MOEHRING & ASSOCIATES ——— CONSULTING ENGINEERS

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION

WICHITA, KANSAS

DRAINAGE PLAN

&

SUPPORTING CALCULATIONS

MOEHRING & ASSOCIATES
CONSULTING ENGINEERS
WICHITA, KANSAS
MARCH 1999

433 S. HYDRAULIC ——— WICHITA, KANSAS 67211 ——— 263-8291

SUMMARY -

The drainage plan proposed for this area directs surface water drainage in three principal directons. The smallest basin, having a drainage area of 0.98 acres, is located in the Southwest corner of the site and is identified on Exhibit "B" as Basin F. This basin flows Southwesterly toward an existing area inlet located in a drainage easement adjacent to the East side of West Street. Also, some of the runoff will undoubtedly flow off site through an existing drive approach. The post developed peak discharge for the 5yr. rainfall event is found to be 2.64 cfs .

Basin G as identified on Exhibit "B", represents the areas adjacent on the North and South sides of the West Street Ct. Cul-de-sac, containing 3.29 acres. The discharge from this basin is directed to the street pavement, and then into the proposed 18" and 21" storm water sewer. The proposed storm water sewer is to be extended approximately 365 feeet to the North and East from the existing storm sewer manhole located on the East side of West Street. The post-developed peak discharge for the 5yr. rainfall event will be 8.5 cfs . The hydraulic grade line for the proposed storm sewer has been analyzed, and has been found to be 1.44 feet below the flow line of the gutter at the upstream end of the sewer.

By virtue of the proposed system of drainage channels shown on Exhibit "B", the remaining 22.52 acres identified as Basins "A" thru "F' inclusive, will flow to the Southeast corner of the plat and into a new off-site outfall channel some 700 feet in length, which then discharges into an existing drainage channel that was designed by, and constructed under the direction of the Wichita / Valley Center Flood Control Office to serve this portion of the Big Slough Drainage basin.

The intervening land between the existing major drainage channel located in part of Lot 10, West-port Industrial Park Sixth Addition, and the Southeast corner of this study area, is in common ownership, and obtaining the necessary off-site drainage easement should not pose a problem.

Due to the proximity of aircraft landing strips to the proposed outfall channel, the drainage plan proposes to backfill that part of the outfall channel that is near the landing strips, and to install a 36" RCP culvert pipe, approximately 154 feet in length. This culvert installation will then serve as a control structure providing for detention within the drainage channels upstream, for the runoff from both the 5 yr. and the 100 yr. rainfall event.

As determined by the routing computatuons (Pages C-27 thru C-34), the 100 yr. peak discharge under post-developed conditions, will be reduced from 94.1 cfs, to 45.43 cfs, which is also slightly less than the post-developed 5 yr. peak discharge of 48.56 cfs . For the 100 yr. event, the detention storage within the channels upstream of the control structure will be 2.5 Ac.-Ft., and the maximum water surface elevation within the channels will be 102.4 feet.

The drainage channels located within drainage easements are to be constructed with 8' wide bottoms and 4:1 side slopes, and should be constructed as part of the overall site drainage improvements. The "V" bottom drainage swales are to be construccted with 10:1 or greater side slopes, to facilitate adjacent lot drainage, and should be constructed at the time of site develop-ment and grading of individual lots.

PREFACE

Following are computations and exhibits for the referenced drainage evaluation. The computations and computer print-out contained in this report employed portions of the computer program entitled "Quick TR-55, Hydrology For Small Watersheds" and also, "Pond-2, Detention Pond Design & Analysis, both of which have been compiled and published by Haestad Methods, Inc. These programs use methodologies established by the United States Conservation Service.

The "Quick TR-55" program also contains the Modified Rational Method for the determination of peak discharge (Q), and further provides an option for computing a hydrograph from the Rational Method results, by using a dimenionless hydrograph template as developed by the Hydrology Unit of the United States Soil Conservation Service, expressed in terms of T/Tc vs. Q/Qp.

The 5 and 100 year rainfall intensities, for each respective time of concentration (Tc), have been based on the Intensity-Duration-Frequency (IDF) values for this area, based upon data available from NOOA Tech. Memorandum, NWS-HYDRO -35, as published by the National Weather Service.

The Soil Survey for Sedgwick County, published by the S.C.S., was used to determine the hydrologic soil group (HSG) for this site.

The methodology contained in TR-55, "Urban Hydrology for Small Watersheds", as developed by the United States Soil Conservation Service, has been used for the determination of the time of concentration (Tc), which is the sum of the travel times for overland sheet flow, shallow concentrated flow, open channel flow, or the appropriate combination thereof.

The publication "Interim Drainage and Storm Sewer Policy for Design Criteria and Documentation, City of Wichita, revised 7/1/87, was used as the guide for the hydrologic and hydraulic procedures and computations. This publication is hereinafter referred to as the "Policy Manual".

PURPOSE

One of the primary objectives of good stormwater management, is to reduce the quantity or rate of runoff brought about by the changes in land use. Storage of excess stormwater runoff is the most effective method to lessen the impact of increased runoff and, such storage is most often in the form of a detention pond.

In this case, the site topography is such that it would be difficult, if not impossible, to create an effective on-site detention pond.

However, the temporary storage capacity within the several drainage channels as proposed in this report, will be evaluated from the standpoint of providing the detention necessary to contain the runoff resulting from the 100 yr. rainfall event.

INITIAL DATA

The land being evaluated is in the process of being re-platted, to be known as Westport Industrial Park Seventh Addition, and is generally located on the East side of West St., approximately one-half mile South of Pawnee, containing 26.79 acres, more or less. The existing and proposed zoning classification is Light Industrial.

This land lies within the Big Slough drainage basin, in which natural surface gradients are as small as 1/10th of one percent. There are no natural watercourses in or adjacent to the site into which surface water runoff could be directed. Along the South and also the East property lines of this site are shallow, poorly graded channels that ultimately drain surface water to a larger drainage channel, located some 700 feet East of the Southeast corner of the site being evaluated. That main channel was designed and constructed under the direction of the Wichita / Valley Center Flood Control Office in the mid 1970's, and the design criteria at that time was for the 50 year frequency storm, plus 3 foot of freeboard

From the SCS Soils Map of Sedgwick County, the soils in this area are predominately Carwile (Cc), in Hydrologic Soil Group "D".

Until recently, approximately 16 acres had been utilized as a tire shredding operation and, some 10 acres are utilized as a salvage yard for vehicles. Under present conditions, the surface of the site is virtually bare of vegetation.

