

Appendix 3

2018 MS4 Stormwater Annual Report

Typical Stormwater Management Report

as submitted to the

City Plan Commission

for the approval of a new development

JULIANO ASSOCIATES, LLC
405 MAIN STREET
YALESVILLE, CONNECTICUT 06492
203-265-1489

STORMWATER DRAINAGE REPORT

PROPOSED RESIDENTIAL UNITS

#34 LEVEL STREET
NEW HAVEN, CONNECTICUT
JANUARY 24, 2019
(REVISED 2/6/2019)

RECEIVED

FEB 07 2019

CITY PLAN DEPT.
165 CHURCH ST.
NEW HAVEN, CT 06510

Handwritten signature

STORM WATER DRAINAGE SYSTEM REPORT

HYDROLOGY & METHODOLOGY

The principal method of predicting the surface water runoff rates utilized in this report is a computer model based upon the SCS/TR-20 watershed modeling. The model forecasts the rate of surface water runoff based upon several factors. The input data includes information on land use, soil types vegetation, watershed areas, time of concentration, rainfall data, storage volumes, and the hydraulic capacities of structures. The computer model predicts the amount of runoff as a function of time. Runoff rates during specific rainstorms may vary due to different assumptions concerning soil moisture, water levels, snowmelt and rainfall patterns.

The input data for rainfall with statistical recurrence frequencies of 1" & 1, 2, 5, 10, 25, 50, and 100-year storms were obtained from the U.S. Weather Bureau Technical Papers. The National Weather Service developed four synthetic storms to simulate rainfall patterns around the country. For analysis with Connecticut, the type III rainfall pattern with a 24-hour distribution is valid.

For the purpose of determining the effects of the proposed development on the watershed and downstream properties, two models were run. The first was to determine what the existing drainage condition were, with the second model incorporating the proposed development.

REVISION SITE SPECIFIC NARRATIVE

The subject site is a 259,725 Sq. Ft. (5.96 Acre) parcel located at the intersection of Level Street and Brookside Avenue in New Haven Connecticut. The property is located in a Residential (RM-1). The topography of the existing site generally slopes towards the rear lot line with a gentle slope. Approximately 31.9% of the site is considered impervious surfaces, with the remainder being grassed areas. There appears to be no wetland or watercourses on site. Based upon the Soil Survey of New Haven County, prepared by the United States Department of Agriculture, Soil Conservation Service, the soils on site are of the Wethersfield Series, with a hydrologic group of C. The building on site was used for commercial use, but is currently empty.

The proposed development will convert the existing building into a 51 unit apartment building. The parking lot will be revised to promote flow as well as associated sidewalks for pedestrian use. The general slope of the site will remain the same with runoff from the proposed addition to be directed into the proposed underground storage units. Overflow from the system will enter the existing drainage system on Brookside Avenue. The

remaining flow will continue to sheet flow to the rear of the property. Due to the increase in impervious area 9,349 sq. ft., a system of StormTrap Double Trap 6-0 Units are proposed. These will not only store the first inch of runoff from the entire site but will reduce the total volume and peak flows for all storms (see below). The system is designed as a closed system that will not infiltrate. The system is designed with an outlet control structure that has a low flow orifice at 85.66 is 5" x 3" square. There is a second orifice that has a 9" tall by 30" wide orifice at elevation 88.0. there is a weir at elevation 90.0.

<u>Existing</u>		
Event	Inflow (cfs)	Volume (cubic-feet)
1" Water Quality	0.48	2,133
1-Year	10.71	26,110
2-Year	15.02	36,493
5-Year	22.43	54,722
10-Year	28.83	70,797
25-Year	37.62	93,327
50-Year	44.44	111,108
100-Year	51.26	129,129
<u>Proposed</u>		
Event	Inflow (cfs)	Volume (cubic-feet)
1" Water Quality	0.00	139
1-Year	2.42	6,217
2-Year	3.76	9,349
5-Year	6.20	15,130
10-Year	8.40	28,834
25-Year	11.52	51,515
50-Year	13.99	69,365
100-Year	16.49	87,430

For water quality purposes, there will be an integrated sediment chamber constructed from StormTrap Units. This chamber has been designed to provide at least 1,020 Cu. Ft. of sediment storage, which is required as per the 2002 Connecticut Guidelines for Sediment and Erosion Control. The water quality system will collect sediment, oils, and debris prior to the StormTrap underground detention system so that routine maintenance can remove it. This will extend the life and usability of the StormTrap System. Refer to Sheet 12 within the civil design drawings for details and addition information regarding the proposed oil/water/sediment chamber design.

As indicated in the above tables, the post construction flows leaving the entire site will be less than existing flows for all storm events up to and including the 100-year design storm.

Underground Detention System:

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
1" Water Quality	1.61	0.00	86.48	3,893
1-Year	10.25	0.00	88.13	24,109
2-Year	13.33	0.00	88.75	31,697
5-Year	18.40	0.00	89.79	44,497
10-Year	22.65	0.36	90.07	47,896
25-Year	28.38	1.06	90.22	49,794
50-Year	32.78	1.12	90.80	56,812
100-Year	37.17	1.20	91.50	65,454

Notes:

The attached HydroCAD calculations only include four (4) rows of twelve (12) units each. The installed units will be four (4) rows of thirteen (13) units each, with the additional four (4) units being used for sediment and oil storage (see detail sheets).

In summary,

As indicated within the previous table, the post construction flows leaving the site will be less than existing conditions flows for all storm events up to and including the 100-year design storm thereby confirming that the project's storm water handling plan meets the City and State requirements for storm water management.

City of New Haven – Section 60 Requirements

D1 – According to the Soil Survey of New Haven County, Connecticut; performed by the United States Department of Agriculture and Soil Conservation Service, the soils on site are of the Wethersfield Series, with a Hydrologic Group of “C”. Two test pits have been conducted in the proposed storm water system area on 4/06/2018, witnessed by James DiMeo of Juliano Associates.

TP1

Topsoll = 0-12”

Brown sand with silt = 12”-32”

Red sand with silt = 32”-84”

Compact sand with red rock = 84”-102”

No Ledge, No Groundwater

TP2

Topsoil = 0-12”

Brown silty loam = 12”-48”

Dark red silt with very fine sand = 48”-73”

Black silt = 73”-102”

No Ledge, No Groundwater

D2 – The closest surface water body Wintergreen Brook. The watercourse is located approximately 600 feet north of the project area. There are no wetlands on the property and the design engineer is unaware of any wetland area on the adjacent properties or those directly across Level Street or Brookside Avenue. Depth to ground water is deeper than 102”.

D3 – There are no waterbodies on the subject site nor are there any waterbodies on any adjacent property.

D4 – As noted in D3 there are no waterbodies.

D5 – The project is proposing an underground detention/infiltration system consisting of 96 units of the 5’ Storm Trap. The system will be located on the south east corner of the property. Please refer to Sheet 5 of 10 of the design drawings for specific information

regarding the proposed system. Water quality/treatment is met using Storm Traps' internal oil and grit chambers. Please refer to the attached product information brochure, specification, and detail.

D6 – A proposed stormwater maintenance manual and schedule is included as part of this stormwater report.

D7 – Stormwater runoff rates for both existing and proposed conditions are included within this report. Soil infiltration rates as taken from the Soil Conservation Service Soil Survey of New Haven County Connecticut are included with this report.

TSS removal:

Parking lot sweeping – 10%

Storm Traps' Oil & Grit Chamber – 80%

Parking lot sweeping = $1 * 0.1 = 0.1$

$1 - 0.1 = 0.9$ TSS remaining

Storm Traps' Oil & Grit Chamber = $0.9 * 0.8 = 0.72$

$0.9 - 0.72 = 0.18$ TSS remaining

Final TSS removal = $1 - 0.18 = 0.82$ or 82%

D8 – The stormwater report provided satisfies this requirement. The proposed detention/infiltration system manages peak flows on site thus reducing impacts downstream.

E1 – There is no direct channeling of untreated surface water runoff. Water entering the underground detention/infiltration system will be treated by the Storm Trap internal oil and grit chambers.

E2 – There is no increase in peak runoff or total volume of stormwater runoff from the site.

E3 – The natural hydrologic conditions (i.e. runoff from the existing parking lot) will be temporarily disturbed for the installation of the galley system. Once the system is installed the parking lot will be renovated and conditions will be restored.

E4 – Since most of the proposed activities are in areas that are either currently impervious or directly adjacent to an existing impervious area the control of pollutants will be easily controlled with the existing storm water system until the proposed system is installed. The proposed system will have an internal oil and grit chamber that all captured storm water will need to pass through in order to enter the underground detention system, this will effectively treat the storm water flows and remove sediments and debris.

E5 – As indicated by the calculations the stormwater management system will manage site runoff to control peak discharges and provide pollution treatment thereby reducing surface and groundwater pollution.

E6 – As indicated by the calculations the stormwater management system has been designed to collect, retain, and treat the first inch of rain on-site.

E7 – The proposed system is an on-site storage and infiltration system.

E8 – The proposed system manages the post development runoff rates and volumes so that they do not exceed pre-development conditions. The proposed system has no impact on any properties or stormwater flows upstream.

E9 – As indicated by the TSS calculations provided the proposed stormwater system employs best management practices and meets the requirement of 80 percent TSS removal.

E10 – The proposed design makes use of BMPs to the maximum extent possible to minimize or mitigate volume, rate and impact of stormwater to ground or surface waters.



Juliano Associates
405 Main Street (Yalesville)
Wallingford, Connecticut 06492
Voice: 203-265-1489
Fax: 203-949-1523

RESIDENTIAL REDEVELOPMENT
34 LEVEL STREET, NEW HAVEN
STORMWATER MAINTENANCE PROGRAM
January 24, 2019

Upon site development, there will be a need to periodically maintain the various elements of the stormwater facilities onsite. The stormwater system consists of catch basins, an oil and grit chambers, and an underground detention/infiltration system along with the associated storm drainage piping.

In order to ensure optimal pollution prevention to receiving waters, the following stormwater maintenance program has been established. The property owner, Level Street Holdings, LLC, or their designated property management company shall be the entity responsible for the implementation of this program.

A. Driveway & Parking Area Sweeping

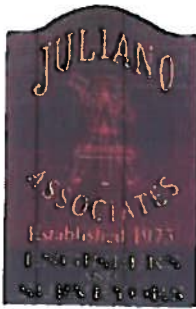
All parking areas and sidewalks shall be swept clean of sand and litter at least twice per year, once between November 15 and December 15 (after leaf fall) and once during the month of April (after snow melt) and at other times as may be necessary.

B. Catch Basins

Catch basins contain sumps that will require periodic maintenance. Each catch basin on the property shall be inspected quarterly for the first two years, and the frequency of such monitoring in subsequent years shall be adjusted based on observation in the first two years. Sediment and debris shall be removed at least once a year, during the month of April and more frequently, if needed.

C. Oil and Grit Chamber

These structures shall be inspected quarterly for the first two years, and the frequency of such monitoring in subsequent years shall be adjusted based on observation in the first two years. Sediment and debris shall be removed at least once a year, during the month of April and more frequently, if needed.



Juliano Associates
405 Main Street (Yalesville)
Wallingford, Connecticut 06492
Voice: 203-265-1489
Fax: 203-949-1523

D. Underground Galley System

These facilities provide storage for runoff during storms as a result of development. Detention is the collection and temporary storage of surface water at a controlled rate of outflow. Infiltration is the collection and immediate conveyance of surface water. It is imperative that these facilities be monitored and maintained to ensure that they are functioning properly.

The galley system is to be installed with a minimum of four (4) access/inspection ports as denoted on the plans. The system is to be inspect a minimum of two (2) times per year during the months of April and October. During the inspections the amount of sediment and/or debris shall be measure and recorded in a maintenance log. If sediment is noted at inspection ports 2, 3, or 4 the galley system shall be cleaned with the use of a vacuum truck.

PHILIPS



Wall Mount

PureForm

LED wall sconce



Project: _____
 Location: _____
 Cat No: _____
 Type: _____
 Qty: _____
 Notes: _____

Philips Gardco PureForm LED wall sconce PWS with precision optics offers a sleek, low profile design that will complement a range of architectural styles. PureForm wall sconce provides up to 21,800 lumens to accommodate multiple mounting heights up to 20', and is available with Type 2, 3, 4, as well as our back light control optics. A full range of control options is available for additional energy savings. Optional emergency battery backup option is available for path-of-egress and is Integral to the luminaire.

Ordering guide

example: PWS-48L-500-NW-G2-2-UNV-DGY

Prefix	Number of LEDs	Drive Current	LED Color - Generation	Distribution	Emergency	Voltage	Dimming controls	Motion sensing	Photo-sensing	Electrical	Finish
PWS											
PWS PureForm wall sconce	48L 48 LEDs	300 300mA ¹ 400 400mA 500 500mA 600 600mA 700 700mA	NW-G2 Warm White 3000K, 70 CRI Generation 2 NW-G2 Neutral White 4000K, 70 CRI Generation 2 CW-G2 Cool White 5000K, 70 CRI Generation 2	2 Type 2 3 Type 3 4 Type 4 BLC Back light control	EBPC Emergency Battery Pack Cold Weather ^{5,6,7} Leave blank to omit an emergency option	120V 120V 347-480V 120V 120V 208V 240V 240V	DD 0-10V External dimming (controls by others) ⁴ DCC Dual Circuit Control ^{4,8,9} FAWS Field Adjustable Wattage ^{4,9} SW Interface Module for StairWise ^{4,8,9} LLC2 Integral wireless module with #2 lens ^{4,9} LLC3 Integral wireless module with #3 lens ^{4,9} BL BL-level functionality with motion sensor ⁴ DynamicDimmer: Automatic Profile Dimming ^{4,7} CS50 Security 50% Dimming, 7 hours CM50 Median 50% Dimming, 8 hours CE50 Economy 50% Dimming, 9 hours DA50 All Night 50% Dimming CS30 Security 30% Dimming, 7 hours CM30 Median 30% Dimming, 8 hours CE30 Economy 30% Dimming, 9 hours DA30 All Night 30% Dimming	IMR2 Integral with #2 lens IMR3 Integral with #3 lens	PCB Photocontrol Button ^{10,11}	Fusing F1 Single (120, 277, 347VAC) ¹² F2 Double (208, 240, 480VAC) ¹² F3 Canadian Double Pull (208, 240, 480VAC) ¹² Surge Protection (10kA is standard) SP2 Increased 20kA	Textured BK Black WH White BZ Bronze DGY Dark Gray MGY Medium Gray Customer specified RAL Specify optional color or RAL (see RAL7024) CC Custom color (Must supply color chip for required factory quote)
	64L 64 LEDs	800 600mA 700 700mA 800 800mA 900 900mA	WY-G2 Warm Yellow 2700K, 80 CRI Generation 2 ⁸ AM-G2 Direct Amber (590nm) Generation 2 ⁸			277 277V 347 347V 480 480V					

- 1. Only 300mA can be used with battery backup (EBPC) configuration.
- 2. Extended lead times apply. Contact factory for details.
- 3. Available only in 120 or 277V.
- 4. Not available with other control options.
- 5. Not available with motion sensor.
- 6. Not available with photocontrol.
- 7. Not available in 347 or 480V.
- 8. Must specify input voltage.
- 9. Available with two modules (64L) at 800mA.
- 10. Not available with DCC, SW, and CS/CM/CE/DA.
- 11. Not available in 800 or 900mA.
- 12. Not available with 64L.

PWS PureForm LED wall sconce

Luminaire Accessories (order separately)

Mounting Accessories

Wall Mount

PWS-WM-62	Wall Mounted Box for Surface Conduit
------------------	--------------------------------------

System accessories

Wireless system remote mount module

LLCR2-(F)	#2 lens - specify finish in place of (F)
LLCR3-(F)	#3 lens - specify finish in place of (F)

Central Remote Motion Response (used connected to SiteWide main pane.)

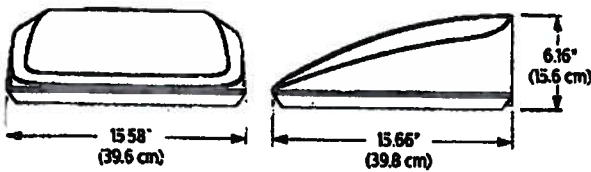
MS2-A-FVR-3
MS2-A-FVR-7

Wireless system remote controller accessory

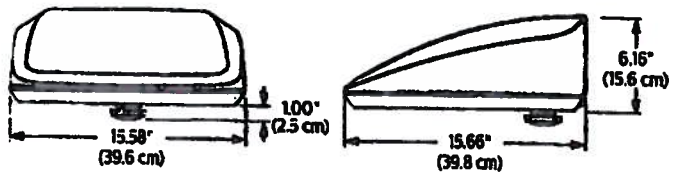
Wireless system offers a remote radio/sensor module that allows connection to a Linelight system (sold by others). Remote module can be mounted to wall or pole with j-box supplied. May be specified by choosing one of two different lenses to accommodate a variety of mounting heights/sensor detection ranges. Must specify option DD on luminaires that are planned to be used with remote mount controllers.

Dimensions

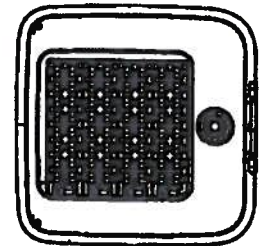
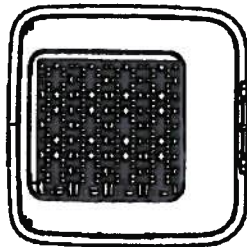
Standard Luminaire



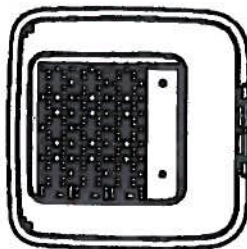
Motion Response and Wireless System



4 modules



3 modules



Luminaire Weights

PureForm LED wall sconce PWS	Weight
Luminaire	24 lbs
Luminaire - BBPC (EM battery pack)	27 lbs

PWS PureForm LED wall sconce

LED Wattage and Lumen Values

Ordering Code	LED Qty	LED Current (mA)	Color Temp.	Average System Watts	Type 2			Type 3			Type 4			BLC		
					Lumen Output	BUG Rating	Efficiency (LPW)	Lumen Output	BUG Rating	Efficiency (LPW)	Lumen Output	BUG Rating	Efficiency (LPW)	Lumen Output	BUG Rating	Efficiency (LPW)
PWS-48L-300-NW-G2-π	48	300	4000	47	6396	B2-U0-G1	137	6288	B1-U0-G2	136	6386	B1-U0-G2	136	4899	B0-U0-G1	105
PWS-48L-400-NW-G2-π	48	400	4000	61	8305	B2-U0-G2	135	8775	B1-U0-G2	133	8290	B1-U0-G2	135	6360	B0-U0-G2	104
PWS-48L-500-NW-G2-π	48	500	4000	76	10091	B2-U0-G2	133	9829	B2-U0-G2	131	10072	B2-U0-G2	133	7727	B0-U0-G2	102
PWS-48L-600-NW-G2-π	48	600	4000	91	11655	B2-U0-G2	130	11664	B2-U0-G2	128	11833	B2-U0-G2	130	9078	B1-U0-G2	100
PWS-48L-700-NW-G2-π	48	700	4000	105	13728	B3-U0-G2	131	13505	B2-U0-G2	129	13702	B2-U0-G3	130	10512	B1-U0-G2	100
PWS-64L-500-NW-G2-π	64	500	4000	118	15843	B3-U0-G3	135	15603	B2-U0-G3	133	15814	B2-U0-G3	135	12132	B1-U0-G2	103
PWS-64L-700-NW-G2-π	64	700	4000	137	17863	B3-U0-G3	130	17594	B3-U0-G3	128	17830	B3-U0-G3	130	13679	B1-U0-G2	100
PWS-64L-800-NW-G2-π	64	800	4000	158	19915	B3-U0-G3	125	19874	B3-U0-G3	124	19878	B3-U0-G4	126	15250	B1-U0-G3	97
PWS-64L-900-NW-G2-π	64	900	4000	179	21981	B3-U0-G3	122	21851	B3-U0-G4	120	21839	B3-U0-G4	122	16756	B1-U0-G3	94

Values from photometric tests performed in accordance with IESNA LM-79 and are representative of the configurations shown. Actual performance may vary due to installation and environmental variables, LED and driver tolerances, and field measurement considerations. It is highly recommended to confirm performance with a photometric layout.

NOTE: Some data may be scaled based on tests of similar (but not identical) luminaires. Contact factory for configurations not shown.

LED Wattage and Lumen Values (Emergency Mode)

Ordering Code	LED Qty	LED Current (mA)	Color Temp.	Lumen Outputs									
				Avg. System Watts		Type 2		Type 3		Type 4		BLC	
				Normal Mode	Emergency Mode	Normal Mode	Emergency Mode	Normal Mode	Emergency Mode	Normal Mode	Emergency Mode	Normal Mode	Emergency Mode
PWS-48L-300-NW-G2-EBPC	48	285	4000	52	14	6362	2799	6266	2068	6349	2095	4871	1807

For emergency EBPC option, publish values are based on initial lumens.

Predicted Lumen Depreciation Data

Predicted performance derived from LED manufacturer's data and engineering design estimates, based on IESNA LM-80 methodology. Actual experience may vary due to field application conditions. L70 is the predicted time when LED performance deprecates to 70% of initial lumen output. Calculated per IESNA TM21-11. Published L70 hours limited to 6 times actual LED test hours

Ambient Temperature °C	Drive current	Calculated L ₇₀ hours	L ₇₀ per TM-21	Lumen Maintenance % at 60,000 hrs.
25°C	up to 900 mA	>100,000 hours	>54,000 hours	>96%

PWS PureForm LED wall sconce

Specifications

Housing

Main body housing and door frame made of low copper die cast aluminum alloy for a high resistance to corrosion. Door hinges secured by aircraft cable to allow access to driver or other electronic components for servicing. The door frame acts as the main heat transfer component and it is optimized to allowing the main housing to have no fins, giving the freedom to have a clean minimalist aesthetic design while allowing it to house emergency battery backup equipment and various other options. Luminaire housing rated to IP65, tested in accordance to Section 9 of IEC 60598-1.

Light engine

Light engine comprises of a module of 16-LED aluminum metal clad board fully sealed with optics offered in multiples of 3 and 4 modules or 48 and 64 LEDs. Module is RoHS compliant. Standard color temperatures: 3000K +/- 125K, 4000K, 5000K +/- 200K. Minimum CRI of 70. Also available in 2700K and Amber (590nm) with extended lead times. Contact factory for details. LED light engine is rated IP66 in accordance to Section 9 of IEC 60598-1.

Energy saving benefits

System efficacy up to 137 lms/W with significant energy savings over Pulse Start Metal Halide luminaires. Optional control options provide added energy savings during unoccupied periods.

Optical systems

Type 2, 3, and 4 distributions available, including a dedicated BLC optic to provide the best backlight control possible to reduce light on the wall. Performance tested per LM-79 and TM-15 (IESNA) certifying its photometric performance. Luminaire designed with 0% uplight (UO per IESNA TM-15).

Mounting

Mounting is completed through integral back plate that features a separate recessed feature for hook and lock quick mount plate that secures with two set screws from bottom of luminaire. Luminaire ships fully assembled, ready to install.

Control options

0-10V dimming (DD): Access to 0-10V dimming leads supplied through back of luminaire (for secondary dimming controls by others). Cannot be used with other control options.

Dual Circuit Control (DCC): Luminaire equipped with the ability to have two separate circuits controlling drivers and light engines independently. Permits separate switching of 2 modules each at 800mA (64L models), controlled by use of two sets of leads, one for each circuit. Not recommended to be used with other control options, motion response, or photocells.

Field Adjustable Wattage Selector (FAWS): Luminaire equipped with the ability to manually adjust the wattage in the field to reduce total luminaire lumen output and light levels. Comes pre-set to the highest position at the lumen output selected. Use chart below to estimate reduction in lumen output desired. Cannot be used with other control options or motion response.

FAWS Position	Percent of Total Lumen Output
1	25%
2	50%
3	55%
4	65%
5	75%
6	80%
7	85%
8	90%
9	95%
10	100%

Note: Typical value accuracy +/- 5%

SiteWise (SW): SiteWise system includes a controller fully integrated in the luminaire that enables the luminaires to communicate with a dimming signal transmitter cabinet located on site using Philips patented central dimming technology. A locally accessible mobile app allows users to access the system and set functionalities such as ON/OFF, dimming levels and scheduling. SiteWise is available with motion response options in order to bring the light back to 100% when motion is detected. Cannot be used with other control options or photocell options. Additional functionalities are available such as communication with indoor lighting and connection to BMS systems. Complete information on the control system can be found on the SiteWise website at philips.com/sitewise.

Automatic Profile Dimming (CS/CM/CE/CA): Standard dimming profile of 30% or 50% provide flexibility towards energy savings goals while optimizing light levels during specific dark hours. When used in combination with not programmed motion response it overrides the controller's schedule when motion is detected. After 5 minutes with no motion, it will return to the automatic dimming profile schedule. Automatic dimming profile scheduled with the following settings:

- CS50/CS30: Security for 7 hours night duration (Ex, 11 PM - 6 AM)
- CM50/CM30: Median for 8 hours night duration (Ex, 10 PM - 6 AM)
- CE50/CE30: Economy for 9 hours night duration (Ex, 9 PM - 6 AM)
- CA50/CA30: for all night (during all dark hours)

Cannot be used with other control options.

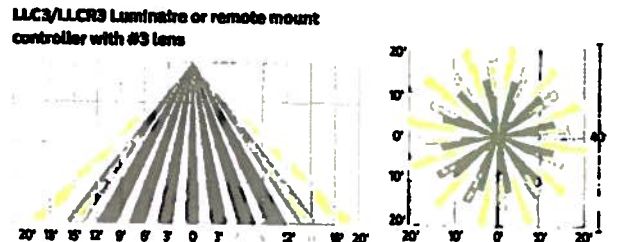
Emergency Battery Backup Cold Pack (EBPC): Emergency battery pack is cold weather rated down to -20C (-4F) and integral to the luminaire, allowing for a consistent look between emergency and non-emergency sconces. A separate surface mount accessory box is not required. Emergency battery pack is used with 48L configuration in 300mA wired in parallel, operating in emergency mode to meet various redundancy requirements. Secondary driver with relay immediately detects AC power loss and powers luminaire for a minimum of 90 minutes from the time power is lost. Available in 120 or 277V only.

