STORMWATER DRAINAGE REPORT
Wal-Mart Supercenter #6392-00
Topeka (25th & California), Kansas

July 2013

CARLSON CONSULTING ENGINEERS, INC.

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Bartlett, Tennessee 38133
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LIST OF SECTIONS

SECTION 1

EXECUTIVE SUMMARY

The proposed project consists of clearing, site grading and drainage installation, utility installation, paving, and building construction of Wal-Mart Supercenter #6392-00, in Topeka, Kansas. It is located at the southeast corner of SE 25th Street and SE California Avenue. The proposed project is approximately 30 acres, including five existing parcels: three grass-covered undeveloped parcels, one paved lot where a drive-in theater once stood, and an approximately 4,000 square foot daycare facility.

Water currently enters the site from offsite through small grass-lined channels on the north and west. Water also enters in the southwest corner of the property from a neighboring detention pond outlet and overland flow from the south of the property. The site drains to four primary outfall points. A majority of the property drains toward an existing natural channel which cuts across the southern part of the property until it leaves through the southeast corner. Smaller portions of the property flow northeast to an existing grass-lined channel, east to an existing stormwater inlet, and northwest to an existing grass-lined channel. From Flood Insurance Rate Map #20177C0219E, the site is entirely within Zone X, areas determined to be outside the 0.2% annual chance floodplain.

In accordance with the Topeka Design Criteria and Drafting Standards, Post Construction Stormwater Quality Policy, and design procedures from the Mid-America Regional Council Manual of Best Management Practices for Stormwater Quality October 2012, the stormwater management and retention system were designed so that the post-developed runoff does not exceed the pre-developed runoff. The Topeka Design Criteria and Drafting Standards manual specifies that the retention system be designed to attenuate any return period from 2 years to 100 years to peak runoff rates that are less than those which are generated by the existing conditions. In accordance with this requirement, the stormwater management and retention system were designed to attenuate the 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year 24-hour storms. Additionally, the manual specifies that enclosed elements of the storm sewer system shall be designed for 10-year 24-hour return frequency.

In order to reduce the discharge of pollutants of concern as identified in the Post Construction Stormwater Quality Policy and limit the maximum stormwater discharge rates from the site, one extended wet detention basin was designed by the procedures in the Mid-America Regional Council Manual of Best Management Practices for Stormwater Quality October 2012 to meet the requirements specified above and to provide safe passage of the 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year storm with 1 foot of freeboard via outlet control structures with emergency spillways.

Site stormwater calculations were made using NCRS TR-20 methodology and were performed with Haestad Methods PondPack Software and Bentley StormCAD Software.

SECTION 2

Hydrologic Summary - Walmart Supercenter #6392-00
Topeka (E), Kansas

All times of travel and times of concentration are in hours.

Storm/Rainfall Volume Data

24-Hour/2-Year Rainfall = 3.60 inches
24-Hour/5-Year Rainfall = 4.56 inches
24-Hour/10-Year Rainfall = 5.28 inches
24-Hour/25-Year Rainfall = 6.24 inches
24-Hour/50-Year Rainfall = 6.96 inches
24-Hour/100-Year Rainfall = 7.68 inches

Discharged to the Northeast

Predeveloped On-Site and Off-Site Conditions

Subareas:

NORTH OFFSITE	Tc=0.402	Tt=0.100	CN=84	1.03 Ac.
NORTHEAST	Tc=0.264	Tt=0.000	CN=78	0.74 Ac.
Total Acreage:				1.77 Ac.

Peak Discharge (2-Year) =	2.91 cfs @ 12.150 hr
Peak Discharge (5-Year) =	4.21 cfs @ 12.150 hr
Peak Discharge (10-Year) =	5.21 cfs @ 12.150 hr
Peak Discharge (25-Year) =	6.56 cfs @ 12.150 hr
Peak Discharge (50-Year) =	7.60 cfs @ 12.100 hr
Peak Discharge (100-Year) =	8.64 cfs @ 12.100 hr

Postdeveloped On-Site and Off-Site Conditions To Be Released Undetained

Subareas:

UNDETAINED 4	Tc=0.100	Tt=0.000	CN=78	0.17 Ac.
Total Acreage:				0.17 Ac.