Enclosed Exhibit "A" is a print of the Preliminary Plat, on which the existing principal drainage patterns are identified. Basin "A" contains 0.61 acres flowing West toward an existing area inlet. Basin "B" contains 1.31 acres flowing Southwesterly toward an existing drive approach, and also to an existing area inlet.

Basin "C" contains 15.87 acres, flowing generally South to an existing small channel adjacent to the South property line, and then East. Basin "D" contains 9.0 acres, flowing generally toward the existing small channel along the East property, and then South. The combined discharge from Basins "C" and "D" join at or near the Southeast property corner, then flowing off site to the East in an existing channel of minimal capacity.

The Rational "C" values used in this study are taken from the City of Wichita "Drainage Policy", and are as follows:

Existing conditions -	"D" Pasture - w/ Less than 1% Slopes	$C_5 = 0.65$
Light Industrial Use -	Post-Developed	$C_5 = 0.69$
Light Industrial Use -	Post-Developed	$C_{100} = 0.80$

At this time, there are no specific development plans for the property. Consequently, we have outlined potential development areas within each lot, which could represent future buildings and associated parking and / or outdoor storage areas, and how they may be drained to adjacent channel improvements.

The proposed drainage plan as shown on the enclosed Exhibit "B", provides for the collection of storm water runoff and subsequent discharge through a new improved outfall channel, into the existing major drainage channel, located some 700 feet to the East of the Southeast corner of the land being re-platted , in part of Lot 10, Westport Industrial Park Sixth Addition.

Due to the proximity of aircraft landing strips to the proposed outfall channel, the drainage plan proposes to backfill that part of the outfall channel that is near the landing strips, and to install a 36" RCP culvert pipe, approximately 154 feet in length. This culvert installation will then serve as a control structure providing for detention, within the upstream drainage channels, for the runoff from both the 5 yr. and the 100 yr. rainfall event.

COMPUTATION PROCEDURE

For Existing Conditions

On Page C-1 of the following computer print-out pages, is the determination of the peak rate of discharge from Basin "A", for Existing Conditions, flowing toward the existing area inlet located in the West street R/W, for the 5 yr. event. This discharge rate is based on an assumed time of concentration of 15 minutes and a "C" value of 0.65 representing existing surface characteristics; Q = 1.81 cfs .

On page C-2 is the determination of the peak discharge (Q) from Basin "B" under existing conditions, flowing Southwesterly toward an existing drive opening and also to an existing area inlet located in a drainage easement along the East side of West Street. This discharge rate is based on an assumed time of concentration of 15 minutes, and a "C" value of 0.65 representing existing surface characteristics; Q = 3.88 cfs .

Pages C-3, C-4 and C-5 are the computations to determine the time of concentration (Tc), the peak discharge (Q), and the hydrograph ordinates for Basin "C", under existing conditions for the 5 yr. rainfall event; Q = 39.69 cfs .

Pages C-6, C-7 and C-8 are the computations to determine the time of concentration (Tc), the peak discharge (Q), and the hydrograph ordinates for Basin "D", under existing conditions for the 5 yr. rainfall event; Q = 24.25 cfs .

Pages C-9 and C-10 are the computations to determine the combined peak discharge (Q), for both Basins "C" and "D". This represent the total discharge directed to the outfall channel flowing off-site to the East, under existing conditions for the 5 yr. rainfall event; Q = 38.03 cfs .

For Post-developed Conditions

On Pages C-11, C-12, C-13 and C-14 are the computations for the individual travel times for the principal flow path, extending from Node A in Basin "A" to Node G located in the proposed outfall channel at the inlet of a 36" RCP culvert, acting as a detention structure.

The time of concentration for Basin "A", is the sum of travel time from Node A to C, which is equal to 0.35 hrs or 21 minutes.

The time of concentration for Basins "A" + "B" is the sum of travel times from Nodes A to E, which is equal to 0.44 hrs. or 26.4 minutes.

The time of concentration for Basins "A" + "B" + "C" + "D" is the sum of travel times from Node A to Node F, which is equal to 0.47 hrs. or 28.2 minutes.

The time of concentration for Basins "A" thru "E" inclusive, is the sum of travel times from Nodes A to Node G, which is equal to 0.54 hrs. or 32.39 minutes, at the location of the detention structure in the outfall channel.

Pages C-15 & C-16 are computations to determine the peak discharge and hydrograph ordinates for Basin "A" under post-developed conditions for the 5 yr. rainfall event. At the inlet of the 24" RCP culvert, Q = 16.17 cfs.

Pages C-17 & C-18 are computations to determine the peak discharge and hydrograph ordinates for Basins "A" + "B" under post-developed conditions for the 5 yr. rainfall event. The peak flow at the East end of the E. - W. channel between Lots 2 and 3 (@ Node E), will be 29.9 cfs .

Pages C-19 & C-20 are the computations to determine the corresponding discharge and hydrograph ordinates from Basins "C" and "D" under post-developed conditions for the 5 yr. rainfall event. The discharge from these two basins flows toward Node E in the channel adjacent to the East property line. Using the same time of concentration as determined for Node E, (Tc = 26.4 minutes), Q = 13.49 CFS .

Pages C-21 & C-22 are the computations to determine the peak discharge and hydrograph ordinates for Basins "A" thru "D" inclusive, flowing to Node F, near the Southeast corner of the plat. At Node F, the time of concentration is 28.2 minutes, and the rate of discharge, Q = 41.9 cfs. for the 5 yr. event.

Pages C-23 & C-24 are the computations to determine the peak discharge and hydrograph ordinates for Basins "A" thru "E" inclusive, flowing to Node G located in the proposed outfall channel, at the inlet of a 36" RCP culvert acting as a detention structure. At Node G, the time of concentration is 32.39 minutes, and the peak rate of discharge, Q = 48.56 cfs for the 5 yr. event.

On Pages C-25 & C-26 are the computations to determine the peak discharge and hydrograph ordinates for Basins "A" thru "E" inclusive, flowing to Node G for the 100 yr. event, in which the time of concentration is 32.39 minutes, and the discharge $Q_{100} = 94.10$ cfs .

Pages C-27 through C-34 contain the input data for the 36" RCP control structure, the structure outflow rating curve data, the channel storage volume data, the rating table file, the routing computations, the summary of the routing computations and, the graphical exhibit of the inflow/outflow relationship for the 100 yr. rainfall event.

On Pages C-35, C-36 & C-37 are the determinations of the time of concentration, the peak discharge and the hydrograph ordinates for Basin "F", which is part of the West end of Lot 2, flowing Southwest toward an existing area inlet, located in the drainage easement adjacent to West Street. Tc = 21 minutes, and $Q_5 = 2.64$ cfs, for the 5yr. event

On Pages C-38, C-39 & C-40 are the determinations for the time of concentration, the peak discharge and the hydrograph ordinates for Basin "G", which is that part of Lots 1 & 2 flowing to the Cul-de-sac and into the proposed storm sewer. For the 5 yr. event, Tc = 22.8 minutes and, $Q_5 = 8.5$ cfs .