Wireless system (LLC): Optional wireless controller integral to luminaire ready to be connected to a LimeLight system (sold by others). The system allows you to wirelessly manage the entire site, independent lighting groups or individual luminaires while on-site or remotely. Based on a high-density mesh network with an easy to use web-based portal, you can conveniently access, monitor and manage your lighting network remotely. Wireless controls can be combined with site and area, pedestrian, and parking garage luminaires as well, for a completely connected outdoor solution. Equipped with motion response with #2 lens (LLC2) for 8' to 15' mounting height* or #3 lens (LLC3) for 8-25' mounting heights. Also available with remote pod accessory where pod is mounted separate from luminaire to pole or wall.

LLC2/LLC2 Luminaire or remote mount controller with #2 lens



LLC3/LLC3 Luminaire or remote mount controller with #3 lens



PWS PureForm LED wall sconce

Specifications (cont'd)

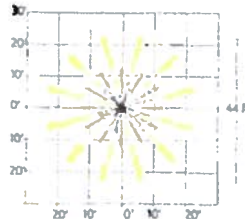
Motion response options

BI-Level Infrared Motion Response (BI-IMRI3): Motion Response module is mounted integral to luminaire factory pre-programmed to 50% dimming when not ordered with other control options. P50-IMRI is set/operates in the following fashion: The motion sensor is set to a constant 50%. When motion is detected by the PIR sensor, the luminaire returns to full power/light output. Dimming on low is factory set to 50% with 5 minutes default in "full power" prior to dimming back to low. When no motion is detected for 5 minutes, the motion response system reduces the wattage by 50%, to 50% of the normal constant wattage reducing the light level. Other dimming settings can be provided if different dimming levels are required. This can also be done with FSIR-100 Wireless Remote Programming Tool (contact Technical Support for details).

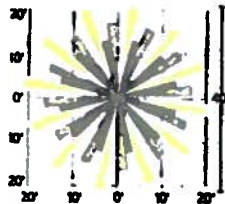
Infrared Motion Response with Other Controls (SW-IMRI3): When used in combination with other controls (Automatic Dimming Profile and SiteWise), motion response device will simply override controller's schedule with the added benefits of a combined dimming profile and sensor detection. In this configuration, the motion response device cannot be re-programmed with FSIR-100 Wireless Remote Programming Tool. The profile can only be re-programmed via the controller.

Infrared Motion Response Lenses (IMRI2/IMRI3): Infrared Motion Response Integral module is available with two different sensor lens types to accommodate various mounting heights and occupancy detection ranges. Lens #2 (IMRI2) is designed for lower mounting heights up to 8' with larger coverage areas up to 44' diameter coverage area. Lens #3 (IMRI3) is designed for mounting heights up to 20' with a 40' diameter coverage area. See charts for approximate detection patterns:

IMRI2 Luminaire or remote mount controller with #2 lens



IMRI3 Luminaire or remote mount controller with #3 lens



Electrical

Driver: Driver efficiency (>90% standard). 120-480V available (restrictions apply). Open/short circuit protection. Optional 0-10V dimming to 10% power. RoHS compliant.

Button Photocontrol (PCB): Button style design for internal luminaires mounting applications. The photocontrol is constructed of a high impact UV stabilized polycarbonate housing. Rated voltage of 120V or 208-277V with a load rating of 1000 VA. The photocell will turn on with 1-4Fc of ambient light.

Surge protection (SP1/SP2): Each luminaire is provided as standard with surge protector tested in accordance with ANSI/IEEE C62.45 per ANSI/IEEE C62.41.2 Scenario I Category C High Exposure 10kV/5kA waveforms for Line Ground, Line Neutral and Neutral Ground, and in accordance with U.S. DOE (Department of Energy) MSSLC (Municipal Solid-State Street Lighting Consortium) Model Specification for LED Roadway Luminaires Appendix D Electrical Immunity High Test Level 10kV / 5kA. Optional 20kV is available for additional protection.

Listings

UL/cUL listed to the UL 1598 standard, suitable for wet locations when mounted downward facing. Also listed for damp locations when inverted upward facing when mounted in covered ceiling application. Suitable for use in ambient temperatures from -40° to 40°C (-40° to 104°F). Most PureForm PWS configurations are qualified under Premium DesignLights Consortium® category. Consult DLC Qualified Products list for more details.

Finish

Each standard color luminaire receives a fade and abrasion resistant, electrostatically applied, thermally cured, triglycidic isocyanurate (TGIC) textured polyester powdercoat finish. The surface treatment achieves a minimum of 1000 hours for salt spray resistant finish in accordance with testing performed and per ASTM B117 standard. Standard colors include bronze (BZ), black (BK), white (WH), dark gray (DGY), and medium gray (MGY). Consult factory for specs on optional or custom colors.

Warranty

PureForm luminaires feature a 5-year limited warranty. See philips.com/warranties for complete details and exclusions.

© 2017 Philips Lighting Holding B.V. All rights reserved. Philips reserves the right to make changes in specifications and/or to discontinue any product at any time without notice or obligation and will not be liable for any consequences resulting from the use of this publication. philips.com/luminaires



Philips Lighting North America Corporation
200 Franklin Square Drive, Somerset, NJ 08873
Tel. 855-486-2216

Philips Lighting Canada Ltd.
281 Hillmount Rd, Markham, ON, Canada L6C 2S3
Tel. 800-668-9008



The color samples may not match precisely with their physical equivalents. Always refer to physical samples before making your color choice.

Solar Reflective Colors



Irish Cream
(SR) = 86

ASTM Method: E1000
Reflectance: .76
Emissivity: .94



Khaki
(SR) = 87

ASTM Method: E1000
Reflectance: .70
Emissivity: .94



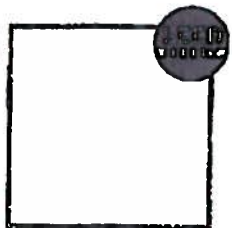
Royal Blue
(SR) = 88

ASTM Method: E1000
Reflectance: .7
Emissivity: .96



SR Terracotta
(SR) = 89

ASTM Method: E1000
Reflectance: .51
Emissivity: .98



White
(SR) = 70

ASTM Method: E1000
Reflectance: .90
Emissivity: .94



Sun Baked Clay
(SR) = 82

ASTM Method: E1000
Reflectance: .44
Emissivity: .93



SR Brownstone
(SR) = 81

ASTM Method: E1000
Reflectance: .50
Emissivity: .90



SR Evergreen
(SR) = 85

ASTM Method: E1000
Reflectance: .32
Emissivity: .96



Fawn
(SR) = 85

ASTM Method: E1000
Reflectance: .51
Emissivity: .90



Sandstone
(SR) = 88

ASTM Method: E1000
Reflectance: .52
Emissivity: .94



SR Slate
(SR) = 84

ASTM Method: E1000
Reflectance: .51
Emissivity: .91

*Reflectance values are measured in accordance with American Standard of Testing Methods (ASTM) D 1925. Emissivity values are measured in accordance with ASTM D 1977. The SR values of StreetBond are calculated according to ASTM E 1000-01.



This Parking Lot Surface is Solar Reflective



Pavement surfaces comprise roughly 30%-40% of the urban footprint and are a leading cause of Urban Heat Island Effect.

Reducing Heat Island Effect results in lower energy consumption: Air conditioning charges in adjacent buildings can potentially be cut by up to 1/3.

StreetBondSR's solar reflective coatings facilitate Urban Heat Island mitigation by reducing the amount of solar energy absorbed by pavement surfaces.

StreetBondSR's unique formulation combines high solar reflectance in color options designed to help hide soiling and typical surface wear & tear thereby minimizing maintenance.

Color Options for Parking Lots



Green!

LEED® Credits

The use of StreetBondSR can contribute LEED® credits under the following categories:

Sustainable Sites (SSc7.1) – Heat Island Effect (Non-Roof)

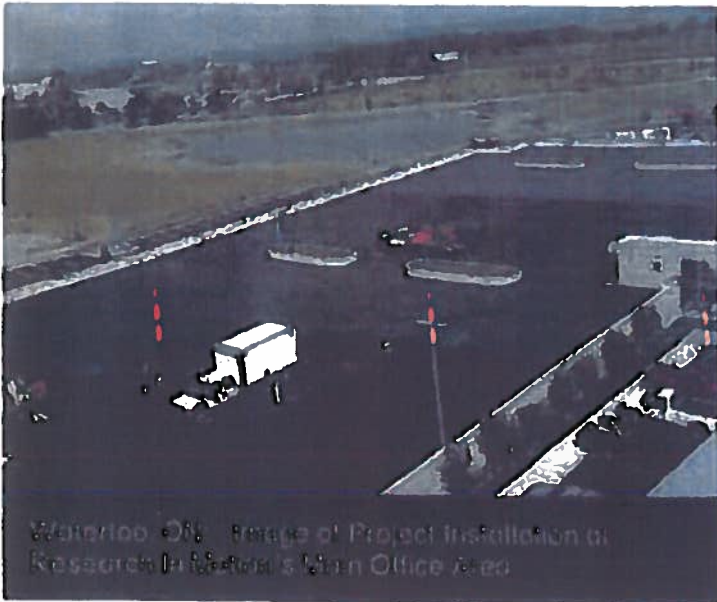
Green Neighborhood Development – Green Infrastructure & Buildings – Heat Island Reduction (GIB Credit 9)

One credit can be realized through the use of surface materials which have a Solar Reflectance Index (SRI) of 29 or higher applied to at least 50% of the site total hardscape including parking lots, roads, sidewalks and courtyards.





StreetBondSR™ Solar Reflective For Parking Lots



Waterloo, ON - Phase of Project Installation at Research In Motion's Main Office Area



Augusta, ME - First Grocery Store to Obtain LEED Platinum

StreetBondSR (In slate color) was used at Research In Motion's 58,000 sq. ft. parking lot area. The use of StreetBondSR led to LEED credits that contributed to overall LEED certification of the building.

Approximately 70,000 sq. feet of StreetBondSR dark slate coating went onto the parking area at Hannaford Augusta, Maine store location.

Slate as a color choice maintains the traditional parking lot look and works well to obscure dirt, grime and darkening.

Hannaford's was able to obtain enough LEED credits to become the first ever LEED Platinum certified grocery store in the world.

StreetBondSR™ -- all the benefits of StreetBond150™ with Solar Reflective Characteristics

A highly refined balance of 6 critical performance characteristics that bonds permanently to all asphalt surfaces.

Quality results and enduring beauty.



Making Asphalt Beautiful





STREETBOND SR COATED ASPHALT SPECIFICATION FLAT (NON STAMPED) SURFACE

PART 1 – GENERAL

1.1 DESCRIPTION

- A. StreetBond Advanced Coatings for Asphalt are specifically formulated for application to asphalt pavement and have been confirmed by a certified testing facility to possess a balance of performance properties for a durable and color-fast finish.**
- B. Certain colors of the StreetBond coatings have been independently verified to have an SRI greater than 29 and therefore can help projects qualify for points in the LEED program under Heat Island Effect: Non-Roof. Please refer to www.hubss.com for further information.**
- C. StreetBond SR is created when StreetBond150 are mixed use one of the colorant with SRI greater than 29.**
- D. Qualifications. Only Accredited StreetBond Applicators may bid for and perform the imprinted portion of this work. Please refer to Section 1.3 DEFINITIONS.**
- E. StreetBond products are manufactured in ISO9001 / ISO14001 facilities to ensure quality products produced in legally-responsible and environmentally-conscious manner**
- F. StreetBond coatings are only available from Quest Construction Products.**

1.2 REFERENCES

- A. ASTM D-4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Tester.**
- B. ASTM D-4060 Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.**
- C. ASTM D-2697 Standard Test Method for Volume of Nonvolatile Matter in Clear or Pigmented Coatings.**
- D. ASTM D522-93A Standard Test Method for Mendel Bend Test of Attached Organic Coatings.**
- E. ASTM D1653 Standard test method for water vapor transmission through organic film coatings.**
- F. ASTM G-154 QUV Accelerated Weathering Environment. Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials.**
- G. ASTM D 2369 Weight Solids Standard test method for Volatile Content of Coatings.**
- H. ASTM D 1475 Standard Test method for Density of Paint, Varnish, Lacquer, Other related products.**
- I. ASTM D-2240 (2000) Standard Test Method for Rubber property – Durometer hardness.**



STREETBONDSR COATED ASPHALT SPECIFICATION FLAT (NON STAMPED) SURFACE

- J. ASTM D-5895 Standard Test Method of drying or curing during film formation of organic coatings using mechanical recorders.**
- K. ASTM D-570 Standard Test Method for water absorption of plastics.**

1.3 DEFINITIONS

- A. "Accredited StreetBond Applicator" has valid Certification for both Textured (stamped) and Non-Textured (flatwork) as offered by Quest Construction Products and are reviewed on an annual basis. All Accredited StreetBond Applicators have been qualified by Quest Construction Products to perform the Work and offer a product Warranty.**
- B. "Approved Applicator" has valid Certification for non-textured (flatwork) application ONLY as offered by Quest Construction Products and are reviewed on an annual basis. Product Warranties may be available to Approved Applicators but require approval and supervision by a Quest Construction Products Technical Sales Representative.**
- C. "Applicator" means the installer of the StreetBond coatings.**
- D. "Owner" means the Owner and refers to the representative person who has decision making authority for the Work.**
- E. "TSR" is a Quest Technical Sales Representative who manages the StreetBond product in a given territory.**
- F. "Stamped asphalt pavement" is asphalt pavement that has been subjected to imprinting or texturing in a specific pattern.**
- G. "Non-Stamped asphalt pavement" is asphalt pavement that is unstamped and is sometimes referred to as "flatwork".**
- H. The "Work" is the asphalt pavement texturing work contemplated in this bid submission and specification.**
- I. "Scuffing" is a "tear" of the asphalt pavement caused by an external force -- for example turning the steering wheel of a stationary vehicle. Scuffing is generally the result of poorly designed or improperly installed asphalt and would most-commonly be seen on weaker residential asphalt.**
- J. "Layer" is a signal thin pass of coating, applied with a texture spray gun, which is allowed to dry before the next layer is applied.**
- K. "Warranty" is a guarantee to the property owner that StreetBond150, when properly applied will not peel, delaminate or show abnormal wear over specific period of time depending on the traffic volumes and number of layer applied. Please contact your local TSR for more details.**

1.4 SUBMITTALS

A copy of the Accreditation Certificate, available from the Applicator, is required with submittal. Independent test results available upon request.



**STREETBOND SR COATED ASPHALT SPECIFICATION
FLAT (NON STAMPED) SURFACE**

PART 2 – PRODUCTS

2.1 MATERIALS – STREETBOND COATINGS

StreetBond coatings have been scientifically formulated to provide the optimal balance of performance properties for a durable, long-lasting color and textured finish to asphalt pavement surfaces. Some of these key properties include wear and crack resistance, color retention, adhesion, minimal water absorption and increased friction properties. StreetBond coatings are environmentally safe and meet EPA requirements for Volatile Organic Compounds (VOC).

- A. StreetBond150 is a premium epoxy-modified, acrylic, waterborne coating specifically designed for application on asphalt pavements. It has a balance of properties to ensure good adhesion and movement on flexible pavement, while providing good durability. StreetBond150 is durable in both dry and wet environments.
- B. StreetBond Colorant is a highly-concentrated, high quality, UV stable pigment blend designed to add color to StreetBond150 coatings. One unit of Colorant shall be used with one pail of StreetBond coating material.

2.1.1 Properties of StreetBond coatings

The following tables outline the test results for physical and performance properties of the StreetBond coatings as determined by an independent testing laboratory.

TABLE 1: Typical Physical Properties of StreetBond Coatings.

Characteristic	Test Specification	SB150
Solids by Volume	ASTM D-2897	68.187%
Solids by Weight	ASTM D-2369	74.919%
Density	ASTM D-1475	13.8 lbs/gal (1.58 kg/l)

**STREETBONDSR COATED ASPHALT SPECIFICATION
FLAT (NON STAMPED) SURFACE**

TABLE 2: Typical Performance Properties of StreetBond Coatings

Characteristic	Test Specification	SB150
Dry time (To re-coat)	ASTM D-5895 23°C; 37% RH	35 min
Taber Wear Abrasion Dry H-10 wheel	ASTM D-4060 1 day cure	0.760g/1000 cycles
Taber Wear Abrasion Wet H-10 wheel	ASTM D-4060 7 days cure	1.670g/1000 cycles
QUV Accelerate Weathering Environment	ASTM G-151 ΔE 1,500hrs.	0.53 (Brick Colorant)
Hydrophobicity Water Absorption	ASTM D-570	11.945%
Shore hardness	ASTM D-2240	38.3
Mandrel Bend	ASTM D522-93A	1/4" @ 21° C
Permeance	ASTM D-1653	3.45g/m ² / 24hr/mmHg (52 mils)
VOC	per MSDS	19.14%
Adhesion to Asphalt	ASTM D-4541	Substrate Failure
Friction Wet	ASTM E-303 British Pendulum Tester	Wet=77.3 Dry=81.3

Certificates of Analysis are available upon request for each of these properties.

2.2 EQUIPMENT FOR STREETBOND APPLICATION

The equipment described has been designed specifically for optimal application of StreetBond coatings. Other equipment may or may not be suitable and could compromise the performance of the StreetBond coatings and/or reduce crew productivity.

- A. The **SB Flex Sprayer** is a proprietary coating sprayer supplied by Intech Equipment and is capable of applying the StreetBond coatings to the asphalt pavement surface in a thin, controlled film which will optimize the drying and curing time of the coating. A Graco RTX and RapidSprayerII sprayer may also be used.
- B. The **StreetBond Coatings Mixer** is a motorized mixing device designed to ensure efficient and thorough blending of the StreetBond components.
- C. **Backpack or Hand-Held sprayer** to apply the diluted StreetBond Adhesion Promoter Concentrate.
- D. The **RapidFinisher II** is an electric powered broom produced by Integrated Paving Concepts Inc. that can be used in the application of StreetBond coatings to improve productivity. It is especially useful on larger projects.



STREETBOND SR COATED ASPHALT SPECIFICATION FLAT (NON STAMPED) SURFACE

PART 3 - EXECUTION

3.1 GENERAL

StreetBond coating shall be supplied and applied on non-textured asphalt surface by an Accredited StreetBond Applicator in accordance with the plans and specifications or as directed by the Owner. Do not begin installation without confirmation of an Accreditation Certificate. Specifications for the execution of the StreetPrint® system can be found at www.hubss.com.

3.2 PRE-CONDITIONS

The condition of the asphalt substrate will impact the performance of the StreetBond coatings. A highly stable asphalt pavement free of defects is recommended.

3.2.1 Pre-requisites for new asphalt pavement

A durable and stable asphalt pavement mix design installed according to best practices over a properly prepared and stable substrate is a pre-requisite for all long-lasting asphalt pavement surfaces. The application of StreetBond does not change this requirement.

3.2.3 Pavement Marking Removal: recommended guidelines

Pavement markings may be removed by sandblasting, water-blasting, grinding, or other approved mechanical methods. The removal methods should, to the fullest extent possible, cause no significant damage to the pavement surface. The Owner shall determine if the removal of the markings is satisfactory for the application of StreetBond coatings. Work shall not proceed until this approval is granted.

3.2.4 Surface Preparation

The asphalt pavement surface shall be dry and free from all foreign matter, including but not limited to dirt, dust, de-icing materials, and chemical residue.

3.3 APPLICATION OF STREETBOND COATINGS

3.3.1 Coating Application Guidelines

- A. The Applicator shall use the SB Flex Spray System or suitable texture coatings sprayers to apply the StreetBond coatings.**
- B. The asphalt pavement surface shall be completely dry and thoroughly cleaned prior to application of the coatings.**
- C. The coating application shall proceed as soon as practical upon completion of the imprinting of the asphalt pavement where applicable.**



**STREETBOND SR COATED ASPHALT SPECIFICATION
FLAT (NON STAMPED) SURFACE**

- D. For polished asphalt, StreetBond Adhesion Promoter should be applied directly to the asphalt and allowed to dry completely prior to the first layers of coating.
- E. For concrete surfaces, StreetBond Concrete Primer WB or StreetBond Concrete Primer QS should be applied and allowed to cure prior to the first layers of coating. Please consult Technical Data sheets for more details on applications.
- F. The first layer of coating shall be spray applied then broomed to work the coating material into the pavement surface. Subsequent applications shall be sprayed then broomed or rolled. Each application of coating material shall be allowed to dry to the touch before applying the next layer.
- G. The Applicator shall apply the StreetBond coatings only when the air temperature is 50°F / (10°C) and rising and will not drop below 50°F / (10°C) within 24 hours. No precipitation should be expected within 24 hours.

3.4 COATING COVERAGE & THICKNESS

Coating coverage and thickness is as outlined in TABLE 4 below. Actual coverage may be affected by the texture of the asphalt pavement substrate and the imprint pattern selected. There will be less coverage with the first layer and higher coverage with subsequent layers.

TABLE 4: COATING COVERAGE AND THICKNESS

# OF LAYERS	COVERAGE (approx.)		THICKNESS (approx.)			
	NON-TEXTURED		WET		DRY	
	sqft/unit*	sqm/unit*	mm	mil	mm	mil
3	200	18.6	0.94	33	0.48	19
4	150	13.9	1.12	44	0.66	26
5	120	11.2	1.40	55	0.81	32
6	100	9.3	1.68	66	0.97	38

*1 unit is a nominal 5 gallon pail comprising Part A, Part B and Colorant (approximately 4.12 gallons). 1 unit when sprayed as a single layer covers approximately 600sqft (55.7 sqm), with an approximate thickness of 6.3mil (0.16mm) dry.



**STREETBONDSR COATED ASPHALT SPECIFICATION
FLAT (NON STAMPED) SURFACE**

3.5 Recommended Coating Coverage Rates

Please check with Quest Construction Products in advance to confirm the recommended application for the climate conditions at the project location.

TABLE 5: Recommended Coating Coverage Rates

Application	Hot Dry Climate	Temperate/Winter Climate
Pedestrian only	3 layers at 600 ft ² (56m ²) per 5 gallon (20 Litre) unit for a net coverage of 200 ft ² (18.6m ²) per 5 gallon (20 Litre) unit	3 layers at 600 ft ² (56m ²) per 5 gallon (20 Litre) unit for a net coverage of 200 ft ² (18.6m ²) per 5 gallon (20 Litre) unit
Residential driveway	3 layers at 600 ft ² (56m ²) per 5 gallon (20 Litre) unit for a net coverage of 200 ft ² (18.6m ²) per 5 gallon (20 Litre) unit	3 layers at 600 ft ² (56m ²) per 5 gallon (20 Litre) unit for a net coverage of 200 ft ² (18.6m ²) per 5 gallon (20 Litre) unit
Vehicular traffic		
Up to 600 cars per day per lane	4 layers at 600 ft ² (56m ²) per 5 gallon (20 Litre) unit for a net coverage of 150 ft ² (13.9m ²) per 5 gallon (20 Litre) unit	4 layers at 600 ft ² (56m ²) per 5 gallon (20 Litre) unit for a net coverage of 150 ft ² (13.9m ²) per 5 gallon (20 Litre) unit
600 to 1000 cars per day per lane	4 layers at 600 ft ² (56m ²) per 5 gallon (20 Litre) unit for a net coverage of 150 ft ² (13.9m ²) per 5 gallon (20 Litre) unit	4 layers at 600 ft ² (56m ²) per 5 gallon (20 Litre) unit for a net coverage of 150 ft ² (13.9m ²) per 5 gallon (20 Litre) unit, plus one additional layer in the wheel paths
1000 to 2000 cars per day per lane	4 layers at 600 ft ² (56m ²) per 5 gallon (20 Litre) unit for a net coverage of 150 ft ² (13.9m ²) per 5 gallon (20 Litre) unit, plus one additional layer in the wheel paths	4 layers at 600 ft ² (56m ²) per 5 gallon (20 Litre) unit for a net coverage of 150 ft ² (13.9m ²) per 5 gallon (20 Litre) unit, plus two additional layers in the wheel paths
2000 to 3000 cars per day per lane	4 passes at 600 ft ² (56m ²) per 5 gallon (20 Litre) unit for a net coverage of 150 ft ² (13.9m ²) per 5 gallon (20 Litre) unit, plus two additional layers in the wheel paths	No warranty is provided for traffic levels above 2000 cars per day per lane
	No warranty is provided for traffic levels above 3000 cars per day per lane	

1. Additional layers of StreetBond150 coatings may be used to provide additional build thickness in high wear areas such as vehicle wheel paths and turning areas.

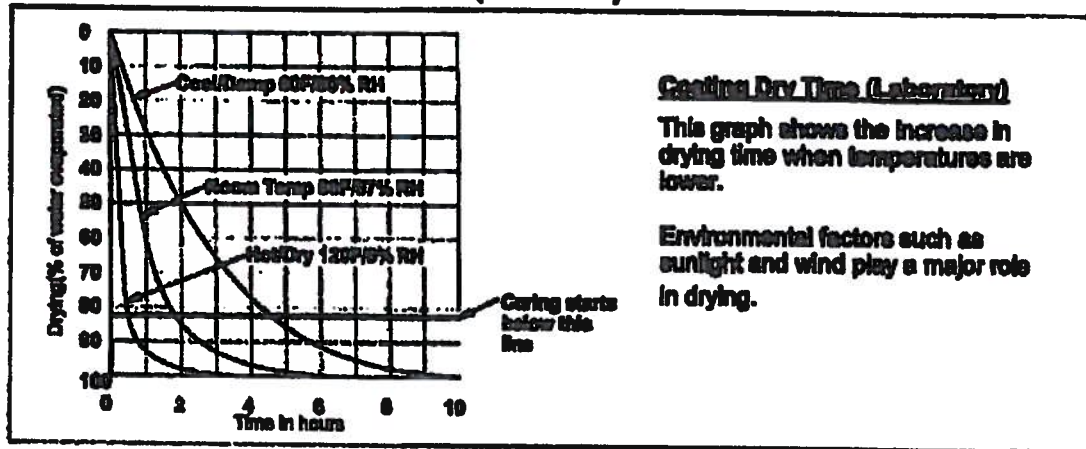
**STREETBONDSR COATED ASPHALT SPECIFICATION
FLAT (NON STAMPED) SURFACE**

2. A maintenance program may be required for applications exposed to:
- abrasive materials (such as salt and sand)
 - abrasive equipment (such as snow removal equipment)
 - Studded winter tire

3.6 OPENING TO TRAFFIC

Minimally, StreetBond150 coating must be 100% dry and sufficient curing time must be allowed before traffic is permitted on the surface.