Peak Discharge (2-Year) =	0.28 cfs @ 11.950 hr
Peak Discharge (5-Year) =	0.42 cfs @ 11.950 hr
Peak Discharge (10-Year) =	0.53 cfs @ 11.950 hr
Peak Discharge (25-Year) =	0.68 cfs @ 11.950 hr
Peak Discharge (50-Year) =	0.79 cfs @ 11.950 hr
Peak Discharge (100-Year) =	0.90 cfs @ 11.950 hr

2-Yr. Summary (Peak Discharge to the Northeast)

2-Yr. Predeveloped Discharge = 2.91 cfs @ 12.150 hr

2-Yr. Postdeveloped Discharge = 0.28 cfs @ 11.950 hr
90% reduction from predevloped

5-Yr. Summary (Peak Discharge to the Northeast)

2-Yr. Predeveloped Discharge = 4.21 cfs @ 12.150 hr

2-Yr. Postdeveloped Discharge = 0.42 cfs @ 11.950 hr
90% reduction from predeveloped

10-Yr. Summary (Peak Discharge to the Northeast)

10-Yr. Predeveloped Discharge = 5.21 cfs @ 12.150 hr

10-Yr. Postdeveloped Discharge = 0.53 cfs @ 11.950 hr
90% reduction from predeveloped

25-Yr. Summary (Peak Discharge to the Northeast)

25-Yr. Predeveloped Discharge = 6.56 cfs @ 12.150 hr

25-Yr. Postdeveloped Discharge = 0.68 cfs @ 11.950 hr
90% reduction from predeveloped

50-Yr. Summary (Peak Discharge to the Northeast)

50-Yr. Predeveloped Discharge = 7.60 cfs @ 12.100 hr

50-Yr. Postdeveloped Discharge = 0.79 cfs @ 11.950 hr
90% reduction from predeveloped

100-Yr. Summary (Peak Discharge to the Northeast)

100-Yr. Predeveloped Discharge = 8.64 cfs @ 12.100 hr

100-Yr. Postdeveloped Discharge = 0.90 cfs @ 11.950 hr
90% reduction from predeveloped

Discharged to the East

Predeveloped On-Site and Off-Site Conditions

Subareas:

EAST	Tc=0.507	Tt=0.000	CN=78	2.57 Ac.
Total Acreage:				2.57 Ac.

Peak Discharge (2-Year) =	3.31 cfs @ 12.200 hr
Peak Discharge (5-Year) =	4.99 cfs @ 12.200 hr
Peak Discharge (10-Year) =	6.30 cfs @ 12.200 hr
Peak Discharge (25-Year) =	8.10 cfs @ 12.200 hr
Peak Discharge (50-Year) =	9.46 cfs @ 12.200 hr
Peak Discharge (100-Year) =	10.83 cfs @ 12.200 hr

Postdeveloped On-Site and Off-Site Conditions To Be Released Undetained

Subareas:

UNDETAINED 3	Tc=0.471	Tt=0.000	CN=78	0.94 Ac.
Total Acreage:				0.94 Ac.

Peak Discharge (2-Year) =	1.26 cfs @ 12.150 hr
Peak Discharge (5-Year) =	1.91 cfs @ 12.150 hr
Peak Discharge (10-Year) =	2.42 cfs @ 12.150 hr
Peak Discharge (25-Year) =	3.11 cfs @ 12.150 hr
Peak Discharge (50-Year) =	3.64 cfs @ 12.150 hr
Peak Discharge (100-Year) =	4.17 cfs @ 12.150 hr

2-Yr. Summary (Peak Discharge to the East)

2-Yr. Predeveloped Discharge = 3.31 cfs @ 12.200 hr

2-Yr. Postdeveloped Discharge = 1.26 cfs @ 12.150 hr
62% reduction from predeveloped

5-Yr. Summary (Peak Discharge to the East)

2-Yr. Predeveloped Discharge = 4.99 cfs @ 12.200 hr

2-Yr. Postdeveloped Discharge = 1.91 cfs @ 12.150 hr
62% reduction from predeveloped

10-Yr. Summary (Peak Discharge to the East)

10-Yr. Predeveloped Discharge = 6.30 cfs @ 12.200 hr

10-Yr. Postdeveloped Discharge = 2.42 cfs @ 12.150 hr
62% reduction from predeveloped