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
EXISTING CONDITIONS - BASIN "A"
5 YR. STORM

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
PASTURE "D"	0.650	0.61	15.00	0.650	0.650	4.560	0.61	1.81

WESTPORT INDUSTRIALPARK SEVENTH ADDITION
EXISTING CONDITIONS - BASIN "B"
5 YR. STORM

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
"D" PASTURE	0.650	1.31	15.00	0.650	0.650	4.560	1.31	3.88

Quick TR-55 Ver.5.47 S/N:
Executed: 11:09:47 03-25-1999 LONGPREC.TCT

WESTPORT INDUSTRIAL PARK 7TH ADDITION
EXISTING CONDITIONS
BASIN "C"

Tc COMPUTATIONS FOR:

SHEET FLOW (Applicable to Tc only)

Segment ID		A - B	
Surface description		"D" PASTURE	
Manning's roughness coeff., n		0.1500	
Flow length, L (total < or = 300)	ft	300.0	
Two-yr 24-hr rainfall, P2	in	3.500	
Land slope, s	ft/ft	0.0067	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.58	= 0.58

SHALLOW CONCENTRATED FLOW

Segment ID		B - C	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	630.0	
Watercourse slope, s	ft/ft	0.0029	
$Avg.V = Csf * (s)^{0.5}$	ft/s	0.8689	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.20	= 0.20

CHANNEL FLOW

Segment ID		C-D	
Cross Sectional Flow Area, a	sq.ft	20.56	
Wetted perimeter, Pw	ft	31.28	
Hydraulic radius, r = a/Pw	ft	0.657	
Channel slope, s	ft/ft	0.0020	
Manning's roughness coeff., n		0.0300	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	1.6791	
Flow length, L	ft	550	
T = L / (3600*V)	hrs	0.09	= 0.09

TOTAL TIME (hrs) 0.87

Quick TR-55 Ver.5.47 S/N:
Executed: 11:16:15 03-25-1999

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
EXISTING CONDITIONS - BASIN "C"
5 YR. STORM

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
"D" PASTURE								
	0.650	15.87						
			52.20	0.650	0.650	2.353	15.87	24.27

Quick TR-55 Ver.5.47 S/N:
Executed: 11:16:15 03-25-1999

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
EXISTING CONDITIONS - BASIN "C"
5 YR. STORM

**** Rational Method Hydrograph Using Q/Qp Template *****
Weighted C = 0.650 Area= 15.870 acres Tc = 52.20 minutes

Adjusted C = 0.650 Tc= 52.20 min. I= 2.35 in/hr Qp= 24.27 cfs

RETURN FREQUENCY: 5 year storm Adj.factor = 1.00
Q/Qp Template: IDF Output file: LONGPREC.HYD

HYDROGRAPH ORDINATES (cfs)
Time increment = 0.083 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.037	0.31	1.37	3.16	5.47	8.51	12.38	16.67
0.620	20.24	22.69	24.04	24.27	24.04	22.69	21.09
1.203	19.26	17.02	14.33	11.88	10.04	8.56	7.31
1.787	6.32	5.47	4.69	4.00	3.39	2.92	2.49
2.370	2.14	1.82	1.56	1.31	1.14	0.97	0.84
2.953	0.71	0.62	0.52	0.45	0.38	0.33	0.28
3.537	0.25	0.22	0.19	0.16	0.14	0.11	0.09
4.120	0.06	0.04	0.02	0.00			

Quick TR-55 Ver.5.47 S/N:
Executed: 11:22:11 03-25-1999 LONGPRED.TCT

WESTPORT INDUSTRIAL PARK 7TH ADDITION
EXISTING CONDITIONS
5 BASIN "D"

Tc COMPUTATIONS FOR:

SHEET FLOW (Applicable to Tc only)

Segment ID		A - B	
Surface description		"D" PASTURE	
Manning's roughness coeff., n		0.1500	
Flow length, L (total < or = 300)	ft	300.0	
Two-yr 24-hr rainfall, P2	in	3.500	
Land slope, s	ft/ft	0.0054	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.63	= 0.63

SHALLOW CONCENTRATED FLOW

Segment ID		B - C	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	168.0	
Watercourse slope, s	ft/ft	0.0060	
$Avg.V = Csf * (s)^{0.5}$	ft/s	1.2498	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.04	= 0.04

CHANNEL FLOW

Segment ID		C - D	
Cross Sectional Flow Area, a	sq.ft	8.80	
Wetted perimeter, Pw	ft	16.12	
Hydraulic radius, r = a/Pw	ft	0.546	
Channel slope, s	ft/ft	0.0013	
Manning's roughness coeff., n		0.0300	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	1.1961	
Flow length, L	ft	830	
T = L / (3600*V)	hrs	0.19	= 0.19

TOTAL TIME (hrs) 0.86

Quick TR-55 Ver.5.47 S/N:
Executed: 11:26:47 03-25-1999

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
EXISTING CONDITIONS - BASIN D
5 YR. STORM

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
"D" PASTURE								
	0.650	9.00						
			51.60	0.650	0.650	2.368	9.00	13.86

Quick TR-55 Ver.5.47 S/N:
Executed: 11:26:47 03-25-1999

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
EXISTING CONDITIONS - BASIN D
5 YR. STORM

**** Rational Method Hydrograph Using Q/Qp Template *****
Weighted C = 0.650 Area= 9.000 acres Tc = 51.60 minutes

Adjusted C = 0.650 Tc= 51.60 min. I= 2.37 in/hr Qp= 13.86 cfs

RETURN FREQUENCY: 5 year storm Adj.factor = 1.00
Q/Qp Template: IDF Output file: LONGPRED.HYD

HYDROGRAPH ORDINATES (cfs)
Time increment = 0.083 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.027	0.13	0.69	1.69	2.99	4.71	6.92	9.42
0.610	11.50	12.94	13.72	13.86	13.72	12.94	12.01
1.193	10.94	9.64	8.07	6.67	5.64	4.80	4.09
1.777	3.55	3.06	2.62	2.22	1.89	1.62	1.38
2.360	1.18	1.00	0.86	0.73	0.63	0.53	0.46
2.943	0.39	0.34	0.28	0.24	0.21	0.18	0.15
3.527	0.14	0.12	0.10	0.09	0.07	0.06	0.04
4.110	0.03	0.02	0.00				