TABLE 6: COATING DRY TIMES (TYPICAL)



If StreetBond coatings are applied when moisture cannot evaporate, then the coating will not dry. The drying and curing of StreetBond coatings have a direct impact on performance.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

The measured area is the actual area of asphalt pavement where StreetBond has been applied, measured in place. No deduction will be made for the area(s) occupied by manholes, inlets, drainage structures, bollards or by any public utility appurtenances within the area.

4.2 PAYMENT

Payment will be full compensation for all work completed as per conditions set out in the contract. For unit price contracts, the payment shall be calculated using the measured area as determined above.

Certificate of Analysis

GeoEngineers, Inc., an independent materials testing facility, has witnessed these tests on a production batch of StreetBond SR. This material is known to have been produced by an ISO9001:2000 certified coatings manufacturing facility. GeoEngineers confirms that the results of the testing were as follows:

Testing of StreetBond SR		
Test Method	Parameters	Measured result
ASTM D 4060 Tabor abrasion resistance	1 day cure, H-10 wheel; cycles (dry)	0.97 g/1000
ASTM D 670 Water sensitivity	Water absorption after 6 days exposure: Remaining absorption after 1 hour of recovery:	6.5% 0.4%
ASTM D 623-03A Flexibility as measured by Mandrel bend	0.5mm thick sample passes 6.35mm at 21°C 0.5mm thick sample passes 101.6mm at -18°C	
ASTM D 155 Color stability	Xenon Arc - 2000 hrs (CIE Units)	Block AB-0.40
ASTM D 3408 Modified MEK Scrubs	10 dry Mils, Number of Scrubs until 80% substrate exposed.	>8000
EPA 24 ASTM D 3009-03 Volatile Organic Compounds	Water-based Acrylic	VOC 16.7 g/l
ASTM E 288 Frictional Properties Using the British Pendulum Tester	14-Day Cure Coverage 180 sq ft per Gall Temperature Tested: 65°F-85°F	94 BPN

This certificate confirms that the above product was tested as per stated standard specification using calibrated equipment and qualified staff.

Signed: Timothy D. Barber
 Timothy D. Barber
 Senior Technical Manager
 A2LA certificate 1670.01

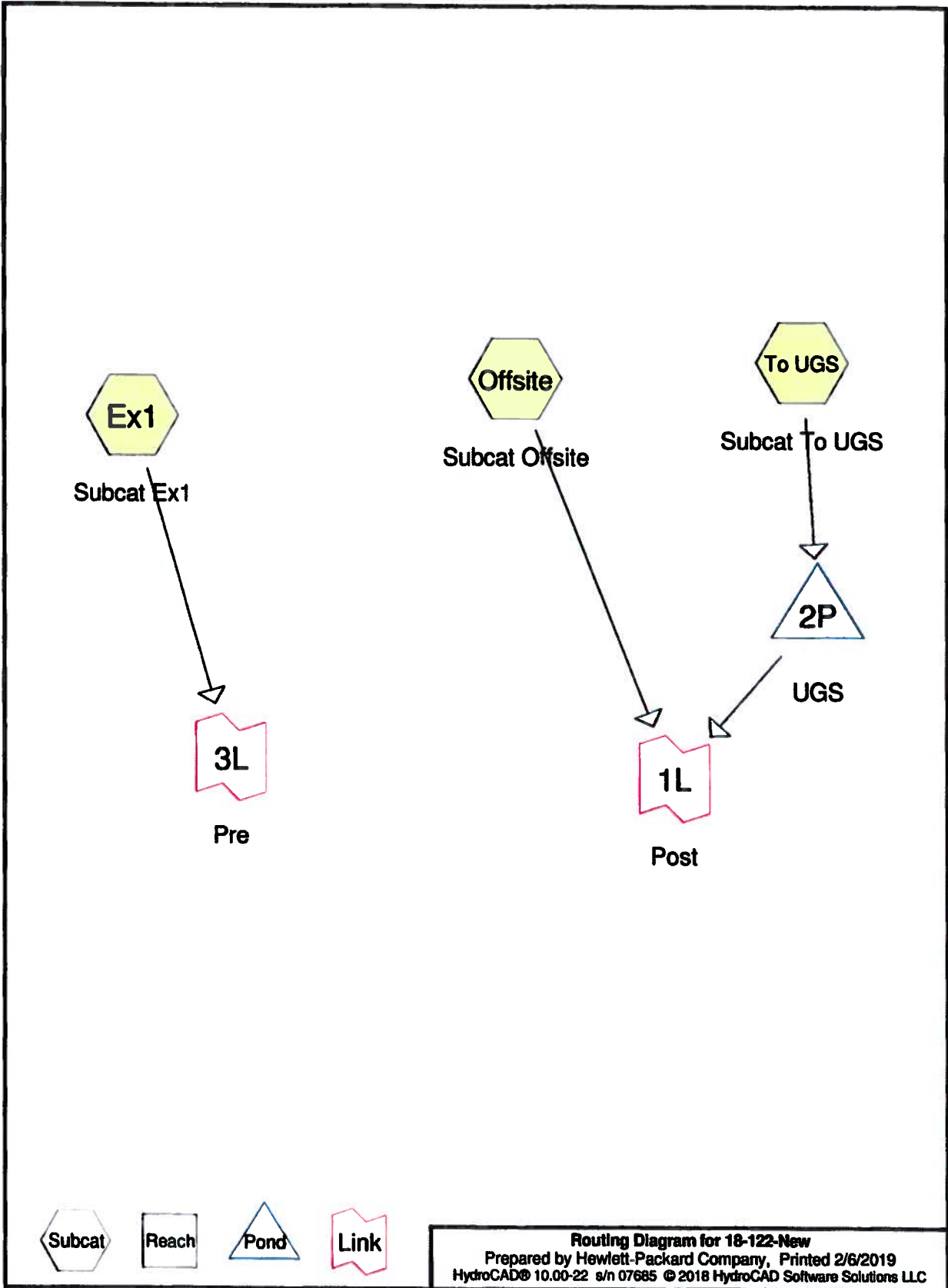
Signed: James B. Harakas
 James B. Harakas
 Professional Engineer

Date: 3/1/2010

Date: 03/01/10

File No. 9688-001-04





18-122-New

Prepared by Hewlett-Packard Company
HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Printed 2/6/2019

Page 2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
298,547	74	>75% Grass cover, Good, HSG C (Ex1, Offsite, To UGS)
51,923	98	Paved parking, HSG C (Ex1)
73,379	98	Paved roads w/curbs & sewers, HSG C (To UGS)
62,972	98	Roofs, HSG C (Ex1, To UGS)
35,683	70	Woods, Good, HSG C (Ex1, Offsite)
522,504	82	TOTAL AREA

18-122-New

Prepared by Hewlett-Packard Company
HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Printed 2/6/2019
Page 3

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
522,504	HSG C	Ex1, Offsite, To UGS
0	HSG D	
0	Other	
522,504		TOTAL AREA

18-122-New

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Printed 2/6/2019

Page 4

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	0	298,547	0	0	298,547	>75% Grass cover, Good
0	0	51,923	0	0	51,923	Paved parking
0	0	73,379	0	0	73,379	Paved roads w/curbs & sewers
0	0	62,972	0	0	62,972	Roofs
0	0	35,683	0	0	35,683	Woods, Good
0	0	522,504	0	0	522,504	TOTAL AREA

18-122-New

Prepared by Hewlett-Packard Company

Printed 2/6/2019

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Page 5

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	To UGS	0.00	0.00	472.0	0.0050	0.013	24.0	0.0	0.0
2	2P	85.66	85.10	40.9	0.0137	0.013	15.0	0.0	0.0

18-122-New

Type II 24-hr 1-Year Rainfall=2.85"

Prepared by Hewlett-Packard Company

Printed 2/6/2019

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Page 6

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Ex1: Subcat Ex1

Runoff Area=261,252 sf 31.93% Impervious Runoff Depth=1.20"
Flow Length=263' Tc=10.9 min CN=81 Runoff=10.71 cfs 26,110 cf

Subcatchment Offsite: Subcat Offsite

Runoff Area=97,319 sf 0.00% Impervious Runoff Depth=0.77"
Flow Length=263' Tc=10.9 min CN=73 Runoff=2.42 cfs 6,217 cf

Subcatchment To UGS: Subcat To UGS

Runoff Area=163,933 sf 63.97% Impervious Runoff Depth=1.76"
Flow Length=786' Tc=9.6 min CN=89 Runoff=10.25 cfs 24,109 cf

Pond 2P: UGS

Peak Elev=88.13' Storage=24,109 cf Inflow=10.25 cfs 24,109 cf
Outflow=0.00 cfs 0 cf

Link 1L: Post

Inflow=2.42 cfs 6,217 cf
Primary=2.42 cfs 6,217 cf

Link 3L: Pre

Inflow=10.71 cfs 26,110 cf
Primary=10.71 cfs 26,110 cf

Total Runoff Area = 522,504 sf Runoff Volume = 56,436 cf Average Runoff Depth = 1.30"
63.97% Pervious = 334,230 sf 36.03% Impervious = 188,274 sf

Summary for Subcatchment Ex1: Subcat Ex1

Runoff = 10.71 cfs @ 12.03 hrs, Volume= 26,110 cf, Depth= 1.20"

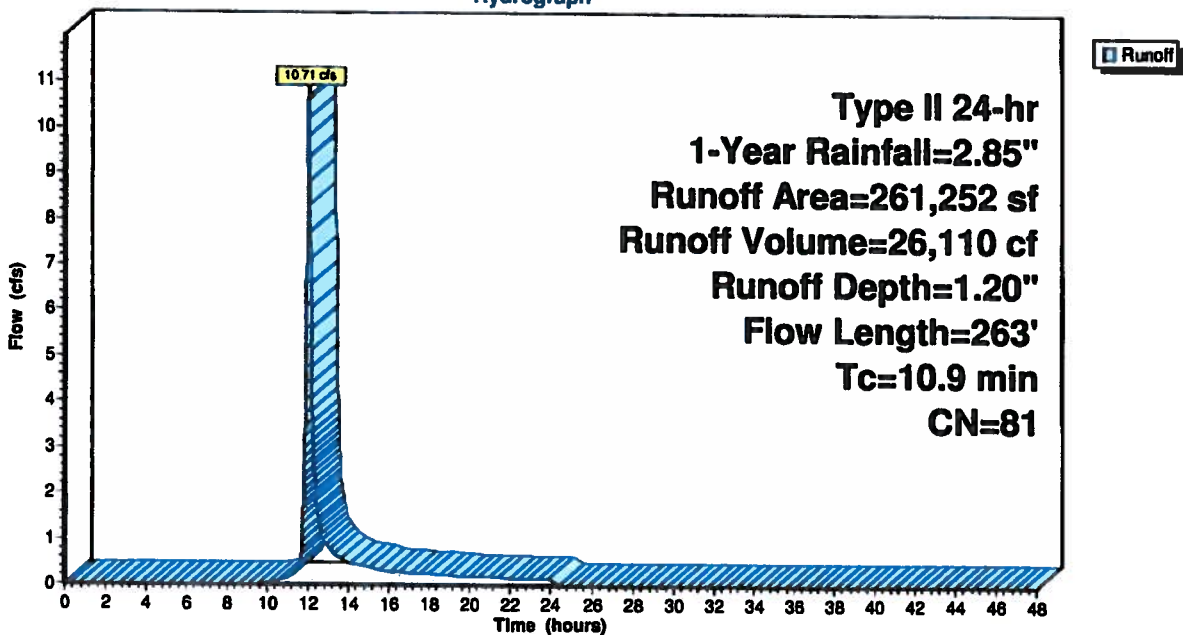
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-Year Rainfall=2.85"

Area (sf)	CN	Description
159,510	74	>75% Grass cover, Good, HSG C
51,923	98	Paved parking, HSG C
31,486	98	Roofs, HSG C
18,333	70	Woods, Good, HSG C
261,252	81	Weighted Average
177,843		68.07% Pervious Area
83,409		31.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0180	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.3	107	0.1074	5.28		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	56	0.1337	1.83		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.9	263	Total			

Subcatchment Ex1: Subcat Ex1

Hydrograph



Summary for Subcatchment Offsite: Subcat Offsite

Runoff = 2.42 cfs @ 12.04 hrs, Volume= 6,217 cf, Depth= 0.77"

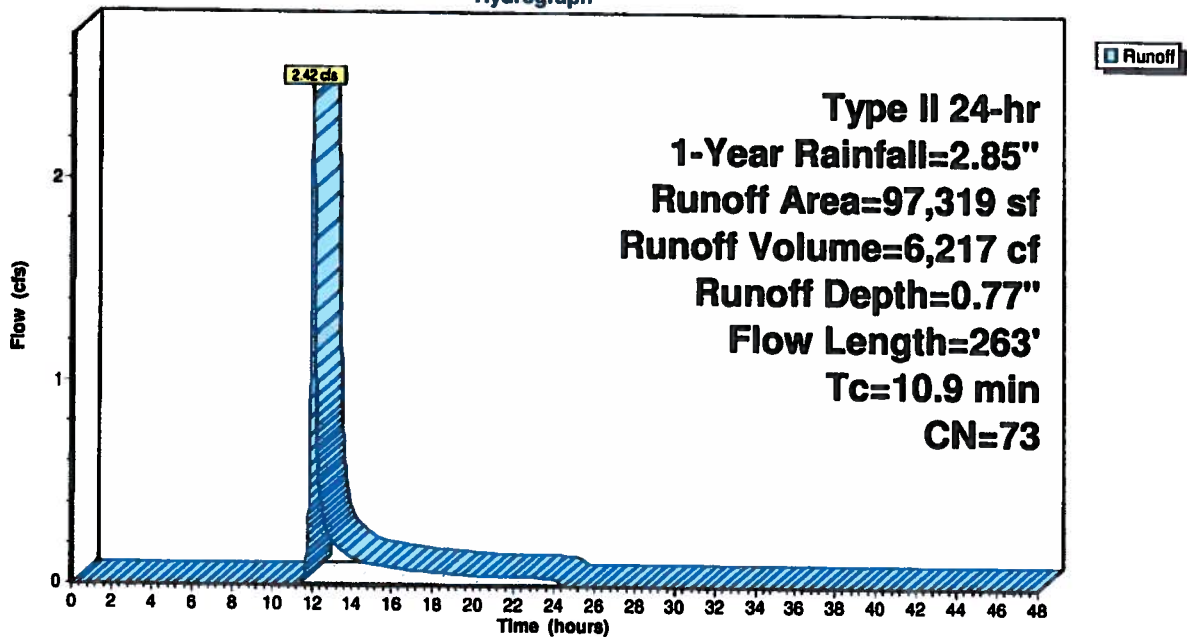
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Year Rainfall=2.85"

Area (sf)	CN	Description
79,969	74	>75% Grass cover, Good, HSG C
17,350	70	Woods, Good, HSG C
97,319	73	Weighted Average
97,319		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0180	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.3	107	0.1074	5.28		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	56	0.1337	1.83		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.9	263	Total			

Subcatchment Offsite: Subcat Offsite

Hydrograph



Summary for Subcatchment To UGS: Subcat To UGS

Runoff = 10.25 cfs @ 12.01 hrs, Volume= 24,109 cf, Depth= 1.76"

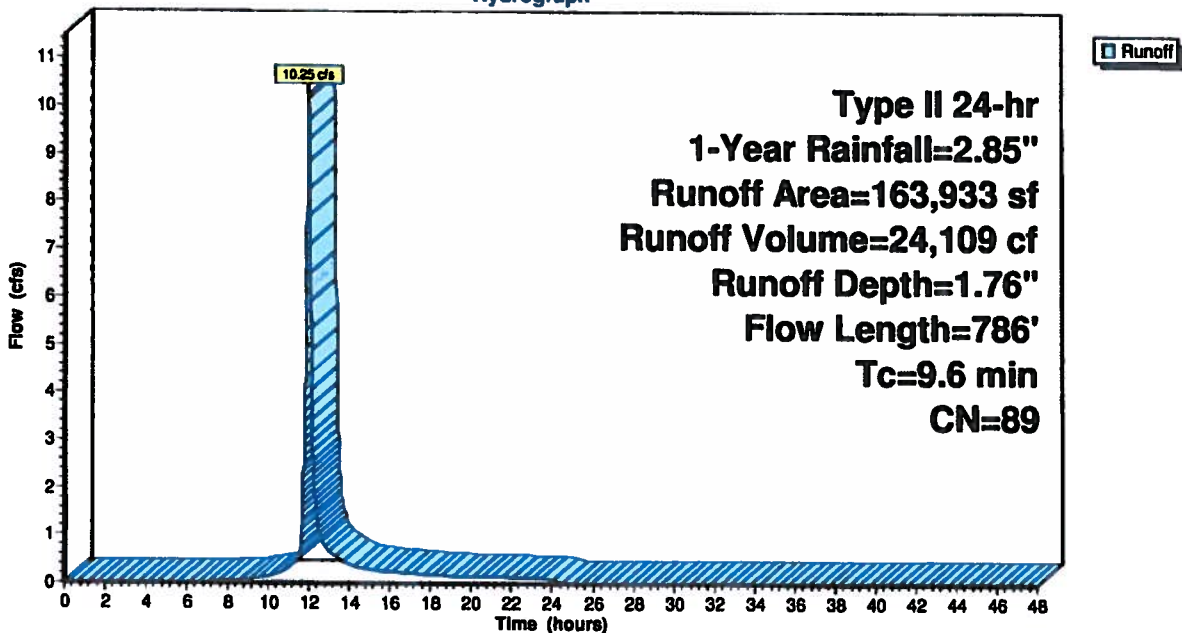
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-Year Rainfall=2.85"

Area (sf)	CN	Description
59,068	74	>75% Grass cover, Good, HSG C
73,379	98	Paved roads w/curbs & sewers, HSG C
31,486	98	Roofs, HSG C
163,933	89	Weighted Average
59,068		36.03% Pervious Area
104,865		63.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0500	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.4	214	0.0254	2.57		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.5	472	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
9.6	786	Total			

Subcatchment To UGS: Subcat To UGS

Hydrograph



Summary for Pond 2P: UGS

Inflow Area = 163,933 sf, 63.97% Impervious, Inflow Depth = 1.76" for 1-Year event
 Inflow = 10.25 cfs @ 12.01 hrs, Volume= 24,109 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 9
 Peak Elev= 88.13' @ 24.54 hrs Surf.Area= 13,701 sf Storage= 24,109 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1A	85.66'	0 cf	64.19'W x 213.46'L x 7.00'H Field A 95,909 cf Overall - 95,909 cf Embedded = 0 cf x 40.0% Voids
#2A	85.66'	73,511 cf	StormTrap ST2 DoubleTrap 6-0 x 78 Inside #1 Inside= 101.7"W x 72.0"H => 45.99 sf x 15.40'L = 708.0 cf Outside= 101.7"W x 84.0"H => 59.35 sf x 15.40'L = 913.8 cf 6 Rows of 13 Chambers 50.88' x 200.15' Core + 6.66' Border = 64.19' x 213.46' System
		73,511 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	85.66'	15.0" Round Culvert L= 40.9' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 85.66' / 85.10' S= 0.0137 ' S= 0.0137 ' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 4	88.00'	30.0" W x 9.0" H Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	85.66'	5.0" W x 3.0" H Vert. Orifice/Grate C= 0.600
#4	Device 3	90.00'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=85.66' (Free Discharge)

- 1=Culvert (Controls 0.00 cfs)
- 3=Orifice/Grate (Controls 0.00 cfs)
- 4=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)
- 2=Orifice/Grate (Controls 0.00 cfs)

18-122-New

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Type II 24-hr 1-Year Rainfall=2.85"

Printed 2/6/2019

Page 11

Pond 2P: UGS - Chamber Wizard Field A

Chamber Model = StormTrap ST2 DoubleTrap 6-0 (StormTrap ST2 DoubleTrap® Type II+IV)

Inside= 101.7"W x 72.0"H => 45.99 sf x 15.40'L = 708.0 cf

Outside= 101.7"W x 84.0"H => 59.35 sf x 15.40'L = 913.8 cf

13 Chambers/Row x 15.40' Long = 200.15' Row Length +79.9" Border x 2 = 213.46' Base Length

6 Rows x 101.7" Wide + 79.9" Side Border x 2 = 64.19' Base Width

84.0" Chamber Height = 7.00' Field Height

78 Chambers x 708.0 cf + 18,288.6 cf Border = 73,511.3 cf Chamber Storage

78 Chambers x 913.8 cf + 24,632.6 cf Border = 95,909.5 cf Displacement

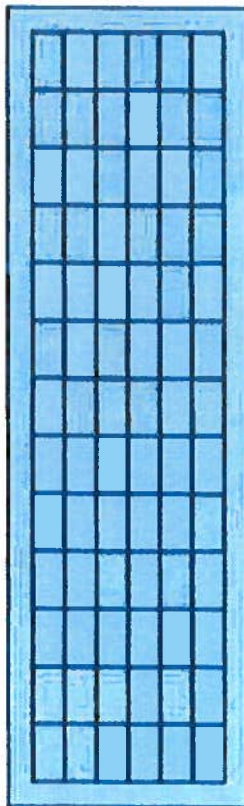
Chamber Storage = 73,511.3 cf = 1.688 af

Overall Storage Efficiency = 76.6%

Overall System Size = 213.46' x 64.19' x 7.00'

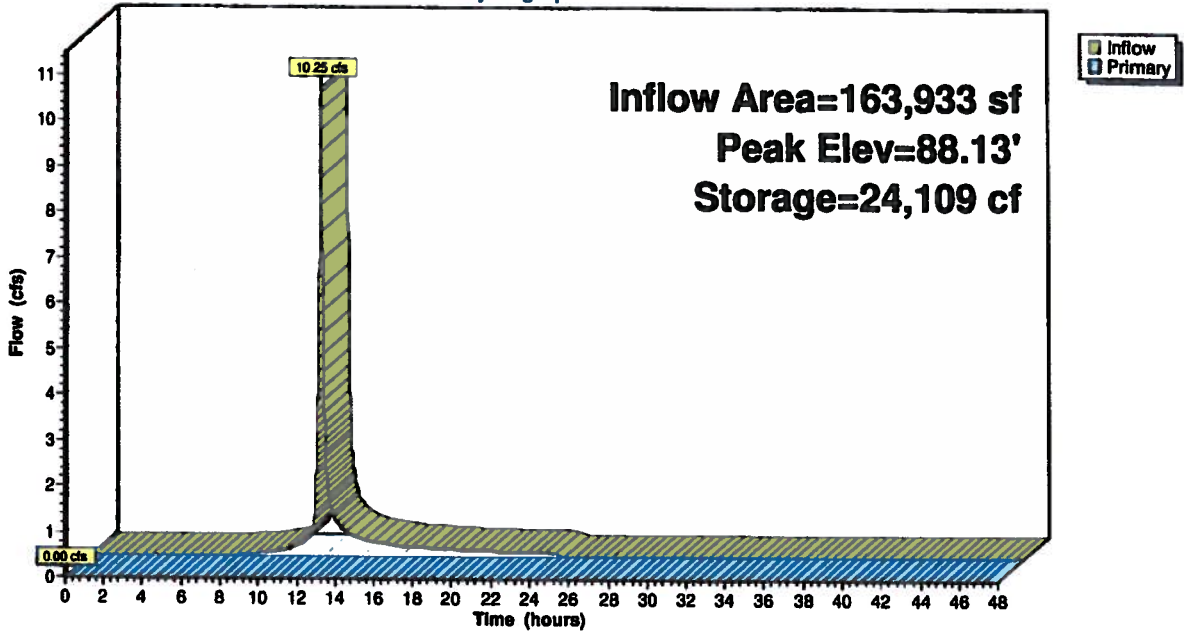
78 Chambers (plus border)

3,552.2 cy Field



Pond 2P: UGS

Hydrograph



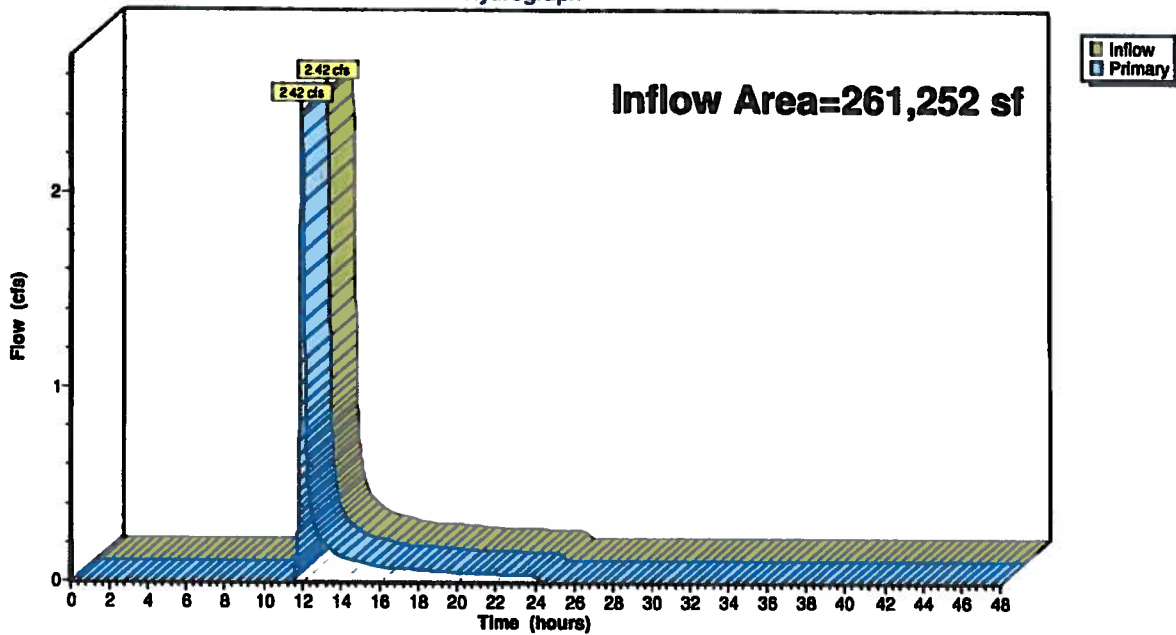
Summary for Link 1L: Post

Inflow Area = 261,252 sf, 40.14% Impervious, Inflow Depth = 0.29" for 1-Year event
Inflow = 2.42 cfs @ 12.04 hrs, Volume= 6,217 cf
Primary = 2.42 cfs @ 12.04 hrs, Volume= 6,217 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 1L: Post