25-Yr. Summary (Peak Discharge to the East)

25-Yr. Predeveloped Discharge = 8.10 cfs @ 12.200 hr

25-Yr. Postdeveloped Discharge = 3.11 cfs @ 12.150 hr
62% reduction from predeveloped

50-Yr. Summary (Peak Discharge to the East)

50-Yr. Predeveloped Discharge = 9.46 cfs @ 12.200 hr

50-Yr. Postdeveloped Discharge = 3.64 cfs @ 12.150 hr
62% reduction from predeveloped

100-Yr. Summary (Peak Discharge to the East)

100-Yr. Predeveloped Discharge = 10.83 cfs @ 12.200 hr

100-Yr. Postdeveloped Discharge = 4.17 cfs @ 12.150 hr
61% reduction from predeveloped

Discharged to the Southeast

Predeveloped On-Site and Off-Site Conditions

Subareas:

SOUTH OFFSITE	Tc=0.411	Tt=0.600	CN=78	0.91 Ac.
SOUTHEAST	Tc=0.928	Tt=0.000	CN=78	24.39 Ac.
SOUTHWEST OFFSITE	Tc=0.590	Tt=0.100	CN=95	7.33 Ac.
WEST OFFSITE	Tc=0.100	Tt=0.100	CN=92	1.07 Ac.
Total Acreage:				33.70 Ac.

Peak Discharge (2-Year) =	36.81 cfs @ 12.400 hr
Peak Discharge (5-Year) =	52.45 cfs @ 12.400 hr
Peak Discharge (10-Year) =	64.55 cfs @ 12.400 hr
Peak Discharge (25-Year) =	80.98 cfs @ 12.400 hr
Peak Discharge (50-Year) =	93.44 cfs @ 12.400 hr
Peak Discharge (100-Year) =	105.98 cfs @ 12.400 hr

Postdeveloped On-Site and Off-Site Conditions To Be Detained

Subareas:

AI 1	Tc=0.100	Tt=0.000	CN=78	0.14 Ac.
AI 2	Tc=0.100	Tt=0.000	CN=98	1.20 Ac.
AI 3	Tc=0.100	Tt=0.000	CN=78	0.29 Ac.
BLDG 1	Tc=0.100	Tt=0.000	CN=98	0.78 Ac.
BLDG 2	Tc=0.100	Tt=0.000	CN=98	0.83 Ac.
BLDG 3	Tc=0.100	Tt=0.000	CN=98	1.04 Ac.
BLDG 4	Tc=0.100	Tt=0.000	CN=98	0.90 Ac.
CB 1	Tc=0.100	Tt=0.000	CN=90	2.04 Ac.
CB 2	Tc=0.100	Tt=0.000	CN=98	1.03 Ac.
CB 3	Tc=0.100	Tt=0.000	CN=98	1.07 Ac.
CB 4	Tc=0.100	Tt=0.000	CN=98	1.08 Ac.
CB 5	Tc=0.100	Tt=0.000	CN=98	1.15 Ac.
CB 6	Tc=0.100	Tt=0.000	CN=98	1.29 Ac.
CI 1	Tc=0.100	Tt=0.000	CN=98	0.10 Ac.
CI 2	Tc=0.100	Tt=0.000	CN=98	0.17 Ac.
CI 3	Tc=0.100	Tt=0.000	CN=98	0.23 Ac.
CI 4	Tc=0.100	Tt=0.000	CN=86	1.27 Ac.
CI 5	Tc=0.100	Tt=0.000	CN=86	0.44 Ac.
CI 6	Tc=0.100	Tt=0.000	CN=89	0.68 Ac.
CI 7	Tc=0.100	Tt=0.000	CN=89	0.50 Ac.
CI 8	Tc=0.100	Tt=0.000	CN=85	0.24 Ac.
CI 9	Tc=0.100	Tt=0.000	CN=98	0.44 Ac.
NORTH OFFSITE	Tc=0.402	Tt=0.100	CN=84	1.03 Ac.
POND 1	Tc=0.100	Tt=0.000	CN=78	2.84 Ac.
TW 1	Tc=0.100	Tt=0.000	CN=98	0.07 Ac.
TW 2	Tc=0.100	Tt=0.000	CN=98	0.07 Ac.
VEST 1	Tc=0.100	Tt=0.000	CN=98	0.04 Ac.
VEST 2	Tc=0.100	Tt=0.000	CN=98	0.03 Ac.
WEST OFFSITE	Tc=0.100	Tt=0.100	CN=92	1.07 Ac.
Total Acreage:				22.06 Ac.

