6491

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

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.100
24 hour precipitation(inches) =  6.000
P6/P24 =    51.7%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Initial subarea total flow distance  =   33.000(Ft.)
Highest elevation =  529.800(Ft.)
Lowest elevation =  527.150(Ft.)
Elevation difference =    2.650(Ft.) Slope =  8.030 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   8.03 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.52 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8200)*( 100.000^.5)/(   8.030^(1/3)]=   2.52
Calculated TC of    2.517 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =      0.087(CFS)
Total initial stream area =        0.013(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      3.828(CFS)
Depth of flow =   0.146(Ft.), Average velocity =   3.600(Ft/s)
       ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             25.00              0.00
       3             50.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      3.828(CFS)
  '     '       flow top width =     14.582(Ft.)
  '     '    velocity=    3.600(Ft/s)
  '     '       area =      1.063(Sq.Ft)
  '     '       Froude number =     2.350

Upstream point elevation =   527.150(Ft.)
Downstream point elevation =   513.730(Ft.)
Flow length =   412.000(Ft.)
Travel time  =    1.91 min.
Time of concentration =    4.42 min.
Depth of flow =   0.146(Ft.)
Average velocity =   3.600(Ft/s)
Total irregular channel flow =     3.828(CFS)
Irregular channel normal depth above invert elev. =   0.146(Ft.)
Average velocity of channel(s) =   3.600(Ft/s)
 Adding area flow to channel
Calculated TC of    4.424 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.820  CA =      0.927
Subarea runoff =      7.481(CFS) for      1.117(Ac.)
Total runoff =      7.568(CFS)        Total area =       1.130(Ac.)
Depth of flow =   0.188(Ft.), Average velocity =   4.269(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
__________________________________________________________________________
Upstream point/station elevation =   509.330(Ft.)
Downstream point/station elevation =   506.860(Ft.)
Pipe length  =   248.00(Ft.) Slope =   0.0100  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.568(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     7.568(CFS)
Normal flow depth in pipe =   11.33(In.)
Flow top width inside pipe =   17.39(In.)
Critical Depth =   12.78(In.)
Pipe flow velocity =      6.46(Ft/s)
Travel time through pipe =    0.64 min.
Time of concentration (TC) =     5.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      204.000
**** CONFLUENCE OF MAIN STREAMS ****
__________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      1.130(Ac.)
Runoff from this stream =      7.568(CFS)
Time of concentration =    5.06 min.
```

```
Rainfall intensity =     8.101(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      206.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Initial subarea total flow distance  =   45.000(Ft.)
Highest elevation =  515.160(Ft.)
Lowest elevation =  514.000(Ft.)
Elevation difference =    1.160(Ft.) Slope =  2.578 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   2.58 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.39 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8200)*(  85.000^.5)/(   2.578^(1/3)]=   3.39
Calculated TC of    3.389 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =      0.509(CFS)
Total initial stream area =        0.076(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      204.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      4.353(CFS)
Depth of flow =   0.206(Ft.), Average velocity =   2.054(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             25.00              0.00
       3             50.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      4.353(CFS)
  '     '       flow top width =     20.587(Ft.)
  '     '    velocity=    2.054(Ft/s)
  '     '       area =      2.119(Sq.Ft)
  '     '       Froude number =     1.128

Upstream point elevation =   514.000(Ft.)
Downstream point elevation =   511.850(Ft.)
Flow length =   321.000(Ft.)
Travel time  =    2.60 min.
Time of concentration =    5.99 min.
Depth of flow =   0.206(Ft.)
Average velocity =   2.054(Ft/s)
Total irregular channel flow =     4.353(CFS)
Irregular channel normal depth above invert elev. =   0.206(Ft.)
Average velocity of channel(s) =   2.054(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      7.267(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity =      7.267(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.820  CA =      1.118
Subarea runoff =      7.613(CFS) for      1.287(Ac.)
Total runoff =      8.122(CFS)        Total area =       1.363(Ac.)
Depth of flow =   0.260(Ft.), Average velocity =   2.401(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      204.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.363(Ac.)
Runoff from this stream =      8.122(CFS)
Time of concentration =    5.99 min.
Rainfall intensity =     7.267(In/Hr)
Summary of stream data:

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


1        7.568      5.06               8.101
2        8.122      5.99               7.267
Qmax(1) =
          1.000 *    1.000 *     7.568) +
          1.000 *    0.845 *     8.122) + =      14.431
Qmax(2) =
          0.897 *    1.000 *     7.568) +
          1.000 *    1.000 *     8.122) + =      14.911

Total of 2 main streams to confluence:
Flow rates before confluence point:
       7.568       8.122
Maximum flow rates at confluence using above data:
       14.431       14.911
Area of streams before confluence:
        1.130        1.363


Results of confluence:
Total flow rate =     14.911(CFS)
Time of concentration =     5.993 min.
Effective stream area after confluence  =      2.493(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      207.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   506.860(Ft.)
Downstream point/station elevation =   504.190(Ft.)
Pipe length  =   368.00(Ft.) Slope =   0.0073  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.911(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    14.911(CFS)
Normal flow depth in pipe =   15.84(In.)
Flow top width inside pipe =   22.74(In.)
Critical Depth =   16.71(In.)
Pipe flow velocity =      6.77(Ft/s)
Travel time through pipe =    0.91 min.
Time of concentration (TC) =     6.90 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      207.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.493(Ac.)
Runoff from this stream =     14.911(CFS)
Time of concentration =    6.90 min.
Rainfall intensity =     6.636(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.000 to Point/Station      209.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                         ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Initial subarea total flow distance  =   67.000(Ft.)
Highest elevation =  516.920(Ft.)
Lowest elevation =  514.150(Ft.)
Elevation difference =    2.770(Ft.) Slope =  4.134 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   4.13 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.98 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8200)*(  90.000^.5)/(   4.134^(1/3)]=   2.98
Calculated TC of    2.979 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =      0.449(CFS)
Total initial stream area =        0.067(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      209.000 to Point/Station      210.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      5.917(CFS)
Depth of flow =   0.222(Ft.), Average velocity =   2.391(Ft/s)
       ******* Irregular Channel Data **********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             25.00              0.00
       3             50.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      5.917(CFS)
  '     '       flow top width =     22.245(Ft.)
  '     '    velocity=    2.391(Ft/s)
  '     '       area =      2.474(Sq.Ft)
  '     '       Froude number =     1.264

Upstream point elevation =   514.150(Ft.)
Downstream point elevation =   510.000(Ft.)
Flow length =   507.000(Ft.)
Travel time  =    3.53 min.
```

```
Time of concentration =    6.51 min.
Depth of flow =   0.222(Ft.)
Average velocity =   2.391(Ft/s)
Total irregular channel flow =     5.917(CFS)
Irregular channel normal depth above invert elev. =   0.222(Ft.)
Average velocity of channel(s) =   2.391(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.888(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity =      6.888(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.820  CA =      1.640
Subarea runoff =     10.847(CFS) for      1.933(Ac.)
Total runoff =     11.296(CFS)        Total area =       2.000(Ac.)
Depth of flow =   0.283(Ft.), Average velocity =   2.811(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      207.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   506.680(Ft.)
Downstream point/station elevation =   504.190(Ft.)
Pipe length  =    67.00(Ft.) Slope =   0.0372  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.296(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    11.296(CFS)
Normal flow depth in pipe =   11.20(In.)
Flow top width inside pipe =   13.04(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.50(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     6.61 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      207.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.000(Ac.)
Runoff from this stream =     11.296(CFS)
Time of concentration =    6.61 min.
Rainfall intensity =     6.822(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      212.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Initial subarea total flow distance  =   42.000(Ft.)
Highest elevation =  516.710(Ft.)
Lowest elevation =  516.060(Ft.)
Elevation difference =    0.650(Ft.) Slope =  1.548 %
```

```
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 75.00 (Ft)
for the top area slope value of   1.55 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.77 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8200)*(  75.000^.5)/(   1.548^(1/3)]=   3.77
Calculated TC of    3.773 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =      0.321(CFS)
Total initial stream area =        0.048(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      213.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      6.209(CFS)
Depth of flow =   0.244(Ft.), Average velocity =   2.082(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             25.00              0.00
       3             50.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------------
Sub-Channel flow  =      6.209(CFS)
  '     '       flow top width =     24.423(Ft.)
  '     '    velocity=    2.082(Ft/s)
  '     '       area =      2.982(Sq.Ft)
  '     '       Froude number =     1.050

Upstream point elevation =   516.060(Ft.)
Downstream point elevation =   513.530(Ft.)
Flow length =   462.000(Ft.)
Travel time  =    3.70 min.
Time of concentration =    7.47 min.
Depth of flow =   0.244(Ft.)
Average velocity =   2.082(Ft/s)
Total irregular channel flow =     6.209(CFS)
Irregular channel normal depth above invert elev. =   0.244(Ft.)
Average velocity of channel(s) =   2.082(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.303(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity =      6.303(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.820  CA =      1.907
Subarea runoff =     11.696(CFS) for      2.277(Ac.)
Total runoff =     12.017(CFS)       Total area =       2.325(Ac.)
Depth of flow =   0.313(Ft.), Average velocity =   2.455(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      213.000 to Point/Station      207.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   507.480(Ft.)
Downstream point/station elevation =   504.190(Ft.)
```

```
Pipe length  =   296.00(Ft.) Slope =   0.0111  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.017(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    12.017(CFS)
Normal flow depth in pipe =   13.18(In.)
Flow top width inside pipe =   20.30(In.)
Critical Depth =   15.50(In.)
Pipe flow velocity =      7.56(Ft/s)
Travel time through pipe =    0.65 min.
Time of concentration (TC) =     8.12 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      207.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      2.325(Ac.)
Runoff from this stream =     12.017(CFS)
Time of concentration =    8.12 min.
Rainfall intensity =     5.972(In/Hr)
Program is now starting with Main Stream No. 4


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      215.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Initial subarea total flow distance  =   50.000(Ft.)
Highest elevation =  516.380(Ft.)
Lowest elevation =  515.880(Ft.)
Elevation difference =    0.500(Ft.) Slope =  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.90 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8200)*(  60.000^.5)/(   1.000^(1/3)]=   3.90
Calculated TC of    3.904 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =      0.167(CFS)
Total initial stream area =        0.025(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      215.000 to Point/Station      216.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      3.861(CFS)
Depth of flow =   0.167(Ft.), Average velocity =   2.773(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             25.00              0.00
       3             50.00              0.50
Manning's 'N' friction factor =   0.013
```

```
------------------------------------------------------------------
Sub-Channel flow  =      3.861(CFS)
  '     '       flow top width =     16.688(Ft.)
  '     '    velocity=    2.773(Ft/s)
  '     '       area =      1.392(Sq.Ft)
  '     '       Froude number =     1.692

Upstream point elevation =   515.880(Ft.)
Downstream point elevation =   513.200(Ft.)
Flow length =   166.000(Ft.)
Travel time  =    1.00 min.
Time of concentration =    4.90 min.
Depth of flow =   0.167(Ft.)
Average velocity =   2.773(Ft/s)
Total irregular channel flow =     3.861(CFS)
Irregular channel normal depth above invert elev. =   0.167(Ft.)
Average velocity of channel(s) =   2.773(Ft/s)
 Adding area flow to channel
Calculated TC of    4.902 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.820  CA =      0.925
Subarea runoff =      7.387(CFS) for      1.103(Ac.)
Total runoff =      7.555(CFS)        Total area =       1.128(Ac.)
Depth of flow =   0.215(Ft.), Average velocity =   3.280(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      219.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   509.960(Ft.)
Downstream point/station elevation =   507.190(Ft.)
Pipe length  =   231.00(Ft.) Slope =   0.0120  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.555(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     7.555(CFS)
Normal flow depth in pipe =   10.64(In.)
Flow top width inside pipe =   17.70(In.)
Critical Depth =   12.78(In.)
Pipe flow velocity =      6.95(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =     5.46 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      219.000 to Point/Station      219.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 4 in normal stream number 1
Stream flow area =      1.128(Ac.)
Runoff from this stream =      7.555(CFS)
Time of concentration =    5.46 min.
Rainfall intensity =     7.721(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      217.000 to Point/Station      218.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
```

```
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Initial subarea total flow distance  =   50.000(Ft.)
Highest elevation =  516.380(Ft.)
Lowest elevation =  515.880(Ft.)
Elevation difference =    0.500(Ft.) Slope =  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.90 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8200)*(  60.000^.5)/(   1.000^(1/3)]=   3.90
Calculated TC of    3.904 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =      0.161(CFS)
Total initial stream area =        0.024(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      218.000 to Point/Station      219.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.908(CFS)
Depth of flow =   0.157(Ft.), Average velocity =   1.541(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             25.00              0.00
       3             50.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      1.908(CFS)
  '     '       flow top width =     15.735(Ft.)
  '     '    velocity=    1.541(Ft/s)
  '     '       area =      1.238(Sq.Ft)
  '     '       Froude number =     0.968

Upstream point elevation =   515.880(Ft.)
Downstream point elevation =   514.370(Ft.)
Flow length =   280.000(Ft.)
Travel time  =    3.03 min.
Time of concentration =    6.93 min.
Depth of flow =   0.157(Ft.)
Average velocity =   1.541(Ft/s)
Total irregular channel flow =     1.908(CFS)
Irregular channel normal depth above invert elev. =   0.157(Ft.)
Average velocity of channel(s) =   1.541(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.616(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity =      6.616(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.820  CA =      0.543
```

```
Subarea runoff =      3.430(CFS) for      0.638(Ac.)
Total runoff =      3.591(CFS)        Total area =       0.662(Ac.)
Depth of flow =   0.199(Ft.), Average velocity =   1.805(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      219.000 to Point/Station      219.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 4 in normal stream number 2
Stream flow area =      0.662(Ac.)
Runoff from this stream =      3.591(CFS)
Time of concentration =    6.93 min.
Rainfall intensity =     6.616(In/Hr)
Summary of stream data:

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


1        7.555      5.46               7.721
2        3.591      6.93               6.616
Qmax(1) =
          1.000 *    1.000 *     7.555) +
          1.000 *    0.787 *     3.591) + =      10.381
Qmax(2) =
          0.857 *    1.000 *     7.555) +
          1.000 *    1.000 *     3.591) + =      10.065

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.555       3.591
Maximum flow rates at confluence using above data:
       10.381       10.065
Area of streams before confluence:
        1.128        0.662
Results of confluence:
Total flow rate =     10.381(CFS)
Time of concentration =     5.456 min.
Effective stream area after confluence =      1.790(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      219.000 to Point/Station      207.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =   507.190(Ft.)
Downstream point/station elevation =   504.190(Ft.)
Pipe length  =    53.00(Ft.) Slope =   0.0566  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.381(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    10.381(CFS)
Normal flow depth in pipe =    9.04(In.)
Flow top width inside pipe =   14.68(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.45(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     5.52 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      207.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =      1.790(Ac.)
Runoff from this stream =     10.381(CFS)
Time of concentration =    5.52 min.
Rainfall intensity =     7.661(In/Hr)
Summary of stream data:
```

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


1       14.911      6.90               6.636
2       11.296      6.61               6.822
3       12.017      8.12               5.972
4       10.381      5.52               7.661
Qmax(1) =
          1.000 *    1.000 *    14.911) +
          0.973 *    1.000 *    11.296) +
          1.000 *    0.849 *    12.017) +
          0.866 *    1.000 *    10.381) + =      45.096
Qmax(2) =
          1.000 *    0.958 *    14.911) +
          1.000 *    1.000 *    11.296) +
          1.000 *    0.814 *    12.017) +
          0.890 *    1.000 *    10.381) + =      44.603
Qmax(3) =
          0.900 *    1.000 *    14.911) +
          0.875 *    1.000 *    11.296) +
          1.000 *    1.000 *    12.017) +
          0.779 *    1.000 *    10.381) + =      43.415
Qmax(4) =
          1.000 *    0.800 *    14.911) +
          1.000 *    0.835 *    11.296) +
          1.000 *    0.680 *    12.017) +
          1.000 *    1.000 *    10.381) + =      39.920

Total of 4 main streams to confluence:
Flow rates before confluence point:
      14.911      11.296      12.017      10.381
Maximum flow rates at confluence using above data:
       45.096       44.603       43.415       39.920
Area of streams before confluence:
        2.493        2.000        2.325        1.790


Results of confluence:
Total flow rate =     45.096(CFS)
Time of concentration =     6.899 min.
Effective stream area after confluence  =      8.608(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      207.000
**** 6 HOUR HYDROGRAPH ****
________________________________________________________________________
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003


Time of Concentration =   6.90
Basin Area =     8.61 Acres
6 Hour Rainfall =  3.100 Inches
Runoff Coefficient =  0.820
Peak Discharge =    45.10 CFS
     Time (Min)     Discharge (CFS)
       0               0.000
       6               1.304
       12               1.319
       18               1.349
       24               1.364
       30               1.397
       36               1.414
       42               1.450
       48               1.469
       54               1.508
       60               1.529
       66               1.573
```

72	1.596
78	1.646
84	1.672
90	1.727
96	1.757
102	1.820
108	1.854
114	1.927
120	1.966
126	2.051
132	2.097
138	2.198
144	2.253
150	2.375
156	2.443
162	2.594
168	2.679
174	2.873
180	2.984
186	3.243
192	3.396
198	3.767
204	3.995
210	4.579
216	4.965
222	6.068
228	6.912
234	10.149
240	14.300
246	45.096
252	8.140
258	5.446
264	4.261
270	3.569
276	3.107
282	2.771
288	2.515
294	2.312
300	2.146
306	2.007
312	1.889
318	1.788
324	1.699
330	1.621
336	1.551
342	1.488
348	1.432
354	1.380
360	1.333
366	1.290

++

6 - H O U R S T O R M

R u n o f f H y d r o g r a p h

Hydrograph in 1 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	11.3	22.5	33.8	45.1
0+ 0	0.0000	0.00	Q	|	|	|	|
0+ 1	0.0003	0.22	Q	|	|	|	|
0+ 2	0.0009	0.43	Q	|	|	|	|
0+ 3	0.0018	0.65	Q	|	|	|	|
0+ 4	0.0030	0.87	Q	|	|	|	|
0+ 5	0.0045	1.09	Q	|	|	|	|
0+ 6	0.0063	1.30	VQ	|	|	|	|
0+ 7	0.0081	1.31	VQ	|	|	|	|
0+ 8	0.0099	1.31	VQ	|	|	|	|
0+ 9	0.0117	1.31	VQ	|	|	|	|
0+10	0.0135	1.31	VQ	|	|	|	|
0+11	0.0153	1.32	VQ	|	|	|	|

0+12	0.0171	1.32	VQ	|	|	|	|
0+13	0.0190	1.32	VQ	|	|	|	|
0+14	0.0208	1.33	VQ	|	|	|	|
0+15	0.0226	1.33	VQ	|	|	|	|
0+16	0.0245	1.34	VQ	|	|	|	|
0+17	0.0263	1.34	VQ	|	|	|	|
0+18	0.0282	1.35	VQ	|	|	|	|
0+19	0.0300	1.35	VQ	|	|	|	|
0+20	0.0319	1.35	VQ	|	|	|	|
0+21	0.0338	1.36	VQ	|	|	|	|
0+22	0.0356	1.36	VQ	|	|	|	|
0+23	0.0375	1.36	VQ	|	|	|	|
0+24	0.0394	1.36	VQ	|	|	|	|
0+25	0.0413	1.37	VQ	|	|	|	|
0+26	0.0432	1.38	VQ	|	|	|	|
0+27	0.0451	1.38	|Q	|	|	|	|
0+28	0.0470	1.39	|Q	|	|	|	|
0+29	0.0489	1.39	|Q	|	|	|	|
0+30	0.0508	1.40	|Q	|	|	|	|
0+31	0.0528	1.40	|Q	|	|	|	|
0+32	0.0547	1.40	|Q	|	|	|	|
0+33	0.0566	1.41	|Q	|	|	|	|
0+34	0.0586	1.41	|Q	|	|	|	|
0+35	0.0605	1.41	|Q	|	|	|	|
0+36	0.0625	1.41	|Q	|	|	|	|
0+37	0.0644	1.42	|Q	|	|	|	|
0+38	0.0664	1.43	|Q	|	|	|	|
0+39	0.0684	1.43	|Q	|	|	|	|
0+40	0.0703	1.44	|Q	|	|	|	|
0+41	0.0723	1.44	|Q	|	|	|	|
0+42	0.0743	1.45	|Q	|	|	|	|
0+43	0.0763	1.45	|Q	|	|	|	|
0+44	0.0783	1.46	|Q	|	|	|	|
0+45	0.0803	1.46	|Q	|	|	|	|
0+46	0.0824	1.46	|Q	|	|	|	|
0+47	0.0844	1.47	|Q	|	|	|	|
0+48	0.0864	1.47	|Q	|	|	|	|
0+49	0.0884	1.48	|QV	|	|	|	|
0+50	0.0905	1.48	|QV	|	|	|	|
0+51	0.0925	1.49	|QV	|	|	|	|
0+52	0.0946	1.50	|QV	|	|	|	|
0+53	0.0966	1.50	|QV	|	|	|	|
0+54	0.0987	1.51	|QV	|	|	|	|
0+55	0.1008	1.51	|QV	|	|	|	|
0+56	0.1029	1.52	|QV	|	|	|	|
0+57	0.1050	1.52	|QV	|	|	|	|
0+58	0.1071	1.52	|QV	|	|	|	|
0+59	0.1092	1.53	|QV	|	|	|	|
1+ 0	0.1113	1.53	|QV	|	|	|	|
1+ 1	0.1134	1.54	|QV	|	|	|	|
1+ 2	0.1155	1.54	|QV	|	|	|	|
1+ 3	0.1177	1.55	|QV	|	|	|	|
1+ 4	0.1198	1.56	|QV	|	|	|	|
1+ 5	0.1220	1.57	|QV	|	|	|	|
1+ 6	0.1241	1.57	|QV	|	|	|	|
1+ 7	0.1263	1.58	|QV	|	|	|	|
1+ 8	0.1285	1.58	|QV	|	|	|	|
1+ 9	0.1307	1.58	|QV	|	|	|	|
1+10	0.1329	1.59	|Q V	|	|	|	|
1+11	0.1351	1.59	|Q V	|	|	|	|
1+12	0.1373	1.60	|Q V	|	|	|	|
1+13	0.1395	1.60	|Q V	|	|	|	|
1+14	0.1417	1.61	|Q V	|	|	|	|
1+15	0.1439	1.62	|Q V	|	|	|	|
1+16	0.1462	1.63	|Q V	|	|	|	|
1+17	0.1484	1.64	|Q V	|	|	|	|
1+18	0.1507	1.65	|Q V	|	|	|	|
1+19	0.1530	1.65	|Q V	|	|	|	|
1+20	0.1552	1.65	|Q V	|	|	|	|
1+21	0.1575	1.66	|Q V	|	|	|	|
1+22	0.1598	1.66	|Q V	|	|	|	|

1+23	0.1621	1.67	|Q V |	|	|	|
1+24	0.1644	1.67	|Q V |	|	|	|
1+25	0.1667	1.68	|Q V |	|	|	|
1+26	0.1691	1.69	|Q V |	|	|	|
1+27	0.1714	1.70	|Q V |	|	|	|
1+28	0.1738	1.71	|Q V |	|	|	|
1+29	0.1761	1.72	|Q V |	|	|	|
1+30	0.1785	1.73	|Q V |	|	|	|
1+31	0.1809	1.73	|Q V |	|	|	|
1+32	0.1833	1.74	|Q V |	|	|	|
1+33	0.1857	1.74	|Q V |	|	|	|
1+34	0.1881	1.75	|Q V |	|	|	|
1+35	0.1905	1.75	|Q V |	|	|	|
1+36	0.1929	1.76	|Q V |	|	|	|
1+37	0.1953	1.77	|Q V |	|	|	|
1+38	0.1978	1.78	|Q V |	|	|	|
1+39	0.2003	1.79	|Q V |	|	|	|
1+40	0.2027	1.80	|Q V |	|	|	|
1+41	0.2052	1.81	|Q V |	|	|	|
1+42	0.2077	1.82	|Q V |	|	|	|
1+43	0.2103	1.83	|Q V |	|	|	|
1+44	0.2128	1.83	|Q V |	|	|	|
1+45	0.2153	1.84	|Q V |	|	|	|
1+46	0.2178	1.84	|Q V |	|	|	|
1+47	0.2204	1.85	|Q V |	|	|	|
1+48	0.2229	1.85	|Q V |	|	|	|
1+49	0.2255	1.87	|Q V |	|	|	|
1+50	0.2281	1.88	|Q V |	|	|	|
1+51	0.2307	1.89	|Q V |	|	|	|
1+52	0.2333	1.90	|Q V |	|	|	|
1+53	0.2360	1.91	|Q V |	|	|	|
1+54	0.2386	1.93	|Q V |	|	|	|
1+55	0.2413	1.93	|Q V |	|	|	|
1+56	0.2440	1.94	|Q V |	|	|	|
1+57	0.2466	1.95	|Q V |	|	|	|
1+58	0.2493	1.95	|Q V |	|	|	|
1+59	0.2520	1.96	|Q V |	|	|	|
2+ 0	0.2547	1.97	|Q V |	|	|	|
2+ 1	0.2575	1.98	|Q V |	|	|	|
2+ 2	0.2602	1.99	|Q V |	|	|	|
2+ 3	0.2630	2.01	|Q V |	|	|	|
2+ 4	0.2658	2.02	|Q V |	|	|	|
2+ 5	0.2686	2.04	|Q V |	|	|	|
2+ 6	0.2714	2.05	|Q V |	|	|	|
2+ 7	0.2742	2.06	|Q V |	|	|	|
2+ 8	0.2771	2.07	|Q V |	|	|	|
2+ 9	0.2799	2.07	|Q V |	|	|	|
2+10	0.2828	2.08	|Q V |	|	|	|
2+11	0.2857	2.09	|Q V |	|	|	|
2+12	0.2886	2.10	|Q V |	|	|	|
2+13	0.2915	2.11	|Q V |	|	|	|
2+14	0.2944	2.13	|Q V |	|	|	|
2+15	0.2974	2.15	|Q V |	|	|	|
2+16	0.3003	2.16	|Q V |	|	|	|
2+17	0.3034	2.18	|Q V |	|	|	|
2+18	0.3064	2.20	|Q V |	|	|	|
2+19	0.3094	2.21	|Q V |	|	|	|
2+20	0.3125	2.22	|Q V |	|	|	|
2+21	0.3155	2.23	|Q V |	|	|	|
2+22	0.3186	2.23	|Q V |	|	|	|
2+23	0.3217	2.24	|Q V |	|	|	|
2+24	0.3248	2.25	|Q V |	|	|	|
2+25	0.3279	2.27	| Q V |	|	|	|
2+26	0.3311	2.29	| Q V |	|	|	|
2+27	0.3343	2.31	| Q V |	|	|	|
2+28	0.3375	2.33	| Q V |	|	|	|
2+29	0.3407	2.35	| Q V |	|	|	|
2+30	0.3440	2.38	| Q V |	|	|	|
2+31	0.3473	2.39	| Q V |	|	|	|
2+32	0.3506	2.40	| Q V |	|	|	|
2+33	0.3539	2.41	| Q V |	|	|	|