Hydrograph



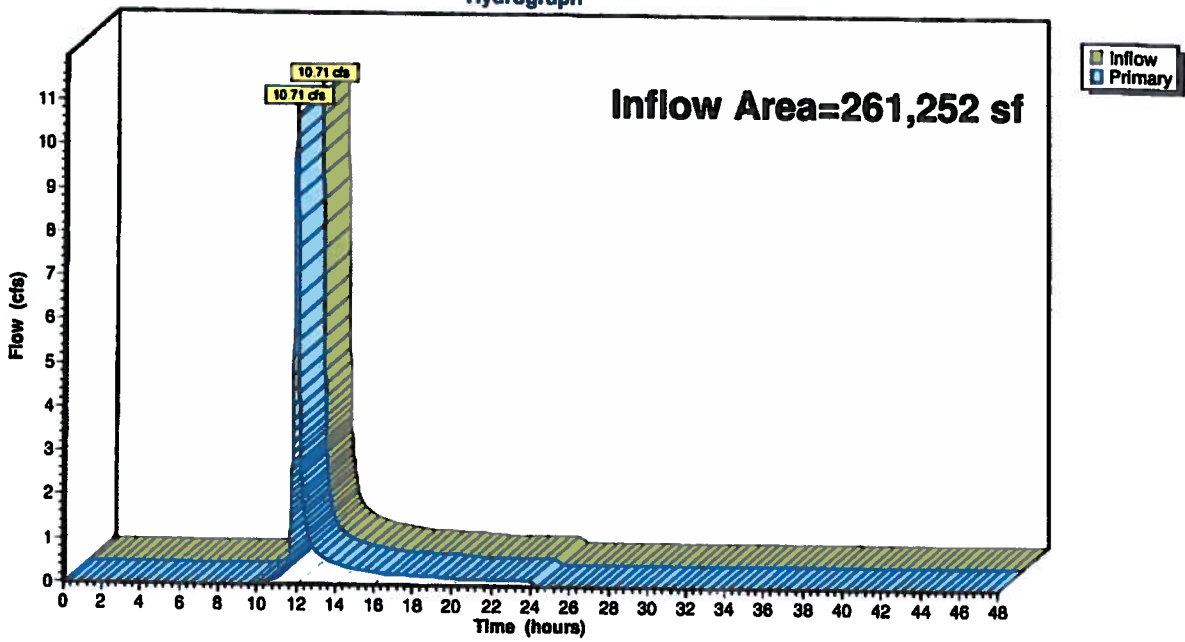
Summary for Link 3L: Pre

Inflow Area = 261,252 sf, 31.93% Impervious, Inflow Depth = 1.20" for 1-Year event
Inflow = 10.71 cfs @ 12.03 hrs, Volume= 26,110 cf
Primary = 10.71 cfs @ 12.03 hrs, Volume= 26,110 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 3L: Pre

Hydrograph



18-122-New

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Type II 24-hr 2-Year Rainfall=3.46"

Printed 2/6/2019

Page 15

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Ex1: Subcat Ex1

Runoff Area=261,252 sf 31.93% Impervious Runoff Depth=1.68"
Flow Length=263' Tc=10.9 min CN=81 Runoff=15.02 cfs 36,493 cf

Subcatchment Offsite: Subcat Offsite

Runoff Area=97,319 sf 0.00% Impervious Runoff Depth=1.15"
Flow Length=263' Tc=10.9 min CN=73 Runoff=3.76 cfs 9,349 cf

Subcatchment To UGS: Subcat To UGS

Runoff Area=163,933 sf 63.97% Impervious Runoff Depth=2.32"
Flow Length=786' Tc=9.6 min CN=89 Runoff=13.33 cfs 31,697 cf

Pond 2P: UGS

Peak Elev=88.75' Storage=31,697 cf Inflow=13.33 cfs 31,697 cf
Outflow=0.00 cfs 0 cf

Link 1L: Post

Inflow=3.76 cfs 9,349 cf
Primary=3.76 cfs 9,349 cf

Link 3L: Pre

Inflow=15.02 cfs 36,493 cf
Primary=15.02 cfs 36,493 cf

Total Runoff Area = 522,504 sf Runoff Volume = 77,539 cf Average Runoff Depth = 1.78"
63.97% Pervious = 334,230 sf 36.03% Impervious = 188,274 sf

Summary for Subcatchment Ex1: Subcat Ex1

Runoff = 15.02 cfs @ 12.03 hrs, Volume= 36,493 cf, Depth= 1.68"

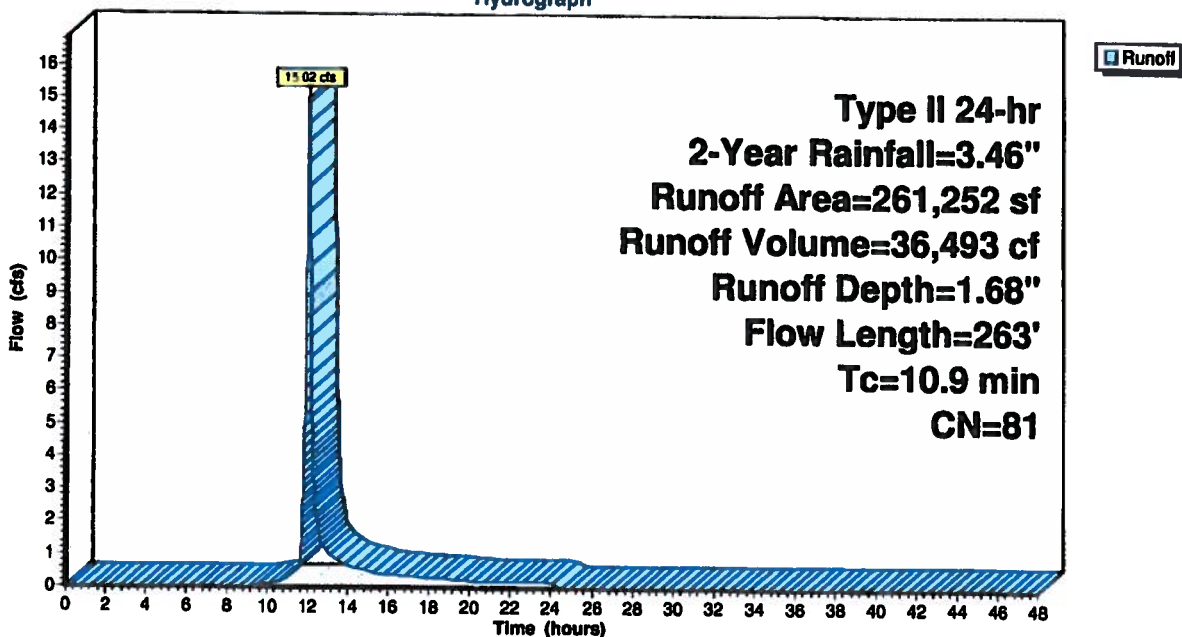
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-Year Rainfall=3.46"

Area (sf)	CN	Description
159,510	74	>75% Grass cover, Good, HSG C
51,923	98	Paved parking, HSG C
31,486	98	Roofs, HSG C
18,333	70	Woods, Good, HSG C
261,252	81	Weighted Average
177,843		68.07% Pervious Area
83,409		31.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0180	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.3	107	0.1074	5.28		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	56	0.1337	1.83		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.9	263	Total			

Subcatchment Ex1: Subcat Ex1

Hydrograph



Summary for Subcatchment Offsite: Subcat Offsite

Runoff = 3.76 cfs @ 12.03 hrs, Volume= 9,349 cf, Depth= 1.15"

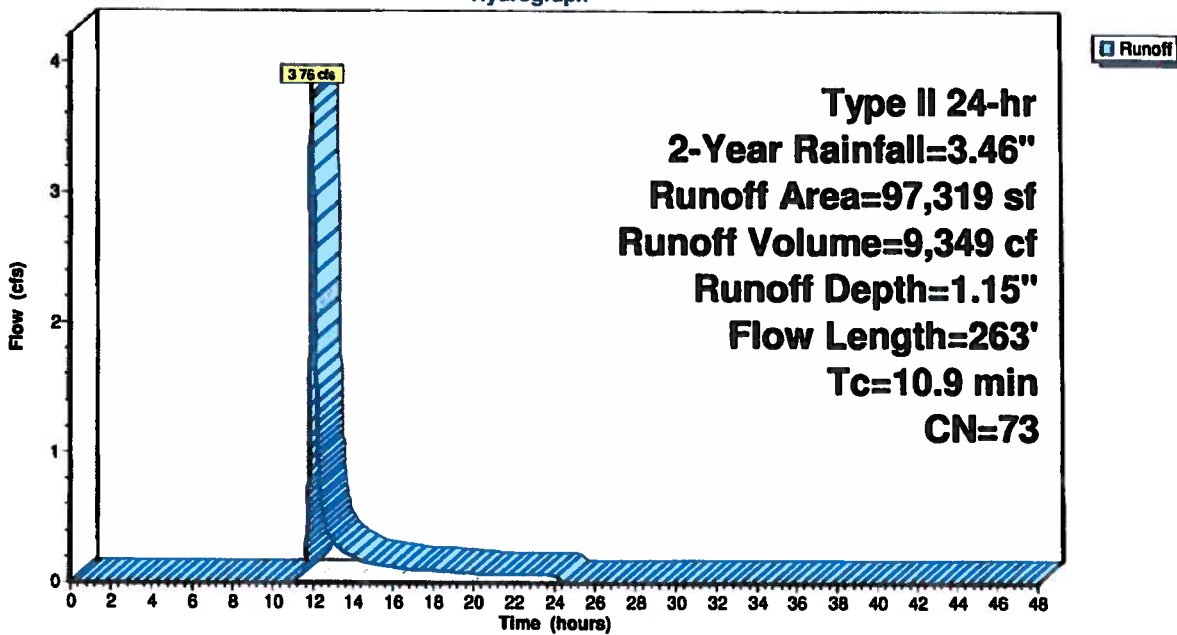
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-Year Rainfall=3.46"

Area (sf)	CN	Description
79,969	74	>75% Grass cover, Good, HSG C
17,350	70	Woods, Good, HSG C
97,319	73	Weighted Average
97,319		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0180	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.3	107	0.1074	5.28		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	56	0.1337	1.83		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.9	263	Total			

Subcatchment Offsite: Subcat Offsite

Hydrograph



Summary for Subcatchment To UGS: Subcat To UGS

Runoff = 13.33 cfs @ 12.01 hrs, Volume= 31,697 cf, Depth= 2.32"

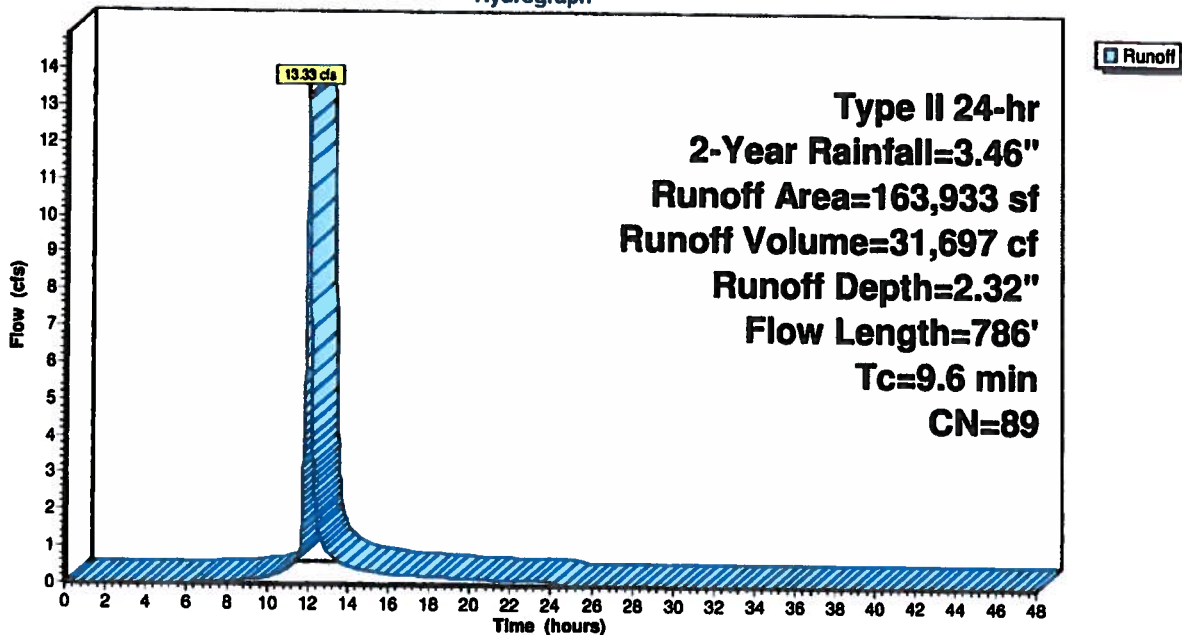
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-Year Rainfall=3.46"

Area (sf)	CN	Description
59,068	74	>75% Grass cover, Good, HSG C
73,379	98	Paved roads w/curbs & sewers, HSG C
31,486	98	Roofs, HSG C
163,933	89	Weighted Average
59,068		36.03% Pervious Area
104,865		63.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0500	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.4	214	0.0254	2.57		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.5	472	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
9.6	786	Total			

Subcatchment To UGS: Subcat To UGS

Hydrograph



Summary for Pond 2P: UGS

Inflow Area = 163,933 sf, 63.97% Impervious, Inflow Depth = 2.32" for 2-Year event
 Inflow = 13.33 cfs @ 12.01 hrs, Volume= 31,697 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 9
 Peak Elev= 88.75' @ 24.54 hrs Surf.Area= 13,701 sf Storage= 31,697 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1A	85.66'	0 cf	64.19'W x 213.46'L x 7.00'H Field A 95,909 cf Overall - 95,909 cf Embedded = 0 cf x 40.0% Voids
#2A	85.66'	73,511 cf	StormTrap ST2 DoubleTrap 6-0 x 78 Inside #1 Inside= 101.7"W x 72.0"H => 45.99 sf x 15.40'L = 708.0 cf Outside= 101.7"W x 84.0"H => 59.35 sf x 15.40'L = 913.8 cf 6 Rows of 13 Chambers 50.88' x 200.15' Core + 6.66' Border = 64.19' x 213.46' System
		73,511 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	85.66'	15.0" Round Culvert L= 40.9' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 85.66' / 85.10' S= 0.0137 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 4	88.00'	30.0" W x 9.0" H Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	85.66'	5.0" W x 3.0" H Vert. Orifice/Grate C= 0.600
#4	Device 3	90.00'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=85.66' (Free Discharge)

- ↑ 1=Culvert (Controls 0.00 cfs)
- ↑ 3=Orifice/Grate (Controls 0.00 cfs)
- ↑ 4=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)
- ↑ 2=Orifice/Grate (Controls 0.00 cfs)

18-122-New

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Type II 24-hr 2-Year Rainfall=3.46"

Printed 2/6/2019

Page 20

Pond 2P: UGS - Chamber Wizard Field A

Chamber Model = StormTrap ST2 DoubleTrap 6-0 (StormTrap ST2 DoubleTrap® Type II+IV)

Inside= 101.7"W x 72.0"H => 45.99 sf x 15.40'L = 708.0 cf

Outside= 101.7"W x 84.0"H => 59.35 sf x 15.40'L = 913.8 cf

13 Chambers/Row x 15.40' Long = 200.15' Row Length +79.9" Border x 2 = 213.46' Base Length

6 Rows x 101.7" Wide + 79.9" Side Border x 2 = 64.19' Base Width

84.0" Chamber Height = 7.00' Field Height

78 Chambers x 708.0 cf + 18,288.6 cf Border = 73,511.3 cf Chamber Storage

78 Chambers x 913.8 cf + 24,632.6 cf Border = 95,909.5 cf Displacement

Chamber Storage = 73,511.3 cf = 1.688 af

Overall Storage Efficiency = 76.6%

Overall System Size = 213.46' x 64.19' x 7.00'

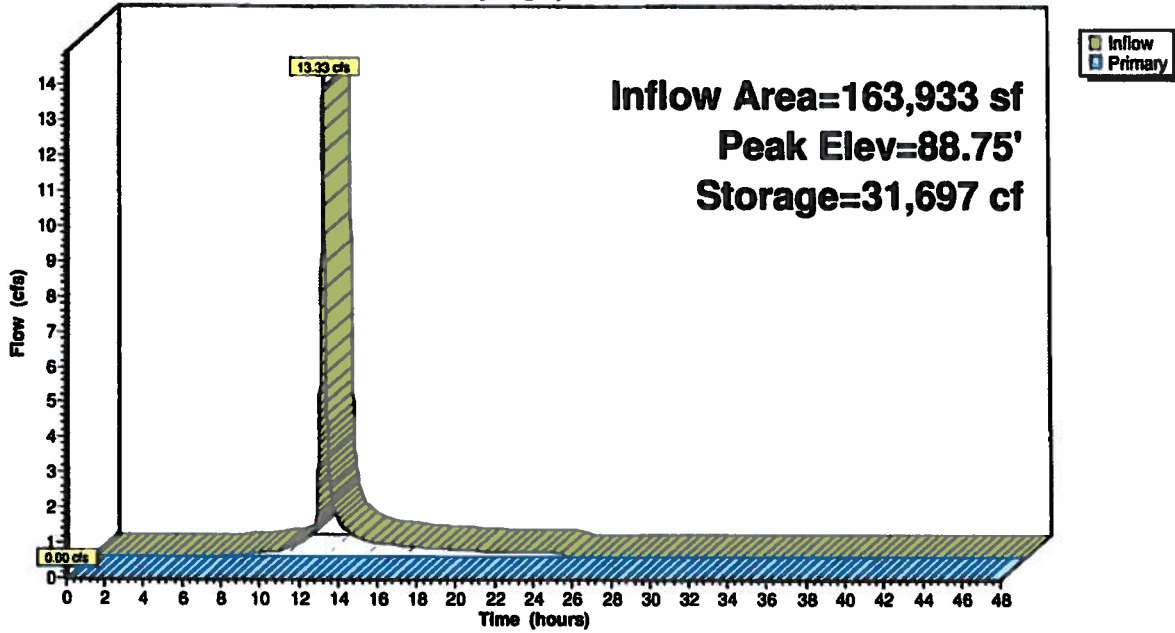
78 Chambers (plus border)

3,552.2 cy Field



Pond 2P: UGS

Hydrograph



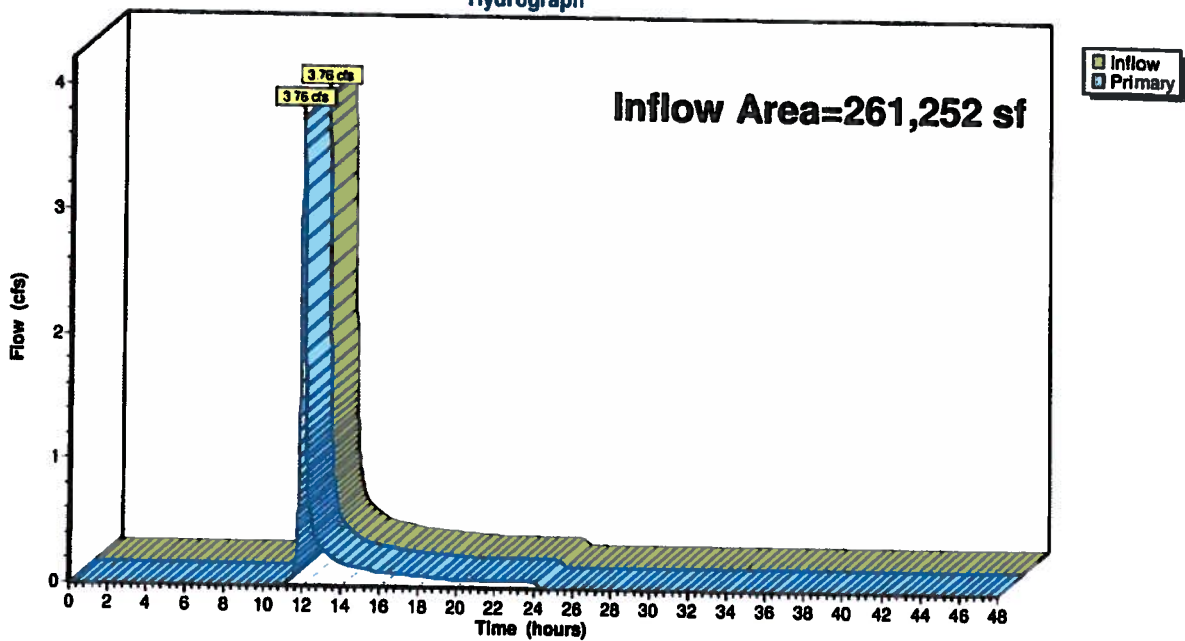
Summary for Link 1L: Post

Inflow Area = 261,252 sf, 40.14% Impervious, Inflow Depth = 0.43" for 2-Year event
Inflow = 3.76 cfs @ 12.03 hrs, Volume= 9,349 cf
Primary = 3.76 cfs @ 12.03 hrs, Volume= 9,349 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 1L: Post

Hydrograph



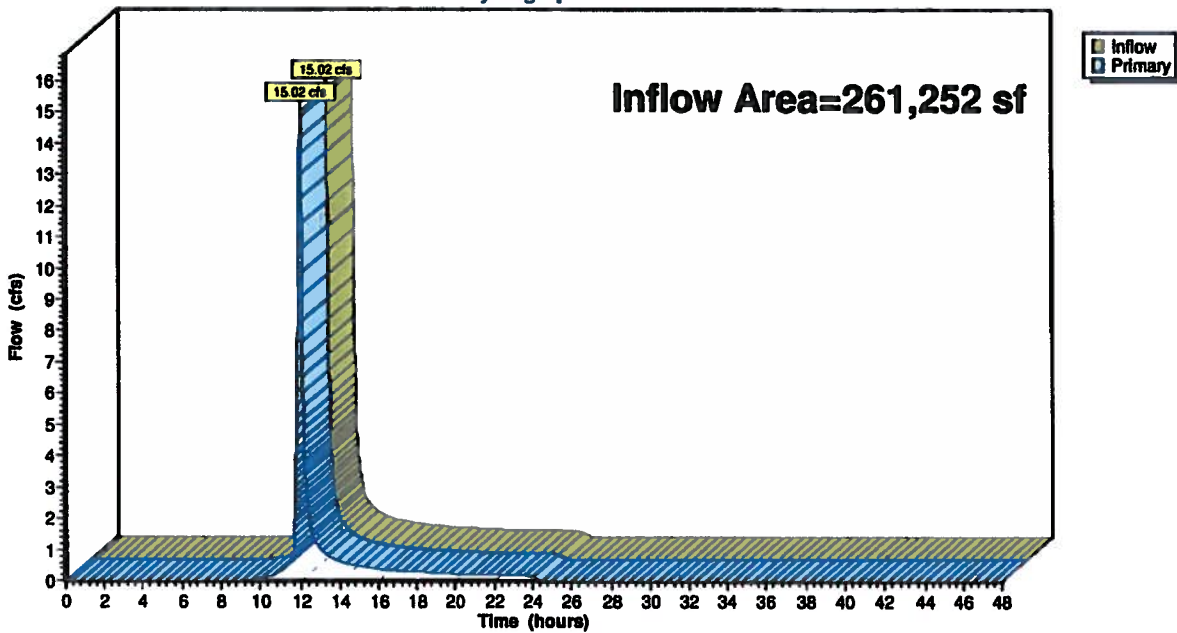
Summary for Link 3L: Pre

Inflow Area = 261,252 sf, 31.93% Impervious, Inflow Depth = 1.68" for 2-Year event
Inflow = 15.02 cfs @ 12.03 hrs, Volume= 36,493 cf
Primary = 15.02 cfs @ 12.03 hrs, Volume= 36,493 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 3L: Pre

Hydrograph



18-122-New

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Type II 24-hr 5-Year Rainfall=4.46"

Printed 2/6/2019

Page 24

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Ex1: Subcat Ex1

Runoff Area=261,252 sf 31.93% Impervious Runoff Depth=2.51"
Flow Length=263' Tc=10.9 min CN=81 Runoff=22.43 cfs 54,722 cf

Subcatchment Offsite: Subcat Offsite

Runoff Area=97,319 sf 0.00% Impervious Runoff Depth=1.87"
Flow Length=263' Tc=10.9 min CN=73 Runoff=6.20 cfs 15,130 cf

Subcatchment To UGS: Subcat To UGS

Runoff Area=163,933 sf 63.97% Impervious Runoff Depth=3.26"
Flow Length=786' Tc=9.6 min CN=89 Runoff=18.40 cfs 44,497 cf

Pond 2P: UGS

Peak Elev=89.79' Storage=44,497 cf Inflow=18.40 cfs 44,497 cf
Outflow=0.00 cfs 0 cf

Link 1L: Post

Inflow=6.20 cfs 15,130 cf
Primary=6.20 cfs 15,130 cf

Link 3L: Pre

Inflow=22.43 cfs 54,722 cf
Primary=22.43 cfs 54,722 cf

Total Runoff Area = 522,504 sf Runoff Volume = 114,348 cf Average Runoff Depth = 2.63"
63.97% Pervious = 334,230 sf 36.03% Impervious = 188,274 sf

Summary for Subcatchment Ex1: Subcat Ex1

Runoff = 22.43 cfs @ 12.03 hrs, Volume= 54,722 cf, Depth= 2.51"