Peak Discharge (2-Year) =	81.13 cfs @ 11.950 hr
Peak Discharge (5-Year) =	106.71 cfs @ 11.950 hr
Peak Discharge (10-Year) =	125.97 cfs @ 11.950 hr
Peak Discharge (25-Year) =	151.69 cfs @ 11.950 hr
Peak Discharge (50-Year) =	170.98 cfs @ 11.950 hr
Peak Discharge (100-Year) =	190.26 cfs @ 11.950 hr

Postdeveloped On-Site and Off-Site Conditions To Be Released Undetained

Subareas:

SOUTH OFFSITE	Tc=0.411	Tt=0.600	CN=78	0.91 Ac.
SOUTHWEST OFFSITE	Tc=0.590	Tt=0.100	CN=95	7.33 Ac.
UNDETAINED 2	Tc=0.593	Tt=0.000	CN=78	10.24 Ac.
Total Acreage:				18.48 Ac.

Peak Discharge (2-Year) =	28.11 cfs @ 12.300 hr
Peak Discharge (5-Year) =	38.91 cfs @ 12.300 hr
Peak Discharge (10-Year) =	47.17 cfs @ 12.300 hr
Peak Discharge (25-Year) =	58.31 cfs @ 12.300 hr
Peak Discharge (50-Year) =	66.72 cfs @ 12.300 hr
Peak Discharge (100-Year) =	75.16 cfs @ 12.300 hr

Extended Wet Detention Pond Data

Total Volume = 11.128 Acre-Feet
Wet Volume = 4.019 Acre-Feet
Top of Pond = 973.50
Bottom of Pond = 962.00
Normal Pool Elevation = 967.00

24-Hour/2-Year Storm:

Peak Inflow =	81.13 cfs @ 11.950 hr
Peak Discharge =	1.64 cfs @ 16.400 hr
Max. Water Surface Elev. =	969.77

24-Hour/5-Year Storm:

Peak Inflow =	106.71 cfs @ 11.950 hr
Peak Discharge =	2.55 cfs @ 15.550 hr
Max. Water Surface Elev. =	970.53

24-Hour/10-Year Storm:

Peak Inflow =	125.97 cfs @ 11.950 hr
Peak Discharge =	3.71 cfs @ 14.600 hr
Max. Water Surface Elev. =	971.00

24-Hour/25-Year Storm:

Peak Inflow =	151.69 cfs @ 11.950 hr
Peak Discharge =	5.62 cfs @ 13.800 hr
Max. Water Surface Elev. =	971.60

24-Hour/50-Year Storm:

Peak Inflow =	170.98 cfs @ 11.950 hr
Peak Discharge =	7.23 cfs @ 13.550 hr
Max. Water Surface Elev. =	972.04

24-Hour/100-Year Storm:

Peak Inflow =	190.26 cfs @ 11.950 hr
Peak Discharge =	8.96 cfs @ 13.350 hr
Max. Water Surface Elev. =	972.48

Detention Pond Outlet Control Structure

Water Quality:

Circular Orifices
Perforation Diameter = 1.9"
Columns = 3
Rows = 4
Horizontal Center-to-Center Spacing = 4"
Vertical Center-to-Center Spacing = 4"
Invert Elevation = 967.00
Orifice Coefficient = 0.62

Circular Culvert
Diameter = 8"
Upstream Invert Elevation = 962.00
Downstream Invert Elevation = 961.87

Primary:

Horizontal Rectangular Weir - Concrete
Length = 1.00' (one side)
Crest Elevation = 970.00
Weir Coefficient = 3.33

Emergency:

Horizontal Rectangular Weir - Concrete
Length = 16.00' (4' per side)
Crest Elevation = 972.50
Weir Coefficient = 3.33

Discharge Culvert:

Circular Culvert - Concrete Square Edge w/ Headwall
Diameter = 36"
Upstream Invert Elevation = 960.20
Downstream Invert Elevation = 960.00

2-Yr. Summary (Peak Discharge to the Southeast)