2+34	0.3573	2.42	| Q V |	|	|	|
2+35	0.3606	2.43	| Q V |	|	|	|
2+36	0.3640	2.44	| Q V |	|	|	|
2+37	0.3674	2.47	| Q V |	|	|	|
2+38	0.3708	2.49	| Q V |	|	|	|
2+39	0.3743	2.52	| Q V |	|	|	|
2+40	0.3778	2.54	| Q V |	|	|	|
2+41	0.3813	2.57	| Q V |	|	|	|
2+42	0.3849	2.59	| Q V |	|	|	|
2+43	0.3885	2.61	| Q V |	|	|	|
2+44	0.3921	2.62	| Q V |	|	|	|
2+45	0.3957	2.64	| Q V |	|	|	|
2+46	0.3994	2.65	| Q V|	|	|	|
2+47	0.4030	2.66	| Q V|	|	|	|
2+48	0.4067	2.68	| Q V|	|	|	|
2+49	0.4105	2.71	| Q V|	|	|	|
2+50	0.4142	2.74	| Q V|	|	|	|
2+51	0.4181	2.78	| Q V|	|	|	|
2+52	0.4219	2.81	| Q V|	|	|	|
2+53	0.4258	2.84	| Q V|	|	|	|
2+54	0.4298	2.87	| Q V|	|	|	|
2+55	0.4338	2.89	| Q V|	|	|	|
2+56	0.4378	2.91	| Q V|	|	|	|
2+57	0.4418	2.93	| Q V|	|	|	|
2+58	0.4459	2.95	| Q V	|	|	|
2+59	0.4500	2.97	| Q V	|	|	|
3+ 0	0.4541	2.98	| Q V	|	|	|
3+ 1	0.4583	3.03	| Q V	|	|	|
3+ 2	0.4625	3.07	| Q V	|	|	|
3+ 3	0.4668	3.11	| Q V	|	|	|
3+ 4	0.4711	3.16	| Q V	|	|	|
3+ 5	0.4755	3.20	| Q V	|	|	|
3+ 6	0.4800	3.24	| Q V	|	|	|
3+ 7	0.4845	3.27	| Q V	|	|	|
3+ 8	0.4890	3.29	| Q |V	|	|	|
3+ 9	0.4936	3.32	| Q |V	|	|	|
3+10	0.4982	3.35	| Q |V	|	|	|
3+11	0.5029	3.37	| Q |V	|	|	|
3+12	0.5075	3.40	| Q |V	|	|	|
3+13	0.5123	3.46	| Q |V	|	|	|
3+14	0.5171	3.52	| Q |V	|	|	|
3+15	0.5221	3.58	| Q |V	|	|	|
3+16	0.5271	3.64	| Q |V	|	|	|
3+17	0.5322	3.71	| Q | V	|	|	|
3+18	0.5374	3.77	| Q | V	|	|	|
3+19	0.5426	3.80	| Q | V	|	|	|
3+20	0.5479	3.84	| Q | V	|	|	|
3+21	0.5533	3.88	| Q | V	|	|	|
3+22	0.5587	3.92	| Q | V	|	|	|
3+23	0.5641	3.96	| Q | V	|	|	|
3+24	0.5696	3.99	| Q | V	|	|	|
3+25	0.5753	4.09	| Q | V	|	|	|
3+26	0.5810	4.19	| Q | V	|	|	|
3+27	0.5869	4.29	| Q | V	|	|	|
3+28	0.5930	4.38	| Q | V	|	|	|
3+29	0.5991	4.48	| Q | V	|	|	|
3+30	0.6054	4.58	| Q | V	|	|	|
3+31	0.6118	4.64	| Q | V	|	|	|
3+32	0.6183	4.71	| Q | V	|	|	|
3+33	0.6249	4.77	| Q | V	|	|	|
3+34	0.6316	4.84	| Q | V	|	|	|
3+35	0.6383	4.90	| Q | V	|	|	|
3+36	0.6452	4.96	| Q | V	|	|	|
3+37	0.6522	5.15	| Q | V	|	|	|
3+38	0.6596	5.33	| Q | V	|	|	|
3+39	0.6672	5.52	| Q | V	|	|	|
3+40	0.6750	5.70	| Q | V	|	|	|
3+41	0.6831	5.88	| Q | V	|	|	|
3+42	0.6915	6.07	| Q | V	|	|	|
3+43	0.7001	6.21	| Q | V	|	|	|
3+44	0.7088	6.35	| Q | V	|	|	|

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3+45       0.7177      6.49  |    Q    |     V   |         |         |
3+46       0.7269      6.63  |    Q    |     V   |         |         |
3+47       0.7362      6.77  |     Q   |     V   |         |         |
3+48       0.7457      6.91  |     Q   |     V   |         |         |
3+49       0.7560      7.45  |     Q   |      V  |         |         |
3+50       0.7670      7.99  |      Q  |      V  |         |         |
3+51       0.7787      8.53  |      Q  |      V  |         |         |
3+52       0.7912      9.07  |       Q |      V  |         |         |
3+53       0.8045      9.61  |       Q |       V |         |         |
3+54       0.8185     10.15  |        Q|       V |         |         |
3+55       0.8334     10.84  |        Q|       V |         |         |
3+56       0.8493     11.53  |         Q        V|         |         |
3+57       0.8661     12.22  |         Q        V|         |         |
3+58       0.8839     12.92  |         |Q        V         |         |
3+59       0.9026     13.61  |         | Q       V         |         |
4+ 0       0.9223     14.30  |         | Q       V         |         |
4+ 1       0.9491     19.43  |         |      Q  |V         |         |
4+ 2       0.9829     24.56  |         |         |QV        |         |
4+ 3       1.0238     29.70  |         |         |  V  Q    |         |
4+ 4       1.0718     34.83  |         |         |   V     Q         |
4+ 5       1.1269     39.96  |         |         |    V    |    Q    |
4+ 6       1.1890     45.10  |         |         |     V   |         Q
4+ 7       1.2426     38.94  |         |         |       V |   Q     |
4+ 8       1.2878     32.78  |         |         |        Q|         |
4+ 9       1.3244     26.62  |         |         |  Q     V|         |
4+10       1.3526     20.46  |         |       Q |         V         |
4+11       1.3723     14.30  |         | Q       |         |V        |
4+12       1.3835      8.14  |       Q |         |         |V        |
4+13       1.3941      7.69  |     Q   |         |         |V        |
4+14       1.4041      7.24  |     Q   |         |         |V        |
4+15       1.4134      6.79  |     Q   |         |         |V        |
4+16       1.4222      6.34  |    Q    |         |         | V       |
4+17       1.4303      5.90  |    Q    |         |         | V       |
4+18       1.4378      5.45  |   Q     |         |         | V       |
4+19       1.4450      5.25  |   Q     |         |         | V       |
4+20       1.4520      5.05  |   Q     |         |         | V       |
4+21       1.4587      4.85  |   Q     |         |         |  V      |
4+22       1.4651      4.66  |   Q     |         |         |  V      |
4+23       1.4712      4.46  |  Q      |         |         |  V      |
4+24       1.4771      4.26  |  Q      |         |         |  V      |
4+25       1.4828      4.15  |  Q      |         |         |  V      |
4+26       1.4884      4.03  |  Q      |         |         |  V      |
4+27       1.4938      3.92  |  Q      |         |         |  V      |
4+28       1.4990      3.80  |  Q      |         |         |  V      |
4+29       1.5041      3.68  |  Q      |         |         |   V     |
4+30       1.5090      3.57  |  Q      |         |         |   V     |
4+31       1.5138      3.49  |  Q      |         |         |   V     |
4+32       1.5185      3.42  |  Q      |         |         |   V     |
4+33       1.5231      3.34  | Q       |         |         |   V     |
4+34       1.5276      3.26  | Q       |         |         |   V     |
4+35       1.5320      3.18  | Q       |         |         |   V     |
4+36       1.5362      3.11  | Q       |         |         |   V     |
4+37       1.5404      3.05  | Q       |         |         |   V     |
4+38       1.5446      2.99  | Q       |         |         |   V     |
4+39       1.5486      2.94  | Q       |         |         |    V    |
4+40       1.5526      2.88  | Q       |         |         |    V    |
4+41       1.5565      2.83  | Q       |         |         |    V    |
4+42       1.5603      2.77  | Q       |         |         |    V    |
4+43       1.5641      2.73  | Q       |         |         |    V    |
4+44       1.5678      2.69  | Q       |         |         |    V    |
4+45       1.5714      2.64  | Q       |         |         |    V    |
4+46       1.5750      2.60  | Q       |         |         |    V    |
4+47       1.5785      2.56  | Q       |         |         |    V    |
4+48       1.5820      2.52  | Q       |         |         |    V    |
4+49       1.5854      2.48  | Q       |         |         |    V    |
4+50       1.5888      2.45  | Q       |         |         |    V    |
4+51       1.5921      2.41  | Q       |         |         |     V   |
4+52       1.5954      2.38  | Q       |         |         |     V   |
4+53       1.5986      2.35  | Q       |         |         |     V   |
4+54       1.6018      2.31  | Q       |         |         |     V   |
4+55       1.6049      2.28  | Q       |         |         |     V   |
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4+56	1.6080	2.26	| Q	|	|	|	V |
4+57	1.6111	2.23	|Q	|	|	|	V |
4+58	1.6141	2.20	|Q	|	|	|	V |
4+59	1.6171	2.17	|Q	|	|	|	V |
5+ 0	1.6201	2.15	|Q	|	|	|	V |
5+ 1	1.6230	2.12	|Q	|	|	|	V |
5+ 2	1.6259	2.10	|Q	|	|	|	V |
5+ 3	1.6288	2.08	|Q	|	|	|	V |
5+ 4	1.6316	2.05	|Q	|	|	|	V |
5+ 5	1.6344	2.03	|Q	|	|	|	V |
5+ 6	1.6372	2.01	|Q	|	|	|	V |
5+ 7	1.6399	1.99	|Q	|	|	|	V |
5+ 8	1.6426	1.97	|Q	|	|	|	V |
5+ 9	1.6453	1.95	|Q	|	|	|	V |
5+10	1.6479	1.93	|Q	|	|	|	V |
5+11	1.6506	1.91	|Q	|	|	|	V |
5+12	1.6532	1.89	|Q	|	|	|	V |
5+13	1.6558	1.87	|Q	|	|	|	V |
5+14	1.6583	1.86	|Q	|	|	|	V |
5+15	1.6608	1.84	|Q	|	|	|	V |
5+16	1.6634	1.82	|Q	|	|	|	V |
5+17	1.6658	1.80	|Q	|	|	|	V |
5+18	1.6683	1.79	|Q	|	|	|	V |
5+19	1.6707	1.77	|Q	|	|	|	V |
5+20	1.6732	1.76	|Q	|	|	|	V |
5+21	1.6756	1.74	|Q	|	|	|	V |
5+22	1.6779	1.73	|Q	|	|	|	V |
5+23	1.6803	1.71	|Q	|	|	|	V |
5+24	1.6826	1.70	|Q	|	|	|	V |
5+25	1.6850	1.69	|Q	|	|	|	V |
5+26	1.6873	1.67	|Q	|	|	|	V |
5+27	1.6896	1.66	|Q	|	|	|	V |
5+28	1.6918	1.65	|Q	|	|	|	V |
5+29	1.6941	1.63	|Q	|	|	|	V |
5+30	1.6963	1.62	|Q	|	|	|	V |
5+31	1.6985	1.61	|Q	|	|	|	V |
5+32	1.7007	1.60	|Q	|	|	|	V |
5+33	1.7029	1.59	|Q	|	|	|	V |
5+34	1.7051	1.57	|Q	|	|	|	V |
5+35	1.7072	1.56	|Q	|	|	|	V |
5+36	1.7094	1.55	|Q	|	|	|	V |
5+37	1.7115	1.54	|Q	|	|	|	V |
5+38	1.7136	1.53	|Q	|	|	|	V |
5+39	1.7157	1.52	|Q	|	|	|	V |
5+40	1.7178	1.51	|Q	|	|	|	V |
5+41	1.7198	1.50	|Q	|	|	|	V |
5+42	1.7219	1.49	|Q	|	|	|	V |
5+43	1.7239	1.48	|Q	|	|	|	V|
5+44	1.7259	1.47	|Q	|	|	|	V|
5+45	1.7280	1.46	|Q	|	|	|	V|
5+46	1.7300	1.45	|Q	|	|	|	V|
5+47	1.7319	1.44	|Q	|	|	|	V|
5+48	1.7339	1.43	|Q	|	|	|	V|
5+49	1.7359	1.42	|Q	|	|	|	V|
5+50	1.7378	1.41	|Q	|	|	|	V|
5+51	1.7398	1.41	|Q	|	|	|	V|
5+52	1.7417	1.40	|Q	|	|	|	V|
5+53	1.7436	1.39	|Q	|	|	|	V|
5+54	1.7455	1.38	|Q	|	|	|	V|
5+55	1.7474	1.37	|Q	|	|	|	V|
5+56	1.7493	1.36	|Q	|	|	|	V|
5+57	1.7511	1.36	|Q	|	|	|	V|
5+58	1.7530	1.35	|Q	|	|	|	V|
5+59	1.7548	1.34	|Q	|	|	|	V|
6+ 0	1.7567	1.33	|Q	|	|	|	V|
6+ 1	1.7585	1.33	|Q	|	|	|	V|
6+ 2	1.7603	1.32	|Q	|	|	|	V|
6+ 3	1.7621	1.31	|Q	|	|	|	V|
6+ 4	1.7639	1.30	|Q	|	|	|	V|
6+ 5	1.7657	1.30	|Q	|	|	|	V|
6+ 6	1.7675	1.29	|Q	|	|	|	V

End of computations, total study area = 8.608 (Ac.)

CIVILD ANALYSIS
POST-DEVELOPED CONDITIONS
POC-A

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               San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 07/26/21
--------------------------------------------------------------------------
POST DEVELOPMENT - POC A
100 YEAR - RATIONAL METHOD ANALYSIS
BY WARE MALCOMB
file:PostA.rsd3
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 6350

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

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.100
24 hour precipitation(inches) =  6.000
P6/P24 =    51.7%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Initial subarea total flow distance  =   60.000(Ft.)
Highest elevation =  691.000(Ft.)
Lowest elevation =  671.000(Ft.)
Elevation difference =   20.000(Ft.) Slope = 33.333 %
Top of Initial Area Slope adjusted by User to  5.357 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   5.36 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.73 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8200)*(  90.000^.5)/(   5.357^(1/3)]=   2.73
Calculated TC of    2.733 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =      0.154(CFS)
Total initial stream area =        0.023(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     30.109(CFS)
Depth of flow =   0.242(Ft.), Average velocity =  10.275(Ft/s)
```

```
       ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             25.00              0.00
       3             50.00              0.50
Manning's 'N' friction factor =   0.013
-------------------------------------------------------------------
Sub-Channel flow  =     30.109(CFS)
  '     '       flow top width =     24.209(Ft.)
  '     '    velocity=   10.275(Ft/s)
  '     '       area =      2.930(Sq.Ft)
  '     '       Froude number =     5.205

Upstream point elevation =   691.000(Ft.)
Downstream point elevation =   514.980(Ft.)
Flow length =  1304.000(Ft.)
Travel time  =    2.12 min.
Time of concentration =    4.85 min.
Depth of flow =   0.242(Ft.)
Average velocity =  10.275(Ft/s)
Total irregular channel flow =    30.109(CFS)
Irregular channel normal depth above invert elev. =   0.242(Ft.)
Average velocity of channel(s) =  10.275(Ft/s)
 Adding area flow to channel
Calculated TC of    4.848 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                         ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.820  CA =      7.354
Subarea runoff =     59.909(CFS) for      8.945(Ac.)
Total runoff =     60.063(CFS)        Total area =       8.968(Ac.)
Depth of flow =   0.314(Ft.), Average velocity =  12.211(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      303.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.968(Ac.)
Runoff from this stream =     60.063(CFS)
Time of concentration =    4.85 min.
Rainfall intensity =     8.168(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      305.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                         ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Initial subarea total flow distance  =   80.000(Ft.)
```

```
Highest elevation =  604.000(Ft.)
Lowest elevation =  596.000(Ft.)
Elevation difference =    8.000(Ft.) Slope = 10.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  10.00 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.34 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8200)*( 100.000^.5)/(  10.000^(1/3)]=   2.34
Calculated TC of    2.339 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =      0.328(CFS)
Total initial stream area =        0.049(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      303.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.857(CFS)
Depth of flow =   0.125(Ft.), Average velocity =   2.383(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             25.00              0.00
       3             50.00              0.50
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =      1.857(CFS)
  '     '       flow top width =     12.486(Ft.)
  '     '    velocity=    2.383(Ft/s)
  '     '       area =      0.779(Sq.Ft)
  '     '       Froude number =     1.680

Upstream point elevation =   596.000(Ft.)
Downstream point elevation =   514.980(Ft.)
Flow length =   637.000(Ft.)
Travel time  =    4.46 min.
Time of concentration =    6.80 min.
Depth of flow =   0.125(Ft.)
Average velocity =   2.383(Ft/s)
Total irregular channel flow =     1.857(CFS)
Irregular channel normal depth above invert elev. =   0.125(Ft.)
Average velocity of channel(s) =   2.383(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.701(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      6.701(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.367  CA =      0.495
Subarea runoff =      2.988(CFS) for      1.299(Ac.)
Total runoff =      3.316(CFS)        Total area =       1.348(Ac.)
Depth of flow =   0.155(Ft.), Average velocity =   2.754(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      303.000
**** CONFLUENCE OF MAIN STREAMS ****
```

```
_____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.348(Ac.)
Runoff from this stream =      3.316(CFS)
Time of concentration =    6.80 min.
Rainfall intensity =     6.701(In/Hr)
Summary of stream data:

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


1       60.063      4.85               8.168
2        3.316      6.80               6.701
Qmax(1) =
          1.000 *    1.000 *    60.063) +
          1.000 *    0.713 *     3.316) + =      62.429
Qmax(2) =
          0.820 *    1.000 *    60.063) +
          1.000 *    1.000 *     3.316) + =      52.595

Total of 2 main streams to confluence:
Flow rates before confluence point:
      60.063       3.316
Maximum flow rates at confluence using above data:
       62.429       52.595
Area of streams before confluence:
        8.968        1.348


Results of confluence:
Total flow rate =     62.429(CFS)
Time of concentration =     4.848 min.
Effective stream area after confluence  =     10.316(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      309.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =   510.480(Ft.)
Downstream point/station elevation =   508.750(Ft.)
Pipe length  =   253.00(Ft.) Slope =   0.0068  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    62.429(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    62.429(CFS)
Normal flow depth in pipe =   29.30(In.)
Flow top width inside pipe =   33.72(In.)
Critical Depth =   30.23(In.)
Pipe flow velocity =      9.33(Ft/s)
Travel time through pipe =    0.45 min.
Time of concentration (TC) =     5.30 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      309.000
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     10.316(Ac.)
Runoff from this stream =     62.429(CFS)
Time of concentration =    5.30 min.
Rainfall intensity =     7.867(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      306.000 to Point/Station      307.000
**** INITIAL AREA EVALUATION ****
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =   32.000(Ft.)
Highest elevation =  553.310(Ft.)
Lowest elevation =  543.210(Ft.)
Elevation difference =   10.100(Ft.) Slope = 31.562 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  31.56 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.27 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  31.562^(1/3)]=   4.27
Calculated TC of    4.272 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.168(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.031(CFS)
Total initial stream area =        0.011(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      307.000 to Point/Station      308.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
____________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.339(CFS)
Depth of flow =   0.081(Ft.), Average velocity =   1.026(Ft/s)
       ******* Irregular Channel Data ***********
--------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1             0.00              0.50
       2            25.00              0.00
       3            50.00              0.50
Manning's 'N' friction factor =   0.035
--------------------------------------------------------------------
Sub-Channel flow  =      0.339(CFS)
  '     '       flow top width =      8.124(Ft.)
  '     '    velocity=    1.026(Ft/s)
  '     '       area =      0.330(Sq.Ft)
  '     '       Froude number =     0.897

Upstream point elevation =   543.210(Ft.)
Downstream point elevation =   517.860(Ft.)
Flow length =   606.000(Ft.)
Travel time  =    9.84 min.
Time of concentration =   14.12 min.
Depth of flow =   0.081(Ft.)
Average velocity =   1.026(Ft/s)
Total irregular channel flow =     0.339(CFS)
Irregular channel normal depth above invert elev. =   0.081(Ft.)
Average velocity of channel(s) =   1.026(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.182(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      4.182(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.135
Subarea runoff =      0.535(CFS) for      0.376(Ac.)
Total runoff =      0.566(CFS)        Total area =       0.387(Ac.)
Depth of flow =   0.099(Ft.), Average velocity =   1.167(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      309.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   509.690(Ft.)
Downstream point/station elevation =   508.750(Ft.)
Pipe length  =    50.00(Ft.) Slope =   0.0188  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.566(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.566(CFS)
Normal flow depth in pipe =    3.83(In.)
Flow top width inside pipe =    5.76(In.)
Critical Depth =    4.60(In.)
Pipe flow velocity =      4.29(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    14.31 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      309.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.387(Ac.)
Runoff from this stream =      0.566(CFS)
Time of concentration =   14.31 min.
Rainfall intensity =     4.145(In/Hr)
Summary of stream data:

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


1       62.429      5.30               7.867
2        0.566     14.31               4.145
Qmax(1) =
          1.000 *    1.000 *    62.429) +
          1.000 *    0.370 *     0.566) + =      62.639
Qmax(2) =
          0.527 *    1.000 *    62.429) +
          1.000 *    1.000 *     0.566) + =      33.461

Total of 2 main streams to confluence:
Flow rates before confluence point:
      62.429       0.566
Maximum flow rates at confluence using above data:
       62.639       33.461
Area of streams before confluence:
       10.316        0.387


Results of confluence:
Total flow rate =     62.639(CFS)
Time of concentration =     5.300 min.
Effective stream area after confluence  =     10.703(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      220.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   508.750(Ft.)
Downstream point/station elevation =   503.280(Ft.)
```

```
Pipe length  =   732.00(Ft.) Slope =   0.0075  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    62.639(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    62.639(CFS)
Normal flow depth in pipe =   28.31(In.)
Flow top width inside pipe =   34.79(In.)
Critical Depth =   30.26(In.)
Pipe flow velocity =      9.70(Ft/s)
Travel time through pipe =    1.26 min.
Time of concentration (TC) =     6.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      220.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     10.703(Ac.)
Runoff from this stream =     62.639(CFS)
Time of concentration =    6.56 min.
Rainfall intensity =     6.857(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      113.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity (I) =      4.146(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  14.31 min.  Rain intensity =       4.15(In/Hr)
Total area =        5.621(Ac.)  Total runoff =    28.050(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      220.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   505.490(Ft.)
Downstream point/station elevation =   503.280(Ft.)
Pipe length  =   345.00(Ft.) Slope =   0.0064  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.050(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    28.050(CFS)
Normal flow depth in pipe =   21.33(In.)
Flow top width inside pipe =   27.20(In.)
Critical Depth =   21.68(In.)
Pipe flow velocity =      7.51(Ft/s)
Travel time through pipe =    0.77 min.
Time of concentration (TC) =    15.07 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      220.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      5.621(Ac.)
Runoff from this stream =     28.050(CFS)
Time of concentration =   15.07 min.
Rainfall intensity =     4.009(In/Hr)
```

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Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      207.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity (I) =      2.286(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  36.00 min.  Rain intensity =       2.29(In/Hr)
Total area =        8.608(Ac.)  Total runoff =     9.614(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      220.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   504.190(Ft.)
Downstream point/station elevation =   503.280(Ft.)
Pipe length  =    34.00(Ft.) Slope =   0.0268  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.614(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     9.614(CFS)
Normal flow depth in pipe =   11.23(In.)
Flow top width inside pipe =   13.02(In.)
Critical Depth =   14.09(In.)
Pipe flow velocity =      9.76(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    36.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      220.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      8.608(Ac.)
Runoff from this stream =      9.614(CFS)
Time of concentration =   36.06 min.
Rainfall intensity =     2.284(In/Hr)
Summary of stream data:

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


1       62.639      6.56               6.857
2       28.050     15.07               4.009
3        9.614     36.06               2.284
Qmax(1) =
          1.000 *    1.000 *    62.639) +
          1.000 *    0.435 *    28.050) +
          1.000 *    0.182 *     9.614) + =      76.590
Qmax(2) =
          0.585 *    1.000 *    62.639) +
          1.000 *    1.000 *    28.050) +
          1.000 *    0.418 *     9.614) + =      68.688
Qmax(3) =
          0.333 *    1.000 *    62.639) +
          0.570 *    1.000 *    28.050) +
          1.000 *    1.000 *     9.614) + =      46.456
```

```
Total of 3 main streams to confluence:
Flow rates before confluence point:
      62.639      28.050       9.614
Maximum flow rates at confluence using above data:
       76.590       68.688       46.456
Area of streams before confluence:
       10.703        5.621        8.608


Results of confluence:
Total flow rate =     76.590(CFS)
Time of concentration =     6.557 min.
Effective stream area after confluence  =     24.932(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      221.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   503.280(Ft.)
Downstream point/station elevation =   503.000(Ft.)
Pipe length  =    34.00(Ft.) Slope =   0.0082  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    76.590(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =    76.590(CFS)
Normal flow depth in pipe =   29.44(In.)
Flow top width inside pipe =   38.46(In.)
Critical Depth =   32.85(In.)
Pipe flow velocity =     10.63(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     6.61 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      221.000 to Point/Station      224.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   0.282(Ft.), Average velocity =  19.237(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             25.00              0.00
       3             50.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =     76.592(CFS)
  '     '       flow top width =     28.218(Ft.)
  '     '    velocity=   19.238(Ft/s)
  '     '       area =      3.981(Sq.Ft)
  '     '       Froude number =     9.026

Upstream point elevation =   503.000(Ft.)
Downstream point elevation =   489.500(Ft.)
Flow length =    35.000(Ft.)
Travel time  =    0.03 min.
Time of concentration =    6.64 min.
Depth of flow =   0.282(Ft.)
Average velocity =  19.237(Ft/s)
Total irregular channel flow =    76.590(CFS)
Irregular channel normal depth above invert elev. =   0.282(Ft.)
Average velocity of channel(s) =  19.237(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      224.000 to Point/Station      224.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
```

```
Stream flow area =     24.932(Ac.)
Runoff from this stream =     76.590(CFS)
Time of concentration =    6.64 min.
Rainfall intensity =     6.802(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      222.000 to Point/Station      223.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  130.000(Ft.)
Highest elevation =  501.150(Ft.)
Lowest elevation =  501.020(Ft.)
Elevation difference =    0.130(Ft.) Slope =  0.100 %
Top of Initial Area Slope adjusted by User to 12.121 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  12.12 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.88 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  12.121^(1/3)]=   5.88
Rainfall intensity (I) =      7.359(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.106(CFS)
Total initial stream area =        0.041(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      223.000 to Point/Station      224.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.644(CFS)
Depth of flow =   0.122(Ft.), Average velocity =   0.867(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             25.00              0.00
       3             50.00              0.50
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =      0.645(CFS)
  '     '       flow top width =     12.191(Ft.)
  '     '    velocity=    0.867(Ft/s)
  '     '       area =      0.743(Sq.Ft)
  '     '       Froude number =     0.619

Upstream point elevation =   501.020(Ft.)
Downstream point elevation =   489.500(Ft.)
Flow length =   662.000(Ft.)
Travel time  =   12.72 min.
Time of concentration =   18.60 min.
Depth of flow =   0.122(Ft.)
Average velocity =   0.867(Ft/s)
Total irregular channel flow =     0.644(CFS)
Irregular channel normal depth above invert elev. =   0.122(Ft.)
Average velocity of channel(s) =   0.867(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      3.500(In/Hr) for a   100.0 year storm
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      3.500(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.311
Subarea runoff =      0.984(CFS) for      0.848(Ac.)
Total runoff =      1.089(CFS)        Total area =       0.889(Ac.)
Depth of flow =   0.148(Ft.), Average velocity =   0.989(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      224.000 to Point/Station      224.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.889(Ac.)
Runoff from this stream =      1.089(CFS)
Time of concentration =   18.60 min.
Rainfall intensity =     3.500(In/Hr)
Summary of stream data:

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


1       76.590      6.64               6.802
2        1.089     18.60               3.500
Qmax(1) =
           1.000 *    1.000 *    76.590) +
           1.000 *    0.357 *     1.089) + =      76.979
Qmax(2) =
           0.515 *    1.000 *    76.590) +
           1.000 *    1.000 *     1.089) + =      40.507

Total of 2 main streams to confluence:
Flow rates before confluence point:
      76.590       1.089
Maximum flow rates at confluence using above data:
       76.979       40.507
Area of streams before confluence:
       24.932        0.889


Results of confluence:
Total flow rate =     76.979(CFS)
Time of concentration =     6.641 min.
Effective stream area after confluence  =     25.821(Ac.)
End of computations, total study area =          25.821 (Ac.)
```

CIVILD ANALYSIS
POST-DEVELOPED CONDITIONS
POC-B

```
               San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 07/26/21
--------------------------------------------------------------------------
POST DEVELOPMENT - POC B
100 YEAR - RATIONAL METHOD ANALYSIS
BY WARE MALCOMB
file:PostB.rsd3
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 6491

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

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.100
24 hour precipitation(inches) =  6.000
P6/P24 =    51.7%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station     4020.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =   39.000(Ft.)
Highest elevation =  553.000(Ft.)
Lowest elevation =  549.000(Ft.)
Elevation difference =    4.000(Ft.) Slope = 10.256 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  10.26 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.21 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  10.256^(1/3)]=   6.21
Rainfall intensity (I) =      7.100(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.017(CFS)
Total initial stream area =        0.007(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      403.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.134(CFS)
Depth of flow =   0.080(Ft.), Average velocity =   1.764(Ft/s)
       ******* Irregular Channel Data ***********
--------------------------------------------------------------------
Information entered for subchannel number 1 :
```