Quick TR-55 Ver.5.47 S/N:
Executed: 11:33:18 03-25-1999

WESTPORT INDUSTRIAL PARK SEVENTH ADDDITION
EXISTING CONDITIONS - BASINS "C" + "D"
5YR. STORM

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
PASTURE"D"	0.650	24.87						
			52.20	0.650	0.650	2.353	24.87	38.03

Quick TR-55 Ver.5.47 S/N:
Executed: 11:33:18 03-25-1999

WESTPORT INDUSTRIAL PARK SEVENTH ADDDITION
EXISTING CONDITIONS - BASINS "C" + "D"
5YR. STORM

**** Rational Method Hydrograph Using Q/Qp Template *****
Weighted C = 0.650 Area= 24.870 acres Tc = 52.20 minutes

Adjusted C = 0.650 Tc= 52.20 min. I= 2.35 in/hr Qp= 38.03 cfs

RETURN FREQUENCY: 5 year storm Adj.factor = 1.00
Q/Qp Template: IDF Output file: NONE STORED

HYDROGRAPH ORDINATES (cfs)
Time increment = 0.083 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.037	0.48	2.15	4.96	8.57	13.33	19.40	26.13
0.620	31.72	35.56	37.67	38.03	37.67	35.56	33.05
1.203	30.18	26.66	22.45	18.62	15.73	13.42	11.45
1.787	9.90	8.58	7.36	6.26	5.31	4.58	3.91
2.370	3.36	2.85	2.44	2.06	1.79	1.51	1.31
2.953	1.11	0.97	0.82	0.71	0.60	0.51	0.44
3.537	0.39	0.34	0.30	0.26	0.21	0.17	0.14
4.120	0.10	0.06	0.03	0.00			

Quick TR-55 Ver.5.47 S/N:
Executed: 17:37:38 03-11-1999 LONGP100.TCT

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
TIME OF CONCENTRATION
POST-DEVELOPED CONDITIONS
PRINCIPAL FLOW PATH THRU SUBDIVISION TO CONTROL STRUCTURE

Tt COMPUTATIONS FOR: LT. INDUSTRUAL

SHEET FLOW (Applicable to Tc only)

Segment ID		A-B	
Surface description		LAWNS	
Manning's roughness coeff., n		0.1500	
Flow length, L (total < or = 300)	ft	130.0	
Two-yr 24-hr rainfall, P2	in	3.500	
Land slope, s	ft/ft	0.0065	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.30	= 0.30

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft	0.0	
Watercourse slope, s	ft/ft	0.0000	
$Avg.V = Csf * (s)^{0.5}$	ft/s	0.0000	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.00	= 0.00

CHANNEL FLOW

Segment ID		B-C	
Cross Sectional Flow Area, a	sq.ft	10.00	
Wetted perimeter, Pw	ft	20.10	
Hydraulic radius, r = a/Pw	ft	0.498	
Channel slope, s	ft/ft	0.0020	
Manning's roughness coeff., n		0.0300	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	1.3946	
Flow length, L	ft	250	
T = L / (3600*V)	hrs	0.05	= 0.05

TOTAL TIME (hrs) 0.35

Quick TR-55 Ver.5.47 S/N:
Executed: 17:37:38 03-11-1999 LONGP100.TCT

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
TIME OF CONCENTRATION
POST-DEVELOPED CONDITIONS
PRINCIPAL FLOW PATH THRU SUBDIVISION TO CONTROL STRUCTURE

Tt COMPUTATIONS FOR: LT. INDUSTRIAL

SHEET FLOW (Applicable to Tc only)

Segment ID				
Surface description				
Manning's roughness coeff., n			0.0000	
Flow length, L (total < or = 300)		ft	0.0	
Two-yr 24-hr rainfall, P2		in	0.000	
Land slope, s		ft/ft	0.0000	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$		hrs	0.00	= 0.00

SHALLOW CONCENTRATED FLOW

Segment ID				
Surface (paved or unpaved)?				
Flow length, L		ft	0.0	
Watercourse slope, s		ft/ft	0.0000	
$Avg.V = Csf * (s)^{0.5}$		ft/s	0.0000	
where:	Unpaved Csf = 16.1345			
	Paved Csf = 20.3282			
T = L / (3600*V)		hrs	0.00	= 0.00

CHANNEL FLOW

Segment ID			C-D	D-E	
Cross Sectional Flow Area, a		sq.ft	3.14	15.13	
Wetted perimeter, Pw		ft	6.28	17.79	
Hydraulic radius, r = a/Pw		ft	0.500	0.850	
Channel slope, s		ft/ft	0.0040	0.0020	
Manning's roughness coeff., n			0.0130	0.0300	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$		ft/s	4.5681	1.9938	
Flow length, L		ft	315	515	
T = L / (3600*V)		hrs	0.02	+ 0.07	= 0.09

TOTAL TIME (hrs) 0.09

Quick TR-55 Ver.5.47 S/N:
Executed: 17:37:38 03-11-1999 LONGP100.TCT

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
TIME OF CONCENTRATION
POST-DEVELOPED CONDITIONS
PRINCIPAL FLOW PATH THRU SUBDIVISION TO CONTROL STRUCTURE

Tt COMPUTATIONS FOR: LT. INDUSTRIAL

SHEET FLOW (Applicable to Tc only)

Segment ID				
Surface description				
Manning's roughness coeff., n			0.0000	
Flow length, L (total < or = 300)		ft	0.0	
Two-yr 24-hr rainfall, P2		in	0.000	
Land slope, s		ft/ft	0.0000	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$		hrs	0.00	= 0.00

SHALLOW CONCENTRATED FLOW

Segment ID				
Surface (paved or unpaved)?				
Flow length, L		ft	0.0	
Watercourse slope, s		ft/ft	0.0000	
$Avg.V = Csf * (s)^{0.5}$		ft/s	0.0000	
where:	Unpaved Csf = 16.1345			
	Paved Csf = 20.3282			
T = L / (3600*V)		hrs	0.00	= 0.00

CHANNEL FLOW

Segment ID		E-F	
Cross Sectional Flow Area, a	sq.ft	22.20	
Wetted perimeter, Pw	ft	20.86	
Hydraulic radius, r = a/Pw	ft	1.064	
Channel slope, s	ft/ft	0.0020	
Manning's roughness coeff., n		0.0300	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	2.3153	
Flow length, L	ft	290	
T = L / (3600*V)	hrs	0.03	= 0.03

TOTAL TIME (hrs) 0.03

Quick TR-55 Ver.5.47 S/N:
Executed: 17:37:38 03-11-1999 LONGP100.TCT

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
TIME OF CONCENTRATION
POST-DEVELOPED CONDITIONS
PRINCIPAL FLOW PATH THRU SUBDIVISION TO CONTROL STRUCTURE