2-Yr. Predeveloped Discharge = 36.81 cfs @ 12.400 hr

2-Yr. Postdeveloped Discharge
(From Detention Pond & Undetained Discharge) = 29.59 cfs @ 12.300 hr
20% reduction from predeveloped

5-Yr. Summary (Peak Discharge to the Southeast)

5-Yr. Predeveloped Discharge = 52.45 cfs @ 12.400 hr

5-Yr. Postdeveloped Discharge
(From Detention Pond & Undetained Discharge) = 40.76 cfs @ 12.300 hr
22% reduction from predeveloped

10-Yr. Summary (Peak Discharge to the Southeast)

10-Yr. Predeveloped Discharge = 64.55 cfs @ 12.400 hr

10-Yr. Postdeveloped Discharge
(From Detention Pond & Undetained Discharge) = 49.92 cfs @ 12.300 hr
23% reduction from predeveloped

25-Yr. Summary (Peak Discharge to the Southeast)

25-Yr. Predeveloped Discharge = 80.98 cfs @ 12.400 hr

25-Yr. Postdeveloped Discharge
(From Detention Pond & Undetained Discharge) = 62.86 cfs @ 12.300 hr
22% reduction from predeveloped

50-Yr. Summary (Peak Discharge to the Southeast)

50-Yr. Predeveloped Discharge = 93.44 cfs @ 12.400 hr

50-Yr. Postdeveloped Discharge
(From Detention Pond & Undetained Discharge) = 72.86 cfs @ 12.300 hr
22% reduction from predeveloped

100-Yr. Summary (Peak Discharge to the Southeast)

100-Yr. Predeveloped Discharge = 105.98 cfs @ 12.400 hr

100-Yr. Postdeveloped Discharge
(From Detention Pond & Undetained Discharge) = 83.04 cfs @ 12.300 hr
22% reduction from predeveloped

Discharged to the Northwest

Predeveloped On-Site and Off-Site Conditions

Subareas:

NORTHWEST	Tc=0.745	Tt=0.000	CN=78	3.90 Ac.
Total Acreage:				3.90 Ac.

Peak Discharge (2-Year) =	3.89 cfs @ 12.350 hr
Peak Discharge (5-Year) =	5.89 cfs @ 12.350 hr
Peak Discharge (10-Year) =	7.45 cfs @ 12.350 hr
Peak Discharge (25-Year) =	9.59 cfs @ 12.350 hr
Peak Discharge (50-Year) =	11.22 cfs @ 12.300 hr
Peak Discharge (100-Year) =	12.87 cfs @ 12.300 hr

Postdeveloped On-Site and Off-Site Conditions To Be Released Undetained

Subareas:

UNDETAINED 1	Tc=0.100	Tt=0.000	CN=78	0.28 Ac.
Total Acreage:				0.28 Ac.

Peak Discharge (2-Year) =	0.66 cfs @ 11.950 hr
Peak Discharge (5-Year) =	0.99 cfs @ 11.950 hr
Peak Discharge (10-Year) =	1.24 cfs @ 11.950 hr
Peak Discharge (25-Year) =	1.58 cfs @ 11.950 hr
Peak Discharge (50-Year) =	1.84 cfs @ 11.950 hr
Peak Discharge (100-Year) =	2.10 cfs @ 11.950 hr

2-Yr. Summary (Peak Discharge to the Northwest)

2-Yr. Predeveloped Discharge = 3.89 cfs @ 12.350 hr

2-Yr. Postdeveloped Discharge = 0.66 cfs @ 11.950 hr
83% reduction from predeveloped

5-Yr. Summary (Peak Discharge to the Northwest)

2-Yr. Predeveloped Discharge = 5.89 cfs @ 12.350 hr

2-Yr. Postdeveloped Discharge = 0.99 cfs @ 11.950 hr
83% reduction from predeveloped

10-Yr. Summary (Peak Discharge to the Northwest)

10-Yr. Predeveloped Discharge = 7.45 cfs @ 12.350 hr

10-Yr. Postdeveloped Discharge = 1.24 cfs @ 11.950 hr
83% reduction from predeveloped

25-Yr. Summary (Peak Discharge to the Northwest)

25-Yr. Predeveloped Discharge = 9.59 cfs @ 12.350 hr

25-Yr. Postdeveloped Discharge = 1.58 cfs @ 11.950 hr
84% reduction from predeveloped