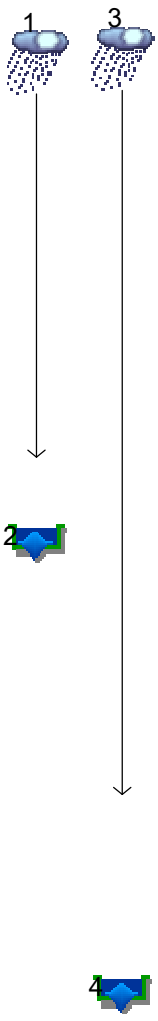
```
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             50.00              0.00
       3            100.00              0.50
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =      1.134(CFS)
  '     '       flow top width =     16.037(Ft.)
  '     '    velocity=    1.764(Ft/s)
  '     '       area =      0.643(Sq.Ft)
  '     '       Froude number =     1.552

Upstream point elevation =   549.000(Ft.)
Downstream point elevation =   485.870(Ft.)
Flow length =   502.000(Ft.)
Travel time  =    4.74 min.
Time of concentration =   10.96 min.
Depth of flow =   0.080(Ft.)
Average velocity =   1.764(Ft/s)
Total irregular channel flow =     1.134(CFS)
Irregular channel normal depth above invert elev. =   0.080(Ft.)
Average velocity of channel(s) =   1.764(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.924(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      4.924(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.442
Subarea runoff =      2.161(CFS) for      1.257(Ac.)
Total runoff =      2.178(CFS)        Total area =       1.264(Ac.)
Depth of flow =   0.102(Ft.), Average velocity =   2.076(Ft/s)
End of computations, total study area =           1.264 (Ac.)
```

Attachment 4 – Hydraulic Analysis

HYDRAFLOW ANALYSIS
UNDERGROUND DETENTION

Watershed Model Schematic

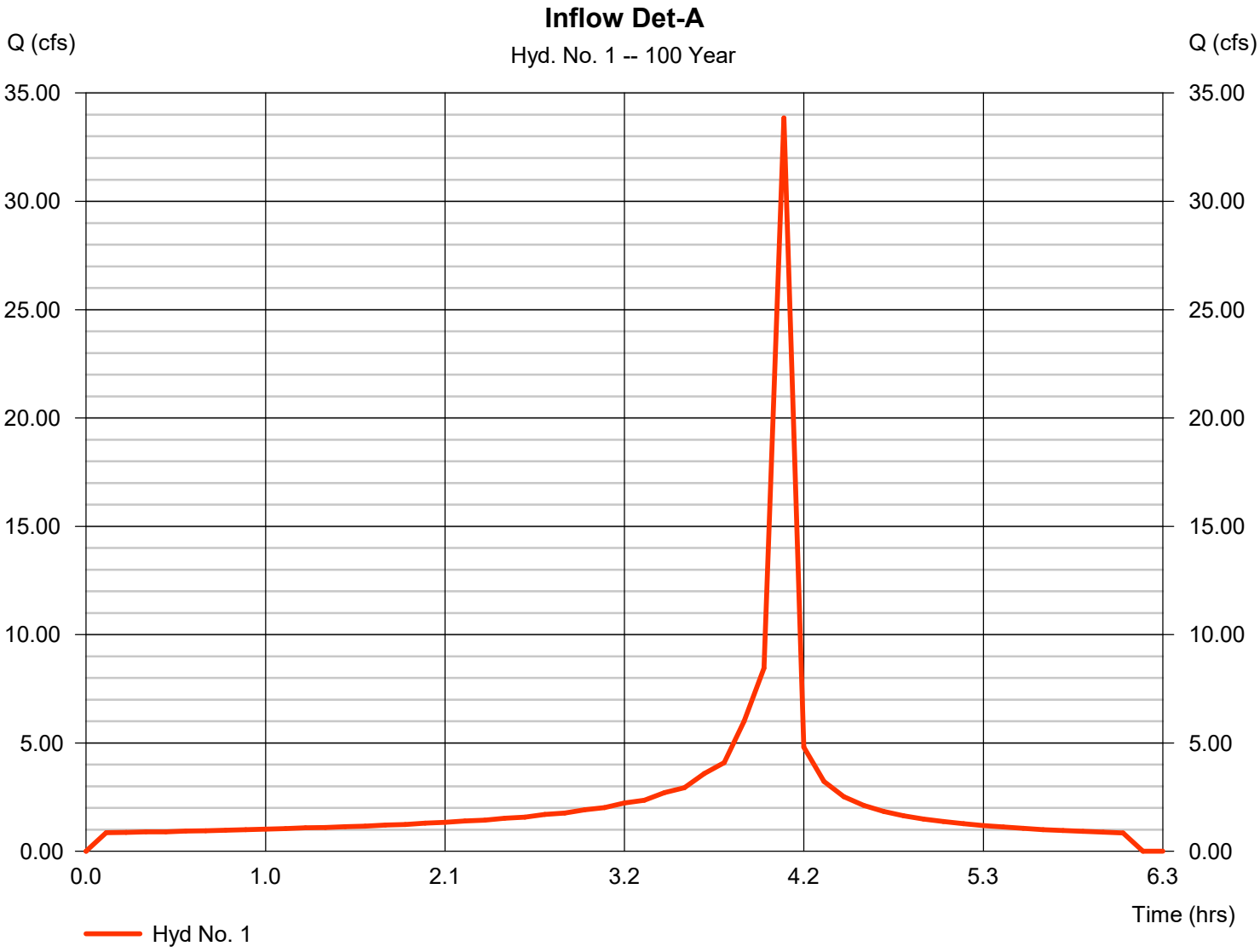


Hydrograph Report

Hyd. No. 1

Inflow Det-A

Hydrograph type	= Manual	Peak discharge	= 33.85 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.08 hrs
Time interval	= 7 min	Hyd. volume	= 53,243 cuft



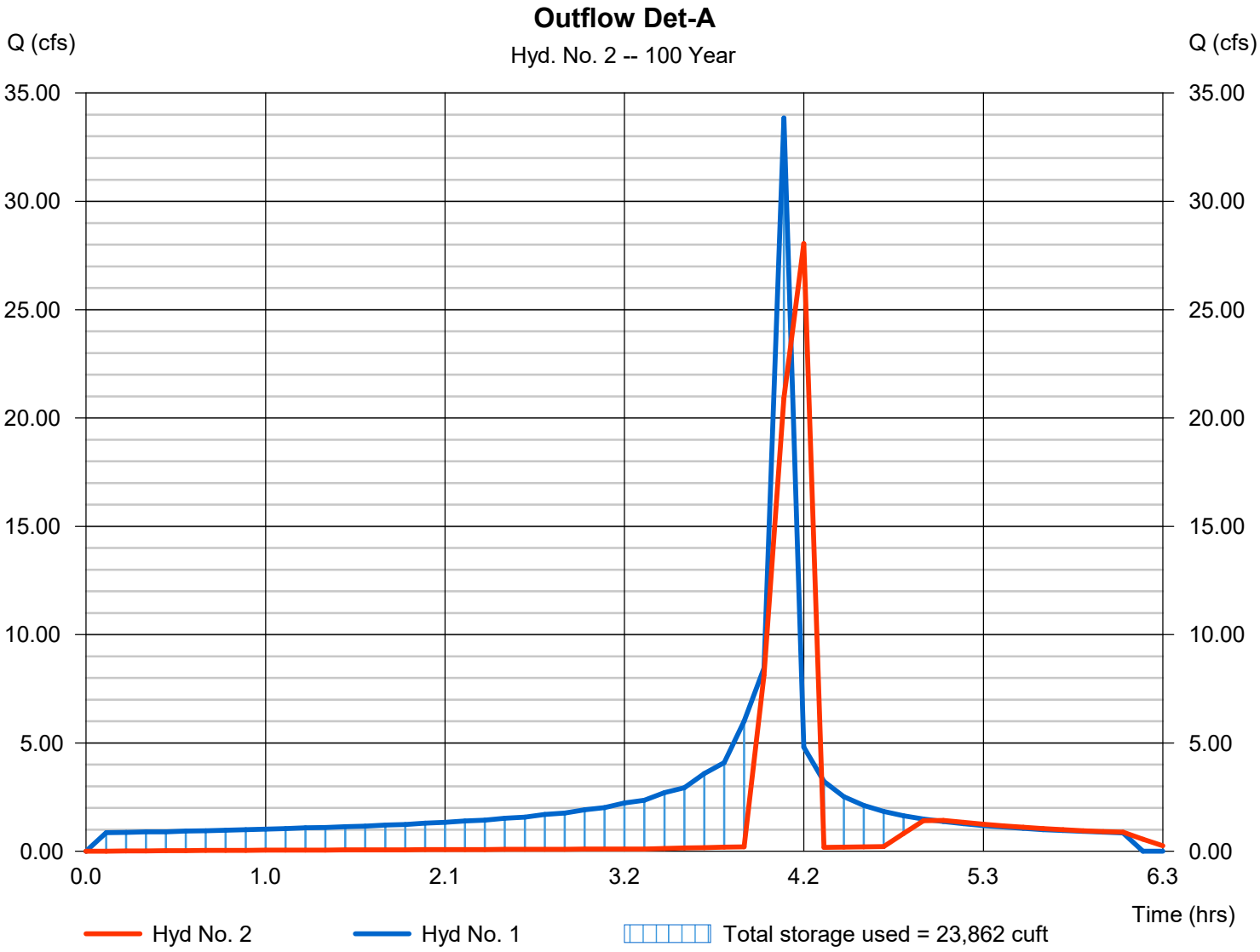
Hydrograph Report

Hyd. No. 2

Outflow Det-A

Hydrograph type	=	Reservoir	Peak discharge	=	28.05 cfs
Storm frequency	=	100 yrs	Time to peak	=	4.20 hrs
Time interval	=	7 min	Hyd. volume	=	53,157 cuft
Inflow hyd. No.	=	1 - Inflow Det-A	Max. Elevation	=	103.58 ft
Reservoir name	=	Det-A	Max. Storage	=	23,862 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Det-A

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 100.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	7,300	0	0
0.50	100.50	7,300	3,650	3,650
1.00	101.00	7,300	3,650	7,299
1.50	101.50	7,300	3,650	10,949
2.00	102.00	7,300	3,650	14,599
2.50	102.50	7,300	3,650	18,248
3.00	103.00	7,300	3,650	21,898
3.10	103.50	7,300	730	22,628
3.20	103.20	7,300	730	23,358
3.30	103.30	7,300	730	24,088
3.40	103.40	7,300	730	24,818
3.50	103.50	7,300	730	25,547

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 2.00	2.00	0.00	0.00
Span (in)	= 2.00	2.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 100.00	102.00	0.00	0.00
Length (ft)	= 10.00	10.00	0.00	0.00
Slope (%)	= 1.00	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

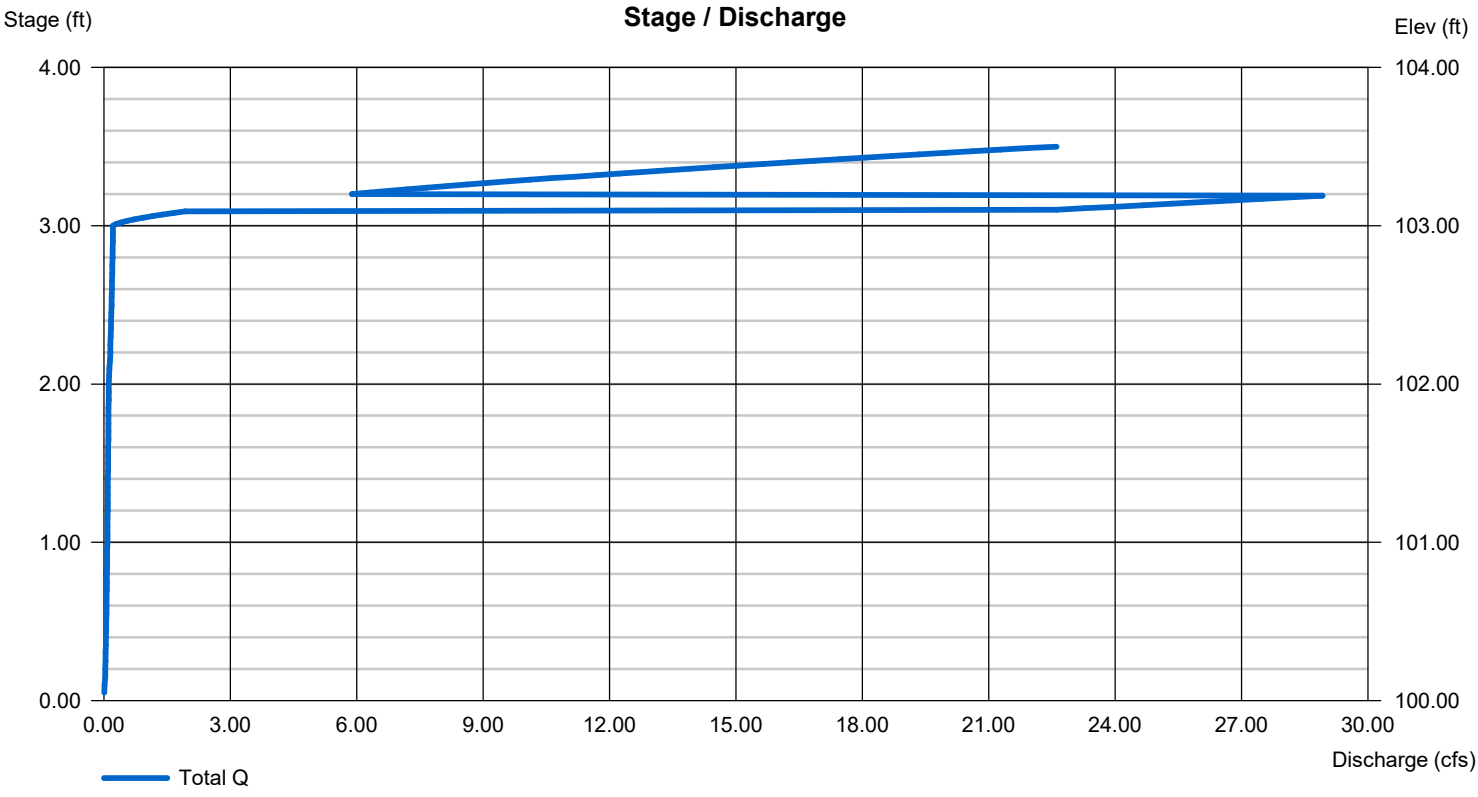
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 19.00	0.00	0.00	0.00
Crest El. (ft)	= 103.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

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

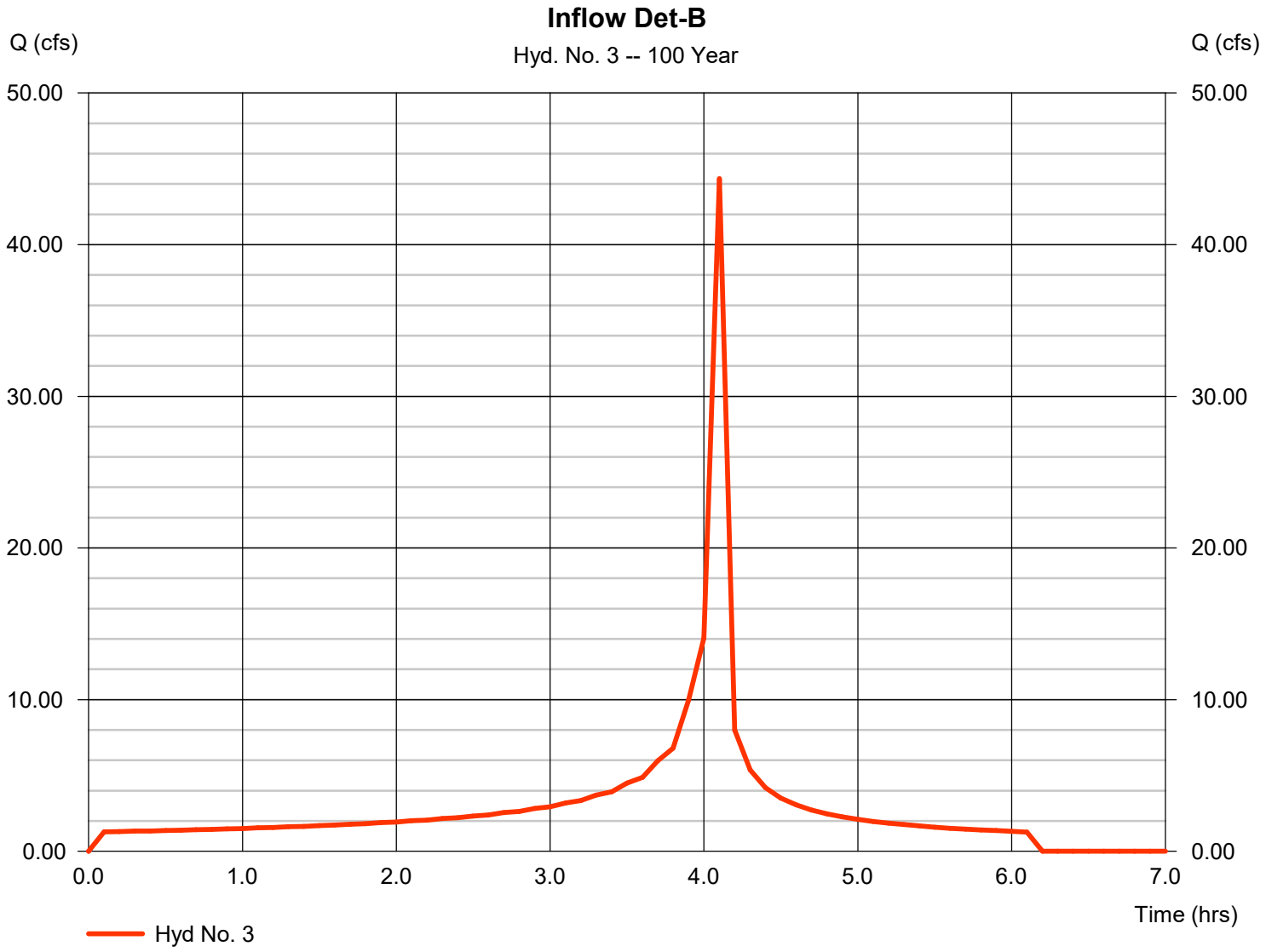


Hydrograph Report

Hyd. No. 3

Inflow Det-B

Hydrograph type	= Manual	Peak discharge	= 44.34 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.10 hrs
Time interval	= 6 min	Hyd. volume	= 75,848 cuft



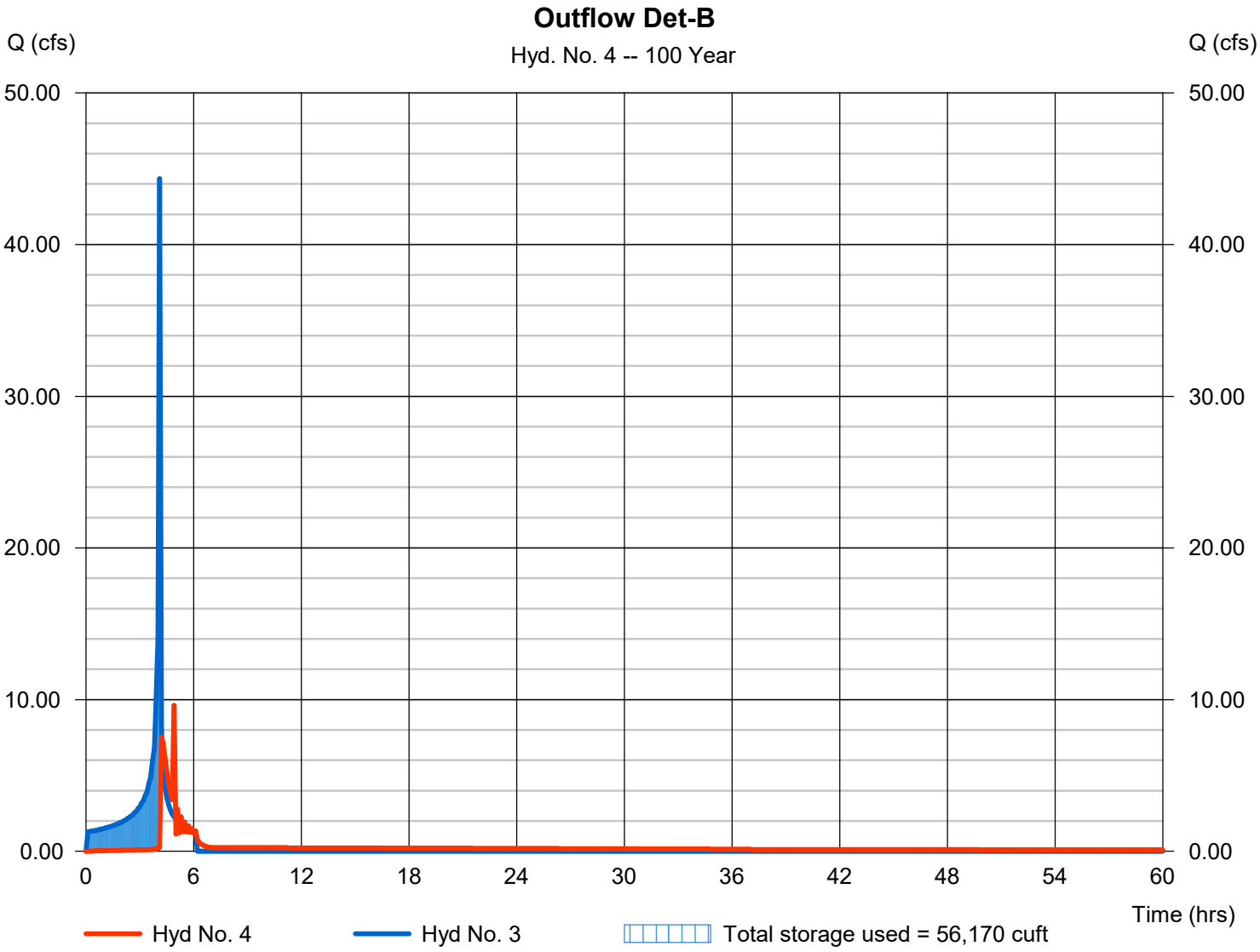
Hydrograph Report

Hyd. No. 4

Outflow Det-B

Hydrograph type	=	Reservoir	Peak discharge	=	9.614 cfs
Storm frequency	=	100 yrs	Time to peak	=	4.90 hrs
Time interval	=	6 min	Hyd. volume	=	75,693 cuft
Inflow hyd. No.	=	3 - Inflow Det-B	Max. Elevation	=	104.07 ft
Reservoir name	=	Det-B	Max. Storage	=	56,170 cuft

Storage Indication method used.



Pond Report

Pond No. 2 - Det-B

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 100.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	14,200	0	0
0.50	100.50	14,200	7,099	7,099
1.00	101.00	14,200	7,099	14,199
1.50	101.50	14,200	7,099	21,298
2.00	102.00	14,200	7,099	28,397
2.50	102.50	14,200	7,099	35,496
3.00	103.00	14,200	7,099	42,596
3.50	103.50	14,200	7,099	49,695
3.60	104.00	14,200	1,420	51,115
3.70	103.70	14,200	1,420	52,535
3.80	103.80	14,200	1,420	53,955
3.90	103.90	14,200	1,420	55,374
4.00	104.00	14,200	1,420	56,794

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 2.00	2.00	0.00	0.00
Span (in)	= 2.00	2.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 100.00	102.00	0.00	0.00
Length (ft)	= 10.00	10.00	0.00	0.00
Slope (%)	= 1.00	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.65	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

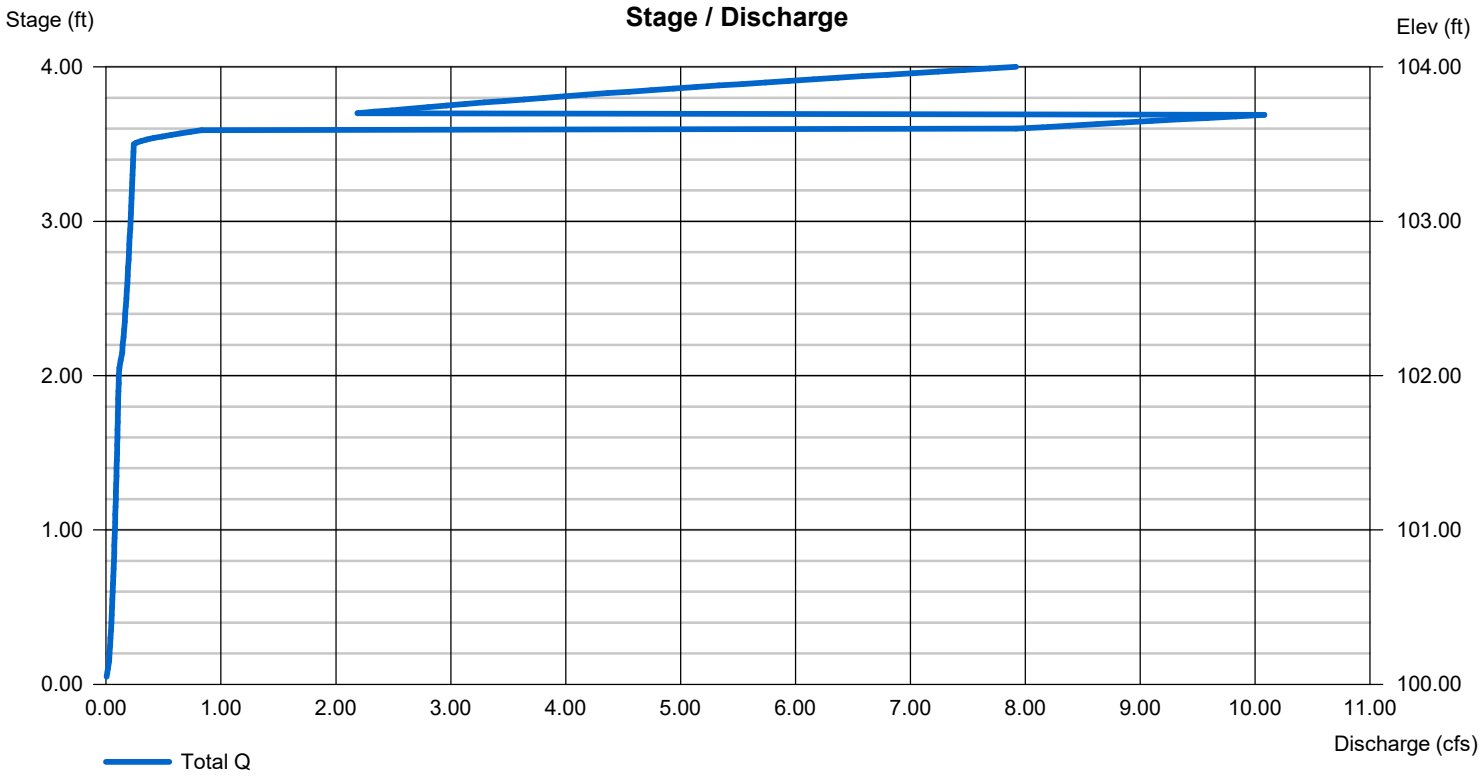
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.50	0.00	0.00	0.00
Crest El. (ft)	= 103.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