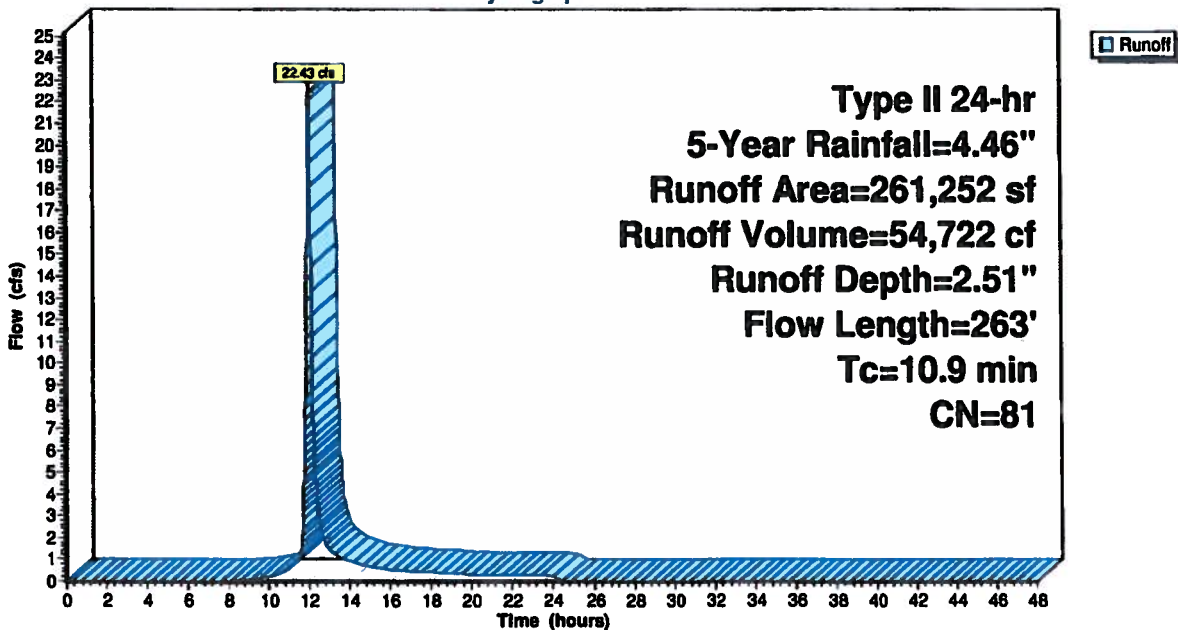
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-Year Rainfall=4.46"

Area (sf)	CN	Description
159,510	74	>75% Grass cover, Good, HSG C
51,923	98	Paved parking, HSG C
31,486	98	Roofs, HSG C
18,333	70	Woods, Good, HSG C
261,252	81	Weighted Average
177,843		68.07% Pervious Area
83,409		31.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0180	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.3	107	0.1074	5.28		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	56	0.1337	1.83		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.9	263	Total			

Subcatchment Ex1: Subcat Ex1

Hydrograph



18-122-New

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Type II 24-hr 5-Year Rainfall=4.46"

Printed 2/6/2019

Page 26

Summary for Subcatchment Offsite: Subcat Offsite

Runoff = 6.20 cfs @ 12.03 hrs, Volume= 15,130 cf, Depth= 1.87"

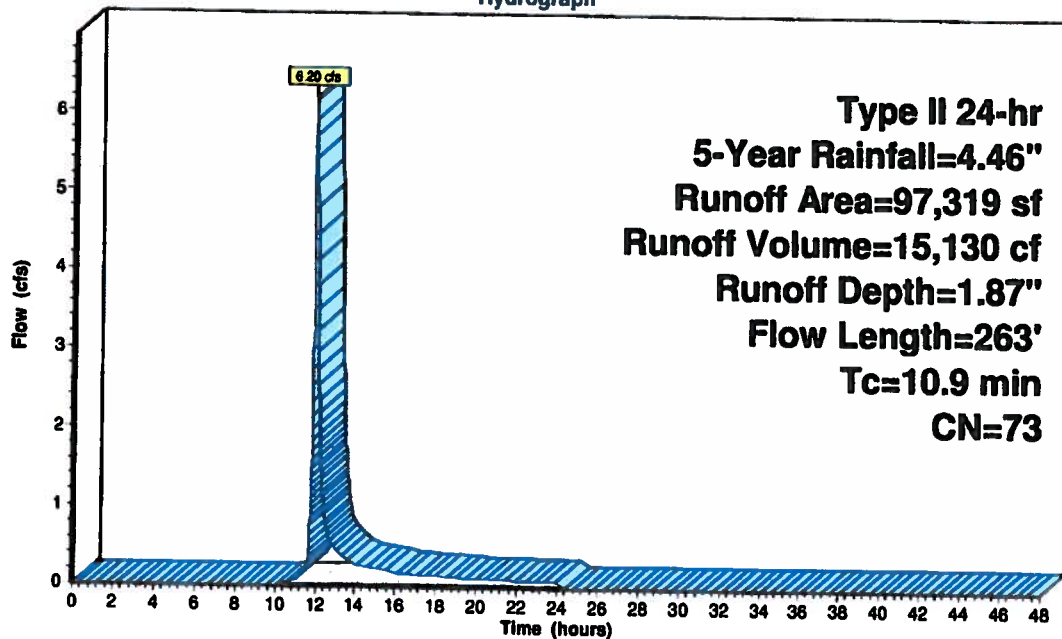
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 5-Year Rainfall=4.46"

Area (sf)	CN	Description
79,969	74	>75% Grass cover, Good, HSG C
17,350	70	Woods, Good, HSG C
97,319	73	Weighted Average
97,319		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0180	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.3	107	0.1074	5.28		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	56	0.1337	1.83		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.9	263	Total			

Subcatchment Offsite: Subcat Offsite

Hydrograph



Summary for Subcatchment To UGS: Subcat To UGS

Runoff = 18.40 cfs @ 12.01 hrs, Volume= 44,497 cf, Depth= 3.26"

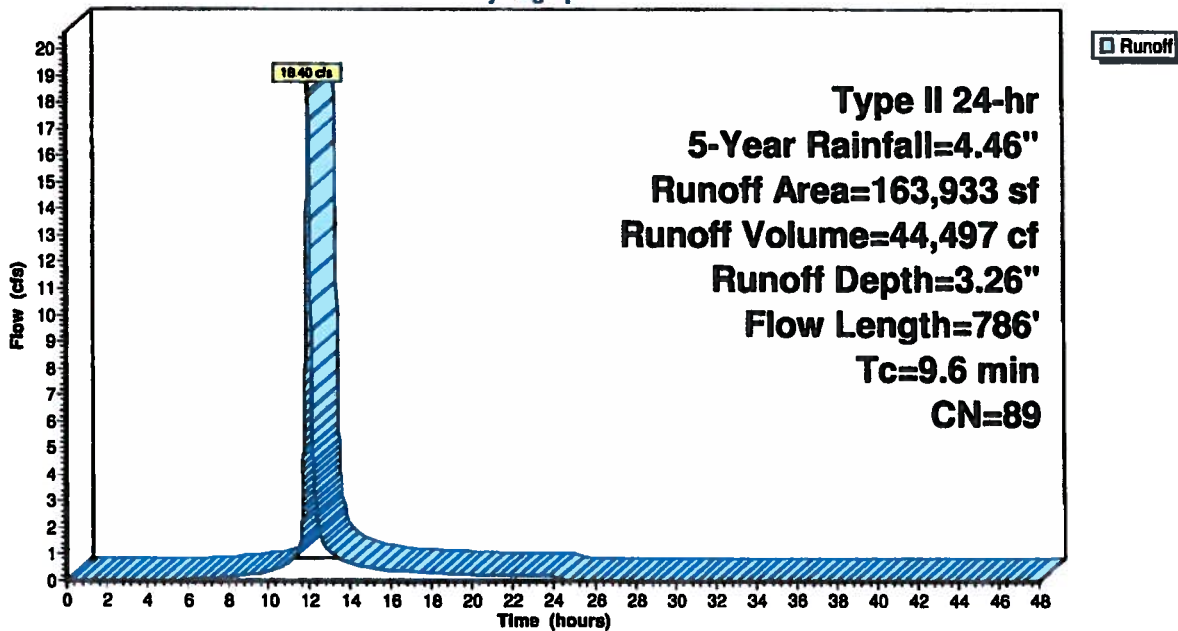
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-Year Rainfall=4.46"

Area (sf)	CN	Description
59,068	74	>75% Grass cover, Good, HSG C
73,379	98	Paved roads w/curbs & sewers, HSG C
31,486	98	Roofs, HSG C
163,933	89	Weighted Average
59,068		36.03% Pervious Area
104,865		63.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0500	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.4	214	0.0254	2.57		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.5	472	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
9.6	786	Total			

Subcatchment To UGS: Subcat To UGS

Hydrograph



Summary for Pond 2P: UGS

Inflow Area = 163,933 sf, 63.97% Impervious, Inflow Depth = 3.26" for 5-Year event
 Inflow = 18.40 cfs @ 12.01 hrs, Volume= 44,497 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 9
 Peak Elev= 89.79' @ 24.54 hrs Surf.Area= 13,701 sf Storage= 44,497 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1A	85.66'	0 cf	64.19'W x 213.46'L x 7.00'H Field A 95,909 cf Overall - 95,909 cf Embedded = 0 cf x 40.0% Voids
#2A	85.66'	73,511 cf	StormTrap ST2 DoubleTrap 6-0 x 78 Inside #1 Inside= 101.7"W x 72.0"H => 45.99 sf x 15.40'L = 708.0 cf Outside= 101.7"W x 84.0"H => 59.35 sf x 15.40'L = 913.8 cf 6 Rows of 13 Chambers 50.88' x 200.15' Core + 6.66' Border = 64.19' x 213.46' System
		73,511 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	85.66'	15.0" Round Culvert L= 40.9' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 85.66' / 85.10' S= 0.0137 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 4	88.00'	30.0" W x 9.0" H Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	85.66'	5.0" W x 3.0" H Vert. Orifice/Grate C= 0.600
#4	Device 3	90.00'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=85.66' (Free Discharge)

- 1=Culvert (Controls 0.00 cfs)
- 3=Orifice/Grate (Controls 0.00 cfs)
- 4=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)
- 2=Orifice/Grate (Controls 0.00 cfs)

Pond 2P: UGS - Chamber Wizard Field A

Chamber Model = StormTrap ST2 DoubleTrap 6-0 (StormTrap ST2 DoubleTrap® Type II+IV)

Inside= 101.7"W x 72.0"H => 45.99 sf x 15.40'L = 708.0 cf

Outside= 101.7"W x 84.0"H => 59.35 sf x 15.40'L = 913.8 cf

13 Chambers/Row x 15.40' Long = 200.15' Row Length +79.9" Border x 2 = 213.46' Base Length

6 Rows x 101.7" Wide + 79.9" Side Border x 2 = 64.19' Base Width

84.0" Chamber Height = 7.00' Field Height

78 Chambers x 708.0 cf + 18,288.6 cf Border = 73,511.3 cf Chamber Storage

78 Chambers x 913.8 cf + 24,632.6 cf Border = 95,909.5 cf Displacement

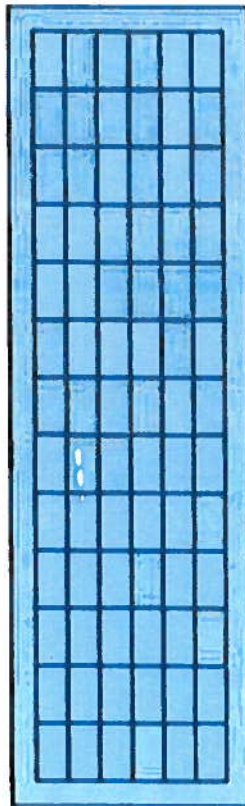
Chamber Storage = 73,511.3 cf = 1.688 af

Overall Storage Efficiency = 76.6%

Overall System Size = 213.46' x 64.19' x 7.00'

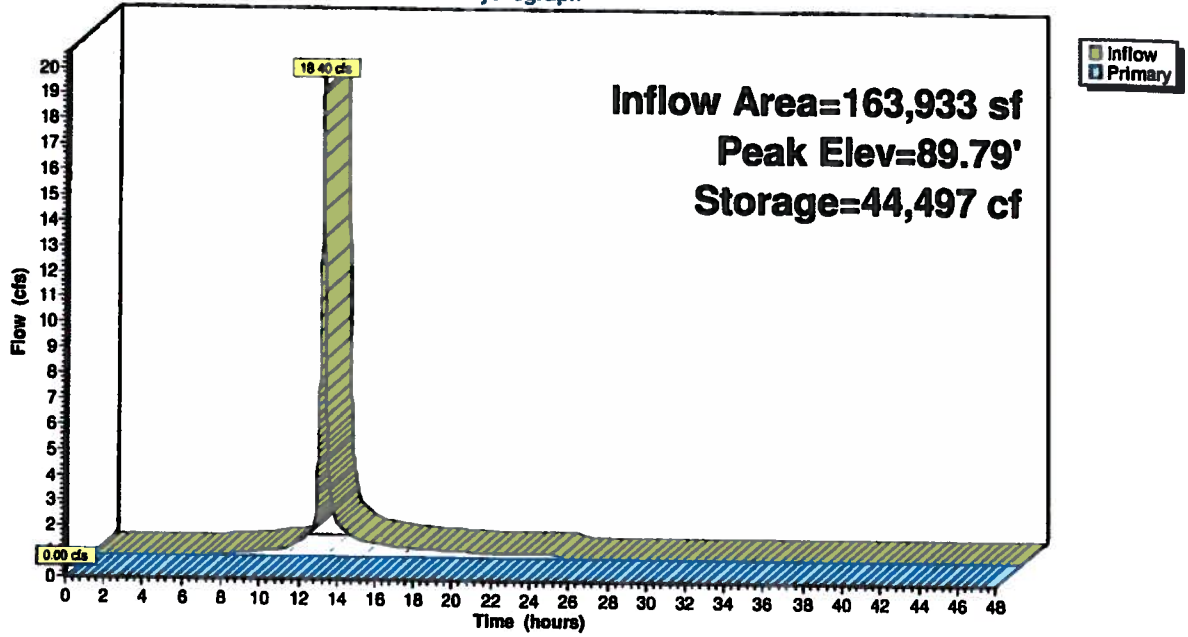
78 Chambers (plus border)

3,552.2 cy Field



Pond 2P: UGS

Hydrograph



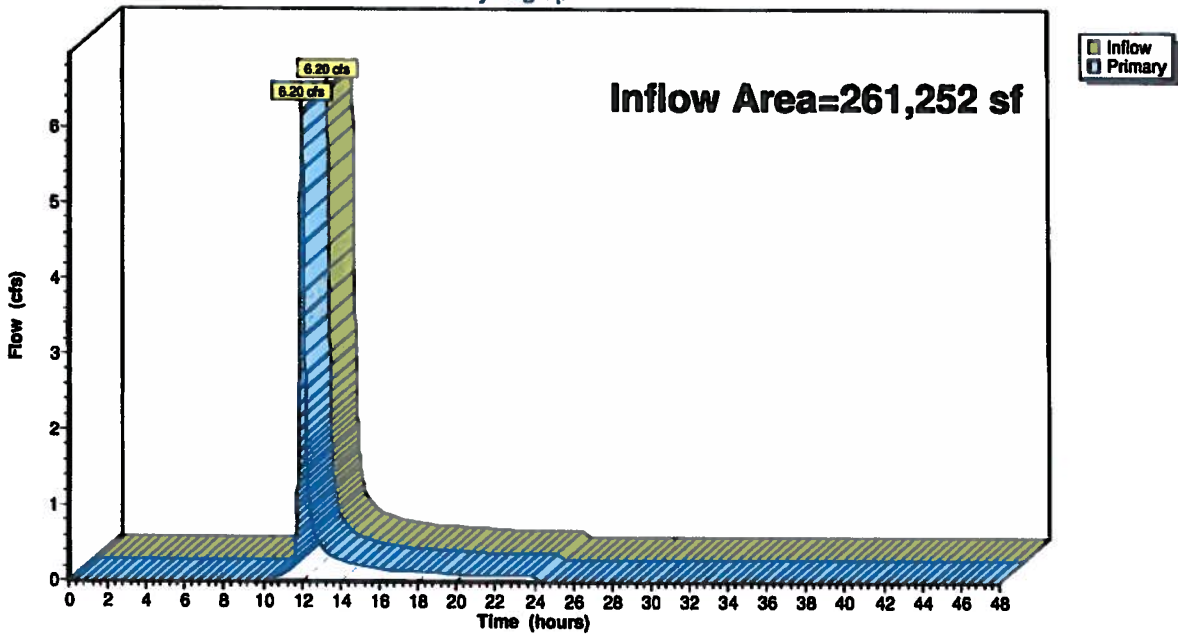
Summary for Link 1L: Post

Inflow Area = 261,252 sf, 40.14% Impervious, Inflow Depth = 0.69" for 5-Year event
Inflow = 6.20 cfs @ 12.03 hrs, Volume= 15,130 cf
Primary = 6.20 cfs @ 12.03 hrs, Volume= 15,130 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 1L: Post

Hydrograph



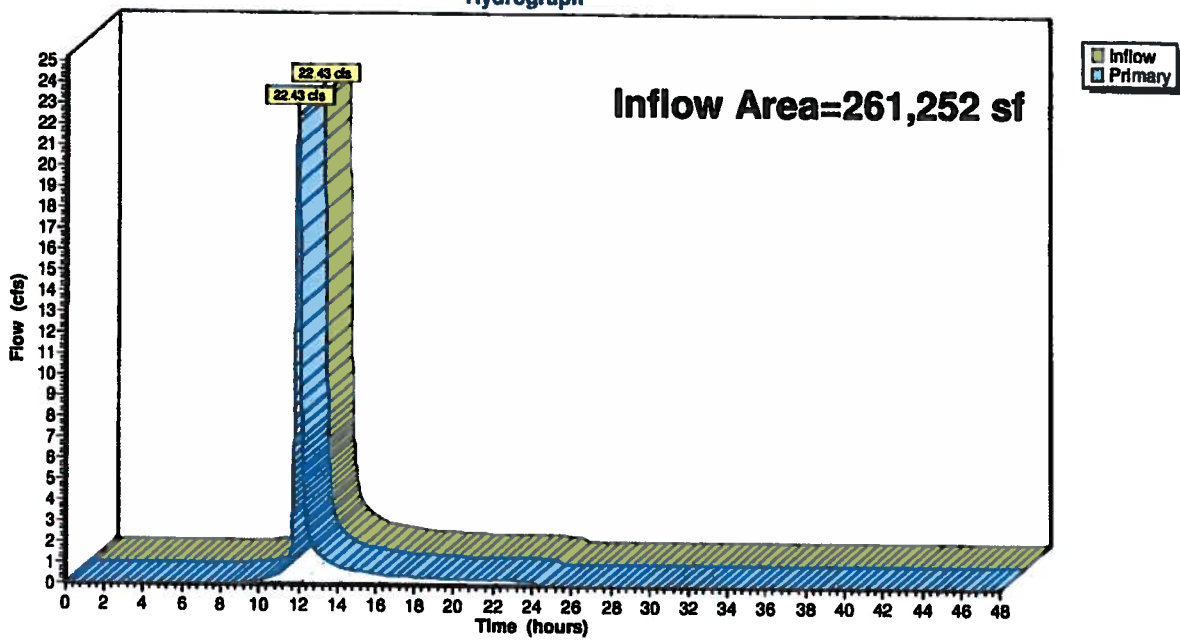
Summary for Link 3L: Pre

Inflow Area = 261,252 sf, 31.93% Impervious, Inflow Depth = 2.51" for 5-Year event
Inflow = 22.43 cfs @ 12.03 hrs, Volume= 54,722 cf
Primary = 22.43 cfs @ 12.03 hrs, Volume= 54,722 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 3L: Pre

Hydrograph



18-122-New

Type II 24-hr 10-Year Rainfall=5.30"

Prepared by Hewlett-Packard Company

Printed 2/6/2019

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Page 33

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Ex1: Subcat Ex1

Runoff Area=261,252 sf 31.93% Impervious Runoff Depth=3.25"
Flow Length=263' Tc=10.9 min CN=81 Runoff=28.83 cfs 70,797 cf

Subcatchment Offsite: Subcat Offsite

Runoff Area=97,319 sf 0.00% Impervious Runoff Depth=2.52"
Flow Length=263' Tc=10.9 min CN=73 Runoff=8.40 cfs 20,421 cf

Subcatchment To UGS: Subcat To UGS

Runoff Area=163,933 sf 63.97% Impervious Runoff Depth=4.06"
Flow Length=786' Tc=9.6 min CN=89 Runoff=22.65 cfs 55,461 cf

Pond 2P: UGS

Peak Elev=90.07' Storage=47,896 cf Inflow=22.65 cfs 55,461 cf
Outflow=0.36 cfs 8,414 cf

Link 1L: Post

Inflow=8.40 cfs 28,834 cf
Primary=8.40 cfs 28,834 cf

Link 3L: Pre

Inflow=28.83 cfs 70,797 cf
Primary=28.83 cfs 70,797 cf

Total Runoff Area = 522,504 sf Runoff Volume = 146,678 cf Average Runoff Depth = 3.37"
63.97% Pervious = 334,230 sf 36.03% Impervious = 188,274 sf

Summary for Subcatchment Ex1: Subcat Ex1

Runoff = 28.83 cfs @ 12.03 hrs, Volume= 70,797 cf, Depth= 3.25"

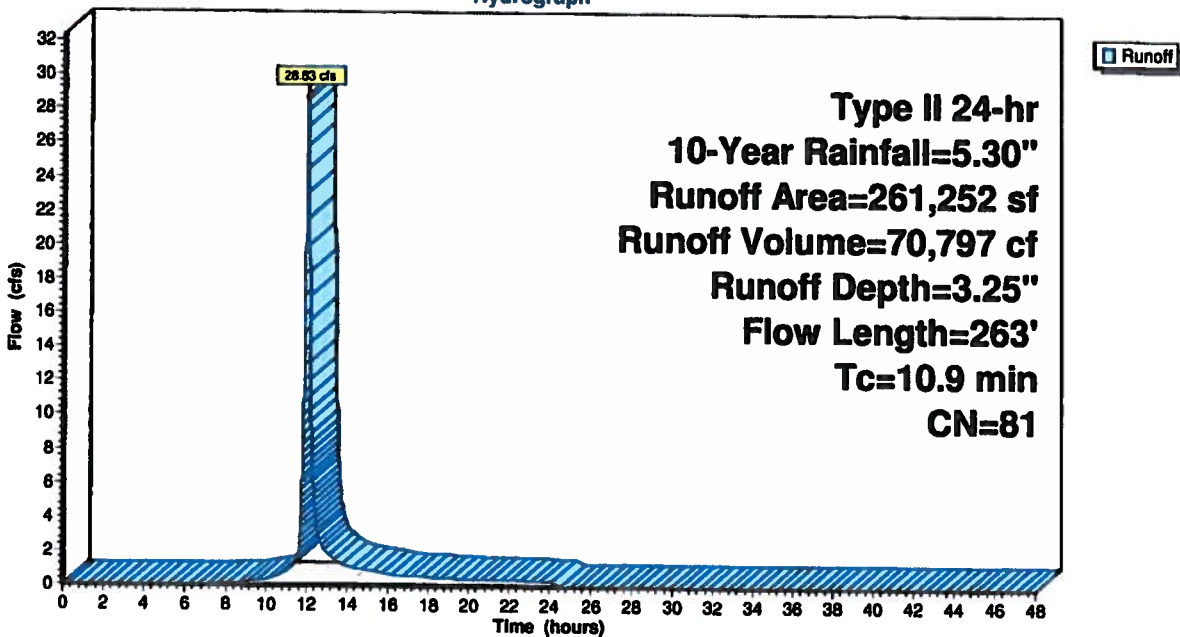
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=5.30"

Area (sf)	CN	Description
159,510	74	>75% Grass cover, Good, HSG C
51,923	98	Paved parking, HSG C
31,486	98	Roofs, HSG C
18,333	70	Woods, Good, HSG C
261,252	81	Weighted Average
177,843		68.07% Pervious Area
83,409		31.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0180	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.3	107	0.1074	5.28		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	56	0.1337	1.83		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.9	263	Total			

Subcatchment Ex1: Subcat Ex1

Hydrograph



Summary for Subcatchment Offsite: Subcat Offsite

Runoff = 8.40 cfs @ 12.03 hrs, Volume= 20,421 cf, Depth= 2.52"

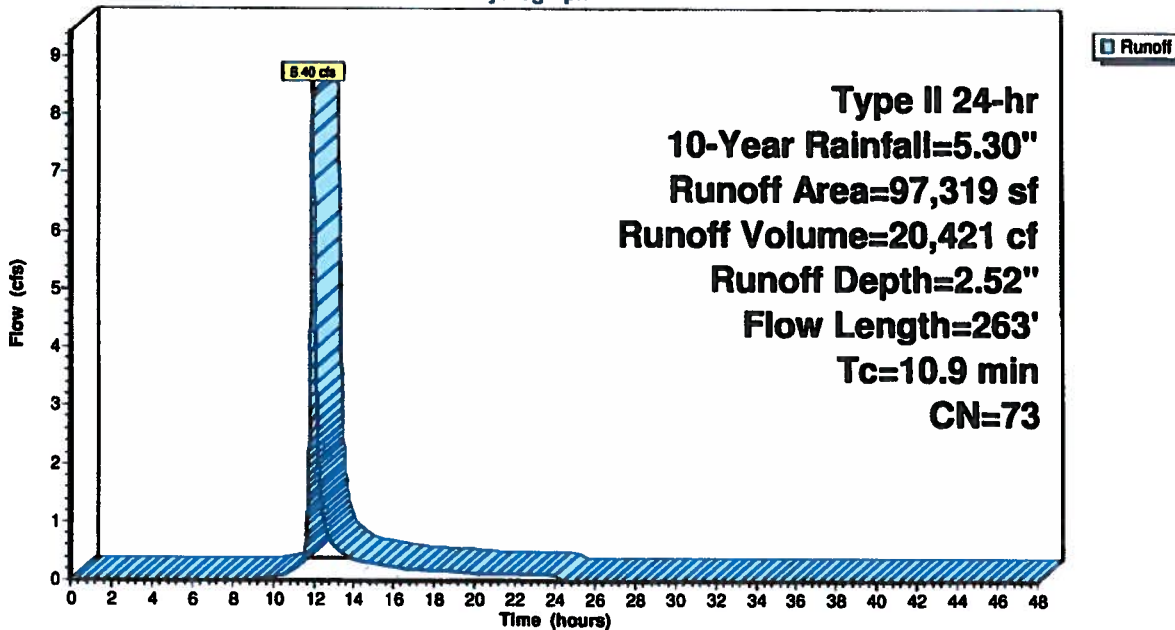
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-Year Rainfall=5.30"