Tt COMPUTATIONS FOR: LT. INDUSTRIAL

SHEET FLOW (Applicable to Tc only)

Segment ID			
Surface description			
Manning's roughness coeff., n		0.0000	
Flow length, L (total < or = 300)	ft	0.0	
Two-yr 24-hr rainfall, P2	in	0.000	
Land slope, s	ft/ft	0.0000	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.00	= 0.00

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft	0.0	
Watercourse slope, s	ft/ft	0.0000	
$Avg.V = Csf * (s)^{0.5}$	ft/s	0.0000	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.00	= 0.00

CHANNEL FLOW

Segment ID		F TO G	
Cross Sectional Flow Area, a	sq.ft	22.20	
Wetted perimeter, Pw	ft	20.86	
Hydraulic radius, r = a/Pw	ft	1.064	
Channel slope, s	ft/ft	0.0020	
Manning's roughness coeff., n		0.0300	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	2.3153	
Flow length, L	ft	550	
T = L / (3600*V)	hrs	0.07	= 0.07

TOTAL TIME (hrs) 0.07

WESTPORT INDUSTRIAL PARK 7TH ADDITION
NORTHWEST CORNER OF SITE
DISCHARGE TO INLET OF 24" RCP SWS
BASIN "A"

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
LT.INDUST.	0.690	6.00						
			21.00	0.690	0.690	3.905	6.00	16.17

WESTPORT INDUSTRIAL PARK 7TH ADDITION
NORTHWEST CORNER OF SITE
DISCHARGE TO INLET OF 24" RCP SWS
BASIN "A"

**** Rational Method Hydrograph Using Q/Qp Template *****
Weighted C = 0.690 Area= 6.000 acres Tc = 21.00 minutes

Adjusted C = 0.690 Tc= 21.00 min. I= 3.90 in/hr Qp= 16.17 cfs

RETURN FREQUENCY: 5 year storm Adj.factor = 1.00
Q/Qp Template: IDF Output file: 5 YR .HYD

HYDROGRAPH ORDINATES (cfs)
Time increment = 0.083 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.017	0.23	2.86	8.33	14.36	16.17	14.60	11.38
0.600	7.28	4.91	3.40	2.28	1.57	1.06	0.72
1.183	0.49	0.33	0.22	0.16	0.11	0.07	0.03
1.767	0.00						

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
POST - DEVELOPED DISCHARGE
BASINS "A" + "B"
5 YR. STORM

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
BASINS A + B								
	0.690	12.46						
			26.40	0.690	0.690	3.478	12.46	29.90

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
POST - DEVELOPED DISCHARGE
BASINS "A" + "B"
5 YR. STORM

**** Rational Method Hydrograph Using Q/Qp Template *****
Weighted C = 0.690 Area= 12.460 acres Tc = 26.40 minutes

Adjusted C = 0.690 Tc= 26.40 min. I= 3.48 in/hr Qp= 29.90 cfs

RETURN FREQUENCY: 5 year storm Adj.factor = 1.00
Q/Qp Template: IDF Output file: NONE STORED

HYDROGRAPH ORDINATES (cfs)
Time increment = 0.083 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.023	0.48	4.13	10.79	20.75	28.00	29.90	28.00
0.607	23.83	17.88	12.55	9.16	6.88	5.06	3.71
1.190	2.73	1.99	1.46	1.08	0.79	0.58	0.42
1.773	0.32	0.25	0.18	0.12	0.06	0.01	

Quick TR-55 Ver.5.47 S/N:
Executed: 11:36:24 03-10-1999

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
POST-DEVELOPED DISCHARGE
BASINS"C" + "D"
5 YR. EVENT

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
LT. INDUST.	0.690	5.62						
			26.40	0.690	0.690	3.478	5.62	13.49

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
POST-DEVELOPED DISCHARGE
BASINS"C" + "D"
5 YR. EVENT

**** Rational Method Hydrograph Using Q/Qp Template *****
Weighted C = 0.690 Area= 5.620 acres Tc = 26.40 minutes

Adjusted C = 0.690 Tc= 26.40 min. I= 3.48 in/hr Qp= 13.49 cfs

RETURN FREQUENCY: 5 year storm Adj.factor = 1.00
Q/Qp Template: IDF Output file: NONE STORED

HYDROGRAPH ORDINATES (cfs)
Time increment = 0.083 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.023	0.21	1.86	4.87	9.36	12.63	13.49	12.63
0.607	10.75	8.07	5.66	4.13	3.10	2.28	1.67
1.190	1.23	0.90	0.66	0.49	0.36	0.26	0.19
1.773	0.14	0.11	0.08	0.05	0.03	0.00	

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
BASINS "A" THRU "D" INCLUSIVE, AT NODE F
POST-DEVELOPED CONDITIONS
5 YR. EVENT

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
LT. INDUST.								
	0.690	18.08						
			28.20	0.690	0.690	3.359	18.08	41.90

Quick TR-55 Ver.5.47 S/N:
Executed: 10:53:13 03-15-1999

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
BASINS "A" THRU "D" INCLUSIVE, AT NODE F
POST-DEVELOPED CONDITIONS
5 YR. EVENT

**** Rational Method Hydrograph Using Q/Qp Template *****
Weighted C = 0.690 Area= 18.080 acres Tc = 28.20 minutes

Adjusted C = 0.690 Tc= 28.20 min. I= 3.36 in/hr Qp= 41.90 cfs

RETURN FREQUENCY: 5 year storm Adj.factor = 1.00
Q/Qp Template: IDF Output file: NONE STORED

HYDROGRAPH ORDINATES (cfs)
Time increment = 0.083 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.053	1.65	7.61	17.55	30.70	39.54	41.90	39.54
0.637	34.20	26.89	19.00	14.17	10.76	8.16	6.01
1.220	4.52	3.40	2.53	1.90	1.43	1.08	0.81
1.803	0.60	0.45	0.36	0.28	0.19	0.12	0.04
2.387	0.00						

Quick TR-55 Ver.5.47 S/N:
Executed: 11:09:28 03-15-1999

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
BASINS "A" THRU "E" INCLUSIVE, AT NODE G
POST DEVELOPED CONDITIONS
5 YR. EVENT

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
LT. INDUST.	0.690	22.52						
			32.39	0.690	0.690	3.125	22.52	48.56

Quick TR-55 Ver.5.47 S/N:
Executed: 11:09:28 03-15-1999

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
BASINS "A" THRU "E" INCLUSIVE, AT NODE G
POST DEVELOPED CONDITIONS
5 YR. EVENT