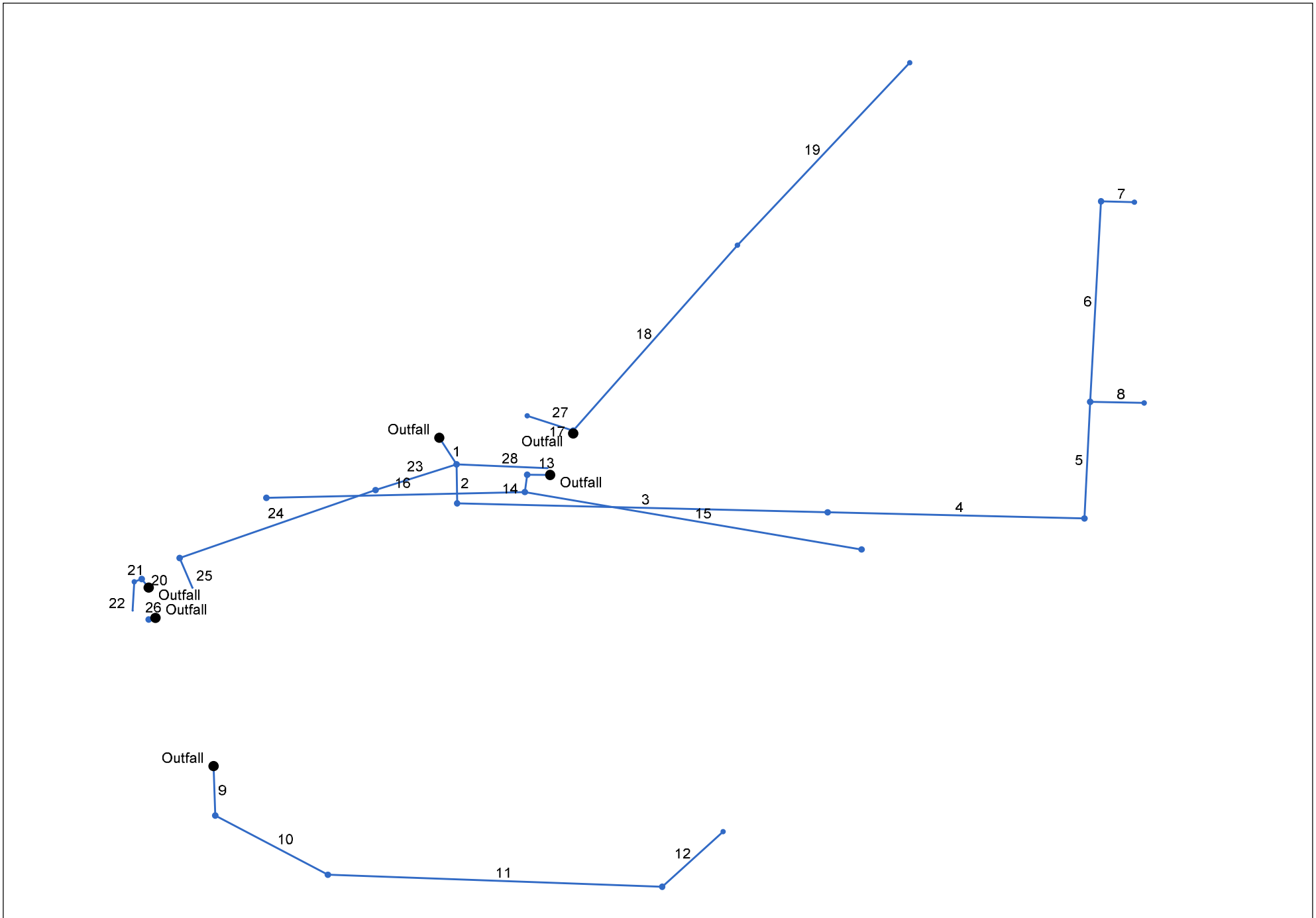
TW Elev. (ft) = 0.00

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



HYDRAFLOW ANALYSIS
STORM DRAIN HYDRAULICS

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: New.stm	Number of lines: 28	Date: 6/8/2021

MyReport

Line No.	Line ID	Line Size (in)	Line Length (ft)	Line Slope (%)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	Gnd/Rim El Dn (ft)	Vel Ave (ft/s)	Vel Ave (ft/s)	HGL Up (ft)	HGL Dn (ft)	EGL Up (ft)	EGL Dn (ft)	Flow Rate (cfs)	Capac Full (cfs)	n-val Pipe	Defl Ang (Deg)	J-Loss Coeff	
1	A1	36	32.263	0.50	503.28	503.12	511.63	0.00	8.27	8.27	505.60	505.37	506.63	506.46	47.66	50.84	0.012	62.635	1.00	
2	B1	36	42.073	0.75	503.70	503.38	514.72	511.63	3.87	3.87	506.68	506.63	506.92	506.86	27.35	62.57	0.012	26.601	1.00	
3	B2	36	322.360	0.75	506.22	503.80	514.14	514.72	5.27	5.27	507.91 j	506.92	508.60	507.15	27.35	62.57	0.012	-87.528	0.15 z	
4	B3	36	223.586	0.50	507.44	506.32	514.75	514.14	6.94	6.94	509.13	507.91	509.82	508.60	27.35	51.09	0.012	-0.016	1.00 z	
5	B4	30	125.885	0.50	508.57	507.94	514.34	514.75	7.21	7.21	510.37	509.74	511.18	510.55	27.35	31.42	0.012	-89.247	1.00	
6	B5	30	216.232	0.50	509.75	508.67	514.02	514.34	5.56	5.56	511.74	511.18	512.30	511.59	25.11	31.42	0.012	0.000	1.00	
7	B6	24	29.048	0.50	510.40	510.25	514.98	514.02	7.99	7.99	512.61	512.30	513.60	513.29	25.11	17.33	0.012	89.507	1.00	
8	B7	24	46.990	1.00	509.64	509.17	518.34	514.34	0.91	0.91	511.18	511.18	511.20	511.19	2.59	24.50	0.012	89.136	1.00	
9	A6	30	53.320	0.50	506.33	506.06	513.73	0.00	7.52	7.52	508.36	507.96	509.18	508.90	31.09	31.42	0.012	88.308	0.85	
10	A7	30	116.745	0.50	507.01	506.43	515.57	513.73	3.38	3.38	509.17	509.06	509.37	509.22	15.91	31.42	0.012	-55.159	0.56	
11	A8	24	291.312	0.50	508.97	507.51	516.85	515.57	5.95	5.95	510.42	509.28	511.08	509.74	15.91	17.33	0.012	-30.595	0.81	
12	A9	24	79.864	0.50	509.47	509.07	513.21	516.85	5.35	5.35	511.20	510.95	511.67	511.37	15.91	17.33	0.012	-50.695	1.00	
13	C1	24	19.868	6.39	505.24	503.97	511.69	505.62	7.53	7.53	506.87	505.60	507.75	506.48	20.58	61.95	0.012	-179.250	1.00 z	
14	C2	24	18.673	6.37	506.53	505.34	514.62	511.69	7.77	7.77	508.16	506.87	509.04	507.75	20.58	61.87	0.012	-84.391	1.00 z	
15	C4	18	299.496	1.00	510.03	507.03	514.03	514.62	7.04	7.04	511.51	508.36	512.24	509.18	12.02	11.38	0.012	-84.437	1.00	
16	C3	18	225.435	1.30	509.96	507.03	513.81	514.62	6.41	6.41	511.14	508.16	511.75	508.77	9.34	12.97	0.012	82.028	1.00 z	
17	D2	24	3.110	1.38	504.01	503.97	510.16	506.15	8.80	8.80	505.80	505.76	507.00	506.96	26.05	28.81	0.012	-89.860	0.94 z	
18	D3	24	245.625	1.00	506.57	504.11	511.84	510.16	5.77	5.77	507.95 j	505.80	508.57	506.43	14.69	24.50	0.012	35.423	0.15 z	
19	D4	24	247.289	1.00	509.14	506.67	513.73	511.84	4.09	4.09	510.09 j	507.95	510.45	508.31	7.06	24.50	0.012	1.767	1.00 z	
20	A10	18	11.107	0.50	506.12	506.06	509.68	0.00	3.39	3.39	506.60	506.55	506.78	506.73	1.69	8.04	0.012	-123.088	0.99 z	
21	A11	12	7.489	0.50	506.66	506.62	509.70	509.68	3.66	3.66	507.23	507.19	507.44	507.40	1.69	2.73	0.012	-81.372	0.91	
22	A12	12	31.078	0.50	506.82	506.66	0.00	509.70	2.38	2.38	507.24	507.42	507.39	507.58	1.00	2.73	0.012	-63.394	1.00 z	
23	A2	30	75.656	0.81	503.99	503.38	512.09	511.63	4.03	4.03	506.78	506.63	507.03	506.88	19.76	39.91	0.012	95.892	0.15	

Project File: New.stm | Number of lines: 28 | Date: 6/8/2021

NOTES: ** Critical depth

MyReport

Line No.	Line ID	Line Size (in)	Line Length (ft)	Line Slope (%)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	Gnd/Rim El Dn (ft)	Vel Ave (ft/s)	Vel Ave (ft/s)	HGL Up (ft)	HGL Dn (ft)	EGL Up (ft)	EGL Dn (ft)	Flow Rate (cfs)	Capac Full (cfs)	n-val Pipe	Defl Ang (Deg)	J-Loss Coeff	
24	A3	30	185.561	0.81	505.59	504.09	512.05	512.09	5.21	5.21	507.10 j	506.81	507.73	507.07	19.76	39.91	0.012	-1.777	1.00 z	
25	A4	30	33.843	0.81	505.96	505.69	0.00	512.05	6.65	6.65	507.47	507.10	508.10	507.73	19.76	39.91	0.012	-85.894	1.00 z	
26	A5	12	6.183	12.00	506.80	506.06	510.91	0.00	4.49	4.49	507.49	506.75	507.81	507.06	2.60	13.36	0.012	164.205	1.00 z	
27	D5	18	43.492	5.00	506.68	504.51	509.91	510.16	7.05	7.05	507.97 j	505.80	508.75	506.57	11.39	25.44	0.012	-68.587	1.00 z	
28	D1	24	79.236	0.61	503.87	503.39	505.51	511.63	0.93	0.93	506.64	506.63	506.65	506.64	2.92	19.11	0.012	-59.726	1.00	

Project File: New.stm | Number of lines: 28 | Date: 6/8/2021

NOTES: ** Critical depth

BIOCLEAN URBANPOND AND MODULAR WETLAND SYSTEM (MWS) DETAIL DETENTION A

SITE SPECIFIC DATA*

PROJECT NUMBER	12255
PROJECT NAME	DIB2 – SWEETWATER
PROJECT LOCATION	SPRING VALLEY, CA
STRUCTURE ID	SYSTEM A
REQUIRED STORAGE VOLUME (CF)	25,900
REQUIRED DCV (CF)	12,324
REQUIRED HYDROMOD VOLUME (CF)	13,576

PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	505.96	HDPE	30"
INLET PIPE 2	505.56	HDPE	18"
INLET PIPE 3	505.56	HDPE	18"
INLET PIPE 4	505.56	HDPE	18"
OUTLET PIPE 1	505.46	HDPE	12"
OUTLET PIPE 2	505.46	HDPE	30"
FINISHED GRADE ELEVATION		511.5±	
TOP OF VAULT ELEVATION		509.54	
TOP OF LINKUP SLABS		510.12	
SURFACE LOADING REQUIREMENT			HS20
FRAME AND COVER			ø30"
CORROSIVE SOIL CONDITIONS			NA
KNOWN GROUNDWATER ELEVATION			NA

NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.
FINISHED GRADE ELEVATION ABOVE URBANPOND SYSTEM A MUST BE AT LEAST 511.12'.
*PER ENGINEER OF RECORD

URBANPOND MODULES

TYPE	HEIGHT	COUNT
8'X8' INTERIOR	3'–6"	1
8'x8' PERIMETER	3'–6"	2
8'X16' INTERIOR	3'–6"	21
8'X16' PERIMETER	3'–6"	38
9'X9' LINKUP SLAB	7"	2
9'X17' LINKUP SLAB	7"	10
8'X16' OUTLET MODULE	3'–6"	1

SIDEWALLS

LENGTH (FT)	HEIGHT (FT)	COUNT
8'–0"	4'–1"	2
8'–7"	4'–1"	3
16'–0.25"	4'–1"	1
17'–2"	4'–1"	1

TOTAL STORAGE CAPACITY @ 3' DEPTH

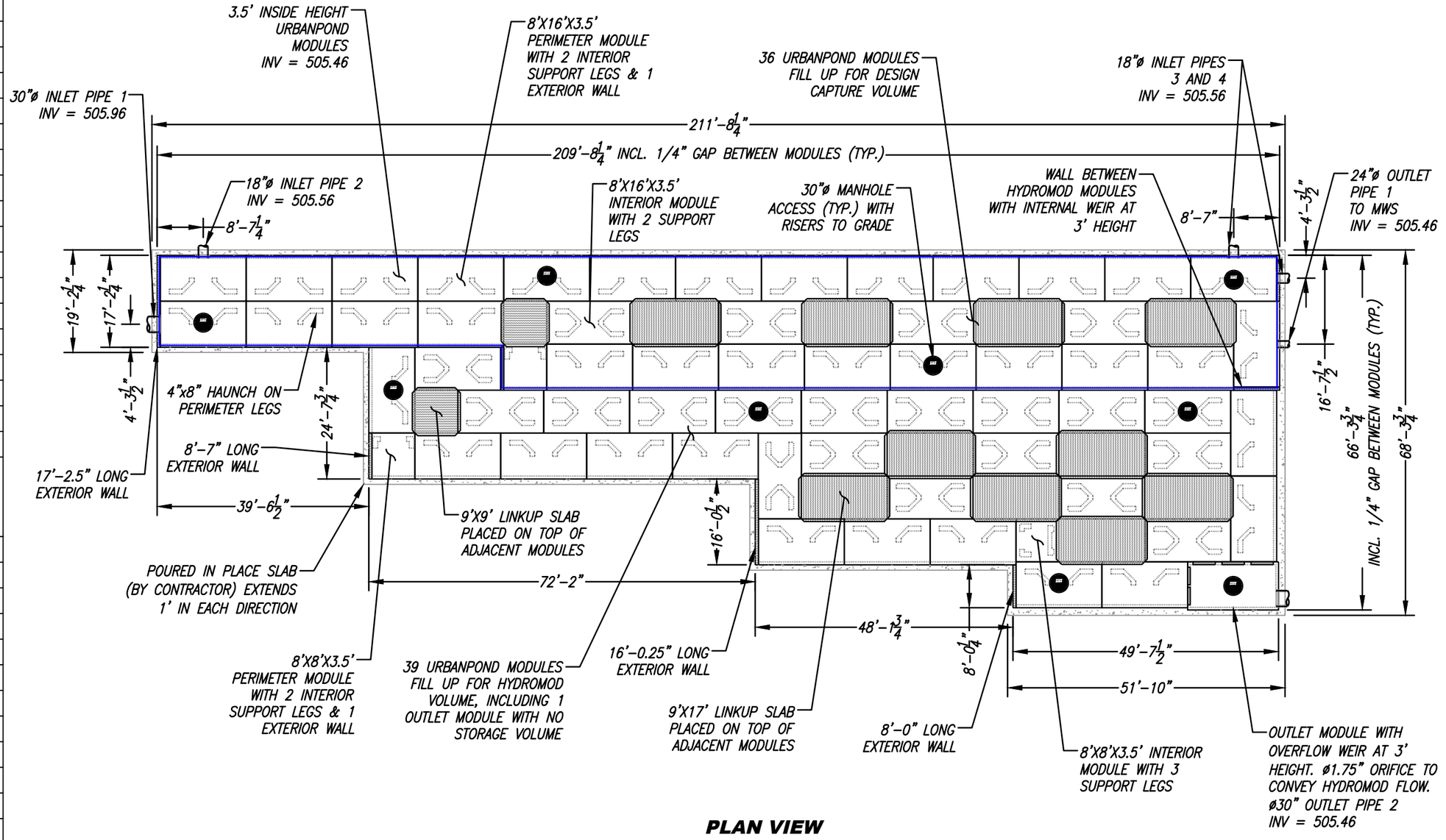
TOTAL WATER VOLUME = 26,255 CF
DCV = 12,901 CF
HYDROMOD = 13,354 CF

1:250 SCALE

GRADE ADJUSTMENT RISERS

	3"	6"	12"
30"ø	9	0	9

HEAVIEST PIECE: 8'X16' PERIM. MODULE = 21,175 LBS.

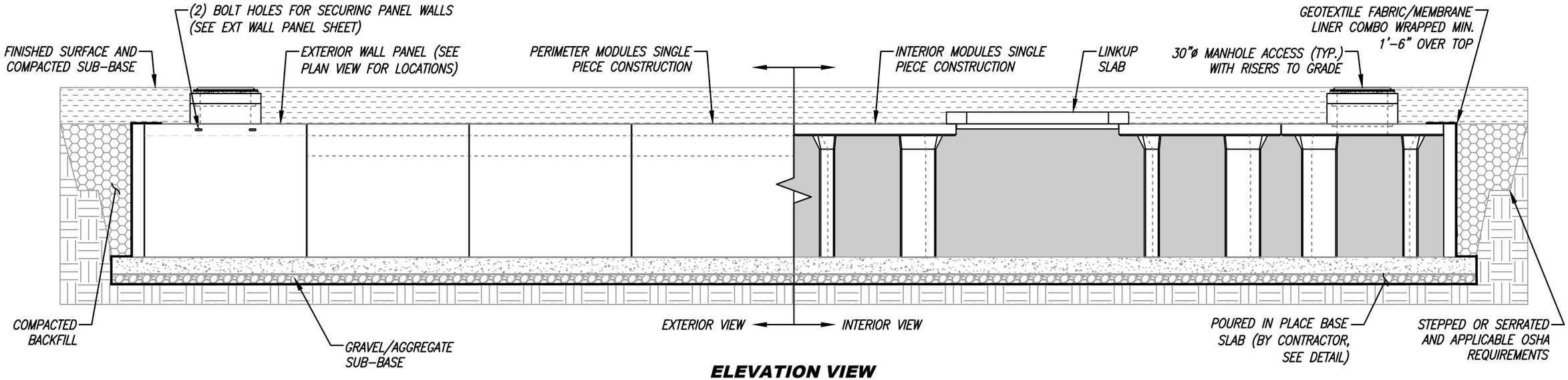


PLAN VIEW

Bio Clean
A Forterra Company

URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
PLAN VIEW

7/13/21MWOOLERY



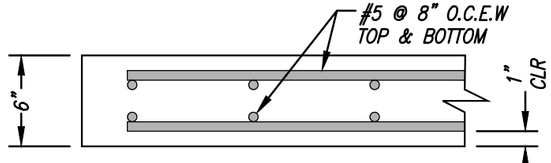
ELEVATION VIEW

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER REQUIRES A POURED IN PLACE CONCRETE BASE SLAB. SOIL COMPACTION REQUIREMENTS PER GEOTECHNICAL ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING RECOMMENDED COMPACTION AND BASE SPECIFICATIONS.
3. THIS SYSTEM REQUIRES A MEMBRANE LINER. THE LINER SHALL BE SANDWICHED BETWEEN AN INNER AND OUTER LAYER OF GEOTEXTILE FABRIC TO PROTECT AGAINST PUNCTURES. THE MEMBRANE LINER AND GEOTEXTILE FABRIC LAYERS SHALL WRAP UP ALL EXTERIOR WALLS ONTO THE TOP OF THE URBAN POND MODULES AND BE SECURED INTO PLACE BY THE BACKFILL.
4. CONTRACTOR TO PLACE FIRST LAYER OF GEOTEXTILE FABRIC IN THE EXCAVATED PIT AREA. THEN PLACE MEMBRANE LINER LAYER. THEN PLACE SECOND LAYER OF GEOTEXTILE FABRIC. A GRAVEL OR AGGREGATE LAYER OF SUB-BASE IS RECOMMENDED BELOW THE POURED IN PLACE BASE SLAB. THE GEOTEXTILE FABRIC SHALL WRAP UP AT LEAST 1' ALONG THE OUTER WALLS AND BE SECURED INTO PLACE WITH THE BACKFILL. THE MEMBRANE LINER PREVENTS STORMWATER FROM LEAKING OUT OF THE SYSTEM, AS WELL AS GROUNDWATER OR FINE SOIL PARTICLES FROM ENTERING INTO THE SYSTEM.
5. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. PIPES CANNOT INTRUDE BEYOND FLUSH. INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR UNLESS OTHERWISE NOTED. ALL GAPS AROUND PIPES SHALL BE SEALED WATERTIGHT WITH A NON-SHRINK GROUT PER MANUFACTURER'S STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
6. PIPES OPENINGS THROUGH THE MEMBRANE LINER SHALLE BE SEALED USING PIPE BOOTS SUPPLIED BY THE LINER MANUFACTURER.
7. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLE FRAMES AND COVERS. CONTRACTOR TO GROUT ALL FRAMES AND COVERS TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
8. THE URBANPOND MODULE SYSTEM IS TO BE INSTALLED IN ACCORDANCE WITH ASTM C891-90, INSTALLATION OF UNDERGROUND PRECAST UTILITY STRUCTURES. PROJECT PLAN AND SPECIFICATIONS MUST BE FOLLOWED ALONG WITH ANY APPLICABLE REGULATIONS.
9. DESIGNATED EMBEDDED LIFTERS MUST BE USED. USE PROPER RIGGING TO ASSURE ALL LIFTERS ARE EQUALLY ENGAGED WITH A MINIMUM 60 DEGREE ANGLE ON SLINGS AS NOTED AND IN ACCORDANCE WITH MANUFACTURER'S LIFTING PROCEDURES. USE RIGGING THAT EQUALIZES THE LOAD BETWEEN ALL LIFTERS.
10. BIO CLEAN RECOMMENDS BEGINNING INSTALLATION WITH THE OUTLET MODULE.
11. MODULES MUST BE PLACED AS CLOSE TOGETHER AS POSSIBLE, AND GAPS SHALL NOT BE GREATER THAN 1/4".
12. INSTALL LINKUP SLABS ONLY AFTER ALL 4 SUPPORTING MODULES ARE IN PLACE. INSTALL LINKUP SLABS AS PROJECT PROGRESSES TO ENSURE BEST FIT.
13. ALL EXTERIOR SYSTEM JOINTS (SIDES AND TOP) SHALL BE COVERED WITH A MIN. 6" JOINT WRAP.
14. INSTALL PANEL WALLS AT DESIGNATED LOCATIONS ON THE PLAN VIEW DRAWING. SECURE PANEL WALLS WITH 2 BOLTS ON TOP.
15. THE FILL PLACED AROUND THE URBANPOND MODULES MUST BE DEPOSITED EVENLY, AT APPROXIMATELY THE SAME ELEVATION, AROUND ALL SIDES. AT NO TIME SHALL THE FILL BEHIND ONE SIDE BE MORE THAN 1'-0" HIGHER THAN THE FILL ON THE OPPOSITE SIDE. BACKFILL SHALL BE COMPACTED AND/OR VIBRATED TO ENSURE THAT BACKFILL MATERIAL IS WELL SEATED AND PROPERLY INTERLOCKED. CARE SHALL BE TAKEN TO PREVENT ANY WEDGING ACTION AGAINST THE STRUCTURE, AND ALL SLOPES WITHIN THE AREA TO BE BACKFILLED MUST BE STEPPED OR SERRATED TO PREVENT WEDGING ACTION. CARE SHALL ALSO BE TAKEN SO AS NOT TO DISRUPT THE JOINT WRAP FROM THE JOINT DURING THE BACKFILL PROCESS. BACKFILL MATERIAL MUST BE CLEAN, CRUSHED, ANGULAR NO. 57 (AASHTO M43) AGGREGATE OR NATIVE MATERIAL IF APPROVED BY THE SITE GEOTECHNICAL ENGINEER. IF NATIVE MATERIAL IS SUSCEPTIBLE TO MIGRATION, CONFIRM WITH GEOTECHNICAL ENGINEER AND PROVIDE PROTECTION AS REQUIRED.
16. AT NO TIME SHALL MACHINERY OR VEHICLES GREATER THAN THE DESIGN HS-20 LOADING CRITERIA TRAVEL ON TOP OF THE SYSTEM WITHOUT THE MINIMUM DESIGN COVERAGE. IF TRAVEL IS NECESSARY OVER THE SYSTEM PRIOR TO ACHIEVING THE MINIMUM DESIGN COVER, IT MAY BE NECESSARY TO REDUCE THE ULTIMATE LOAD/BURDEN OF THE OPERATING MACHINERY SO AS NOT TO EXCEED THE CAPACITY OF THE SYSTEM. IN SOME CASES HAND OPERATED COMPACTION EQUIPMENT MAY BE NECESSARY IN ORDER TO NOT EXCEED THE ALLOTTED DESIGN LOADING.
17. A PRE-CONSTRUCTION MEETING IS REQUIRED PRIOR TO PLACEMENT OF URBANPOND.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT MANUFACTURER.
3. ANY VARIATION FOUND DURING CONSTRUCTION FROM THE SITE AND SYSTEM ANALYSIS MUST BE REPORTED TO THE PROJECT DESIGN ENGINEER.
4. CONCRETE BASE SLAB F'C = 4,000 PSI AT 28 DAYS
   FY = 40,000 PSI
   GROUT (NON-SHRINK) FM = 6,000 PSI



POURED IN PLACE BASE SLAB DETAIL

3/24/21SSERTICH

1:60 SCALE

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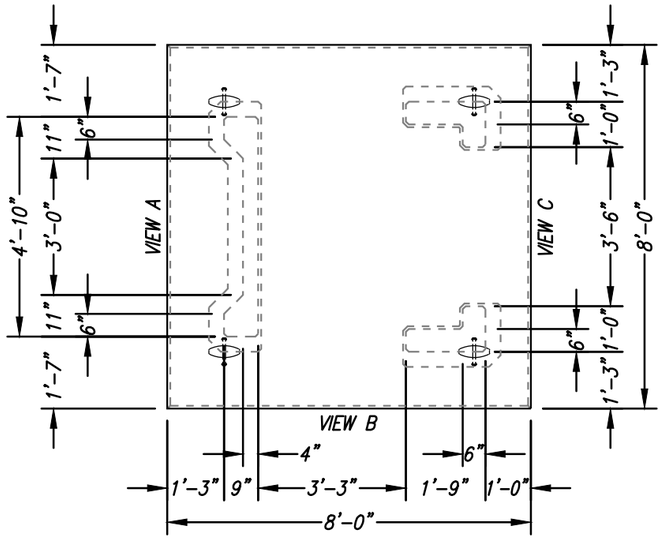
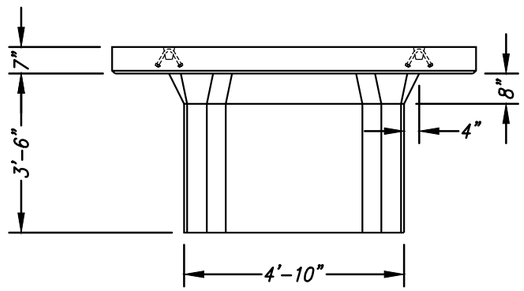
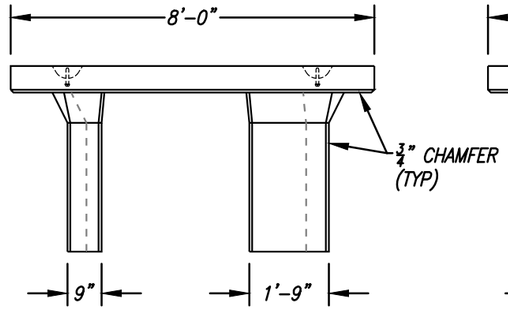
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
GENERAL ELEVATION DETAILS



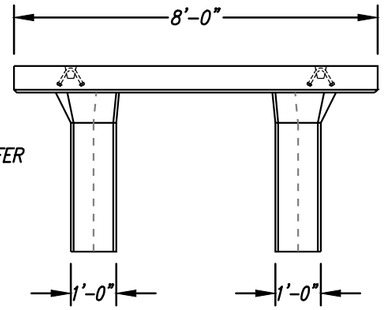
TOP VIEW



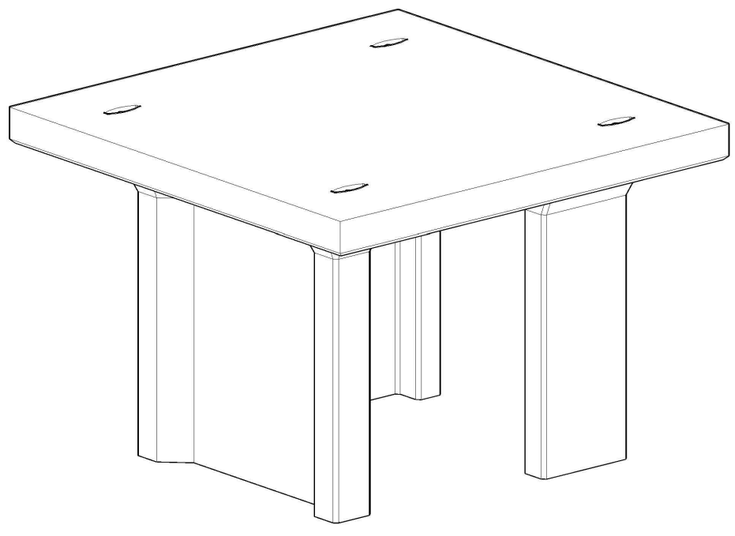
ELEVATION VIEW A



ELEVATION VIEW B



ELEVATION VIEW C



1:40 SCALE

3/23/21SSERTICH

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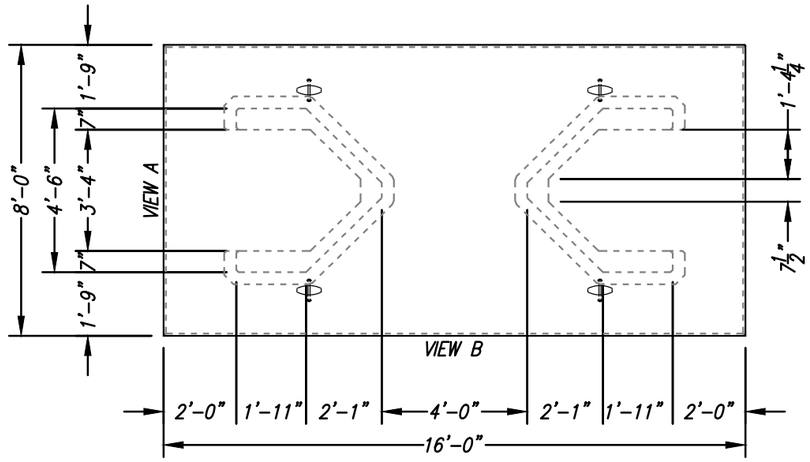
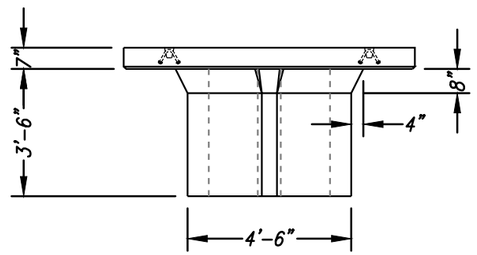
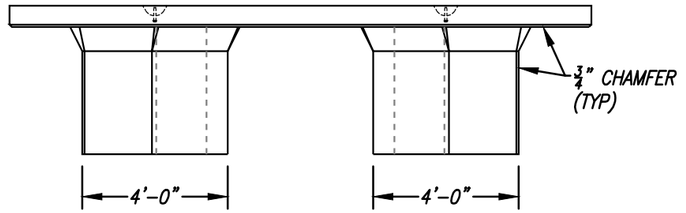
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
SINGLE MODULE - INTERIOR