Area (sf)	CN	Description
79,969	74	>75% Grass cover, Good, HSG C
17,350	70	Woods, Good, HSG C
97,319	73	Weighted Average
97,319		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0180	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.3	107	0.1074	5.28		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	56	0.1337	1.83		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.9	263	Total			

Subcatchment Offsite: Subcat Offsite

Hydrograph



Summary for Subcatchment To UGS: Subcat To UGS

Runoff = 22.65 cfs @ 12.01 hrs, Volume= 55,461 cf, Depth= 4.06"

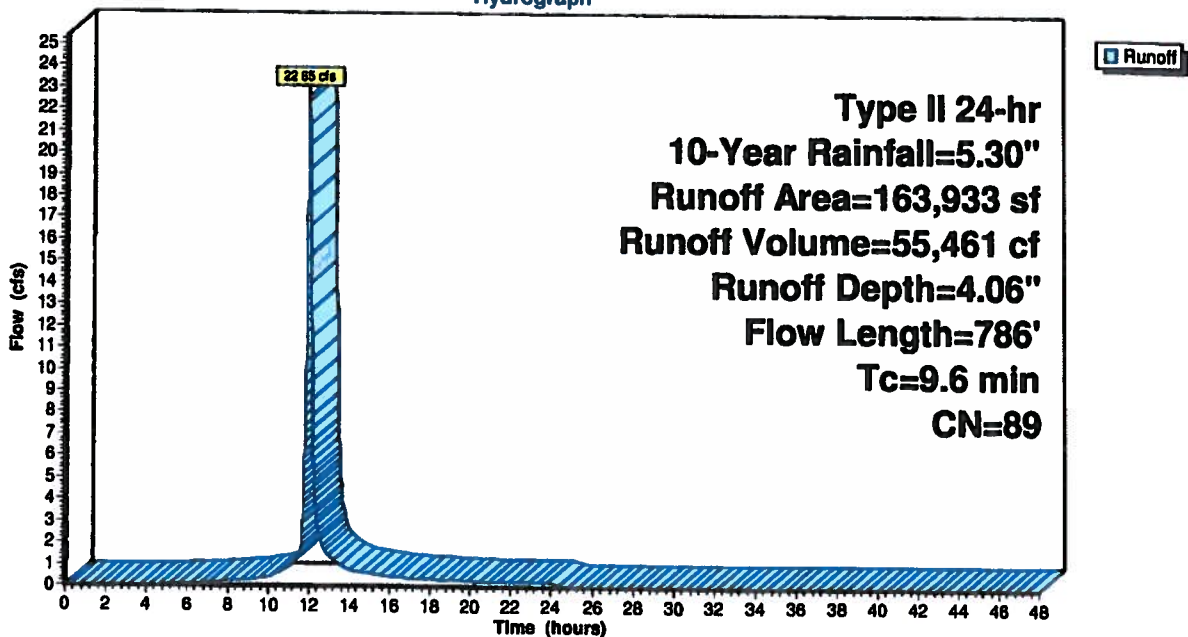
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-Year Rainfall=5.30"

Area (sf)	CN	Description
59,068	74	>75% Grass cover, Good, HSG C
73,379	98	Paved roads w/curbs & sewers, HSG C
31,486	98	Roofs, HSG C
163,933	89	Weighted Average
59,068		36.03% Pervious Area
104,865		63.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0500	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.4	214	0.0254	2.57		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.5	472	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
9.6	786	Total			

Subcatchment To UGS: Subcat To UGS

Hydrograph



Summary for Pond 2P: UGS

Inflow Area = 163,933 sf, 63.97% Impervious, Inflow Depth = 4.06" for 10-Year event
 Inflow = 22.65 cfs @ 12.01 hrs, Volume= 55,461 cf
 Outflow = 0.36 cfs @ 17.88 hrs, Volume= 8,414 cf, Atten= 98%, Lag= 352.2 min
 Primary = 0.36 cfs @ 17.88 hrs, Volume= 8,414 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 9
 Peak Elev= 90.07' @ 17.88 hrs Surf.Area= 13,701 sf Storage= 47,896 cf

Plug-Flow detention time= 618.6 min calculated for 8,414 cf (15% of inflow)
 Center-of-Mass det. time= 421.8 min (1,214.3 - 792.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	85.66'	0 cf	64.19'W x 213.46'L x 7.00'H Field A 95,909 cf Overall - 95,909 cf Embedded = 0 cf x 40.0% Voids
#2A	85.66'	73,511 cf	StormTrap ST2 DoubleTrap 6-0 x 78 Inside #1 Inside= 101.7"W x 72.0"H => 45.99 sf x 15.40'L = 708.0 cf Outside= 101.7"W x 84.0"H => 59.35 sf x 15.40'L = 913.8 cf 6 Rows of 13 Chambers 50.88' x 200.15' Core + 6.66' Border = 64.19' x 213.46' System
		73,511 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	85.66'	15.0" Round Culvert L= 40.9' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 85.66' / 85.10' S= 0.0137 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 4	88.00'	30.0" W x 9.0" H Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	85.66'	5.0" W x 3.0" H Vert. Orifice/Grate C= 0.600
#4	Device 3	90.00'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=0.36 cfs @ 17.88 hrs HW=90.07' (Free Discharge)

- ↑ 1=Culvert (Passes 0.36 cfs of 11.49 cfs potential flow)
- ↑ 3=Orifice/Grate (Passes 0.36 cfs of 1.04 cfs potential flow)
- ↑ 4=Sharp-Crested Rectangular Weir (Weir Controls 0.36 cfs @ 0.86 fps)
- ↑ 2=Orifice/Grate (Passes 0.36 cfs of 7.13 cfs potential flow)

18-122-New

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Type II 24-hr 10-Year Rainfall=5.30"

Printed 2/6/2019

Page 38

Pond 2P: UGS - Chamber Wizard Field A

Chamber Model = StormTrap ST2 DoubleTrap 6-0 (StormTrap ST2 DoubleTrap® Type II+IV)

Inside= 101.7"W x 72.0"H => 45.99 sf x 15.40'L = 708.0 cf

Outside= 101.7"W x 84.0"H => 59.35 sf x 15.40'L = 913.8 cf

13 Chambers/Row x 15.40' Long = 200.15' Row Length +79.9" Border x 2 = 213.46' Base Length

6 Rows x 101.7" Wide + 79.9" Side Border x 2 = 64.19' Base Width

84.0" Chamber Height = 7.00' Field Height

78 Chambers x 708.0 cf + 18,288.6 cf Border = 73,511.3 cf Chamber Storage

78 Chambers x 913.8 cf + 24,632.6 cf Border = 95,909.5 cf Displacement

Chamber Storage = 73,511.3 cf = 1.688 af

Overall Storage Efficiency = 76.6%

Overall System Size = 213.46' x 64.19' x 7.00'

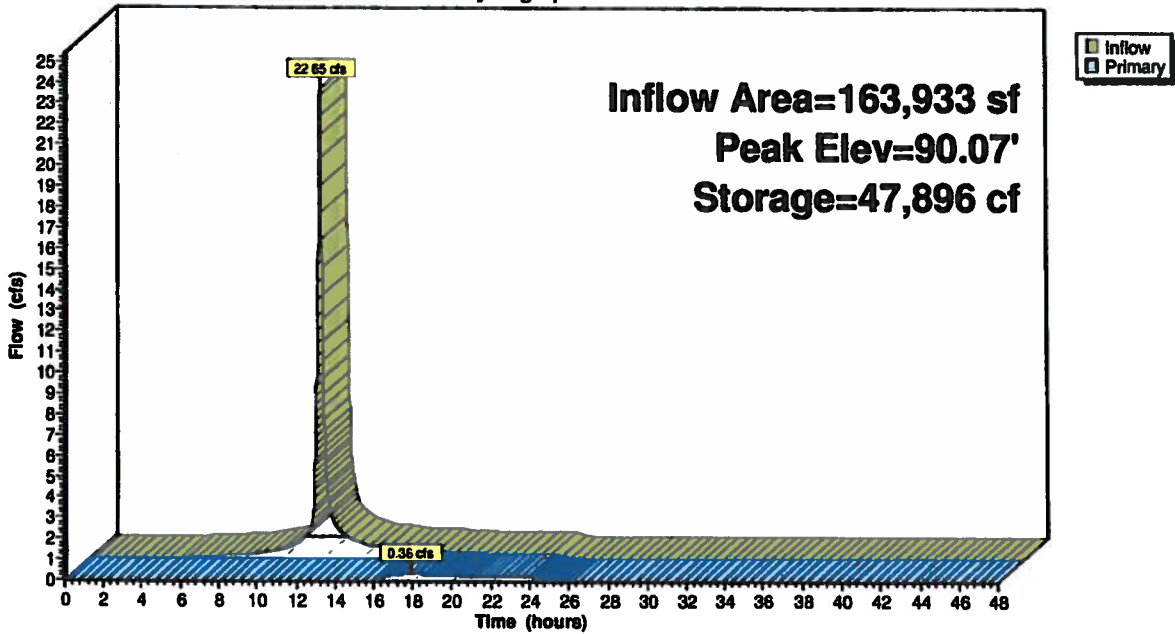
78 Chambers (plus border)

3,552.2 cy Field



Pond 2P: UGS

Hydrograph



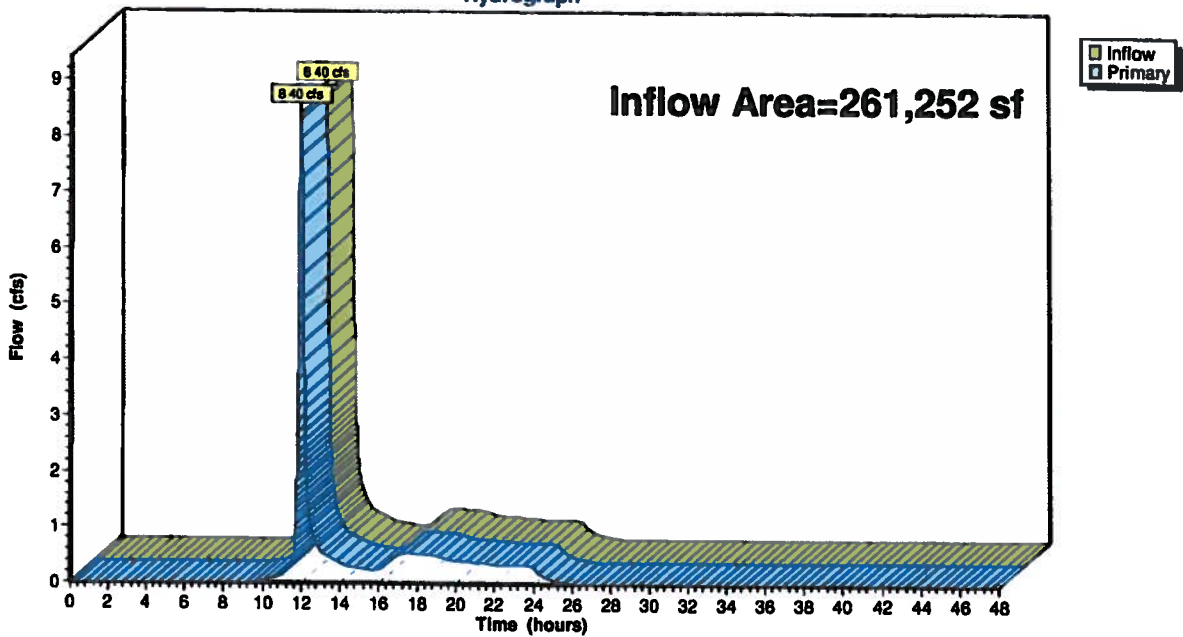
Summary for Link 1L: Post

Inflow Area = 261,252 sf, 40.14% Impervious, Inflow Depth = 1.32" for 10-Year event
Inflow = 8.40 cfs @ 12.03 hrs, Volume= 28,834 cf
Primary = 8.40 cfs @ 12.03 hrs, Volume= 28,834 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 1L: Post

Hydrograph



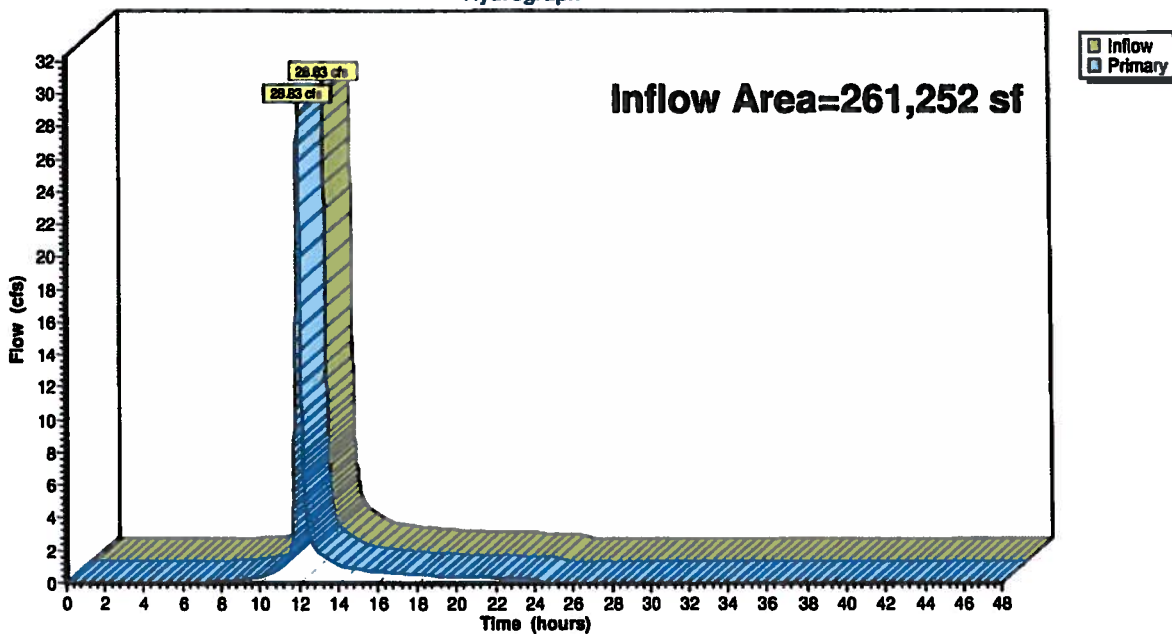
Summary for Link 3L: Pre

Inflow Area = 261,252 sf, 31.93% Impervious, Inflow Depth = 3.25" for 10-Year event
Inflow = 28.83 cfs @ 12.03 hrs, Volume= 70,797 cf
Primary = 28.83 cfs @ 12.03 hrs, Volume= 70,797 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 3L: Pre

Hydrograph



18-122-New

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Type II 24-hr 25-Year Rainfall=6.44"

Printed 2/6/2019

Page 42

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Ex1: Subcat Ex1

Runoff Area=261,252 sf 31.93% Impervious Runoff Depth=4.29"
Flow Length=263' Tc=10.9 min CN=81 Runoff=37.62 cfs 93,327 cf

Subcatchment Offsite: Subcat Offsite

Runoff Area=97,319 sf 0.00% Impervious Runoff Depth=3.46"
Flow Length=263' Tc=10.9 min CN=73 Runoff=11.52 cfs 28,037 cf

Subcatchment To UGS: Subcat To UGS

Runoff Area=163,933 sf 63.97% Impervious Runoff Depth=5.16"
Flow Length=786' Tc=9.6 min CN=89 Runoff=28.38 cfs 70,525 cf

Pond 2P: UGS

Peak Elev=90.22' Storage=49,794 cf Inflow=28.38 cfs 70,525 cf
Outflow=1.06 cfs 23,478 cf

Link 1L: Post

Inflow=11.52 cfs 51,515 cf
Primary=11.52 cfs 51,515 cf

Link 3L: Pre

Inflow=37.62 cfs 93,327 cf
Primary=37.62 cfs 93,327 cf

Total Runoff Area = 522,504 sf Runoff Volume = 191,890 cf Average Runoff Depth = 4.41"
63.97% Pervious = 334,230 sf 36.03% Impervious = 188,274 sf

Summary for Subcatchment Ex1: Subcat Ex1

Runoff = 37.62 cfs @ 12.02 hrs, Volume= 93,327 cf, Depth= 4.29"

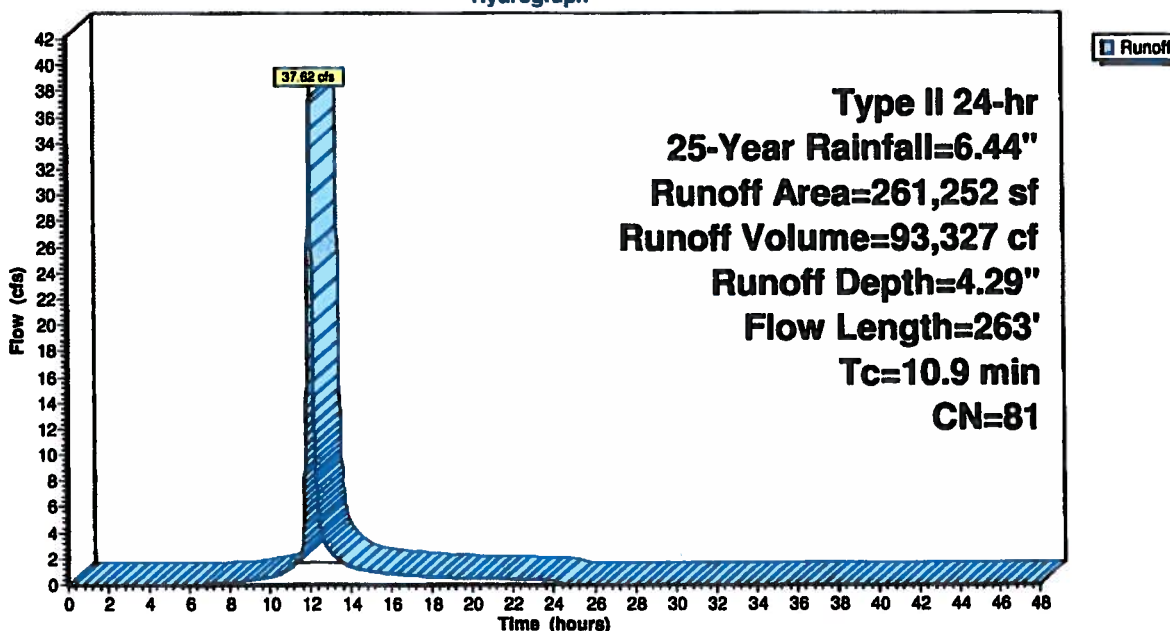
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-Year Rainfall=6.44"

Area (sf)	CN	Description
159,510	74	>75% Grass cover, Good, HSG C
51,923	98	Paved parking, HSG C
31,486	98	Roofs, HSG C
18,333	70	Woods, Good, HSG C
261,252	81	Weighted Average
177,843		68.07% Pervious Area
83,409		31.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0180	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.3	107	0.1074	5.28		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	56	0.1337	1.83		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.9	263	Total			

Subcatchment Ex1: Subcat Ex1

Hydrograph



Summary for Subcatchment Offsite: Subcat Offsite

Runoff = 11.52 cfs @ 12.03 hrs, Volume= 28,037 cf, Depth= 3.46"

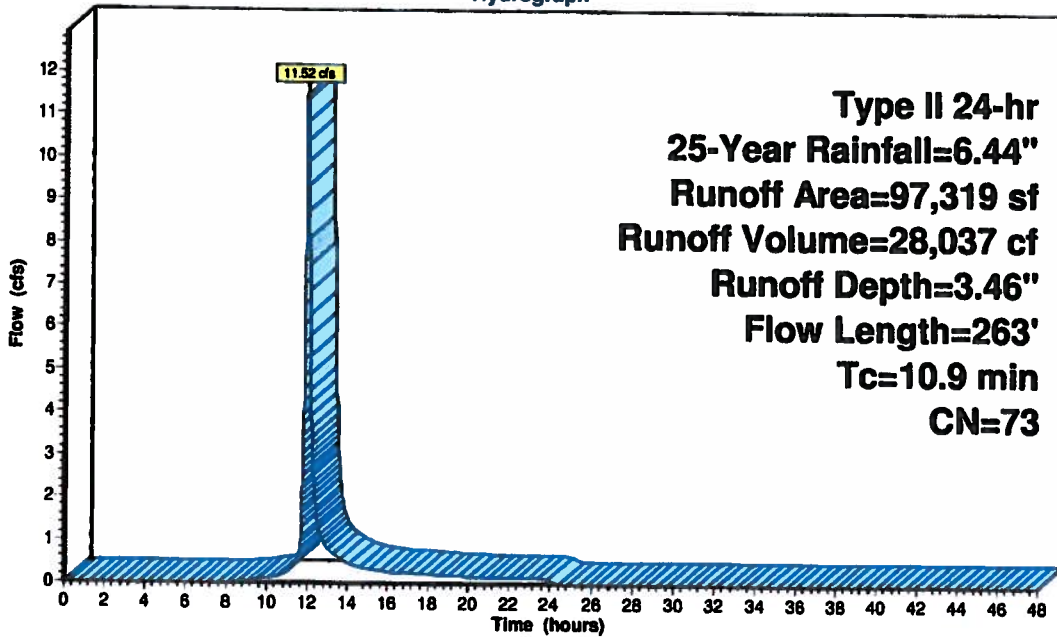
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-Year Rainfall=6.44"

Area (sf)	CN	Description
79,969	74	>75% Grass cover, Good, HSG C
17,350	70	Woods, Good, HSG C
97,319	73	Weighted Average
97,319		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0180	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.3	107	0.1074	5.28		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	56	0.1337	1.83		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.9	263	Total			

Subcatchment Offsite: Subcat Offsite

Hydrograph



Summary for Subcatchment To UGS: Subcat To UGS

Runoff = 28.38 cfs @ 12.01 hrs, Volume= 70,525 cf, Depth= 5.16"

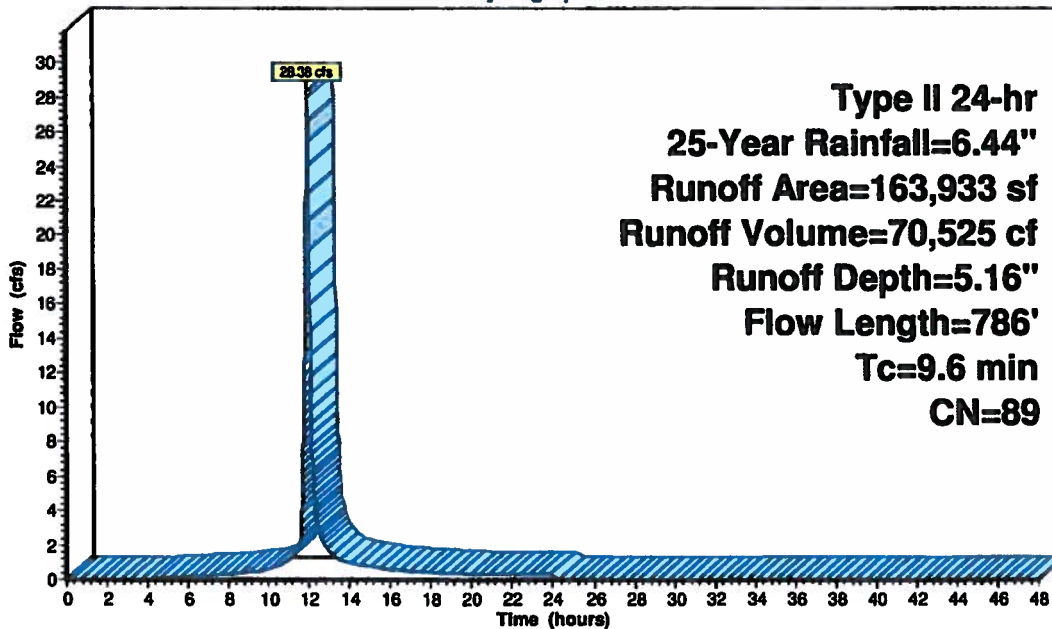
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-Year Rainfall=6.44"

Area (sf)	CN	Description
59,068	74	>75% Grass cover, Good, HSG C
73,379	98	Paved roads w/curbs & sewers, HSG C
31,486	98	Roofs, HSG C
163,933	89	Weighted Average
59,068		36.03% Pervious Area
104,865		63.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0500	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.4	214	0.0254	2.57		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.5	472	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
9.6	786	Total			

Subcatchment To UGS: Subcat To UGS

Hydrograph



Summary for Pond 2P: UGS

Inflow Area = 163,933 sf, 63.97% Impervious, Inflow Depth = 5.16" for 25-Year event
 Inflow = 28.38 cfs @ 12.01 hrs, Volume= 70,525 cf
 Outflow = 1.06 cfs @ 13.75 hrs, Volume= 23,478 cf, Atten= 96%, Lag= 104.5 min
 Primary = 1.06 cfs @ 13.75 hrs, Volume= 23,478 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 9
 Peak Elev= 90.22' @ 13.75 hrs Surf.Area= 13,701 sf Storage= 49,794 cf

Plug-Flow detention time= 373.5 min calculated for 23,473 cf (33% of inflow)
 Center-of-Mass det. time= 235.0 min (1,020.9 - 785.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	85.66'	0 cf	64.19'W x 213.46'L x 7.00'H Field A 95,909 cf Overall - 95,909 cf Embedded = 0 cf x 40.0% Voids
#2A	85.66'	73,511 cf	StormTrap ST2 DoubleTrap 6-0 x 78 Inside #1 Inside= 101.7"W x 72.0"H => 45.99 sf x 15.40'L = 708.0 cf Outside= 101.7"W x 84.0"H => 59.35 sf x 15.40'L = 913.8 cf 6 Rows of 13 Chambers 50.88' x 200.15' Core + 6.66' Border = 64.19' x 213.46' System
		73,511 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	85.66'	15.0" Round Culvert L= 40.9' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 85.66' / 85.10' S= 0.0137 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 4	88.00'	30.0" W x 9.0" H Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	85.66'	5.0" W x 3.0" H Vert. Orifice/Grate C= 0.600
#4	Device 3	90.00'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=1.06 cfs @ 13.75 hrs HW=90.22' (Free Discharge)