**** Rational Method Hydrograph Using Q/Qp Template *****
Weighted C = 0.690 Area= 22.520 acres Tc = 32.39 minutes

Adjusted C = 0.690 Tc= 32.39 min. I= 3.13 in/hr Qp= 48.56 cfs

RETURN FREQUENCY: 5 year storm Adj.factor = 1.00
Q/Qp Template: IDF Output file: LONGPOST.HYD

HYDROGRAPH ORDINATES (cfs)
Time increment = 0.083 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.040	1.08	6.09	14.04	26.23	39.14	46.49	48.56
0.623	46.49	41.42	34.81	26.35	19.90	15.39	12.17
1.206	9.54	7.29	5.74	4.48	3.46	2.65	2.08
1.790	1.63	1.27	0.98	0.76	0.60	0.48	0.39
2.373	0.30	0.22	0.14	0.07	0.00		

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
BASINS "A" THRU "E" INCLUSIVE
DISCHARGE TO DETENTION STRUCTURE IN OUTFALL CHANNEL AT NODE G
100 YR. STORM

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
LT. INDUST.	0.800	22.52						
			32.39	0.800	0.800	5.223	22.52	94.10

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
BASINS "A" THRU "E" INCLUSIVE
DISCHARGE TO DETENTION STRUCTURE IN OUTFALL CHANNEL AT NODE G
100 YR. STORM

**** Rational Method Hydrograph Using Q/Qp Template *****
Weighted C = 0.800 Area= 22.520 acres Tc = 32.39 minutes

Adjusted C = 0.800 Tc= 32.39 min. I= 5.22 in/hr Qp= 94.10 cfs

RETURN FREQUENCY: 100 year storm Adj.factor = 1.00
Q/Qp Template: IDF Output file: LONGP100.HYD

HYDROGRAPH ORDINATES (cfs)
Time increment = 0.083 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.040	2.08	11.79	27.20	50.82	75.85	90.09	94.10
0.623	90.09	80.27	67.46	51.05	38.55	29.82	23.58
1.206	18.49	14.13	11.13	8.68	6.70	5.13	4.04
1.790	3.17	2.47	1.91	1.47	1.16	0.94	0.76
2.373	0.59	0.42	0.28	0.13	0.00		

Outlet Structure File: LONG .STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
STRUCTURE FILE
36" RCP
****

>>>>>> Structure No. 1 <<<<<<
(Input Data)

CULVERT-CR
Circular Culvert (With Inlet Control)

E1 elev.(ft)?	99
E2 elev.(ft)?	103
Diam. (ft)?	3
Inv. el.(ft)?	99
Slope (ft/ft)?	.004
T1 ratio?	
T2 ratio?	
K Coeff.?	.0045
M Coeff.?	2.0
c Coeff.?	.0317
Y Coeff.?	.69
Form 1 or 2?	1
Slope factor?	-0.5

Outlet Structure File: LONG .STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
STRUCTURE FILE
36" RCP

****

Outflow Rating Table for Structure #1
CULVERT-CR Circular Culvert (With Inlet Control)

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages		
99.00	0.0	No headwater		
99.25	0.4	Equ.1: HW =.25	dc=.189	Ac=.186
99.50	1.5	Equ.1: HW =.5	dc=.382	Ac=.525
99.75	3.2	Equ.1: HW =.750	dc=.561	Ac=.913
100.00	5.5	Equ.1: HW =1.0	dc=.737	Ac=1.347
100.25	8.4	Equ.1: HW =1.25	dc=.914	Ac=1.821
100.50	11.8	Equ.1: HW =1.5	dc=1.091	Ac=2.322
100.75	15.6	Equ.1: HW =1.75	dc=1.262	Ac=2.822
101.00	19.6	Equ.1: HW =2.0	dc=1.422	Ac=3.299
101.25	24.0	Equ.1: HW =2.25	dc=1.58	Ac=3.773
101.50	28.4	Equ.1: HW =2.5	dc=1.725	Ac=4.207
101.75	33.0	Equ.1: HW =2.75	dc=1.864	Ac=4.617
102.00	37.8	Equ.1: HW =3.0	dc=2.0	Ac=5.005
102.25	42.3	Equ.1: HW =3.25	dc=2.119	Ac=5.338
102.50	47.3	Transition: HW =3.5		
102.75	51.5	Submerged: HW =3.75		
103.00	0.0	E = or > E2=103		

Used Unsubmerged Equ. Form (1) for elev. less than 102.28 ft
Used Submerged Equation for elevations greater than 102.59 ft
HW=Headwater (ft) dc=Critical depth (ft) Ac=Area (sq.ft) at dc

Transition flows interpolated from the following values:
E1=102.28 ft; Q1=42.85 cfs; Dc=2.13 ft; E2=102.59 ft; Q2=48.97 cfs

WESTPORT INDUSTRIAL SEVENTH ADDITION
DITCH STORAGE

CALCULATED 02-11-1999 11:22:40
DISK FILE: LONG .VOL

Planimeter scale: 1 inch = 60 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
99.00	0.64	0.05	0.00	0.00	0.00
100.00	3.00	0.25	0.41	0.14	0.14
101.00	9.37	0.77	1.46	0.49	0.62
102.00	19.26	1.59	3.48	1.16	1.78
103.00	29.28	2.42	5.97	1.99	3.78

$$IA = (\text{sq.rt}(Area1) + ((Ei-E1)/(E2-E1))*(\text{sq.rt}(Area2)-\text{sq.rt}(Area1)))^2$$

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1,Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Outlet Structure File: LONG .STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
STRUCTURE FILE
36" RCP

****

Outlet Structure File: LONG .STR
Planimeter Input File: LONG .VOL
Rating Table Output File: LONG .PND

Min. Elev.(ft) = 99 Max. Elev.(ft) = 103 Incr.(ft) = .25

Additional elevations (ft) to be included in table:
* *

****

SYSTEM CONNECTIVITY

****

Structure	No.	Q Table		Q Table
CULVERT-CR	1		->	1

Outflow rating table summary was stored in file:
LONG .PND

POND-2 Version: 5.21 S/N:
EXECUTED: 02-11-1999 11:37:42

****
*
*
* WESTPORT INDUSTRIAL PARK SEVENTH ADDITION *
* STRUCTURE FILE *
* 36" RCP *
*
****

Inflow Hydrograph: LONGP100.HYD
Rating Table file: LONG .PND

----INITIAL CONDITIONS----
Elevation = 99.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
99.00	0.0	0.000	0.0	0.0
99.25	0.4	0.017	5.0	5.4
99.50	1.5	0.045	13.0	14.5
99.75	3.2	0.084	24.4	27.6
100.00	5.5	0.138	40.1	45.6
100.25	8.4	0.213	61.8	70.2
100.50	11.8	0.316	91.7	103.5
100.75	15.6	0.452	131.1	146.7
101.00	19.6	0.625	181.5	201.1
101.25	24.0	0.840	244.0	268.0
101.50	28.4	1.102	320.1	348.5
101.75	33.0	1.415	411.0	444.0
102.00	37.8	1.784	518.0	555.8
102.25	42.3	2.205	640.4	682.7
102.50	47.3	2.676	777.1	824.4
102.75	51.5	3.198	928.8	980.3

Time increment (t) = 0.083 hrs.