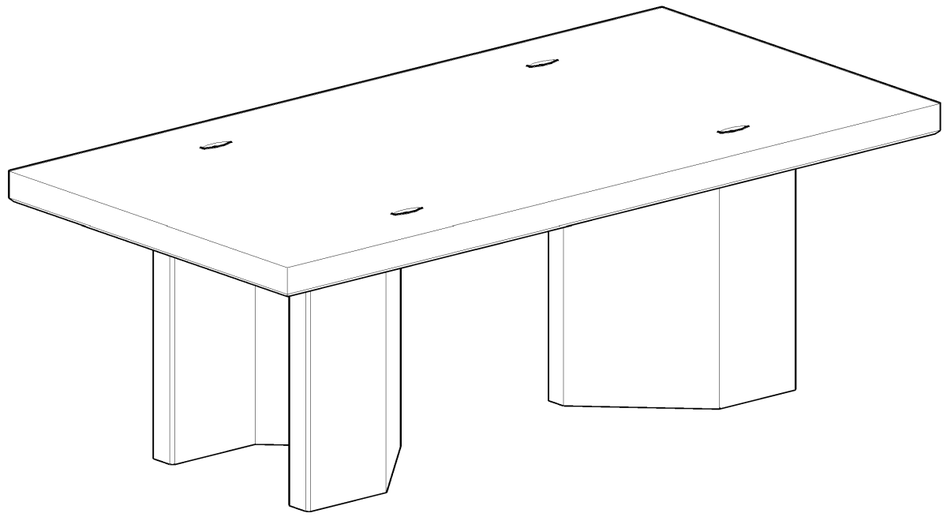
TOP VIEW



ELEVATION VIEW A



ELEVATION VIEW B



1:50 SCALE

8/4/2021RARDT

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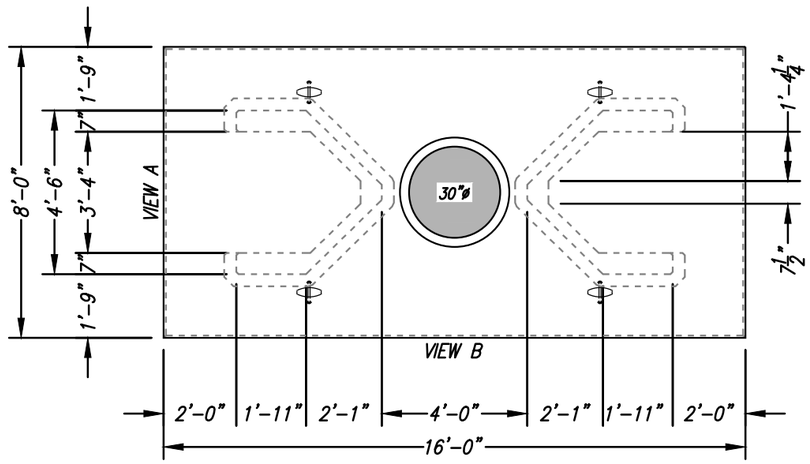
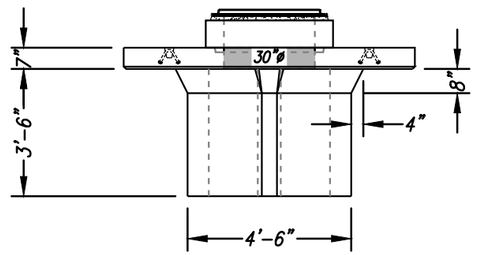
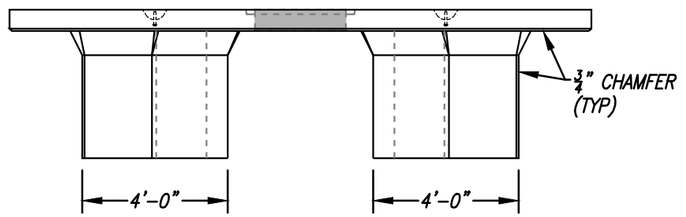
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
SINGLE MODULE - INTERIOR



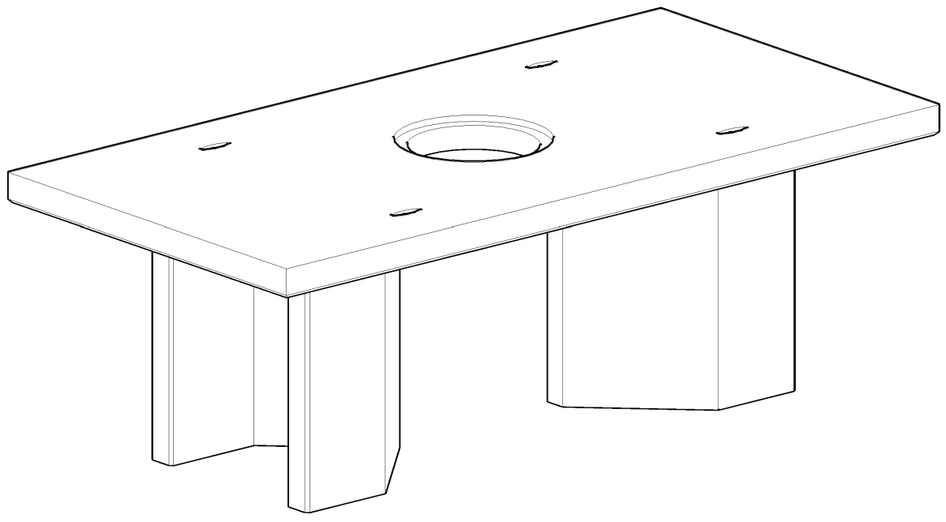
TOP VIEW
(FRAME & COVER / GRADE ADJUSTMENT NOT SHOWN)



ELEVATION VIEW A



ELEVATION VIEW B



1:50 SCALE

8/4/2021RARDT

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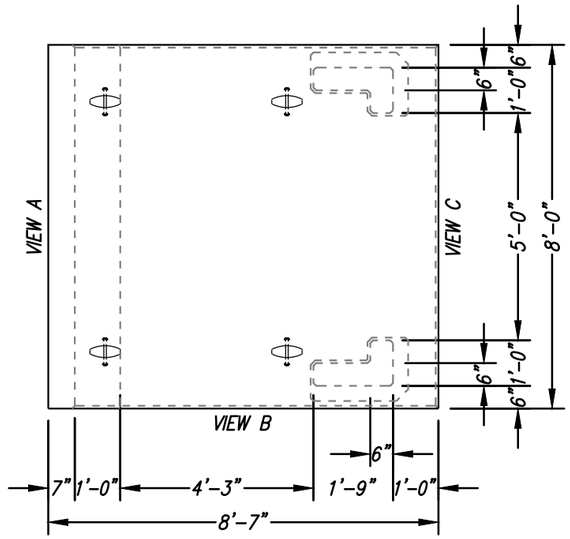
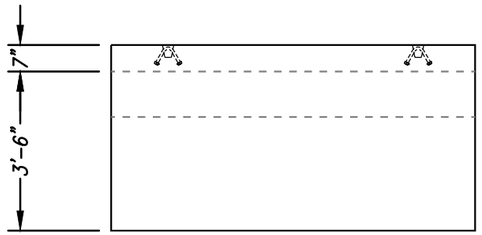
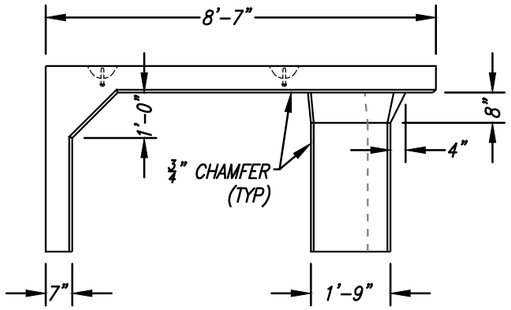
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
SINGLE MODULE - INTERIOR



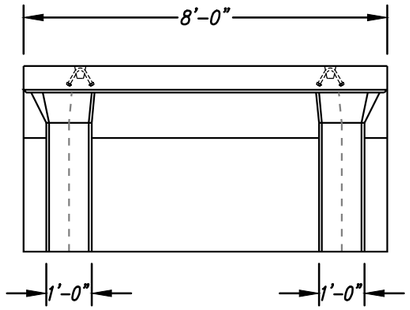
TOP VIEW



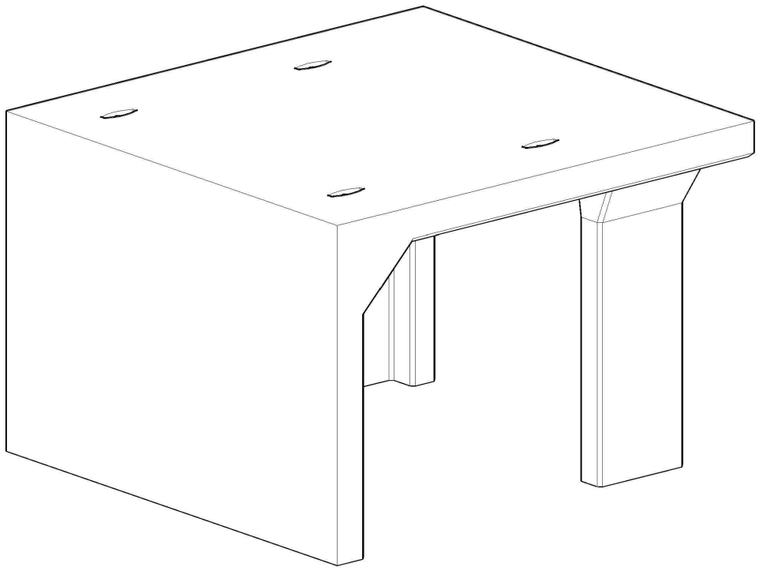
ELEVATION VIEW A



ELEVATION VIEW B



ELEVATION VIEW C



3/23/21SSERTICH

1:40 SCALE

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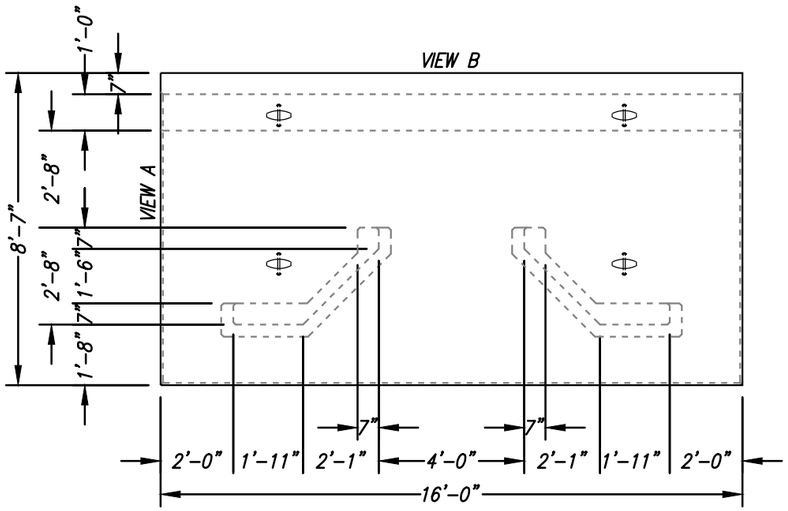
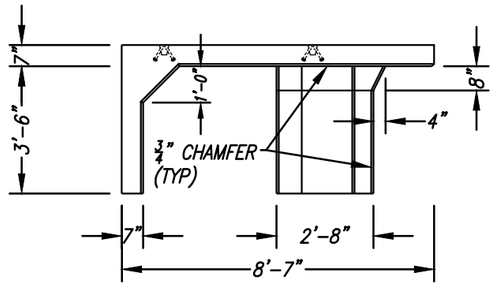
URBANPOND

PRECAST CONCRETE STORMWATER DETENTION

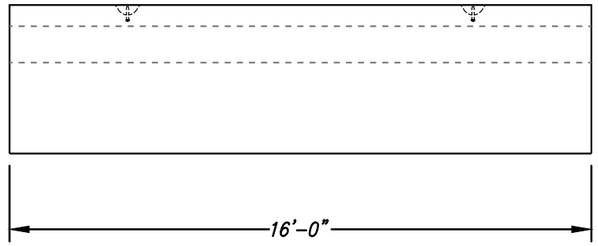
SINGLE MODULE - PERIMETER



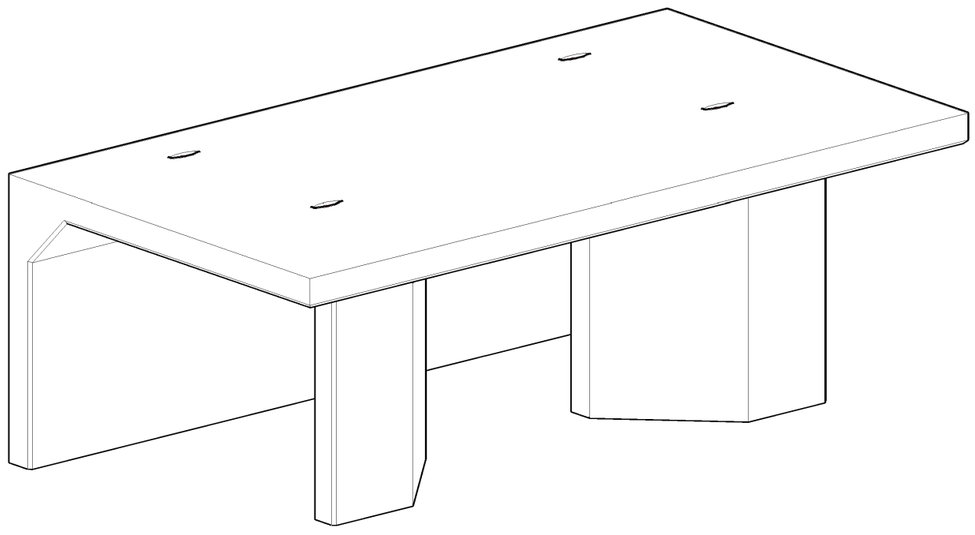
TOP VIEW



ELEVATION VIEW A



ELEVATION VIEW B



1:50 SCALE

8/3/2021RADT

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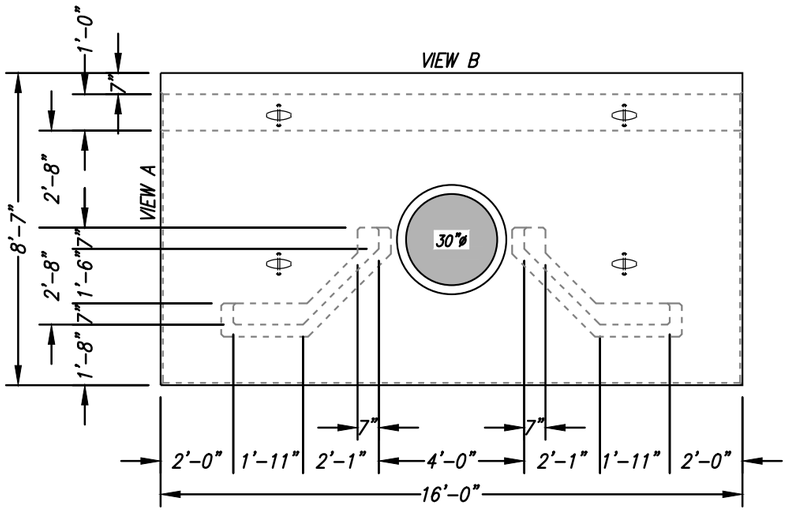
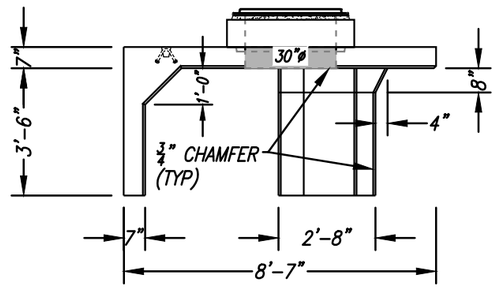
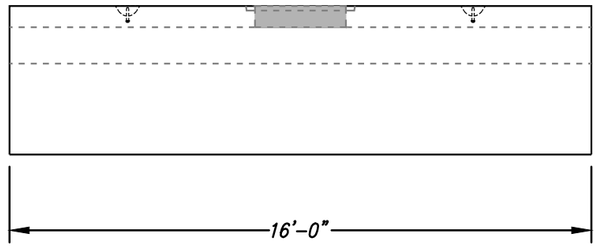
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
SINGLE MODULE - PERIMETER



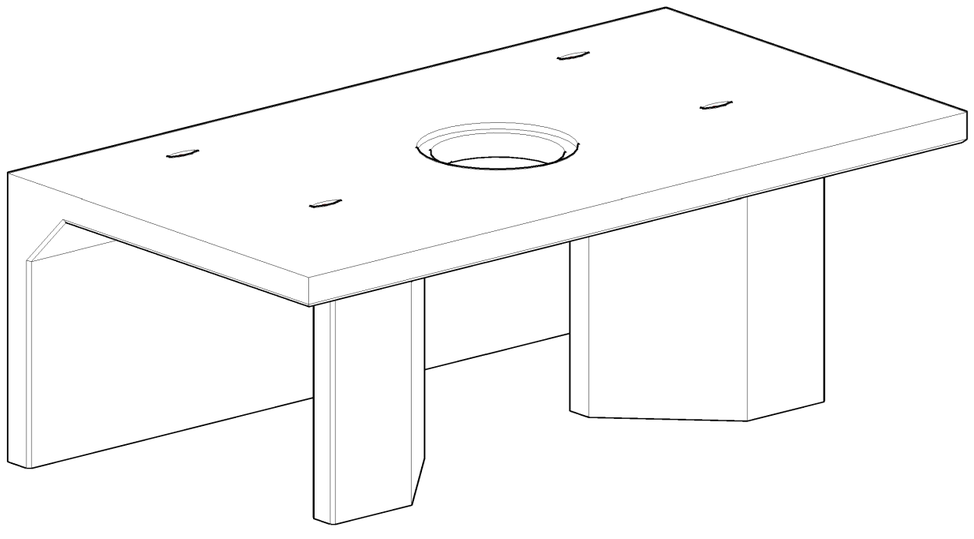
TOP VIEW



ELEVATION VIEW A



ELEVATION VIEW B



1:50 SCALE

8/3/2021RADT

Bio Clean
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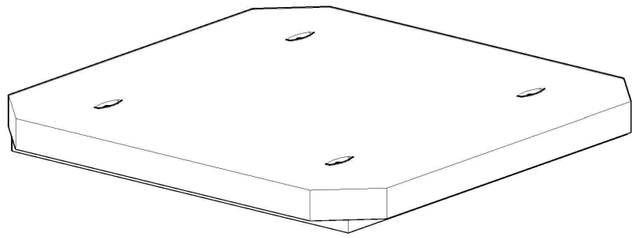
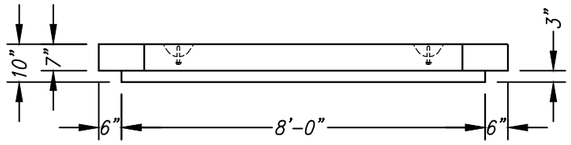
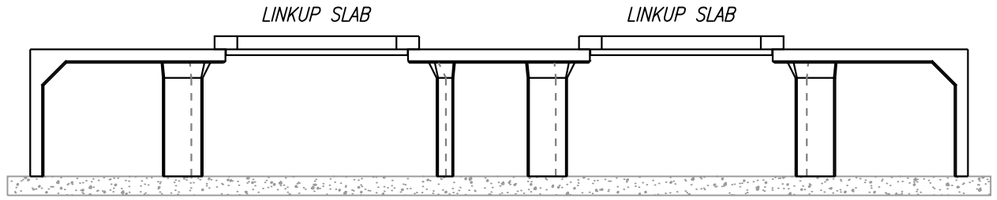
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
SINGLE MODULE - PERIMETER



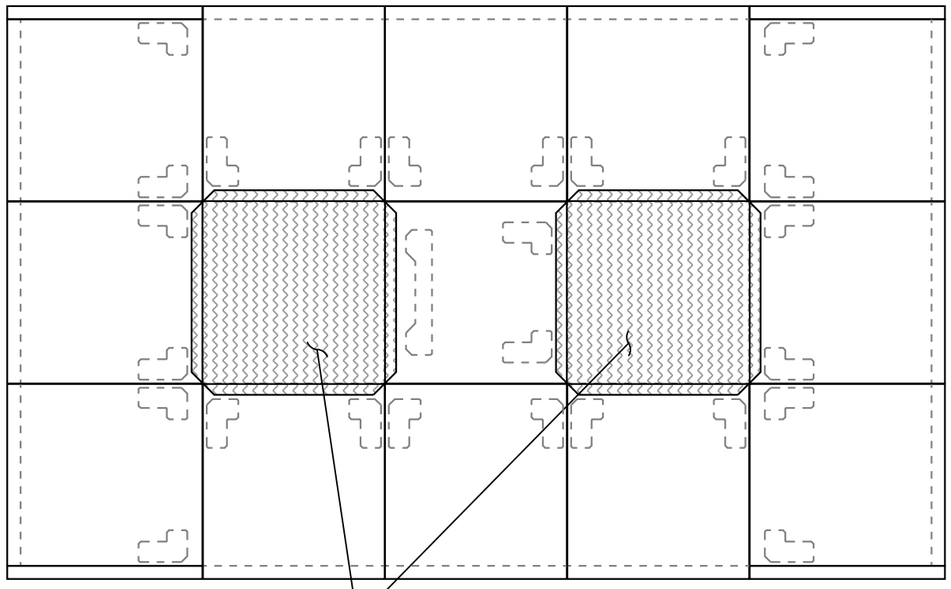


LINKUP SLAB
ELEVATION VIEW



ELEVATION VIEW
(HALF SCALE)

LINKUP SLAB
TOP VIEW



LINKUP SLABS BEAR ON TOP EDGES OF 4 ADJACENT MODULES

TOP VIEW
(HALF SCALE)

12/11/19TOLEE

1:40 SCALE

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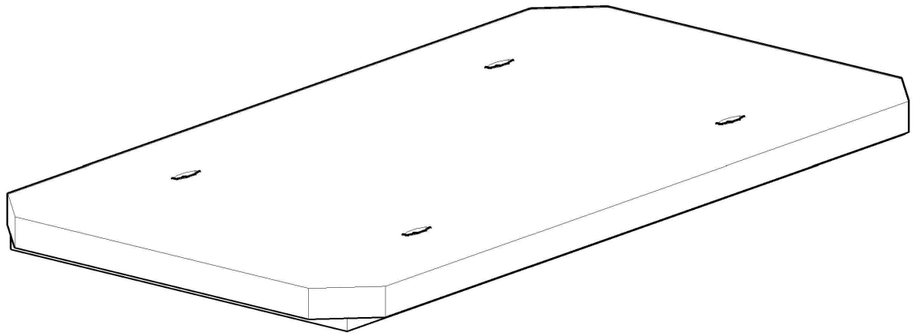
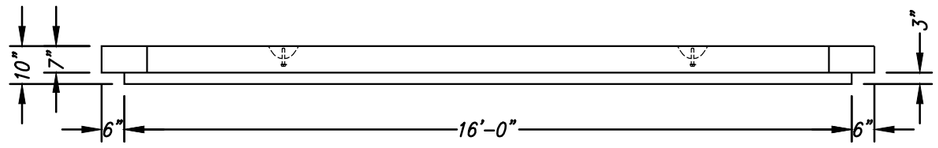
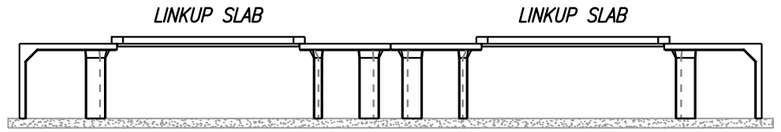
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
LINKUP SLAB

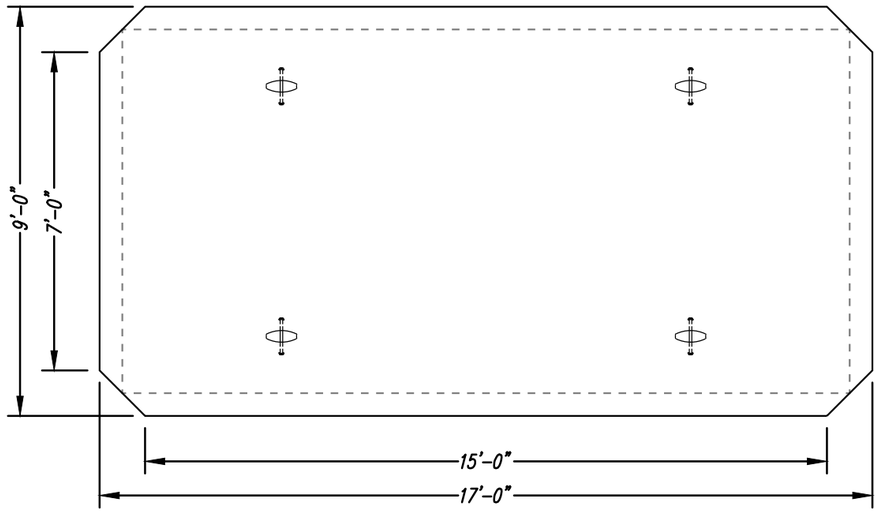




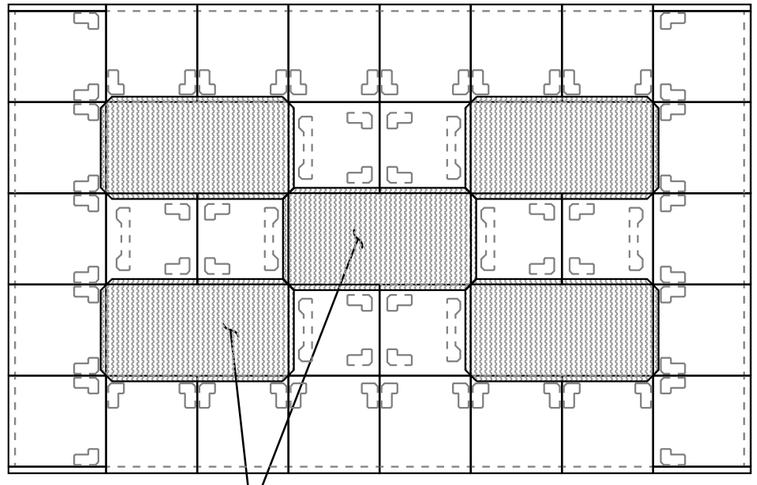
LINKUP SLAB
ELEVATION VIEW



ELEVATION VIEW
(QUARTER SCALE)



LINKUP SLAB
TOP VIEW



LINKUP SLABS BEAR ON TOP EDGES OF 4 ADJACENT MODULES

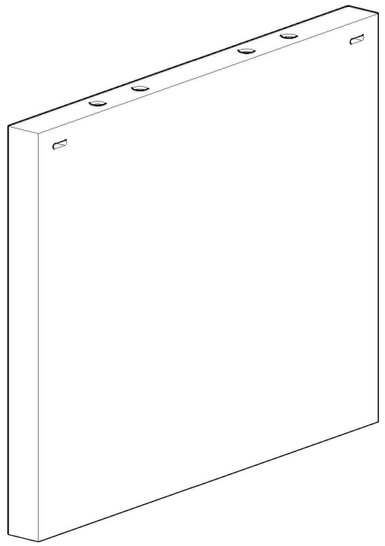
TOP VIEW
(QUARTER SCALE)