- ↑ 1=Culvert (Passes 1.06 cfs of 11.73 cfs potential flow)
- ↑ 3=Orifice/Grate (Orifice Controls 1.06 cfs @ 10.14 fps)
- ↑ 4=Sharp-Crested Rectangular Weir (Passes 1.06 cfs of 2.07 cfs potential flow)
- ↑ 2=Orifice/Grate (Passes 1.06 cfs of 12.82 cfs potential flow)

18-122-New

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Type II 24-hr 25-Year Rainfall=6.44"

Printed 2/6/2019

Page 47

Pond 2P: UGS - Chamber Wizard Field A

Chamber Model = StormTrap ST2 DoubleTrap 6-0 (StormTrap ST2 DoubleTrap® Type II+IV)

Inside= 101.7"W x 72.0"H => 45.99 sf x 15.40'L = 708.0 cf

Outside= 101.7"W x 84.0"H => 59.35 sf x 15.40'L = 913.8 cf

13 Chambers/Row x 15.40' Long = 200.15' Row Length +79.9" Border x 2 = 213.46' Base Length

6 Rows x 101.7" Wide + 79.9" Side Border x 2 = 64.19' Base Width

84.0" Chamber Height = 7.00' Field Height

78 Chambers x 708.0 cf + 18,288.6 cf Border = 73,511.3 cf Chamber Storage

78 Chambers x 913.8 cf + 24,632.6 cf Border = 95,909.5 cf Displacement

Chamber Storage = 73,511.3 cf = 1.688 af

Overall Storage Efficiency = 76.6%

Overall System Size = 213.46' x 64.19' x 7.00'

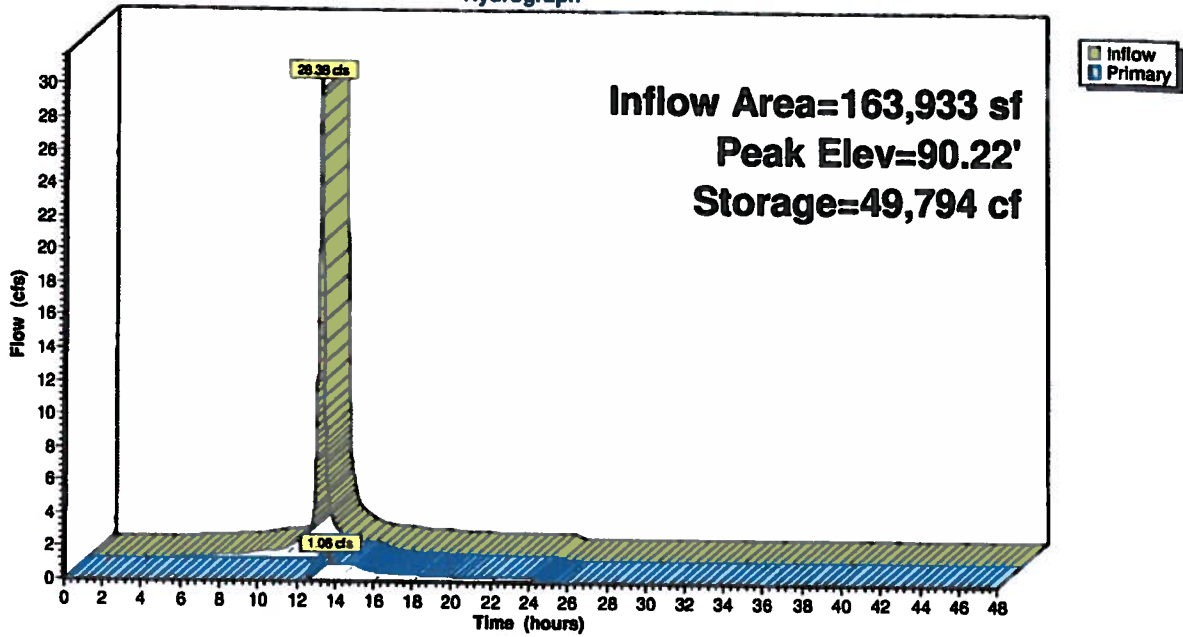
78 Chambers (plus border)

3,552.2 cy Field



Pond 2P: UGS

Hydrograph



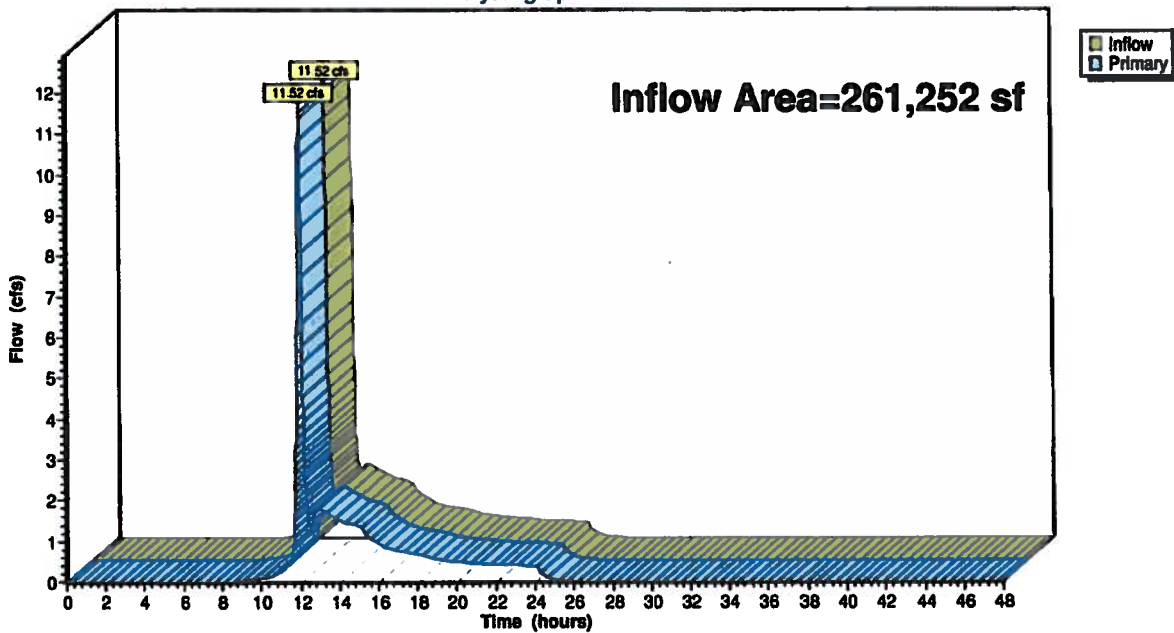
Summary for Link 1L: Post

Inflow Area = 261,252 sf, 40.14% Impervious, Inflow Depth = 2.37" for 25-Year event
Inflow = 11.52 cfs @ 12.03 hrs, Volume= 51,515 cf
Primary = 11.52 cfs @ 12.03 hrs, Volume= 51,515 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 1L: Post

Hydrograph



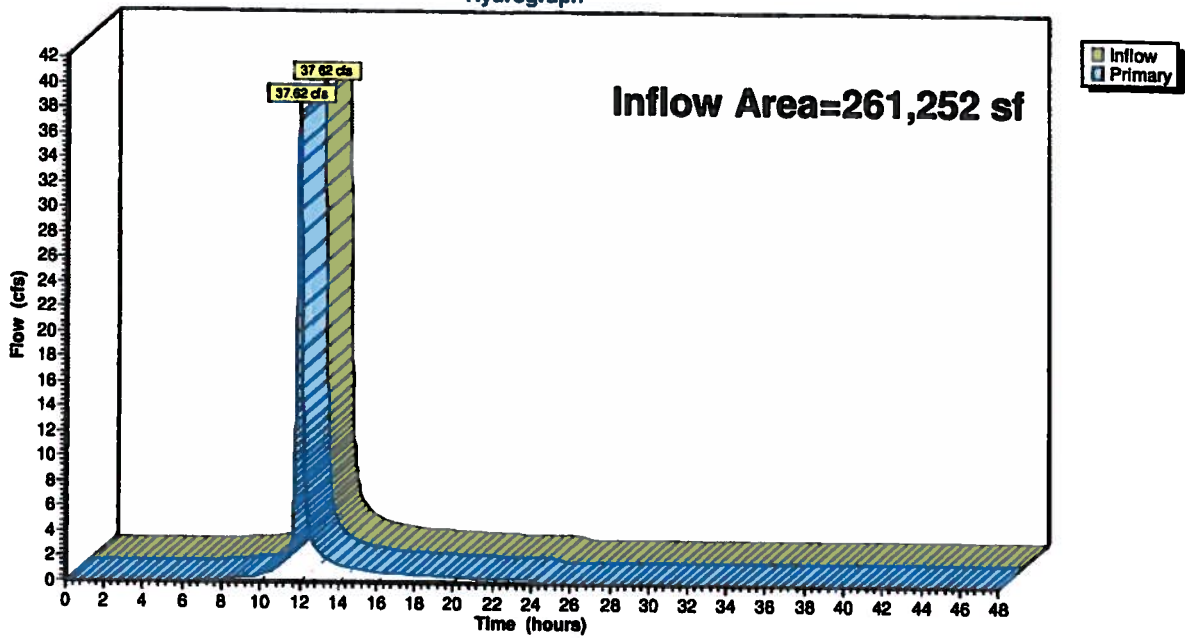
Summary for Link 3L: Pre

Inflow Area = 261,252 sf, 31.93% Impervious, Inflow Depth = 4.29" for 25-Year event
Inflow = 37.62 cfs @ 12.02 hrs, Volume= 93,327 cf
Primary = 37.62 cfs @ 12.02 hrs, Volume= 93,327 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 3L: Pre

Hydrograph



18-122-New

Type II 24-hr 50-Year Rainfall=7.32"

Prepared by Hewlett-Packard Company

Printed 2/6/2019

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Page 51

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Ex1: Subcat Ex1 Runoff Area=261,252 sf 31.93% Impervious Runoff Depth=5.10"
Flow Length=263' Tc=10.9 min CN=81 Runoff=44.44 cfs 111,108 cf

Subcatchment Offsite: Subcat Offsite Runoff Area=97,319 sf 0.00% Impervious Runoff Depth=4.21"
Flow Length=263' Tc=10.9 min CN=73 Runoff=13.99 cfs 34,163 cf

Subcatchment To UGS: Subcat To UGS Runoff Area=163,933 sf 63.97% Impervious Runoff Depth=6.02"
Flow Length=786' Tc=9.6 min CN=89 Runoff=32.78 cfs 82,249 cf

Pond 2P: UGS Peak Elev=90.80' Storage=56,812 cf Inflow=32.78 cfs 82,249 cf
Outflow=1.12 cfs 35,202 cf

Link 1L: Post Inflow=13.99 cfs 69,365 cf
Primary=13.99 cfs 69,365 cf

Link 3L: Pre Inflow=44.44 cfs 111,108 cf
Primary=44.44 cfs 111,108 cf

Total Runoff Area = 522,504 sf Runoff Volume = 227,520 cf Average Runoff Depth = 5.23"
63.97% Pervious = 334,230 sf 36.03% Impervious = 188,274 sf

Summary for Subcatchment Ex1: Subcat Ex1

Runoff = 44.44 cfs @ 12.02 hrs, Volume= 111,108 cf, Depth= 5.10"

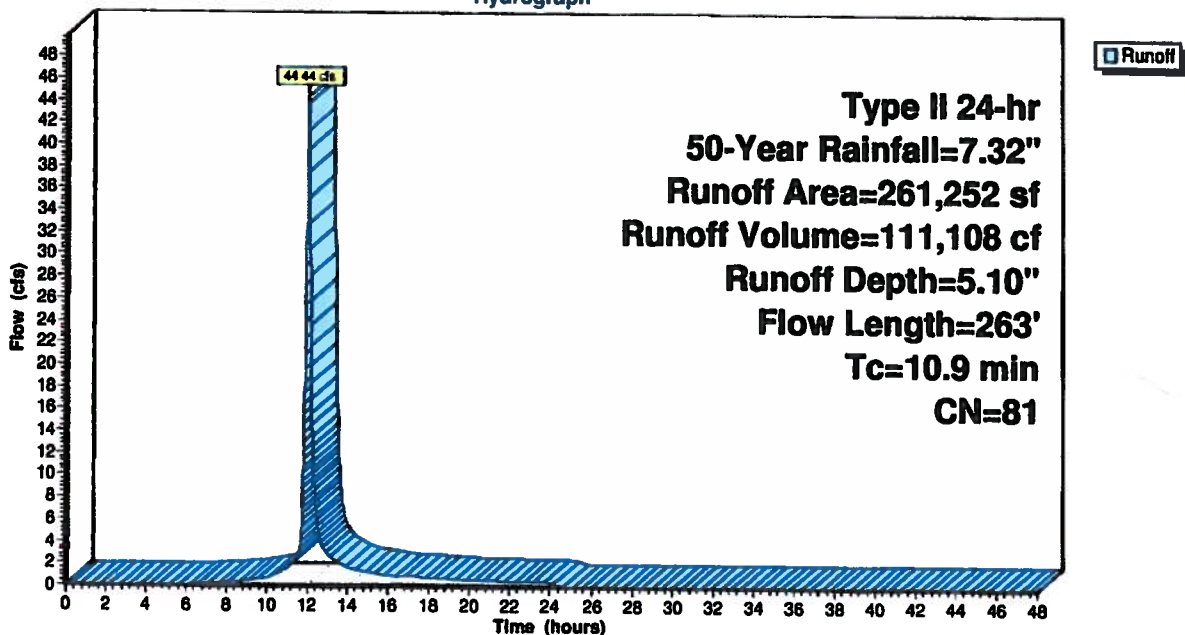
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-Year Rainfall=7.32"

Area (sf)	CN	Description
159,510	74	>75% Grass cover, Good, HSG C
51,923	98	Paved parking, HSG C
31,486	98	Roofs, HSG C
18,333	70	Woods, Good, HSG C
261,252	81	Weighted Average
177,843		68.07% Pervious Area
83,409		31.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0180	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.3	107	0.1074	5.28		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	56	0.1337	1.83		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.9	263	Total			

Subcatchment Ex1: Subcat Ex1

Hydrograph



Summary for Subcatchment Offsite: Subcat Offsite

Runoff = 13.99 cfs @ 12.03 hrs, Volume= 34,163 cf, Depth= 4.21"

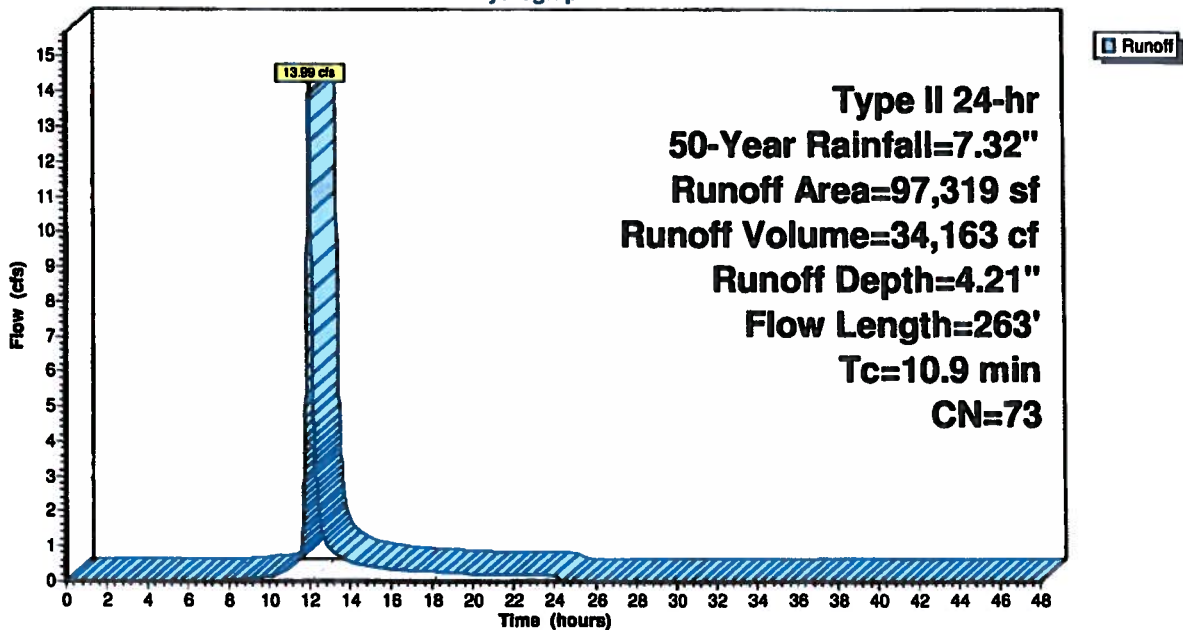
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-Year Rainfall=7.32"

Area (sf)	CN	Description
79,969	74	>75% Grass cover, Good, HSG C
17,350	70	Woods, Good, HSG C
97,319	73	Weighted Average
97,319		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0180	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.3	107	0.1074	5.28		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	56	0.1337	1.83		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.9	263	Total			

Subcatchment Offsite: Subcat Offsite

Hydrograph



Summary for Subcatchment To UGS: Subcat To UGS

Runoff = 32.78 cfs @ 12.01 hrs, Volume= 82,249 cf, Depth= 6.02"

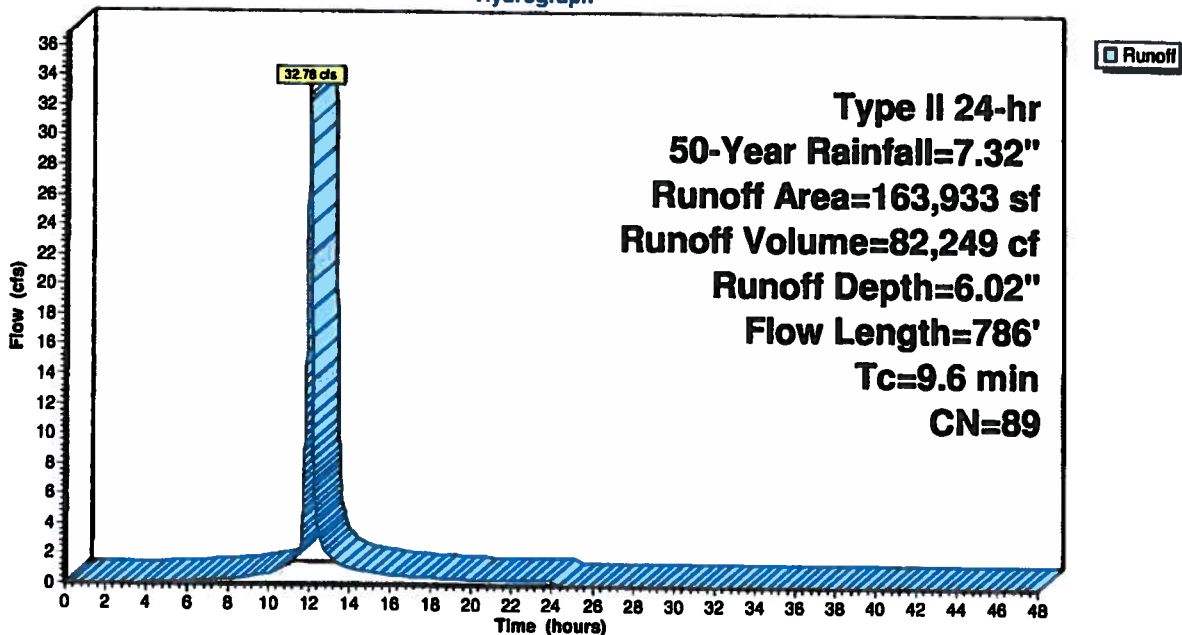
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-Year Rainfall=7.32"

Area (sf)	CN	Description
59,068	74	>75% Grass cover, Good, HSG C
73,379	98	Paved roads w/curbs & sewers, HSG C
31,486	98	Roofs, HSG C
163,933	89	Weighted Average
59,068		36.03% Pervious Area
104,865		63.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0500	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.4	214	0.0254	2.57		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.5	472	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
9.6	786	Total			

Subcatchment To UGS: Subcat To UGS

Hydrograph



Summary for Pond 2P: UGS

Inflow Area = 163,933 sf, 63.97% Impervious, Inflow Depth = 6.02" for 50-Year event
 Inflow = 32.78 cfs @ 12.01 hrs, Volume= 82,249 cf
 Outflow = 1.12 cfs @ 13.91 hrs, Volume= 35,202 cf, Atten= 97%, Lag= 114.3 min
 Primary = 1.12 cfs @ 13.91 hrs, Volume= 35,202 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 9
 Peak Elev= 90.80' @ 13.91 hrs Surf.Area= 13,701 sf Storage= 56,812 cf

Plug-Flow detention time= 358.5 min calculated for 35,202 cf (43% of inflow)
 Center-of-Mass det. time= 234.1 min (1,015.8 - 781.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	85.66'	0 cf	64.19'W x 213.46'L x 7.00'H Field A 95,909 cf Overall - 95,909 cf Embedded = 0 cf x 40.0% Voids
#2A	85.66'	73,511 cf	StormTrap ST2 DoubleTrap 6-0 x 78 Inside #1 Inside= 101.7"W x 72.0"H => 45.99 sf x 15.40'L = 708.0 cf Outside= 101.7"W x 84.0"H => 59.35 sf x 15.40'L = 913.8 cf 6 Rows of 13 Chambers 50.88' x 200.15' Core + 6.66' Border = 64.19' x 213.46' System
		73,511 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	85.66'	15.0" Round Culvert L= 40.9' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 85.66' / 85.10' S= 0.0137 ' / Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 4	88.00'	30.0" W x 9.0" H Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	85.66'	5.0" W x 3.0" H Vert. Orifice/Grate C= 0.600
#4	Device 3	90.00'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=1.12 cfs @ 13.91 hrs HW=90.80' (Free Discharge)

- 1=Culvert (Passes 1.12 cfs of 12.55 cfs potential flow)
- 3=Orifice/Grate (Orifice Controls 1.12 cfs @ 10.78 fps)
- 4=Sharp-Crested Rectangular Weir (Passes 1.12 cfs of 13.59 cfs potential flow)
- 2=Orifice/Grate (Passes 1.12 cfs of 24.18 cfs potential flow)

18-122-New

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Type II 24-hr 50-Year Rainfall=7.32"

Printed 2/6/2019

Page 56

Pond 2P: UGS - Chamber Wizard Field A

Chamber Model = StormTrap ST2 DoubleTrap 6-0 (StormTrap ST2 DoubleTrap® Type II+IV)

Inside= 101.7"W x 72.0"H => 45.99 sf x 15.40'L = 708.0 cf

Outside= 101.7"W x 84.0"H => 59.35 sf x 15.40'L = 913.8 cf

13 Chambers/Row x 15.40' Long = 200.15' Row Length +79.9" Border x 2 = 213.46' Base Length

6 Rows x 101.7" Wide + 79.9" Side Border x 2 = 64.19' Base Width

84.0" Chamber Height = 7.00' Field Height

78 Chambers x 708.0 cf + 18,288.6 cf Border = 73,511.3 cf Chamber Storage

78 Chambers x 913.8 cf + 24,632.6 cf Border = 95,909.5 cf Displacement

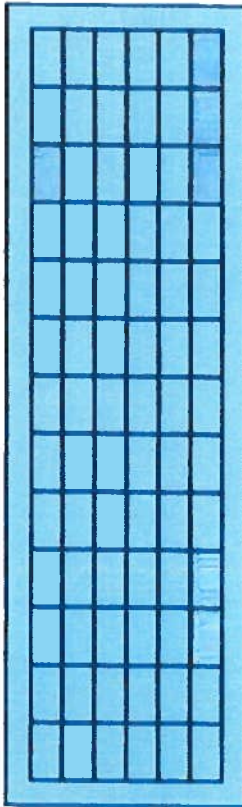
Chamber Storage = 73,511.3 cf = 1.688 af

Overall Storage Efficiency = 76.6%

Overall System Size = 213.46' x 64.19' x 7.00'

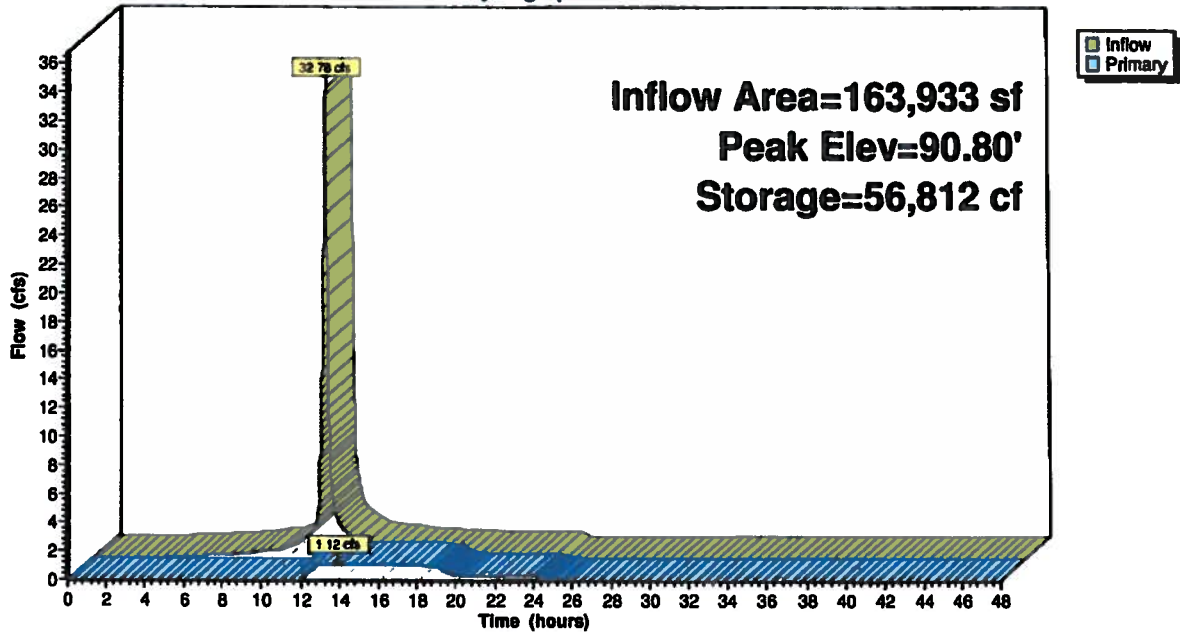
78 Chambers (plus border)