POND-2 Version: 5.21 S/N:
EXECUTED: 02-11-1999 11:37:42

Pond File: LONG .PND
Inflow Hydrograph: LONGP100.HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.040	2.08	-----	0.0	0.0	0.00	99.00
0.123	11.79	13.9	11.0	13.9	1.43	99.48
0.206	27.20	39.0	38.0	50.0	6.02	100.04
0.290	50.82	78.0	90.2	116.0	12.90	100.57
0.373	75.85	126.7	175.6	216.9	20.64	101.06
0.456	90.09	165.9	285.5	341.5	28.02	101.48
0.540	94.10	184.2	401.5	469.7	34.10	101.81
0.623	90.09	184.2	507.9	585.7	38.86	102.06
0.706	80.27	170.4	594.0	678.3	42.14	102.24
0.790	67.46	147.7	653.0	741.7	44.38	102.35
0.873	51.05	118.5	680.6	771.5	45.43	102.41
0.956	38.55	89.6	679.4	770.2	45.39	102.40
1.040	29.82	68.4	658.6	747.8	44.60	102.36
1.123	23.58	53.4	625.4	712.0	43.33	102.30
1.206	18.49	42.1	583.9	667.4	41.76	102.22
1.290	14.13	32.6	536.6	616.5	39.95	102.12
1.373	11.13	25.3	485.9	561.9	38.02	102.01
1.456	8.68	19.8	434.4	505.7	35.65	101.89
1.540	6.70	15.4	383.2	449.7	33.25	101.76
1.623	5.13	11.8	333.8	395.1	30.65	101.62
1.706	4.04	9.2	286.8	343.0	28.10	101.48
1.790	3.17	7.2	243.1	294.0	25.42	101.33
1.873	2.47	5.6	203.3	248.8	22.74	101.18
1.956	1.91	4.4	167.6	207.7	20.03	101.02
2.040	1.47	3.4	136.2	171.0	17.39	100.86
2.123	1.16	2.6	109.0	138.9	14.91	100.70
2.206	0.94	2.1	86.2	111.1	12.47	100.54
2.290	0.76	1.7	67.5	87.9	10.21	100.38
2.373	0.59	1.4	52.3	68.8	8.24	100.24
2.456	0.42	1.0	40.5	53.4	6.41	100.08
2.540	0.28	0.7	31.4	41.2	4.94	99.94
2.623	0.13	0.4	24.3	31.8	3.73	99.81
2.706	0.00	0.1	18.9	24.4	2.79	99.69

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: LONG .PND
Inflow Hydrograph: LONGP100.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 99.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	94.10 cfs
Peak Outflow	=	45.43 cfs
Peak Elevation	=	102.41 ft

***** Summary of Approximate Peak Storage *****

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	2.50 ac-ft
Total Storage in Pond	=	2.50 ac-ft

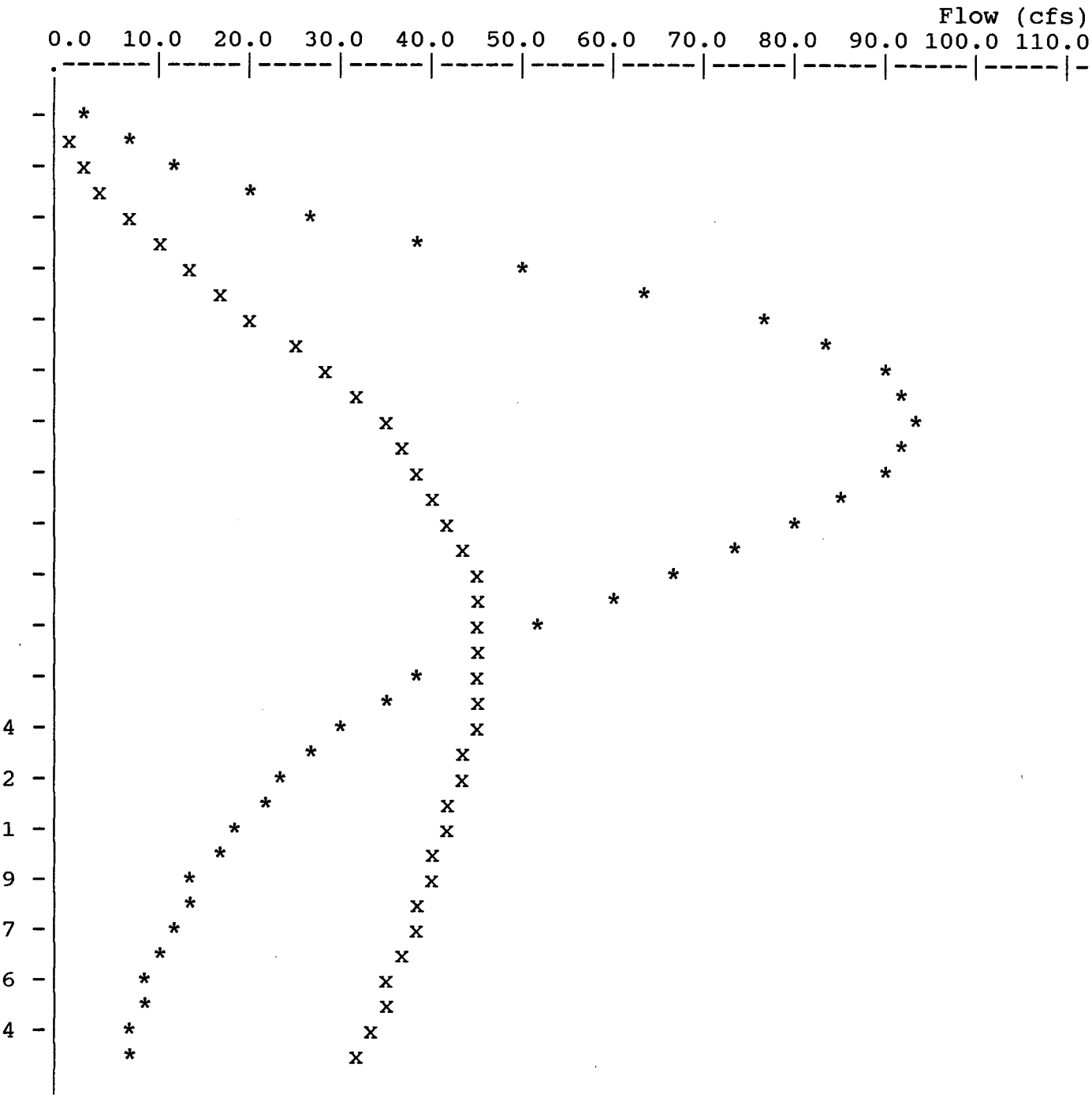
Warning: Inflow hydrograph truncated on left side.