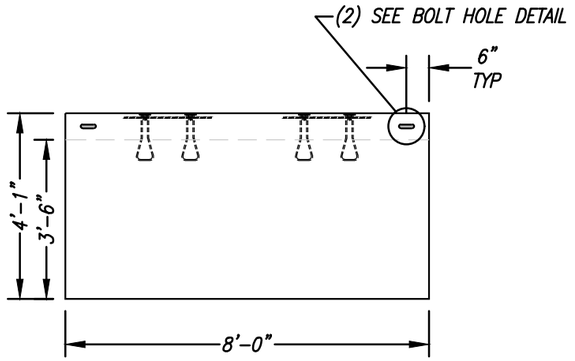
12/30/19SSERTICH

1:40 SCALE

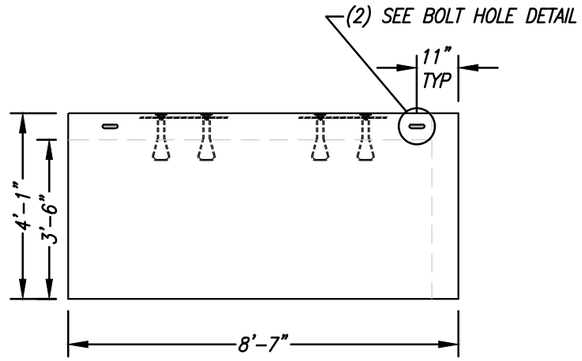
BioClean
A Forterra Company

URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
LINKUP SLAB

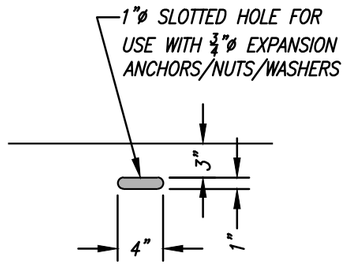




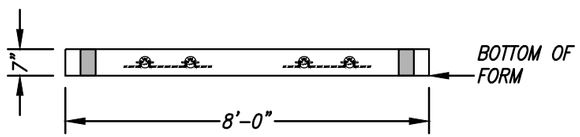
EXTERIOR VIEW



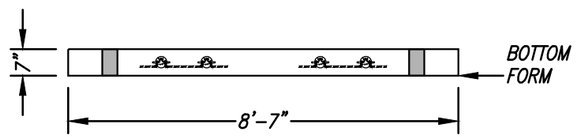
EXTERIOR VIEW



BOLT HOLE DETAIL



TOP VIEW



TOP VIEW

7/13/21MWOOLERY

1:40 SCALE

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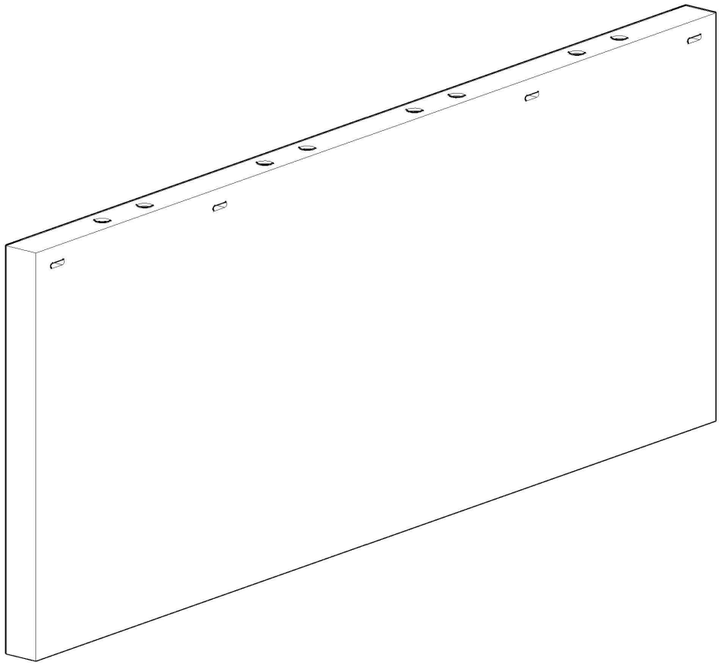
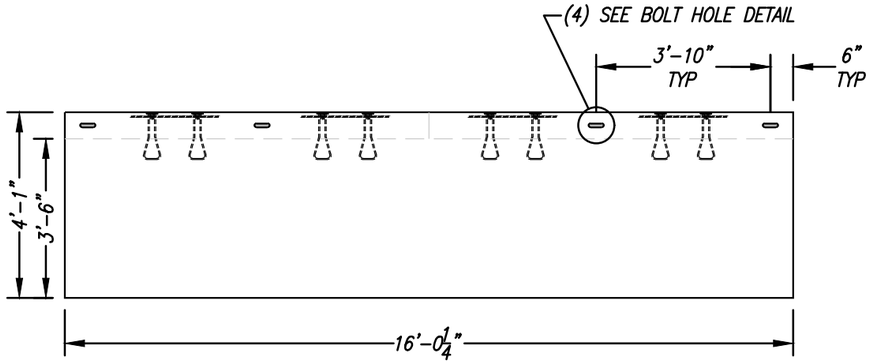
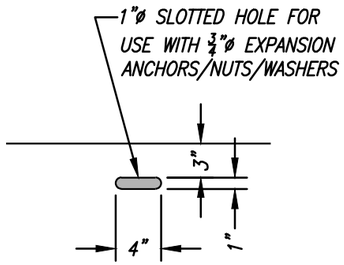
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
SINGLE MODULE - EXTERIOR WALL PANEL

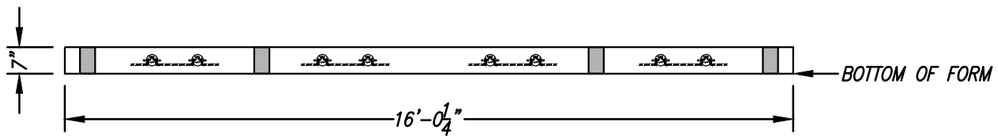




EXTERIOR VIEW



BOLT HOLE DETAIL



TOP VIEW

7/13/21MWOOLERY

1:40 SCALE

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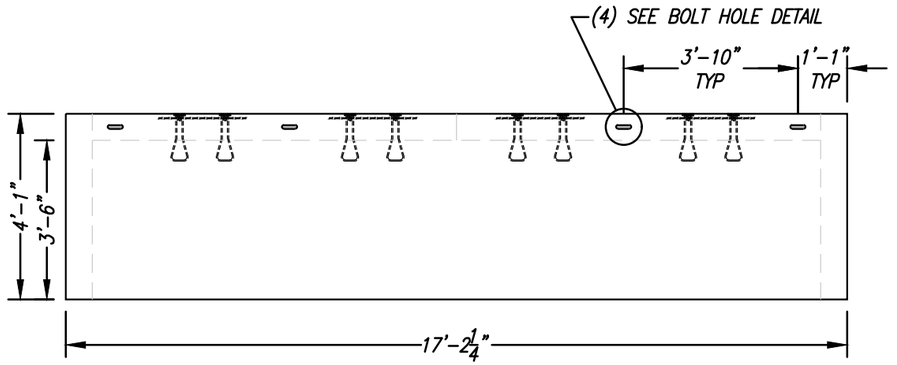
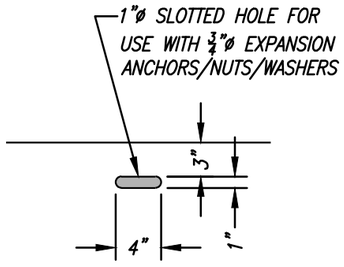
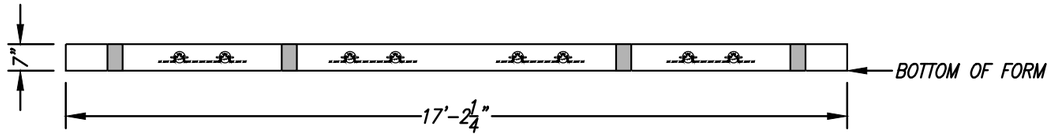
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
SINGLE MODULE - EXTERIOR WALL PANEL



EXTERIOR VIEW



BOLT HOLE DETAIL



TOP VIEW

1:40 SCALE

6/18/20SSERTICH

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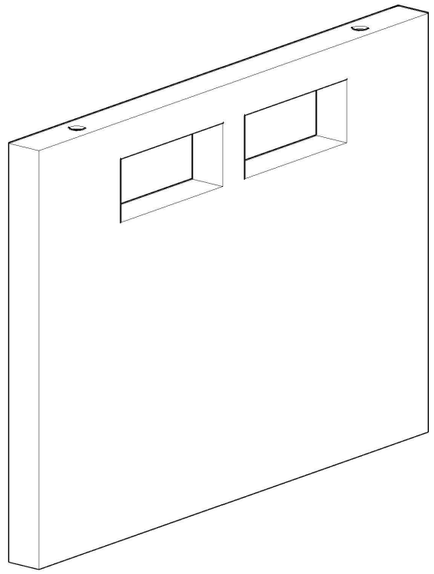
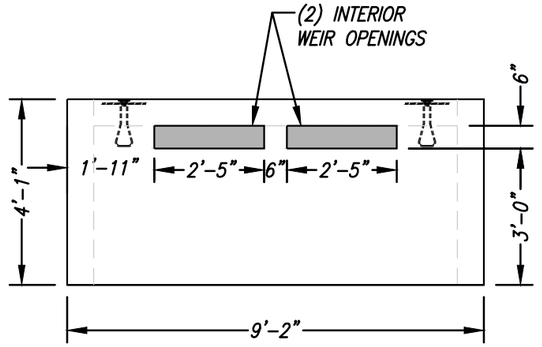
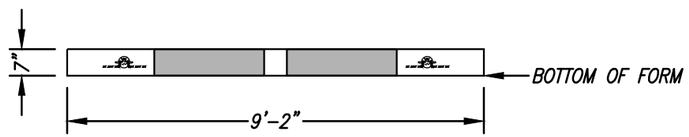
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
SINGLE MODULE - EXTERIOR WALL PANEL





WEIR WALL
ELEVATION VIEW



WEIR WALL
TOP VIEW

7/13/21MWOOLERY

1:40 SCALE

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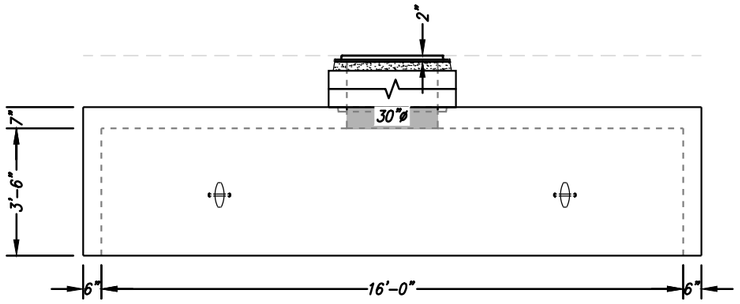
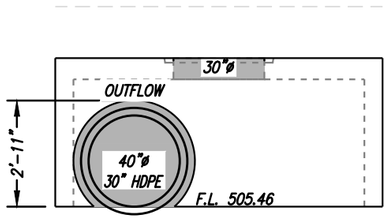
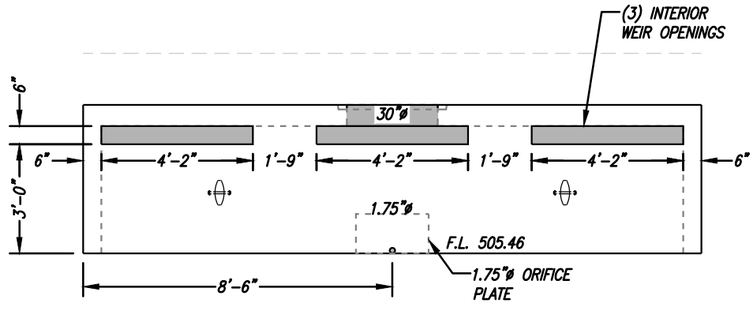
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
SINGLE MODULE - EXTERIOR WALL PANEL



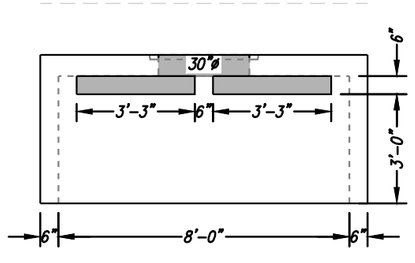
ELEVATION VIEW A



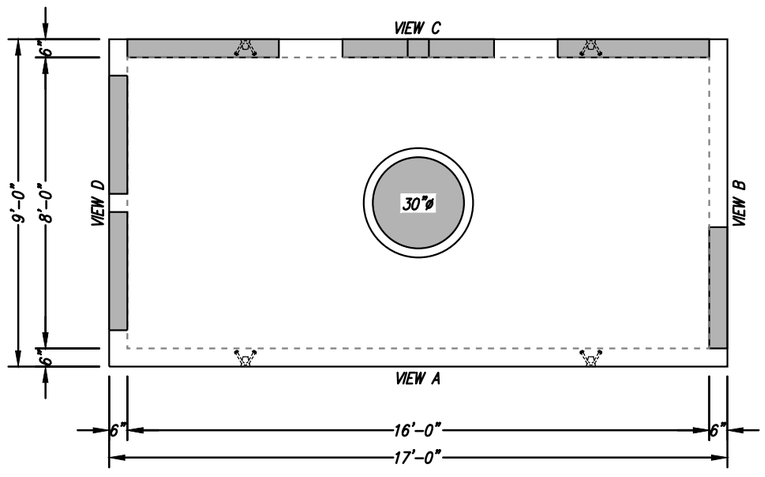
ELEVATION VIEW B



ELEVATION VIEW C



ELEVATION VIEW D



TOP VIEW
(FRAME & COVER / GRADE ADJUSTMENT NOT SHOWN)

7/13/21MWOOLERY

1:50 SCALE

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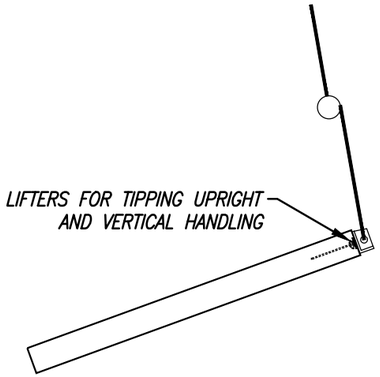
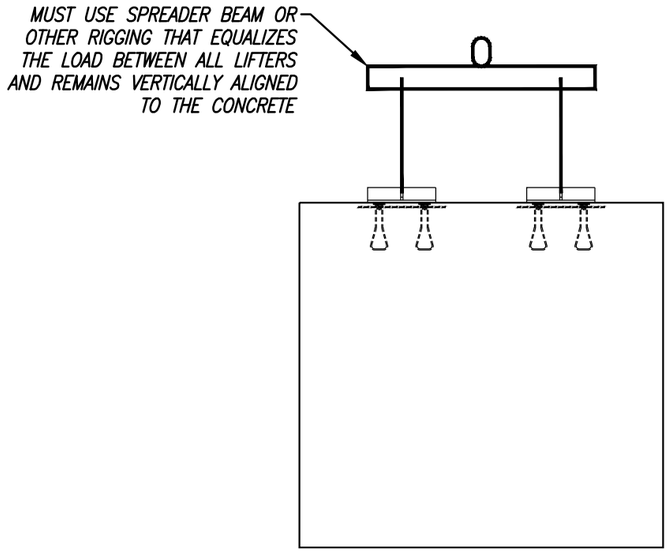
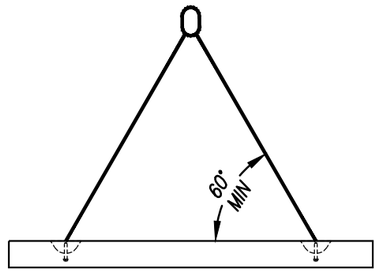
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION OUTLET VAULT

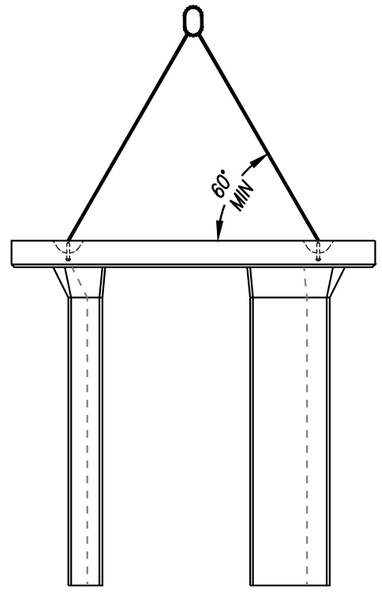




EXTERIOR WALL PANEL



LINKUP SLAB



*** SINGLE MODULE**
INTERIOR & PERIMETER

** SOME MODULES MUST USE RIGGING THAT EQUALIZES THE LOAD BETWEEN ALL LIFTERS*

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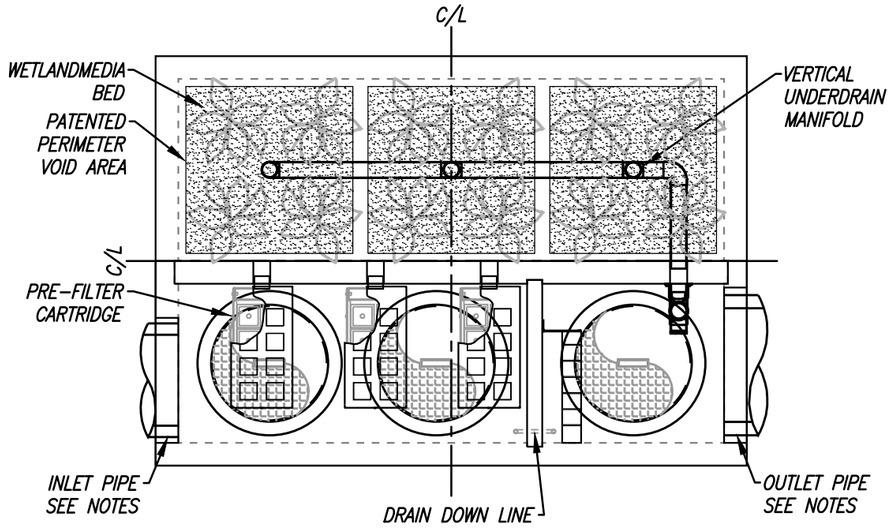
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
LIFT RIGGING

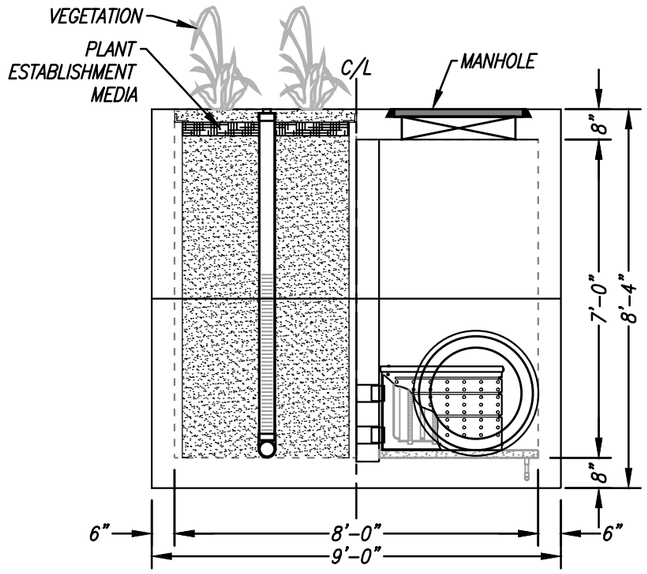
1:40 SCALE

8/4/2021RADT

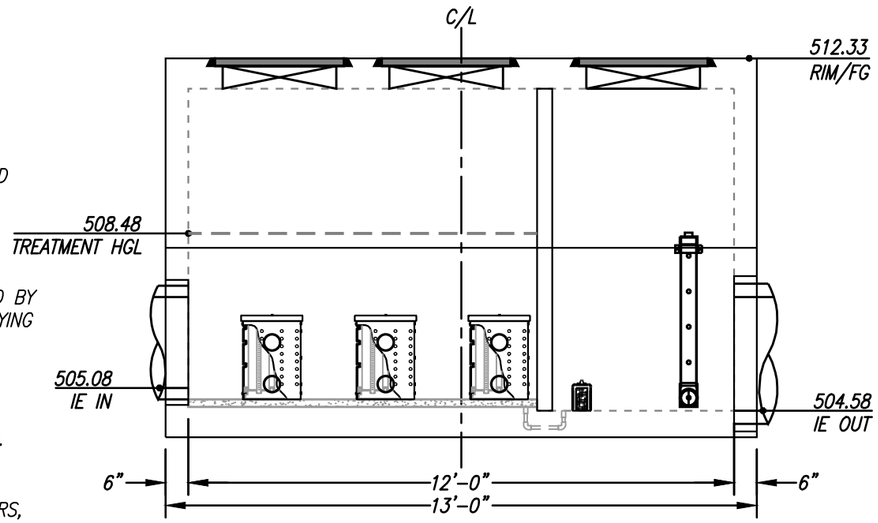
SITE SPECIFIC DATA			
PROJECT NUMBER		12255	
PROJECT NAME		DIB2 – SWEETWATER	
PROJECT LOCATION		SPRING VALLEY, CA	
STRUCTURE ID		MWS A	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
12,324		N/A	
TREATMENT HGL AVAILABLE (FT)			N/K
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	505.08	HDPE	24"
OUTLET PIPE	504.58	HDPE	30"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	512.33	512.33	512.33
SURFACE LOAD	PEDESTRIAN	N/A	PEDESTRIAN
FRAME & COVER	2EA ø30"	OPEN PLANTER	ø30"
WETLANDMEDIA VOLUME (CY)			11.66
ORIFICE SIZE (DIA. INCHES)			5 EA. ø0.76"
ORIFICE SPACING (FT)			0.78
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.			



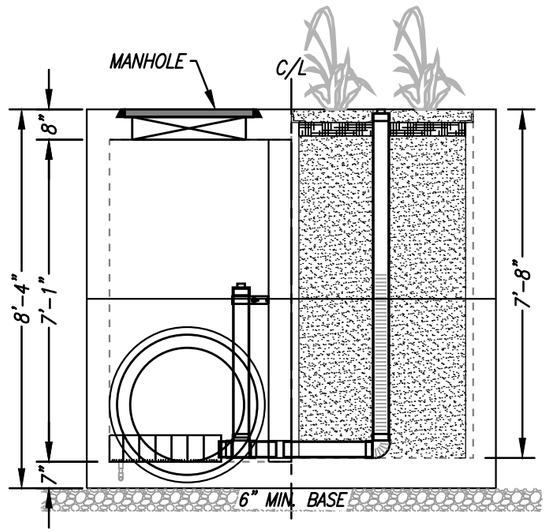
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS' SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL PIPES, RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.

LOW INFLOW PIPE DISCLOSURE:

IT IS RECOMMENDED THAT A SUFFICIENT VARIATION IN ELEVATION BETWEEN THE INLET AND OUTLET BE PROVIDED TO ALLOW FOR ACCUMULATION OF SEDIMENT IN THE PRE–TREATMENT CHAMBER. FAILURE TO DO SO MAY RESULT IN BLOCKAGE AT INFLOW POINT(S) WHICH MAY CAUSE UPSTREAM FLOODING.

REQUIRED TREATMENT VOLUME (CF)	12,324
DRAINDOWN DURATION (HOURS)	36
AVERAGE DISCHARGE RATE PER MWS UNIT(GPM)	43.16
OPERATING HEAD (FT)	3.6
WETLANDMEDIA INFILTRATION RATE (IN/HR) OR	27
WETLANDMEDIA LOADING RATE (GPM/SF) OR	0.27

MWS-L-8-12-7'-8"-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

7/13/21MWOOLERY

BIOCLEAN URBANPOND AND MODULAR WETLAND SYSTEM (MWS) DETAIL DETENTION B

SITE SPECIFIC DATA*

PROJECT NUMBER	12255
PROJECT NAME	DIB2 – SWEETWATER
PROJECT LOCATION	SPRING VALLEY, CA
STRUCTURE ID	SYSTEM B
REQUIRED STORAGE VOLUME (CF)	56,800
REQUIRED DCV VOLUME (CF)	19,554
REQUIRED HYDROMOD VOLUME (CF)	37,246

PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	504.18	HDPE	24"
INLET PIPE 2	504.18	HDPE	24"
INLET PIPE 3	506.18	HDPE	18"
OUTLET PIPE 1	504.18	HDPE	24"
FINISHED GRADE ELEVATION	510.34 MIN.		
TOP OF VAULT ELEVATION	508.76		
TOP OF LINKUPS ELEVATION	509.34		
SURFACE LOADING REQUIREMENT			HS20
FRAME AND COVER			ø30"
CORROSIVE SOIL CONDITIONS			NA
KNOWN GROUNDWATER ELEVATION			NA

NOTES: PRELIMINARY, NOT FOR CONSTRUCTION. FINISHED GRADE ELEVATION ABOVE URBANPOND SYSTEM B MUST BE AT LEAST 510.34'.

*PER ENGINEER OF RECORD

URBANPOND MODULES

TYPE	HEIGHT	COUNT
8'X8' INTERIOR	4'–0"	1
8'x8' PERIMETER	4'–0"	2
8'X16' INTERIOR	4'–0"	46
8'X16' PERIMETER	4'–0"	52
9'X9' LINKUP SLAB	7"	2
9'X17' LINKUP SLAB	7"	32
OUTLET MODULE	4'–0"	1

SIDEWALLS

LENGTH (FT)	HEIGHT (FT)	COUNT
8'–7"	4'–7"	4
8'–7"	4'–7" WITH WEIR	1

TOTAL STORAGE CAPACITY @ 3.5' DEPTH

TOTAL WATER VOLUME = 56,956 CF

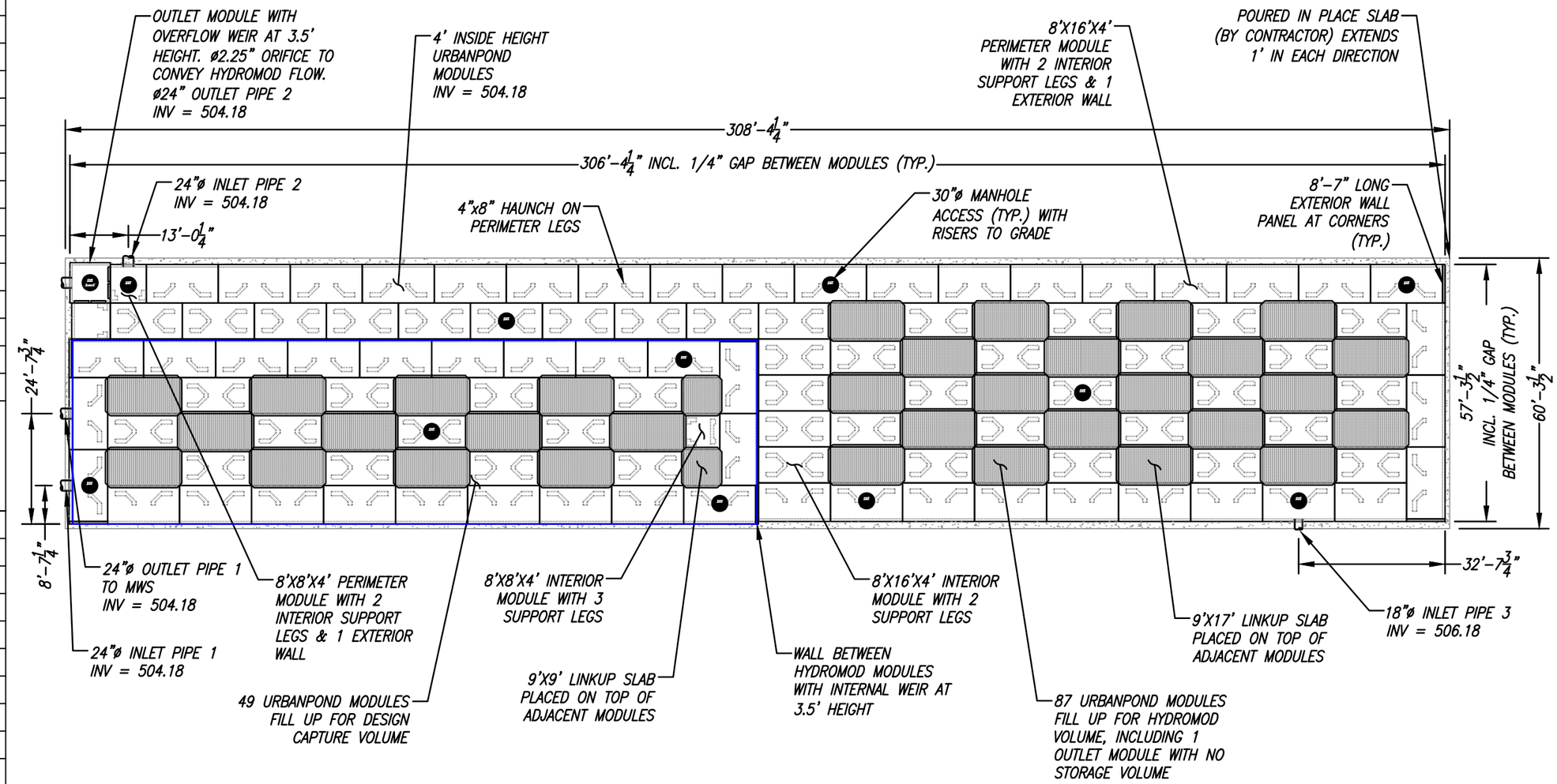
DCV = 20,448 CF

HYDROMOD = 36,508 CF

HEAVIEST PIECE: 8'X16' PERIM. MODULE = 22,250 LBS.