3,552.2 cy Field



Pond 2P: UGS

Hydrograph



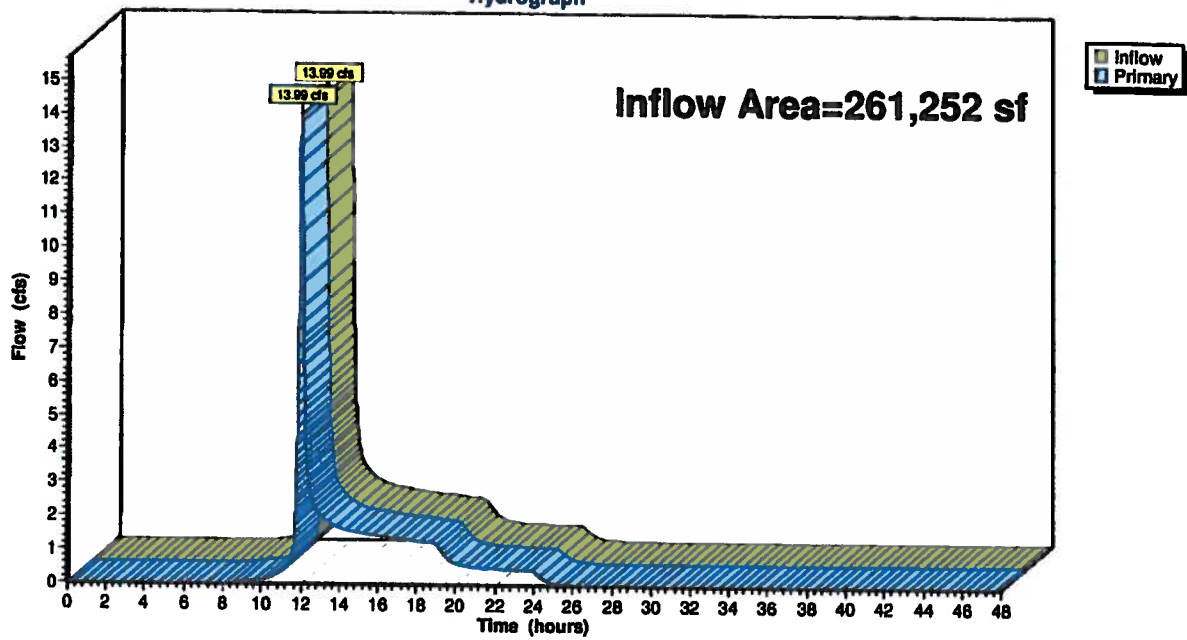
Summary for Link 1L: Post

Inflow Area = 261,252 sf, 40.14% Impervious, Inflow Depth = 3.19" for 50-Year event
Inflow = 13.99 cfs @ 12.03 hrs, Volume= 69,365 cf
Primary = 13.99 cfs @ 12.03 hrs, Volume= 69,365 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 1L: Post

Hydrograph



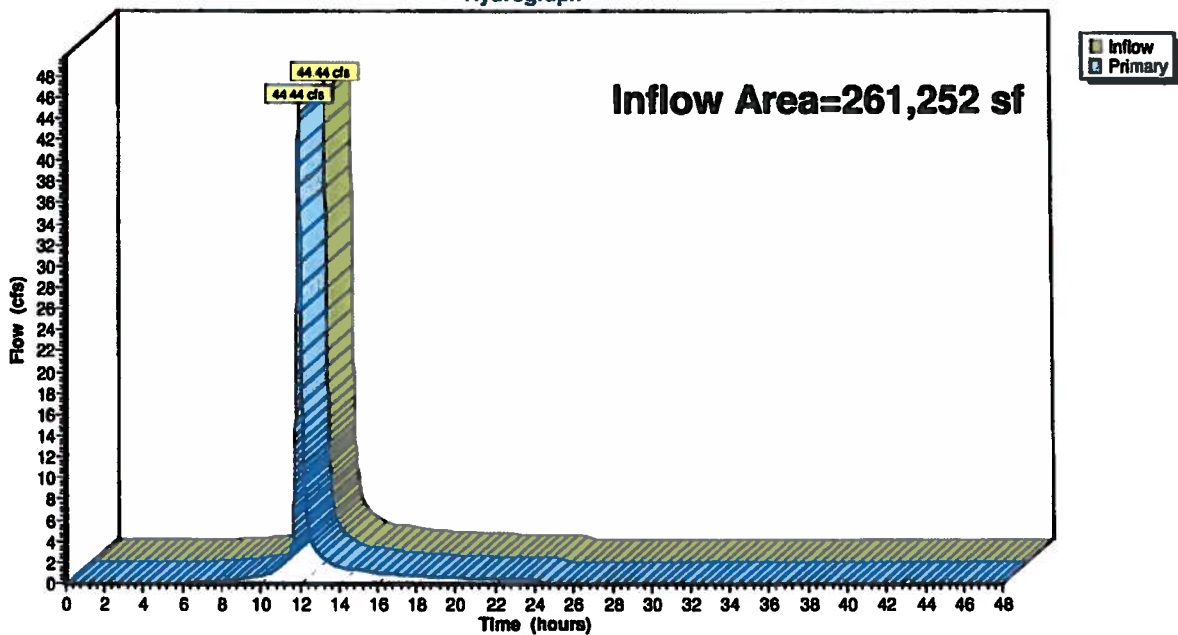
Summary for Link 3L: Pre

Inflow Area = 261,252 sf, 31.93% Impervious, Inflow Depth = 5.10" for 50-Year event
Inflow = 44.44 cfs @ 12.02 hrs, Volume= 111,108 cf
Primary = 44.44 cfs @ 12.02 hrs, Volume= 111,108 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 3L: Pre

Hydrograph



18-122-New

Type II 24-hr 100-Year Rainfall=8.20"

Prepared by Hewlett-Packard Company

Printed 2/6/2019

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Page 60

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Ex1: Subcat Ex1

Runoff Area=261,252 sf 31.93% Impervious Runoff Depth=5.93"
Flow Length=263' Tc=10.9 min CN=81 Runoff=51.26 cfs 129,129 cf

Subcatchment Offsite: Subcat Offsite

Runoff Area=97,319 sf 0.00% Impervious Runoff Depth=4.99"
Flow Length=263' Tc=10.9 min CN=73 Runoff=16.49 cfs 40,449 cf

Subcatchment To UGS: Subcat To UGS

Runoff Area=163,933 sf 63.97% Impervious Runoff Depth=6.88"
Flow Length=786' Tc=9.6 min CN=89 Runoff=37.17 cfs 94,031 cf

Pond 2P: UGS

Peak Elev=91.50' Storage=65,454 cf Inflow=37.17 cfs 94,031 cf
Outflow=1.20 cfs 46,981 cf

Link 1L: Post

Inflow=16.49 cfs 87,430 cf
Primary=16.49 cfs 87,430 cf

Link 3L: Pre

Inflow=51.26 cfs 129,129 cf
Primary=51.26 cfs 129,129 cf

Total Runoff Area = 522,504 sf Runoff Volume = 263,608 cf Average Runoff Depth = 6.05"
63.97% Pervious = 334,230 sf 36.03% Impervious = 188,274 sf

Summary for Subcatchment Ex1: Subcat Ex1

Runoff = 51.26 cfs @ 12.02 hrs, Volume= 129,129 cf, Depth= 5.93"

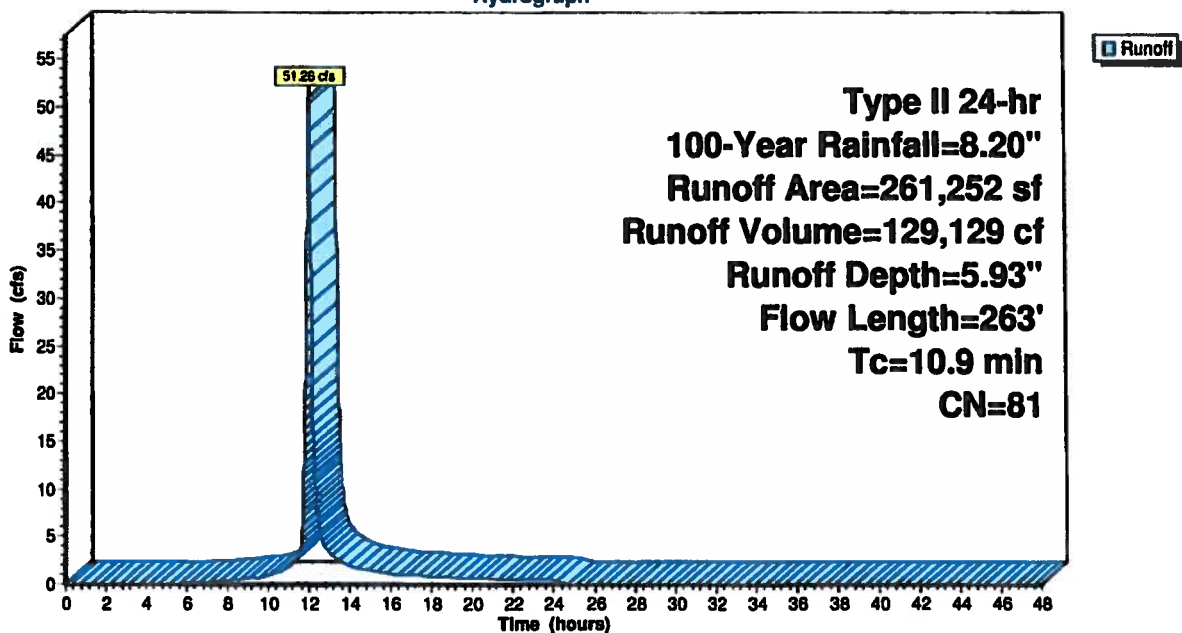
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=8.20"

Area (sf)	CN	Description
159,510	74	>75% Grass cover, Good, HSG C
51,923	98	Paved parking, HSG C
31,486	98	Roofs, HSG C
18,333	70	Woods, Good, HSG C
261,252	81	Weighted Average
177,843		68.07% Pervious Area
83,409		31.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0180	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.3	107	0.1074	5.28		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	56	0.1337	1.83		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.9	263	Total			

Subcatchment Ex1: Subcat Ex1

Hydrograph



Summary for Subcatchment Offsite: Subcat Offsite

Runoff = 16.49 cfs @ 12.03 hrs, Volume= 40,449 cf, Depth= 4.99"

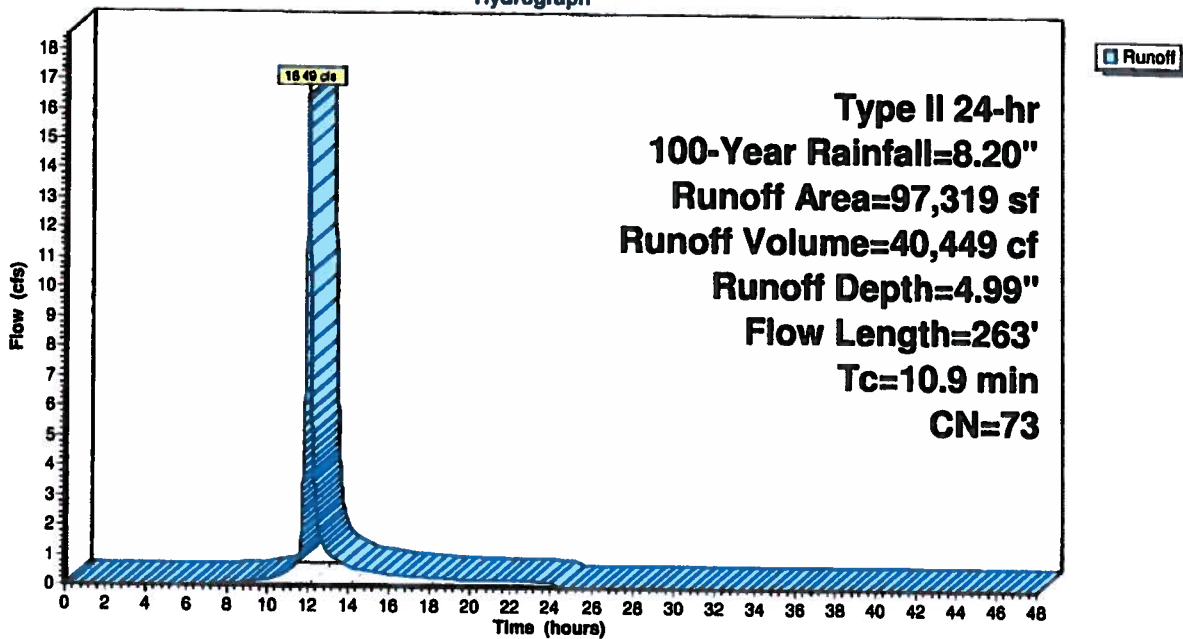
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-Year Rainfall=8.20"

Area (sf)	CN	Description
79,969	74	>75% Grass cover, Good, HSG C
17,350	70	Woods, Good, HSG C
97,319	73	Weighted Average
97,319		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0180	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.3	107	0.1074	5.28		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.5	56	0.1337	1.83		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.9	263	Total			

Subcatchment Offsite: Subcat Offsite

Hydrograph



18-122-New

Type II 24-hr 100-Year Rainfall=8.20"

Prepared by Hewlett-Packard Company

Printed 2/6/2019

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Page 63

Summary for Subcatchment To UGS: Subcat To UGS

Runoff = 37.17 cfs @ 12.01 hrs, Volume= 94,031 cf, Depth= 6.88"

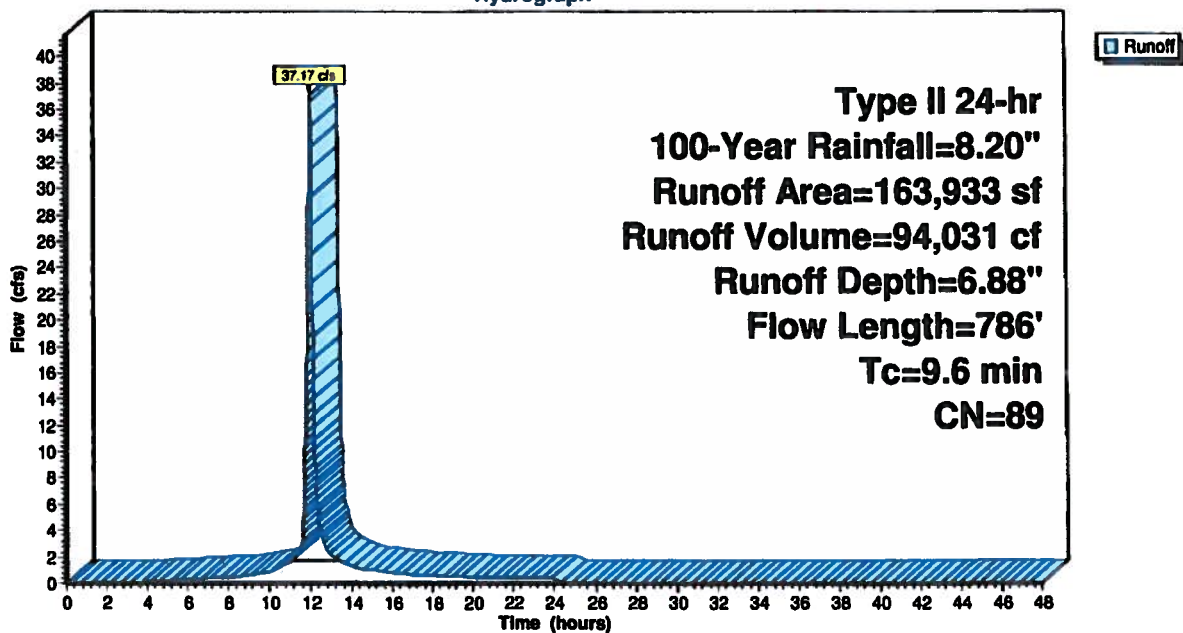
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=8.20"

Area (sf)	CN	Description
59,068	74	>75% Grass cover, Good, HSG C
73,379	98	Paved roads w/curbs & sewers, HSG C
31,486	98	Roofs, HSG C
163,933	89	Weighted Average
59,068		36.03% Pervious Area
104,865		63.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0500	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.4	214	0.0254	2.57		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.5	472	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
9.6	786	Total			

Subcatchment To UGS: Subcat To UGS

Hydrograph



Summary for Pond 2P: UGS

Inflow Area = 163,933 sf, 63.97% Impervious, Inflow Depth = 6.88" for 100-Year event
 Inflow = 37.17 cfs @ 12.01 hrs, Volume= 94,031 cf
 Outflow = 1.20 cfs @ 14.02 hrs, Volume= 46,981 cf, Atten= 97%, Lag= 120.9 min
 Primary = 1.20 cfs @ 14.02 hrs, Volume= 46,981 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 9
 Peak Elev= 91.50' @ 14.02 hrs Surf.Area= 13,701 sf Storage= 65,454 cf

Plug-Flow detention time= 400.2 min calculated for 46,981 cf (50% of inflow)
 Center-of-Mass det. time= 284.1 min (1,062.3 - 778.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	85.66'	0 cf	64.19'W x 213.46'L x 7.00'H Field A 95,909 cf Overall - 95,909 cf Embedded = 0 cf x 40.0% Voids
#2A	85.66'	73,511 cf	StormTrap ST2 DoubleTrap 6-0 x 78 Inside #1 Inside= 101.7"W x 72.0"H => 45.99 sf x 15.40'L = 708.0 cf Outside= 101.7"W x 84.0"H => 59.35 sf x 15.40'L = 913.8 cf 6 Rows of 13 Chambers 50.88' x 200.15' Core + 6.66' Border = 64.19' x 213.46' System
		73,511 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	85.66'	15.0" Round Culvert L= 40.9' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 85.66' / 85.10' S= 0.0137 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 4	88.00'	30.0" W x 9.0" H Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	85.66'	5.0" W x 3.0" H Vert. Orifice/Grate C= 0.600
#4	Device 3	90.00'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=1.20 cfs @ 14.02 hrs HW=91.50' (Free Discharge)

- 1=Culvert (Passes 1.20 cfs of 13.50 cfs potential flow)
- 3=Orifice/Grate (Orifice Controls 1.20 cfs @ 11.51 fps)
- 4=Sharp-Crested Rectangular Weir (Passes 1.20 cfs of 34.32 cfs potential flow)
- 2=Orifice/Grate (Passes 1.20 cfs of 33.20 cfs potential flow)

18-122-New

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Type II 24-hr 100-Year Rainfall=8.20"

Printed 2/6/2019

Page 65

Pond 2P: UGS - Chamber Wizard Field A

Chamber Model = StormTrap ST2 DoubleTrap 6-0 (StormTrap ST2 DoubleTrap® Type II+IV)

Inside= 101.7"W x 72.0"H => 45.99 sf x 15.40'L = 708.0 cf

Outside= 101.7"W x 84.0"H => 59.35 sf x 15.40'L = 913.8 cf

13 Chambers/Row x 15.40' Long = 200.15' Row Length +79.9" Border x 2 = 213.46' Base Length

6 Rows x 101.7" Wide + 79.9" Side Border x 2 = 64.19' Base Width

84.0" Chamber Height = 7.00' Field Height

78 Chambers x 708.0 cf + 18,288.6 cf Border = 73,511.3 cf Chamber Storage

78 Chambers x 913.8 cf + 24,632.6 cf Border = 95,909.5 cf Displacement

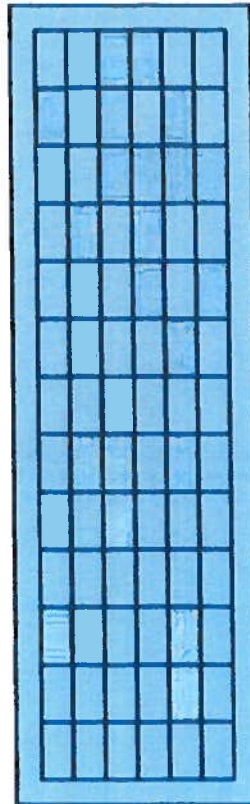
Chamber Storage = 73,511.3 cf = 1.688 af

Overall Storage Efficiency = 76.6%

Overall System Size = 213.46' x 64.19' x 7.00'

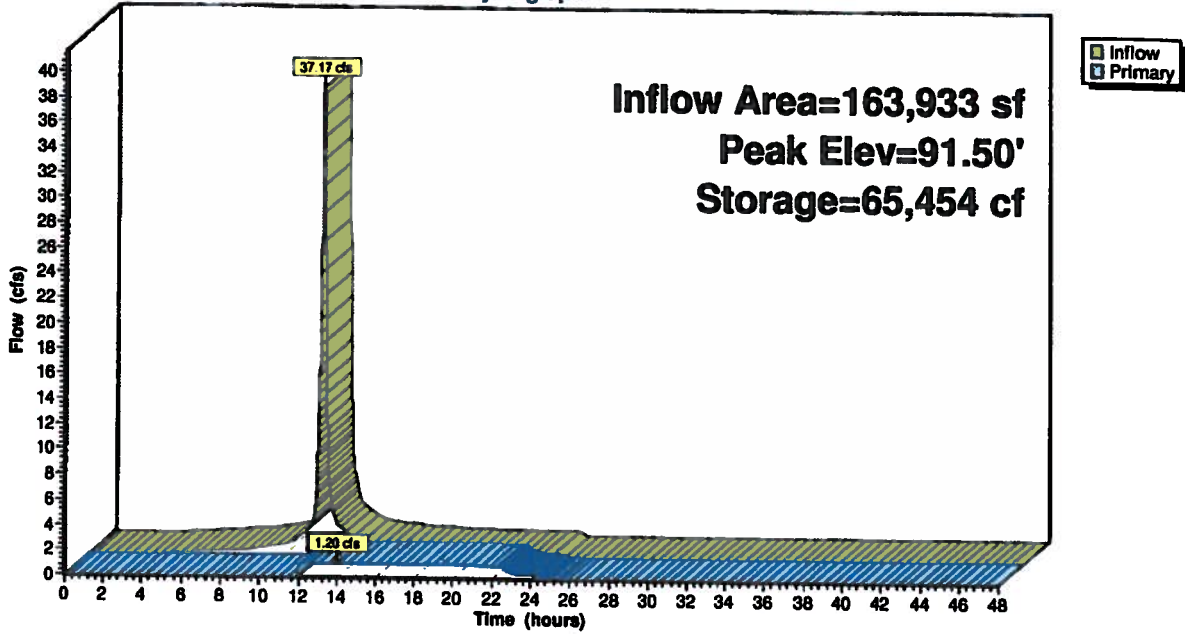
78 Chambers (plus border)

3,552.2 cy Field



Pond 2P: UGS

Hydrograph



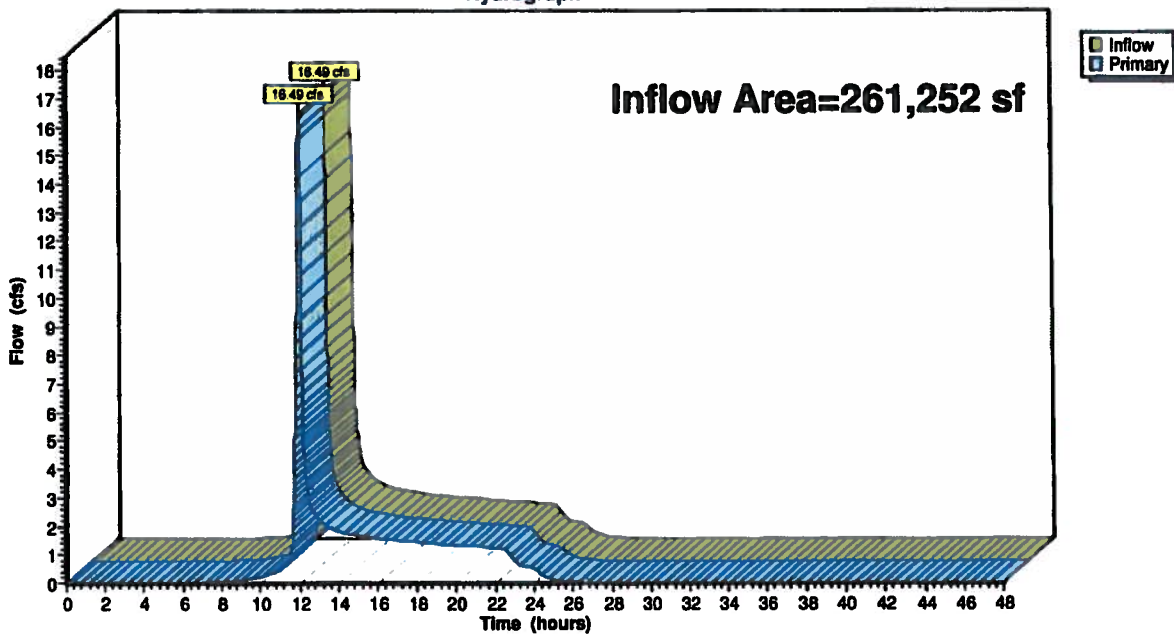
Summary for Link 1L: Post

Inflow Area = 261,252 sf, 40.14% Impervious, Inflow Depth = 4.02" for 100-Year event
Inflow = 16.49 cfs @ 12.03 hrs, Volume= 87,430 cf
Primary = 16.49 cfs @ 12.03 hrs, Volume= 87,430 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 1L: Post

Hydrograph



18-122-New

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-22 s/n 07685 © 2018 HydroCAD Software Solutions LLC

Type II 24-hr 100-Year Rainfall=8.20"

Printed 2/6/2019

Page 68

Summary for Link 3L: Pre

Inflow Area = 261,252 sf, 31.93% Impervious, Inflow Depth = 5.93" for 100-Year event
Inflow = 51.26 cfs @ 12.02 hrs, Volume= 129,129 cf
Primary = 51.26 cfs @ 12.02 hrs, Volume= 129,129 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 3L: Pre

Hydrograph