50-Yr. Summary (Peak Discharge to the Northwest)

50-Yr. Predeveloped Discharge = 11.22 cfs @ 12.300 hr

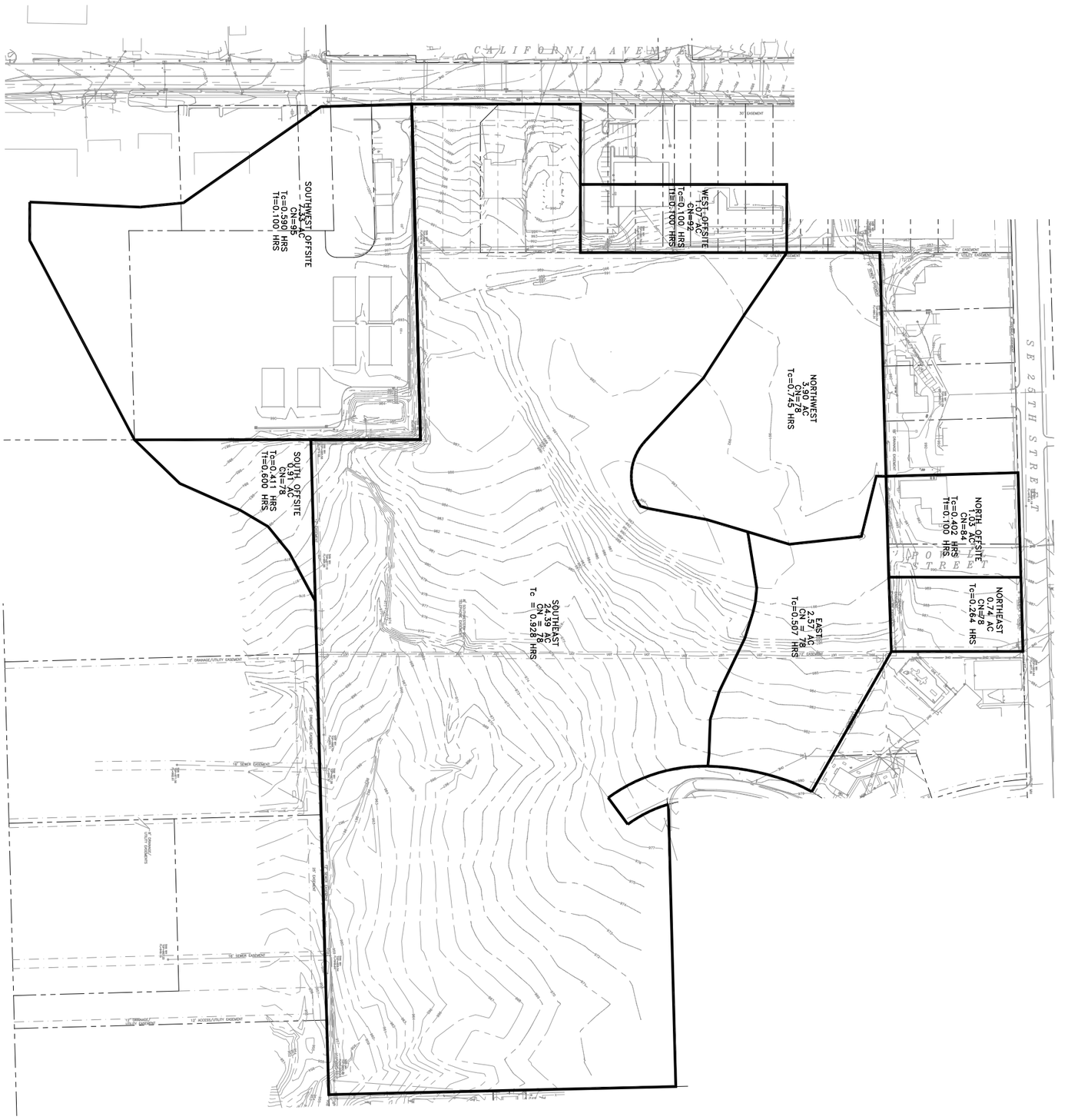
50-Yr. Postdeveloped Discharge = 1.84 cfs @ 11.950 hr
84% reduction from predeveloped