POND-2 Version: 5.21 S/N:

Pond File: LONG .PND
Inflow Hydrograph: LONGP100.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 02-11-1999
11:37:42

Peak Inflow = 94.10 cfs
Peak Outflow = 45.43 cfs ~~45.52~~
Peak Elevation = 102.41 ft



* File: LONGP100.HYD Qmax = 94.1 cfs
x File: OUT .HYD Qmax = 45.4 cfs

Quick TR-55 Ver.5.47 S/N:
Executed: 19:50:23 02-19-1999 LONG2SW.TCT

SOUTHWERT INDUSTRIAL PARK SEVENTH ADDITION
POST DEVELOPED TIME OF CONCENTRATION
WEST END OF LOT 2 - FLOWING TOWARD S.W. CORNER
BASIN "F"

Tc COMPUTATIONS FOR:

SHEET FLOW (Applicable to Tc only)

Segment ID		A TO B		
Surface description		LAWN		
Manning's roughness coeff., n		0.1500		
Flow length, L (total < or = 300)	ft	120.0		
Two-yr 24-hr rainfall, P2	in	3.500		
Land slope, s	ft/ft	0.0040		
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.34	=	0.34

SHALLOW CONCENTRATED FLOW

Segment ID		B TO C		
Surface (paved or unpaved)?		Unpaved		
Flow length, L	ft	25.0		
Watercourse slope, s	ft/ft	0.0040		
$Avg.V = Csf * (s)^{0.5}$	ft/s	1.0204		
where: Unpaved Csf = 16.1345				
Paved Csf = 20.3282				
T = L / (3600*V)	hrs	0.01	=	0.01

CHANNEL FLOW

Segment ID				
Cross Sectional Flow Area, a	sq.ft	0.00		
Wetted perimeter, Pw	ft	0.00		
Hydraulic radius, r = a/Pw	ft	0.000		
Channel slope, s	ft/ft	0.0000		
Manning's roughness coeff., n		0.0000		
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	0.0000		
Flow length, L	ft	0		
T = L / (3600*V)	hrs	0.00	=	0.00

TOTAL TIME (hrs) 0.35

Quick TR-55 Ver.5.47 S/N:
Executed: 16:03:16 02-17-1999

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
POST-DEVELOPED CONDITIONS
PART OF LOT 2 - FLOWING TO SOUTHWEST CORNER OF LOT 2
5YR. STORM

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
LT. INDUST.	0.690	0.98	21.00	0.690	0.690	3.905	0.98	2.64

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
POST-DEVELOPED CONDITIONS
PART OF LOT 2 - FLOWING TO SOUTHWEST CORNER OF LOT 2
5YR. STORM

**** Rational Method Hydrograph Using Q/Qp Template *****
Weighted C = 0.690 Area= 0.980 acres Tc = 21.00 minutes

Adjusted C = 0.690 Tc= 21.00 min. I= 3.90 in/hr Qp= 2.64 cfs

RETURN FREQUENCY: 5 year storm Adj.factor = 1.00
Q/Qp Template: IDF Output file: NONE STORED

HYDROGRAPH ORDINATES (cfs)
Time increment = 0.083 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.017	0.04	0.47	1.36	2.35	2.64	2.39	1.86
0.600	1.19	0.80	0.56	0.37	0.26	0.17	0.12
1.183	0.08	0.05	0.04	0.03	0.02	0.01	0.01
1.767	0.00						

Quick TR-55 Ver.5.47 S/N:
Executed: 00:45:49 02-19-1999 LONGSCDS.TCT

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
POST-DEVELOPED TIME OF CONCENTRATION
PART OF LOTS 1 & 2 FLOWING TO CUL-DE-SAC & STORM SEWER
5YR. STORM

Tc COMPUTATIONS FOR: BASIN "G"

SHEET FLOW (Applicable to Tc only)

Segment ID		A TO B	
Surface description		LAWN	
Manning's roughness coeff., n		0.1500	
Flow length, L (total < or = 300)	ft	150.0	
Two-yr 24-hr rainfall, P2	in	3.500	
Land slope, s	ft/ft	0.0057	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.36	= 0.36

SHALLOW CONCENTRATED FLOW

Segment ID		B TO C	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	85.0	
Watercourse slope, s	ft/ft	0.0057	
$Avg.V = Csf * (s)^{0.5}$	ft/s	1.2181	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.02	= 0.02

CHANNEL FLOW

Segment ID			
Cross Sectional Flow Area, a	sq.ft	0.00	
Wetted perimeter, Pw	ft	0.00	
Hydraulic radius, r = a/Pw	ft	0.000	
Channel slope, s	ft/ft	0.0000	
Manning's roughness coeff., n		0.0000	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	0.0000	
Flow length, L	ft	0	
T = L / (3600*V)	hrs	0.00	= 0.00

TOTAL TIME (hrs) 0.38

6

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
POST-DEVELOPED CONDITIONS
PART OF LOTS 1 & 2- FLOWING FLOWING TO CUL-DE-SAC & STORM SEWER
5YR. STORM

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
LT.INDUST.	0.690	3.29						
			22.80	0.690	0.690	3.746	3.29	8.50

WESTPORT INDUSTRIAL PARK SEVENTH ADDITION
POST-DEVELOPED CONDITIONS
PART OF LOTS 1 & 2- FLOWING FLOWING TO CUL-DE-SAC & STORM SEWER
5YR. STORM

**** Rational Method Hydrograph Using Q/Qp Template *****
Weighted C = 0.690 Area= 3.290 acres Tc = 22.80 minutes

Adjusted C = 0.690 Tc= 22.80 min. I= 3.75 in/hr Qp= 8.50 cfs

RETURN FREQUENCY: 5 year storm Adj.factor = 1.00
Q/Qp Template: IDF Output file: NONE STORED

HYDROGRAPH ORDINATES (cfs)
Time increment = 0.083 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.047	0.39	2.05	4.99	7.73	8.50	7.79	6.30
0.630	4.27	2.92	2.08	1.46	1.02	0.71	0.49
1.213	0.34	0.24	0.17	0.12	0.09	0.06	0.04
1.797	0.02	0.00					