GRADE ADJUSTMENT RISERS

		3"	6"	12"
1:320 SCALE	30"ø	12	0	12



PLAN VIEW

7/13/21MWOOLERY

Bio Clean
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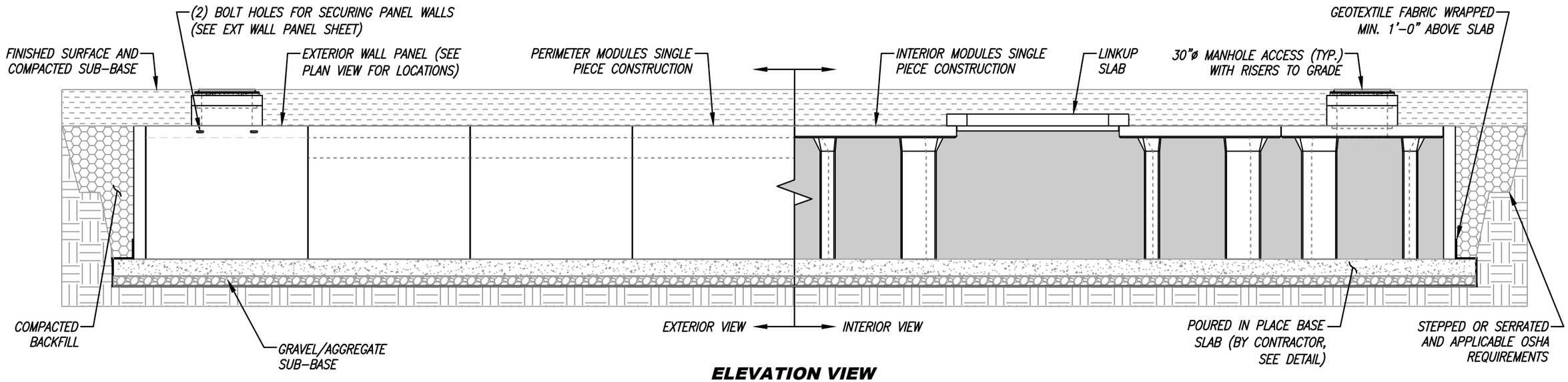
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
PLAN VIEW



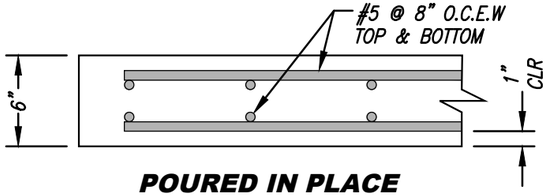
ELEVATION VIEW

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER REQUIRES A POURED IN PLACE CONCRETE BASE SLAB. SOIL COMPACTION REQUIREMENTS PER GEOTECHNICAL ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING RECOMMENDED COMPACTION AND BASE SPECIFICATIONS.
3. CONTRACTOR TO PLACE A LAYER OF GEOTEXTILE FABRIC IN THE EXCAVATED PIT AREA. A GRAVEL OR AGGREGATE LAYER OF SUB-BASE IS RECOMMENDED BELOW THE POURED IN PLACE BASE SLAB. THE GEOTEXTILE FABRIC SHALL WRAP UP AT LEAST 1' ALONG THE OUTER WALLS AND BE SECURED INTO PLACE WITH THE BACKFILL. THE GEOTEXTILE FABRIC PREVENTS FINE SOIL PARTICLES FROM MIGRATING INTO THE SYSTEM.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. PIPES CANNOT INTRUDE BEYOND FLUSH. INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR UNLESS OTHERWISE NOTED. ALL GAPS AROUND PIPES SHALL BE SEALED WATERTIGHT WITH A NON-SHRINK GROUT PER MANUFACTURER'S STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLE FRAMES AND COVERS. CONTRACTOR TO GROUT ALL FRAMES AND COVERS TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. THE URBANPOND MODULE SYSTEM IS TO BE INSTALLED IN ACCORDANCE WITH ASTM C891-90, INSTALLATION OF UNDERGROUND PRECAST UTILITY STRUCTURES. PROJECT PLAN AND SPECIFICATIONS MUST BE FOLLOWED ALONG WITH ANY APPLICABLE REGULATIONS.
7. DESIGNATED EMBEDDED LIFTERS MUST BE USED. USE PROPER RIGGING TO ASSURE ALL LIFTERS ARE EQUALLY ENGAGED WITH A MINIMUM 60 DEGREE ANGLE ON SLINGS AS NOTED AND IN ACCORDANCE WITH MANUFACTURER'S LIFTING PROCEDURES. USE RIGGING THAT EQUALIZES THE LOAD BETWEEN ALL LIFTERS.
8. BIO CLEAN RECOMMENDS BEGINNING INSTALLATION WITH THE OUTLET MODULE.
9. MODULES MUST BE PLACED AS CLOSE TOGETHER AS POSSIBLE, AND GAPS SHALL NOT BE GREATER THAN 1/4".
10. INSTALL LINKUP SLABS ONLY AFTER ALL 4 SUPPORTING MODULES ARE IN PLACE. INSTALL LINKUP SLABS AS PROJECT PROGRESSES TO ENSURE BEST FIT.
11. ALL EXTERIOR SYSTEM JOINTS (SIDES AND TOP) SHALL BE COVERED WITH A MIN. 6" JOINT WRAP.
12. INSTALL PANEL WALLS AT DESIGNATED LOCATIONS ON THE PLAN VIEW DRAWING. SECURE PANEL WALLS WITH 2 BOLTS ON TOP.
13. THE FILL PLACED AROUND THE URBANPOND MODULES MUST BE DEPOSITED EVENLY, AT APPROXIMATELY THE SAME ELEVATION, AROUND ALL SIDES. AT NO TIME SHALL THE FILL BEHIND ONE SIDE BE MORE THAN 1'-0" HIGHER THAN THE FILL ON THE OPPOSITE SIDE. BACKFILL SHALL BE COMPACTED AND/OR VIBRATED TO ENSURE THAT BACKFILL MATERIAL IS WELL SEATED AND PROPERLY INTERLOCKED. CARE SHALL BE TAKEN TO PREVENT ANY WEDGING ACTION AGAINST THE STRUCTURE, AND ALL SLOPES WITHIN THE AREA TO BE BACKFILLED MUST BE STEPPED OR SERRATED TO PREVENT WEDGING ACTION. CARE SHALL ALSO BE TAKEN SO AS NOT TO DISRUPT THE JOINT WRAP FROM THE JOINT DURING THE BACKFILL PROCESS. BACKFILL MATERIAL MUST BE CLEAN, CRUSHED, ANGULAR NO. 57 (AASHTO M43) AGGREGATE OR NATIVE MATERIAL IF APPROVED BY THE SITE GEOTECHNICAL ENGINEER. IF NATIVE MATERIAL IS SUSCEPTIBLE TO MIGRATION, CONFIRM WITH GEOTECHNICAL ENGINEER AND PROVIDE PROTECTION AS REQUIRED.
14. AT NO TIME SHALL MACHINERY OR VEHICLES GREATER THAN THE DESIGN HS-20 LOADING CRITERIA TRAVEL ON TOP OF THE SYSTEM WITHOUT THE MINIMUM DESIGN COVERAGE. IF TRAVEL IS NECESSARY OVER THE SYSTEM PRIOR TO ACHIEVING THE MINIMUM DESIGN COVER, IT MAY BE NECESSARY TO REDUCE THE ULTIMATE LOAD/BURDEN OF THE OPERATING MACHINERY SO AS NOT TO EXCEED THE CAPACITY OF THE SYSTEM. IN SOME CASES HAND OPERATED COMPACTION EQUIPMENT MAY BE NECESSARY IN ORDER TO NOT EXCEED THE ALLOTTED DESIGN LOADING.
15. A PRE-CONSTRUCTION MEETING IS REQUIRED PRIOR TO PLACEMENT OF URBANPOND.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT MANUFACTURER.
3. ANY VARIATION FOUND DURING CONSTRUCTION FROM THE SITE AND SYSTEM ANALYSIS MUST BE REPORTED TO THE PROJECT DESIGN ENGINEER.
4. CONCRETE BASE SLAB F'C = 4,000 PSI AT 28 DAYS
   FY = 40,000 PSI
   GROUT (NON-SHRINK) FM = 6,000 PSI



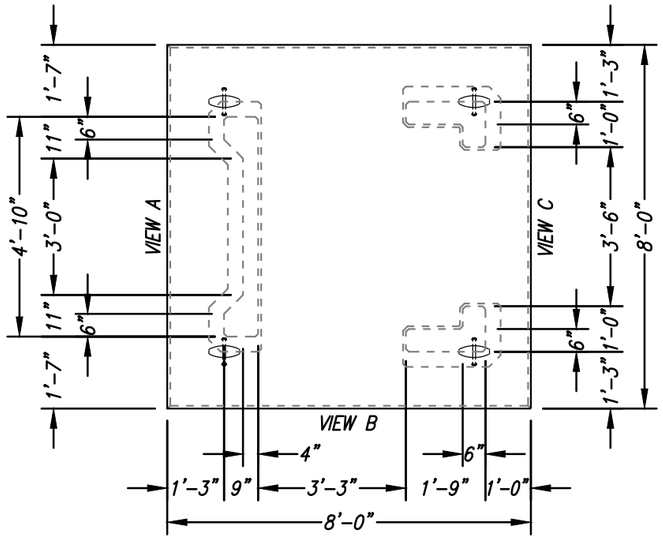
POURED IN PLACE BASE SLAB DETAIL

3/24/21SSERTICH

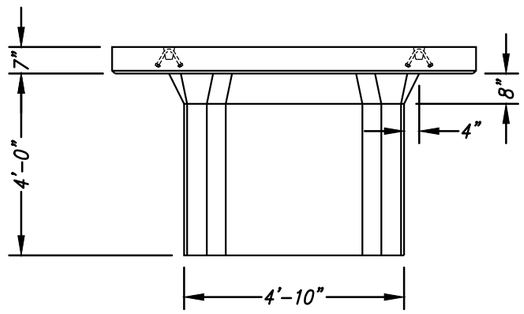
1:60 SCALE

Bio Clean
A Forterra Company

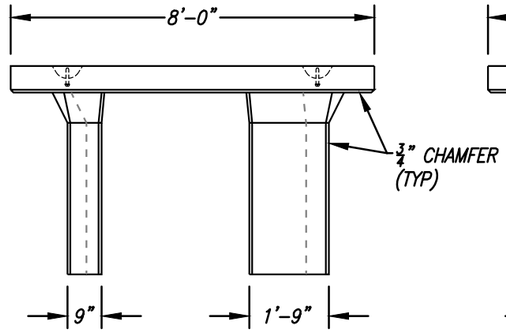
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
GENERAL ELEVATION DETAILS



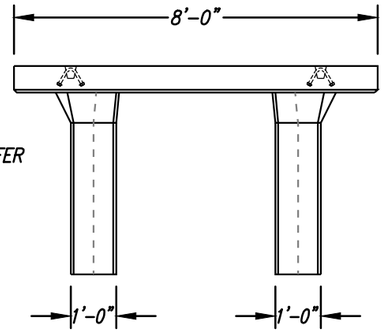
TOP VIEW



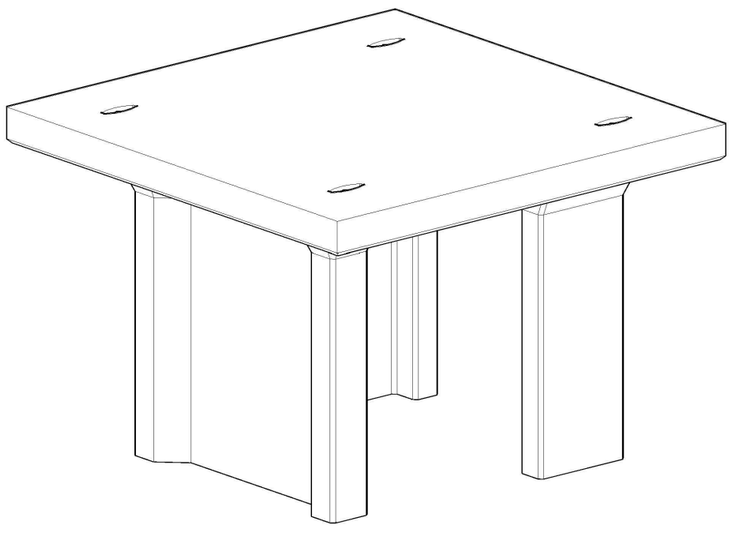
ELEVATION VIEW A



ELEVATION VIEW B



ELEVATION VIEW C

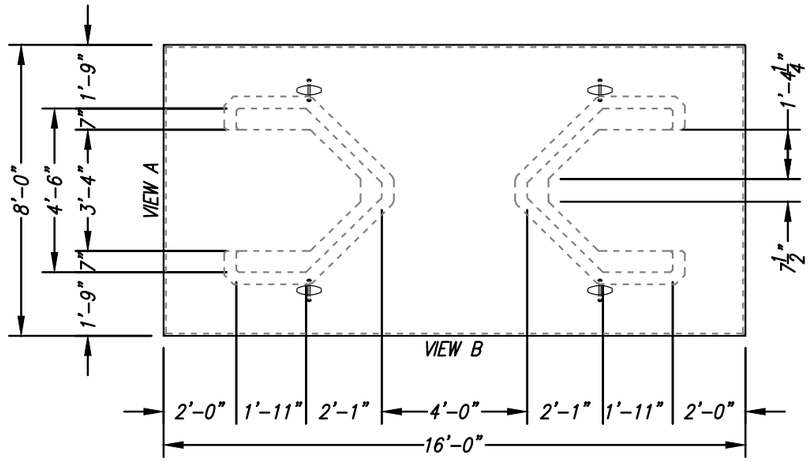


1:40 SCALE

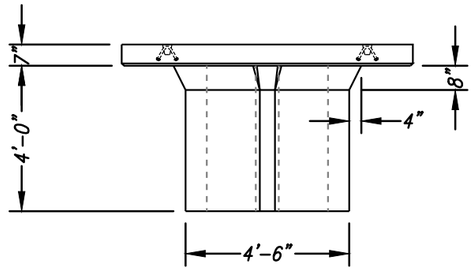
12/11/19,ICHANG

Bio Clean
A Forterra Company

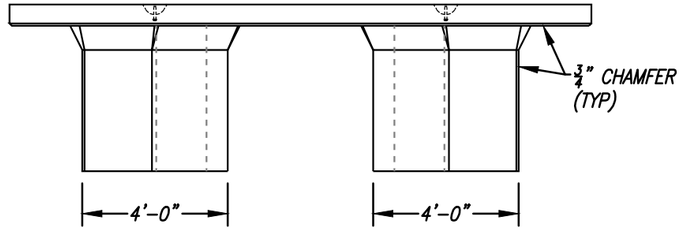
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
SINGLE MODULE - INTERIOR



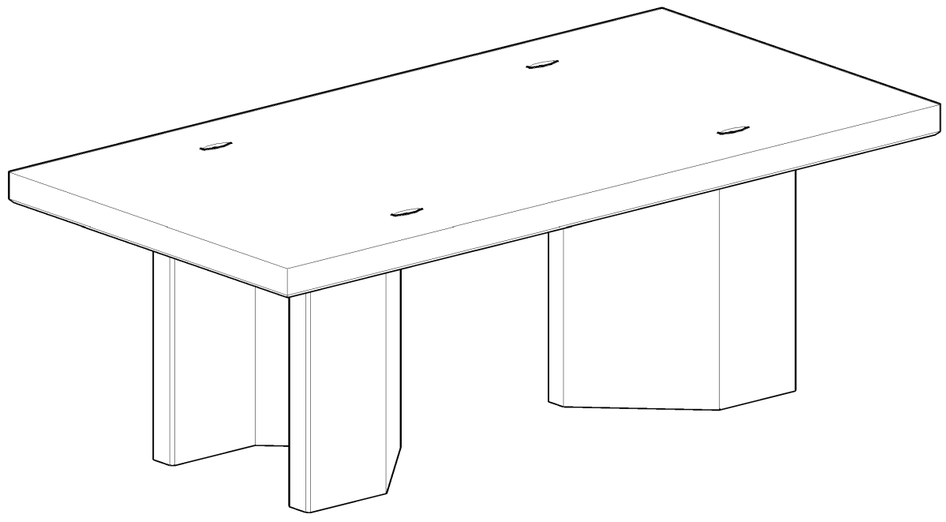
TOP VIEW



ELEVATION VIEW A



ELEVATION VIEW B

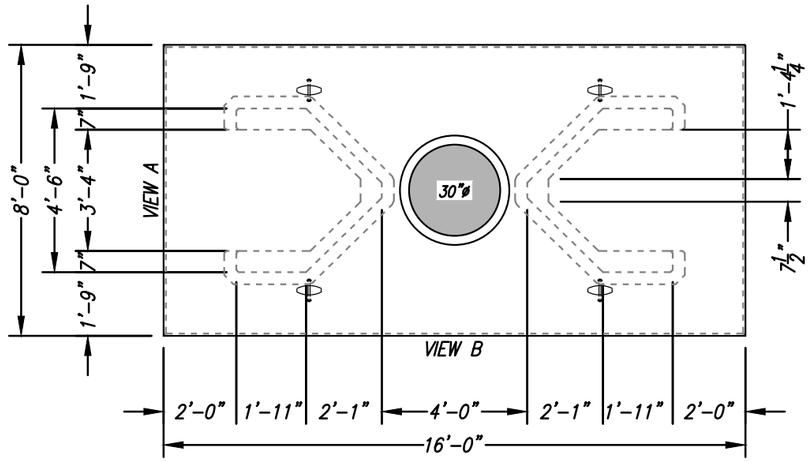


1:50 SCALE

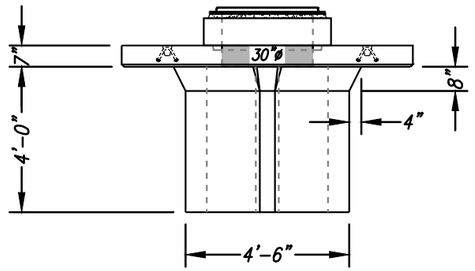
8/4/2021RADT

Bio Clean
A Forterra Company

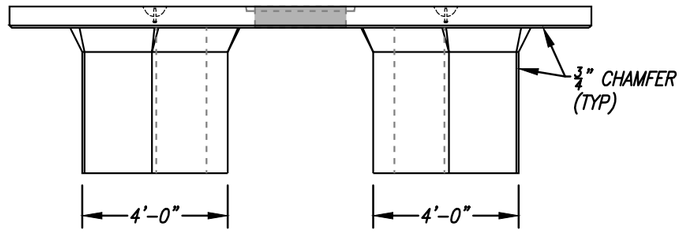
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
SINGLE MODULE - INTERIOR



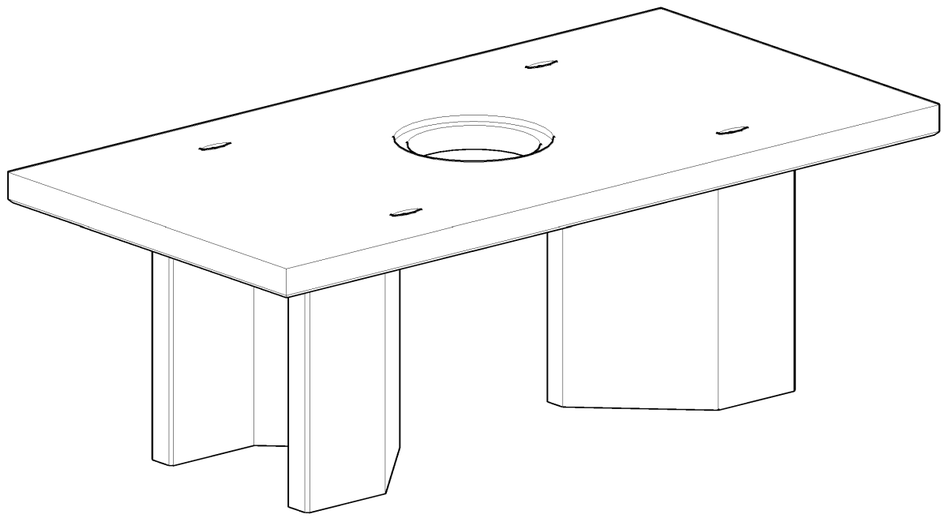
TOP VIEW
(FRAME & COVER / GRADE ADJUSTMENT NOT SHOWN)



ELEVATION VIEW A



ELEVATION VIEW B

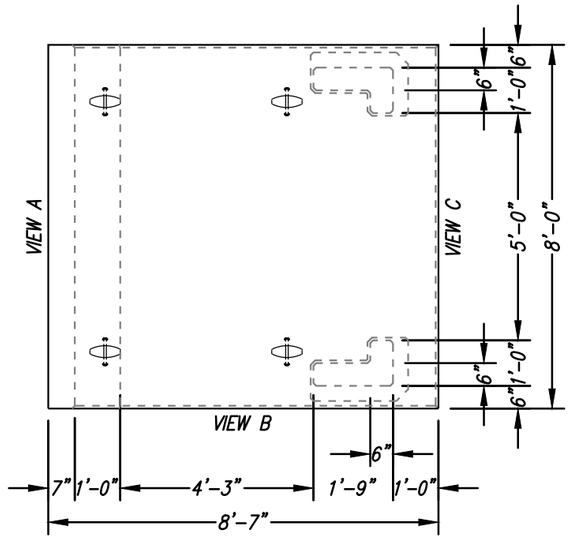


8/4/2021RADT

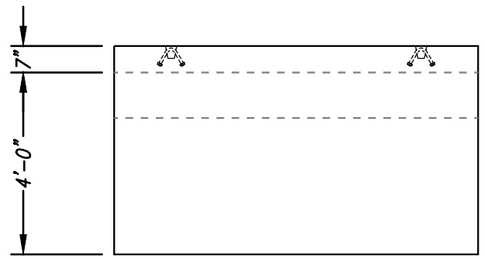
1:50 SCALE

Bio Clean
A Forterra Company

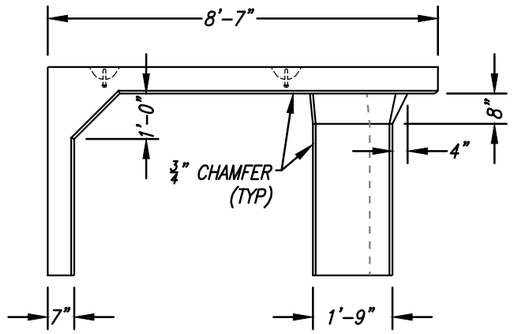
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
SINGLE MODULE - INTERIOR



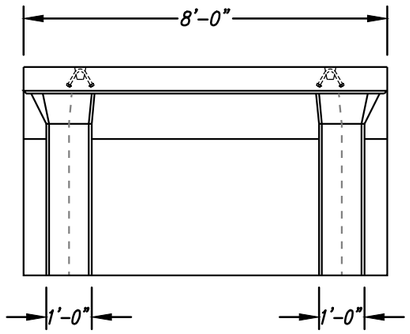
TOP VIEW



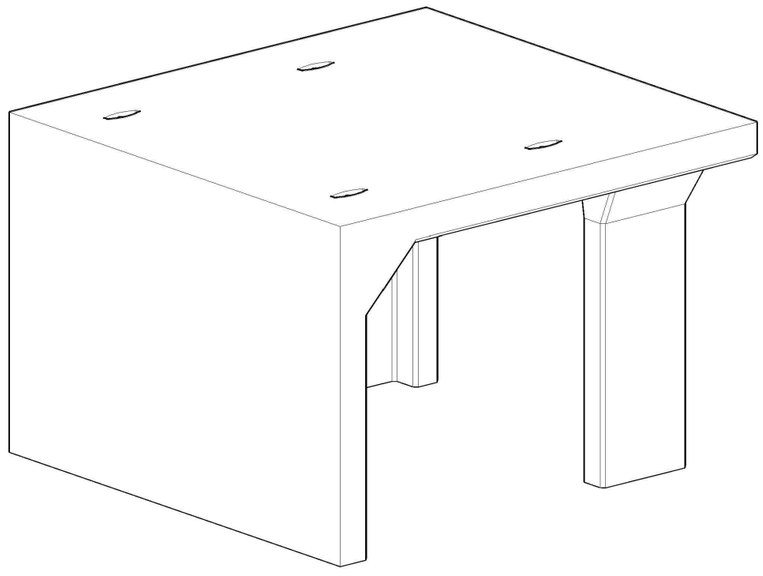
ELEVATION VIEW A



ELEVATION VIEW B



ELEVATION VIEW C

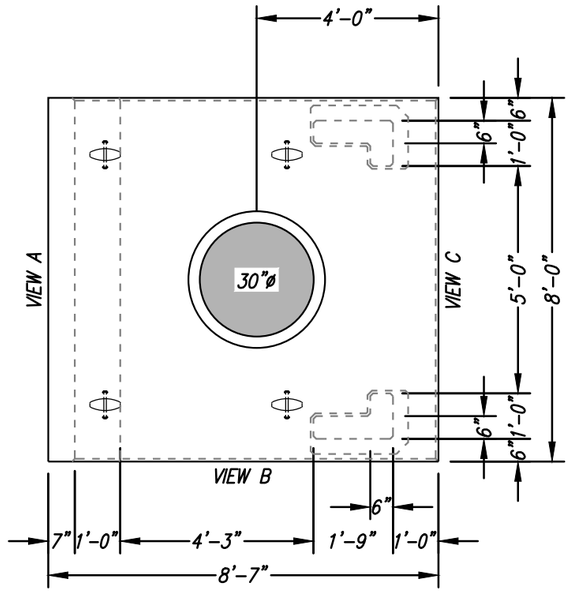


1:40 SCALE

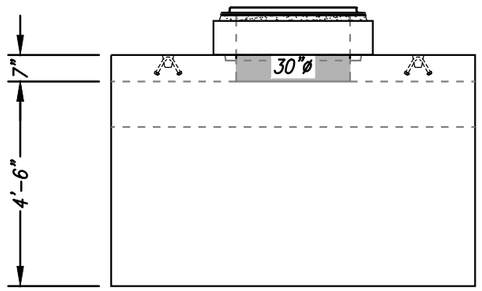
Bio Clean
A Forterra Company

URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
SINGLE MODULE - PERIMETER

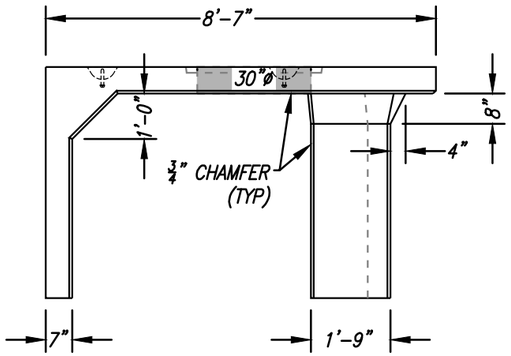
12/11/19SSERTICH



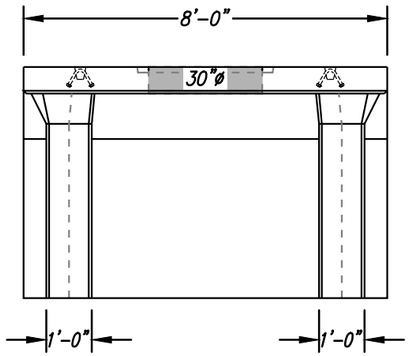
TOP VIEW



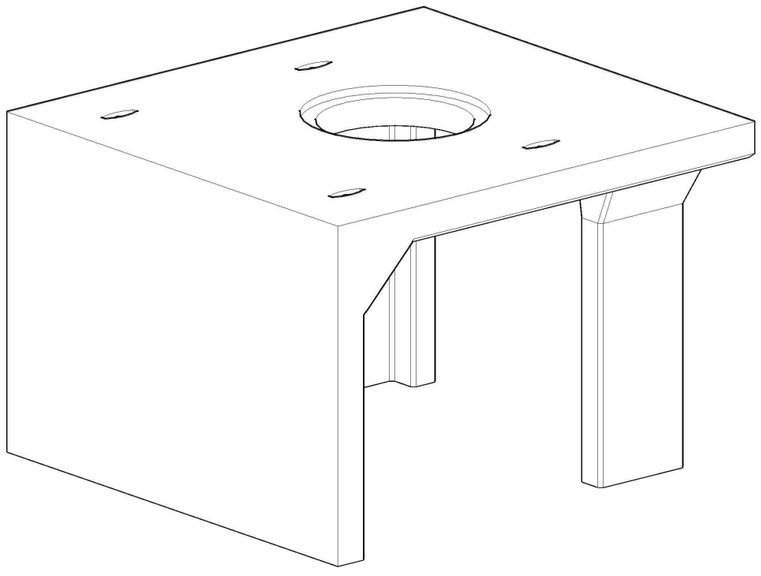
ELEVATION VIEW A



ELEVATION VIEW B



ELEVATION VIEW C



12/11/19,ICHANG

1:40 SCALE

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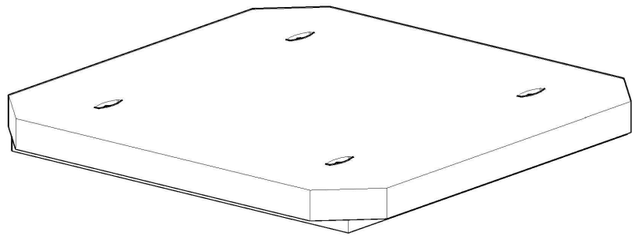
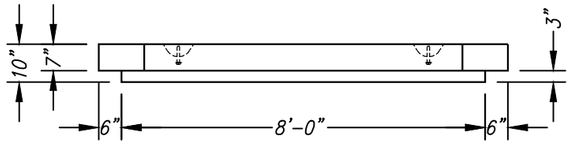
URBANPOND

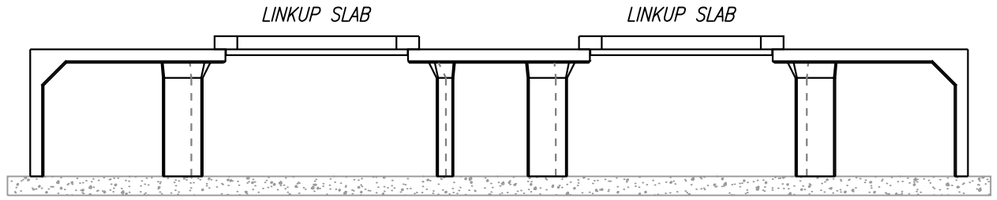
PRECAST CONCRETE STORMWATER DETENTION

SINGLE MODULE - PERIMETER



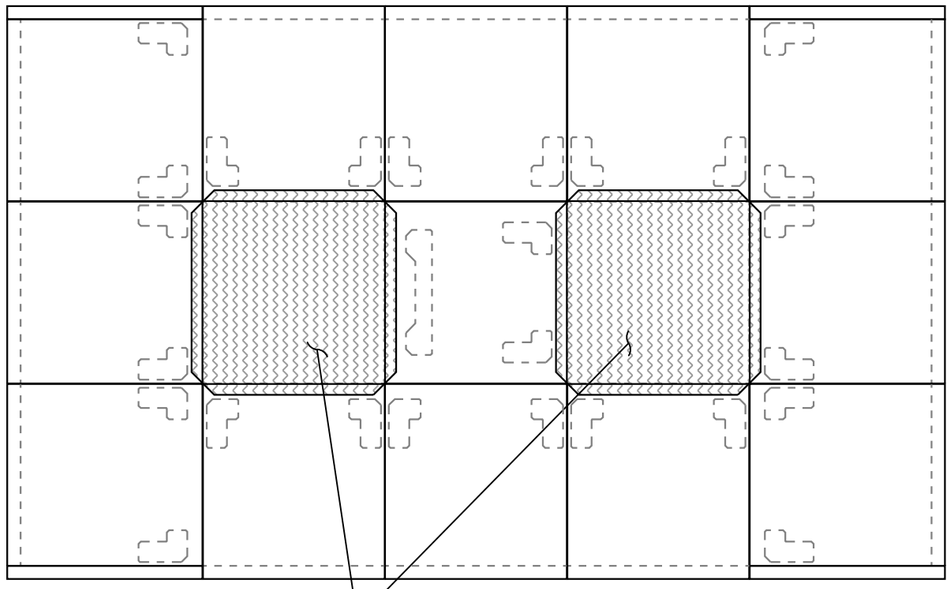


LINKUP SLAB
ELEVATION VIEW



ELEVATION VIEW
(HALF SCALE)

LINKUP SLAB
TOP VIEW



LINKUP SLABS BEAR ON TOP EDGES OF 4 ADJACENT MODULES

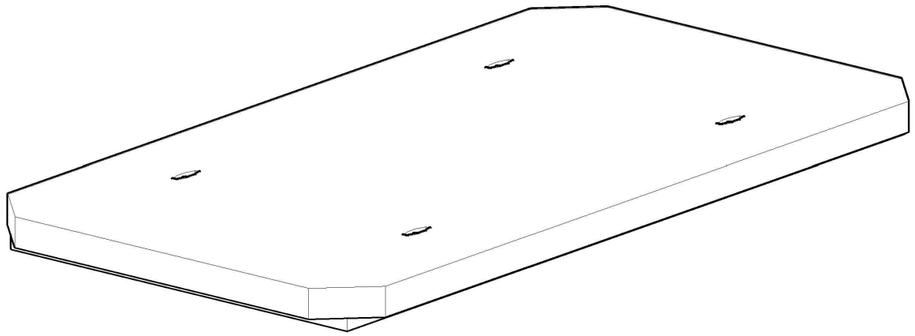
TOP VIEW
(HALF SCALE)

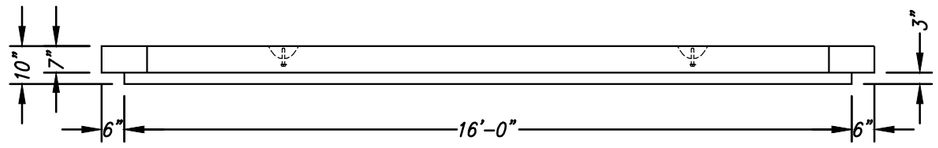
12/11/19TOLEE

1:40 SCALE

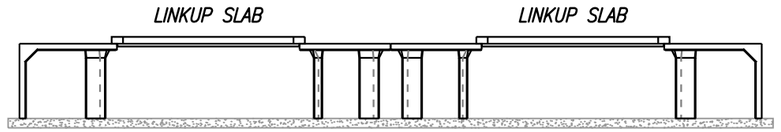
BioClean
A Forterra Company

URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
LINKUP SLAB

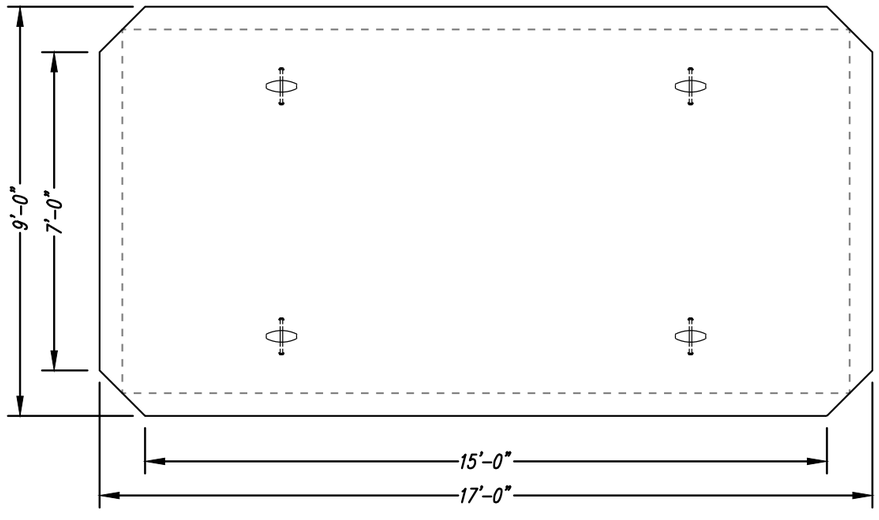




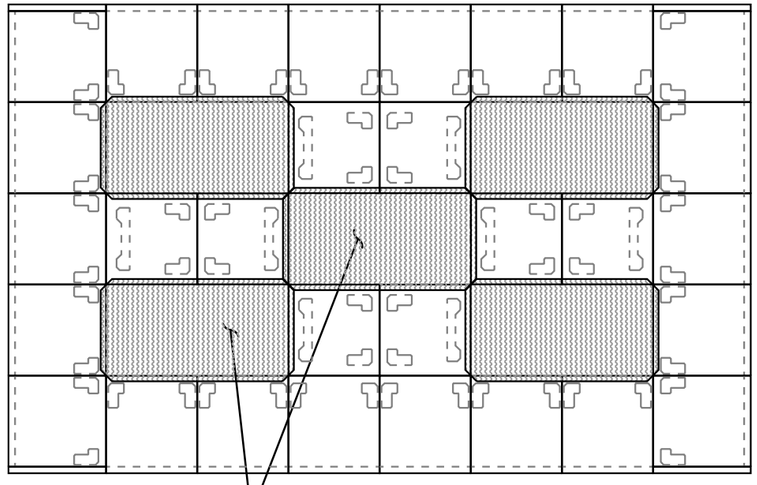
LINKUP SLAB
ELEVATION VIEW



ELEVATION VIEW
(QUARTER SCALE)



LINKUP SLAB
TOP VIEW



LINKUP SLABS BEAR ON TOP EDGES OF 4 ADJACENT MODULES

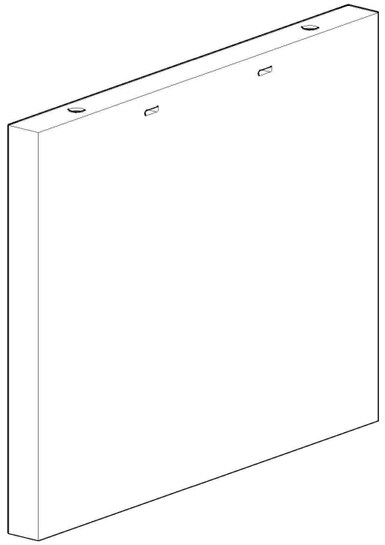
TOP VIEW
(QUARTER SCALE)

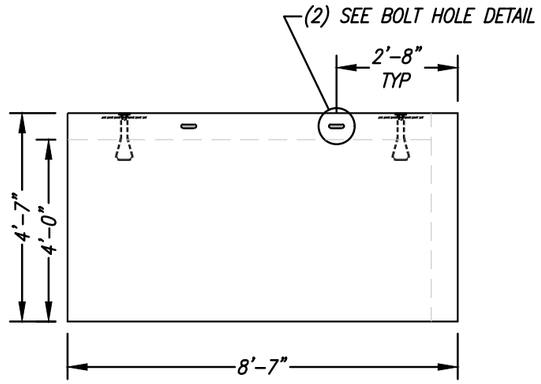
12/30/19SSERTICH

1:40 SCALE

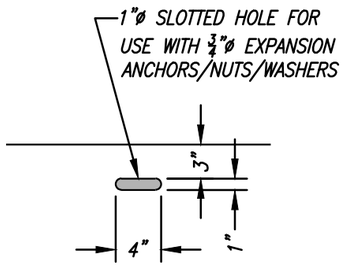
BioClean
A Forterra Company

URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
LINKUP SLAB

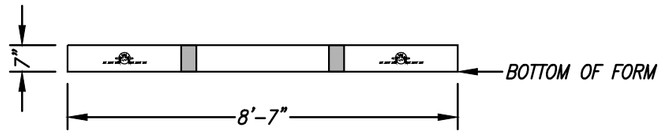




EXTERIOR VIEW



BOLT HOLE DETAIL



TOP VIEW

1:40 SCALE

12/13/19/JCHANG

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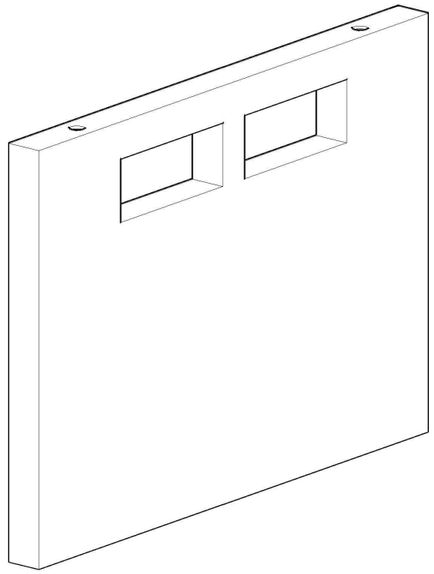
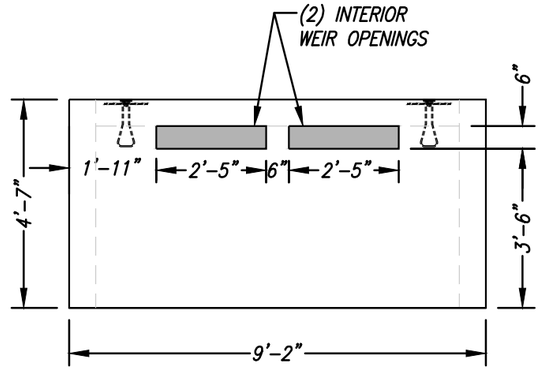
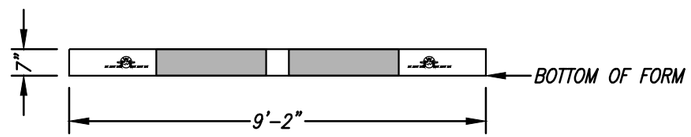
A Forterra Company

URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
SINGLE MODULE - EXTERIOR WALL PANEL





WEIR WALL
ELEVATION VIEW



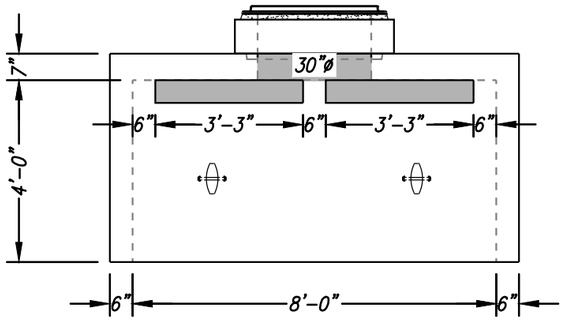
WEIR WALL
TOP VIEW

7/12/21MWOOLERY

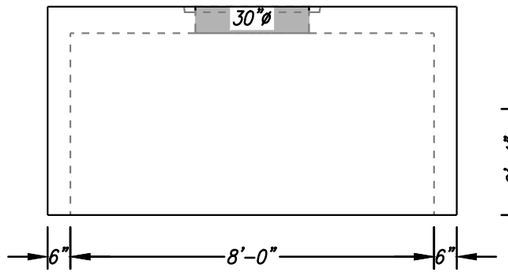
1:40 SCALE

BioClean
A Forterra Company

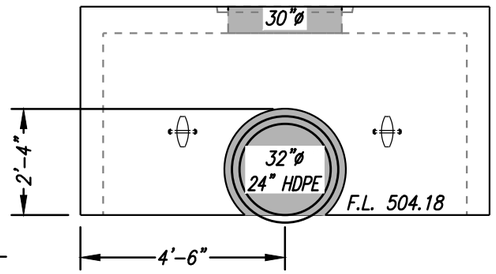
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
SINGLE MODULE - EXTERIOR WALL PANEL



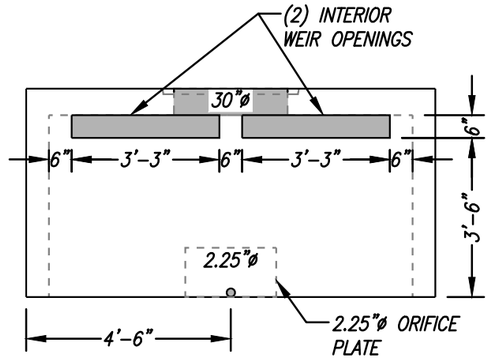
ELEVATION VIEW A



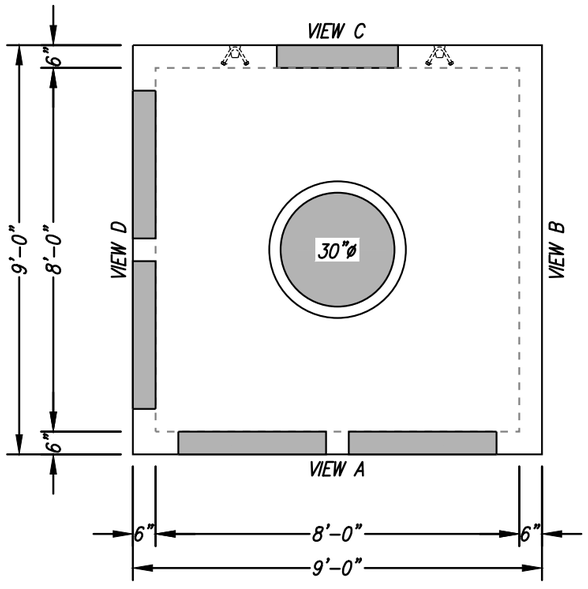
ELEVATION VIEW B



ELEVATION VIEW C



ELEVATION VIEW D



TOP VIEW
(FRAME & COVER / GRADE ADJUSTMENT NOT SHOWN)

7/13/21MWOOLERY

1:50 SCALE

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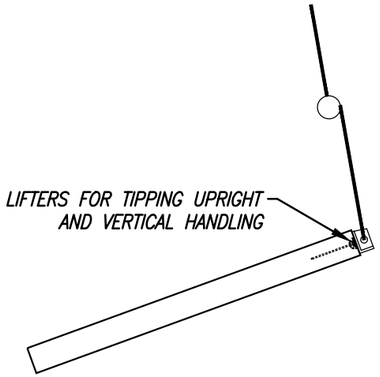
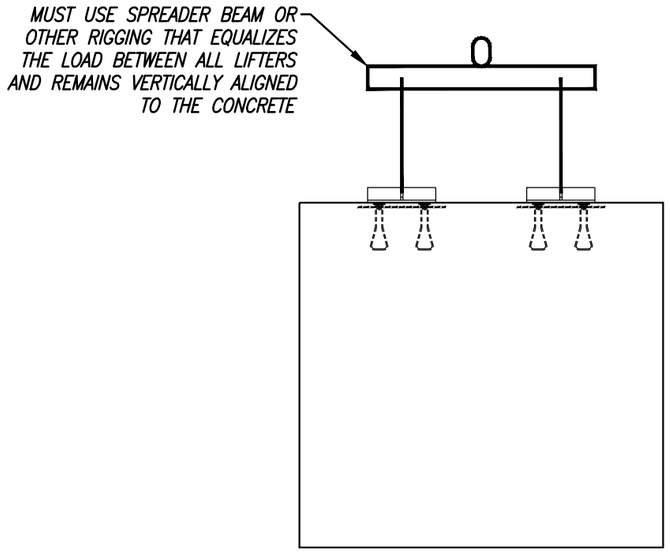
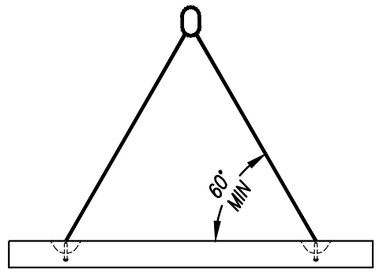
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION OUTLET VAULT

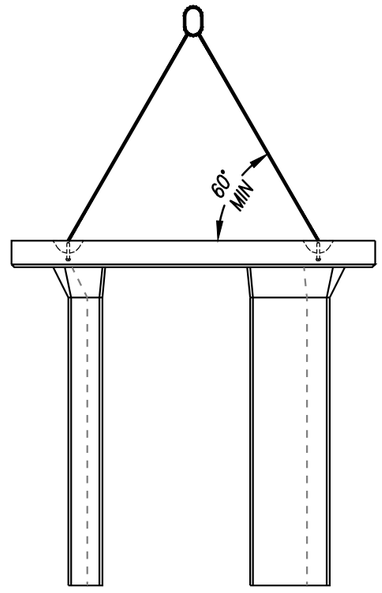




EXTERIOR WALL PANEL



LINKUP SLAB



*** SINGLE MODULE**
INTERIOR & PERIMETER

** SOME MODULES MUST USE RIGGING THAT EQUALIZES THE LOAD BETWEEN ALL LIFTERS*

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URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
LIFT RIGGING

1:40 SCALE

8/4/2021RADT

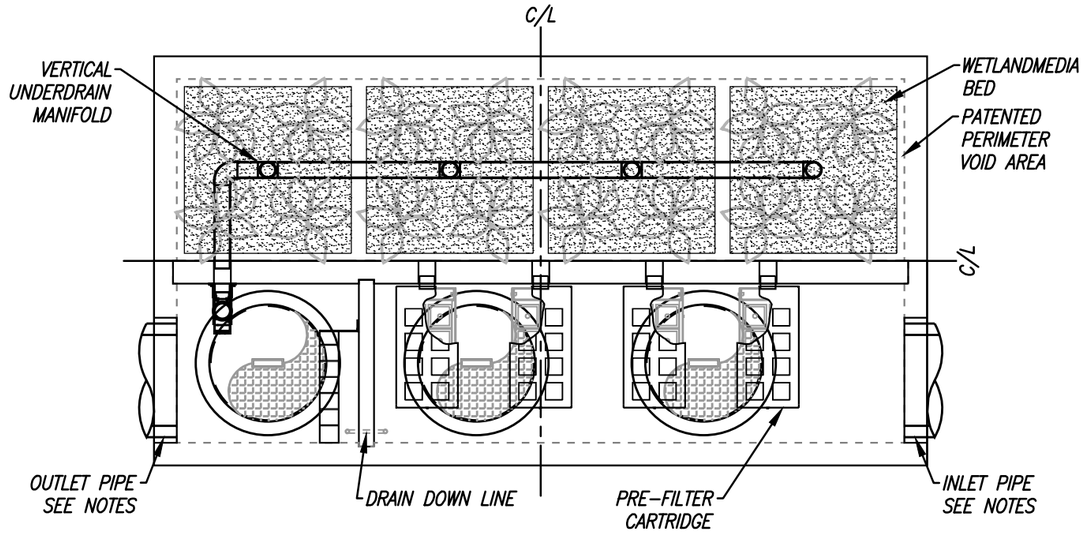
SITE SPECIFIC DATA			
PROJECT NUMBER		12255	
PROJECT NAME		DIB2 – SWEETWATER	
PROJECT LOCATION		SPRING VALLEY, CA	
STRUCTURE ID		MWS B	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
19,554		N/A	
TREATMENT HGL AVAILABLE (FT)			N/K
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	504.13	HDPE	24"
OUTLET PIPE	503.64	HDPE	24"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	511.81	511.81	511.81
SURFACE LOAD	PEDESTRIAN	N/A	PEDESTRIAN
FRAME & COVER	2EA ø30"	OPEN PLANTER	ø30"
WETLANDMEDIA VOLUME (CY)			16.40
ORIFICE SIZE (DIA. INCHES)			5 EA. ø0.95"
ORIFICE SPACING (FT)			0.82
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.			

INSTALLATION NOTES

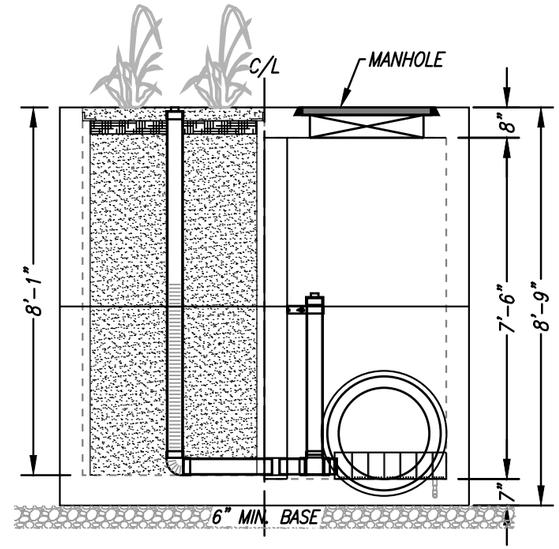
1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS' SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL PIPES, RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

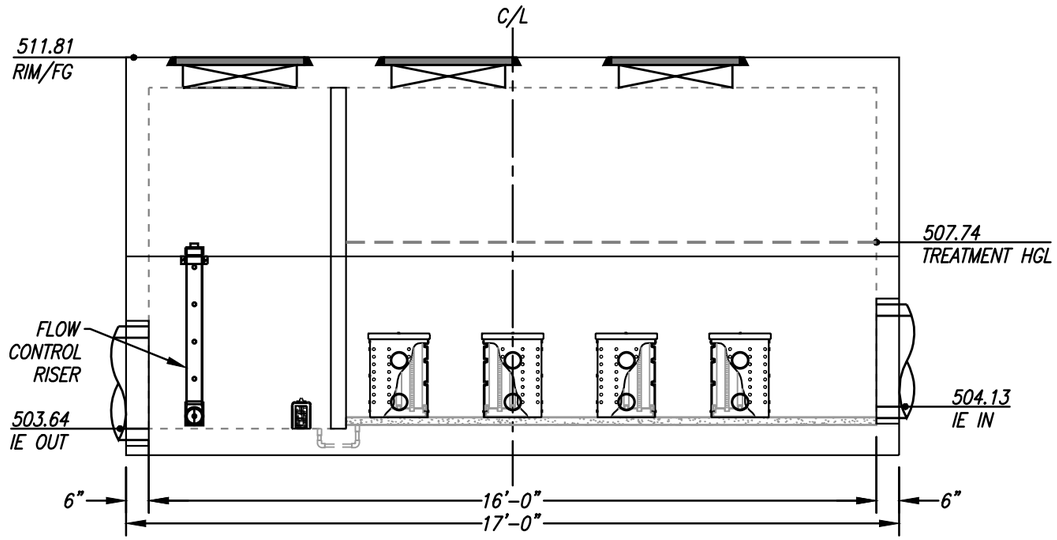
1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.



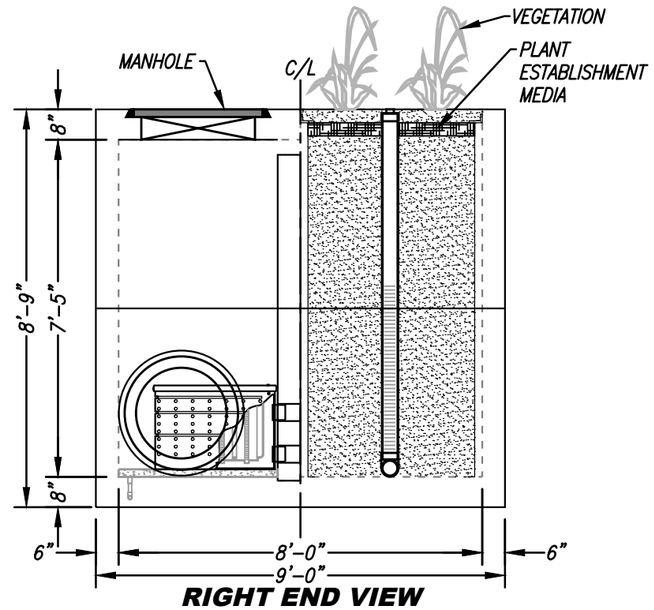
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

LOW INFLOW PIPE DISCLOSURE:

IT IS RECOMMENDED THAT A SUFFICIENT VARIATION IN ELEVATION BETWEEN THE INLET AND OUTLET BE PROVIDED TO ALLOW FOR ACCUMULATION OF SEDIMENT IN THE PRE-TREATMENT CHAMBER. FAILURE TO DO SO MAY RESULT IN BLOCKAGE AT INFLOW POINT(S) WHICH MAY CAUSE UPSTREAM FLOODING.

REQUIRED TREATMENT VOLUME (CF)		19,554
DRAINDOWN DURATION (HOURS)		36
AVERAGE DISCHARGE RATE PER MWS UNIT(GPM)		67.96
OPERATING HEAD (FT)		4.1
WETLANDMEDIA INFILTRATION RATE (IN/HR)	OR	28
WETLANDMEDIA LOADING RATE (GPM/SF)		0.28

MWS-L-8-16-8'-1"-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

7/12/21WOOLERY