100-Yr. Summary (Peak Discharge to the Northwest)

100-Yr. Predeveloped Discharge = 12.87 cfs @ 12.300 hr

100-Yr. Postdeveloped Discharge = 2.10 cfs @ 11.950 hr
84% reduction from predeveloped

SECTION 3



DESIGN STORMS
24 HOUR/2-YEAR RAINFALL = 3.60 IN
24 HOUR/5-YEAR RAINFALL = 4.58 IN
24 HOUR/10-YEAR RAINFALL = 5.28 IN
24 HOUR/25-YEAR RAINFALL = 6.24 IN
24 HOUR/50-YEAR RAINFALL = 6.96 IN
24 HOUR/100-YEAR RAINFALL = 7.86 IN

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SHEET: PRE-DEVELOPED DRAINAGE AREAS

PROJECT: WALMART SUPERCENTER #6392-00
TOPEKA, KANSAS

Walmart
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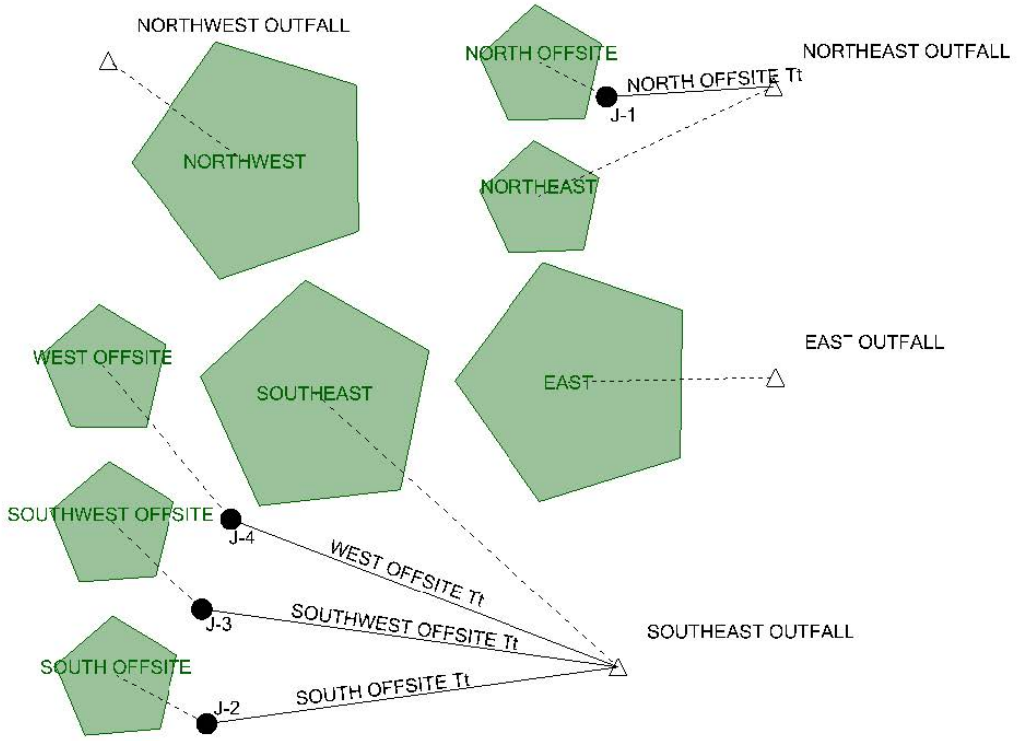
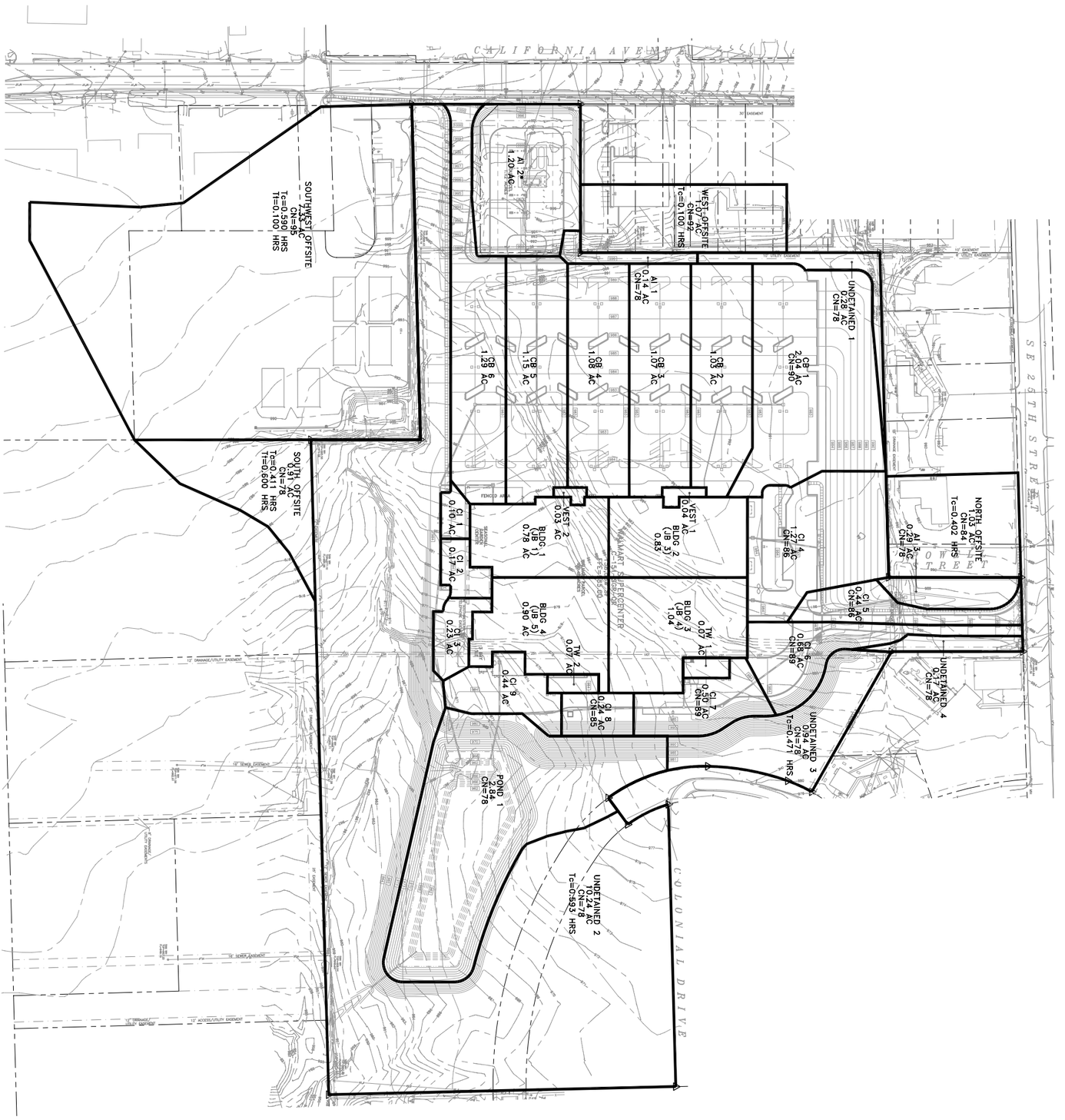
REVISIONS

NO.	DATE	DESCRIPTION

DWG: DRAINAGE MAPS
DATE: JUNE 4, 2013
SCALE: NTS
SHEET 1 OF 1



Pre-Developed Routing Map



CN = 98 (UNLESS NOTED OTHERWISE)
Tc = 0.100 HR (UNLESS NOTED OTHERWISE)

DESIGN STORMS
24 HOUR/2-YEAR RAINFALL = 3.60 IN
24 HOUR/5-YEAR RAINFALL = 4.58 IN
24 HOUR/10-YEAR RAINFALL = 5.28 IN
24 HOUR/25-YEAR RAINFALL = 6.24 IN
24 HOUR/50-YEAR RAINFALL = 6.96 IN
24 HOUR/100-YEAR RAINFALL = 7.86 IN

*FULLY DEVELOPED OUTPARCEL (CN = 98) ASSUMED

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DWG: DRAINAGE MAPS
DATE: JUNE 4, 2013
SCALE: NTS
SHEET 1 OF 1

SHEET:
POST-DEVELOPED DRAINAGE AREAS

PROJECT:
WALMART SUPERCENTER #6392-00
TOPEKA, KANSAS

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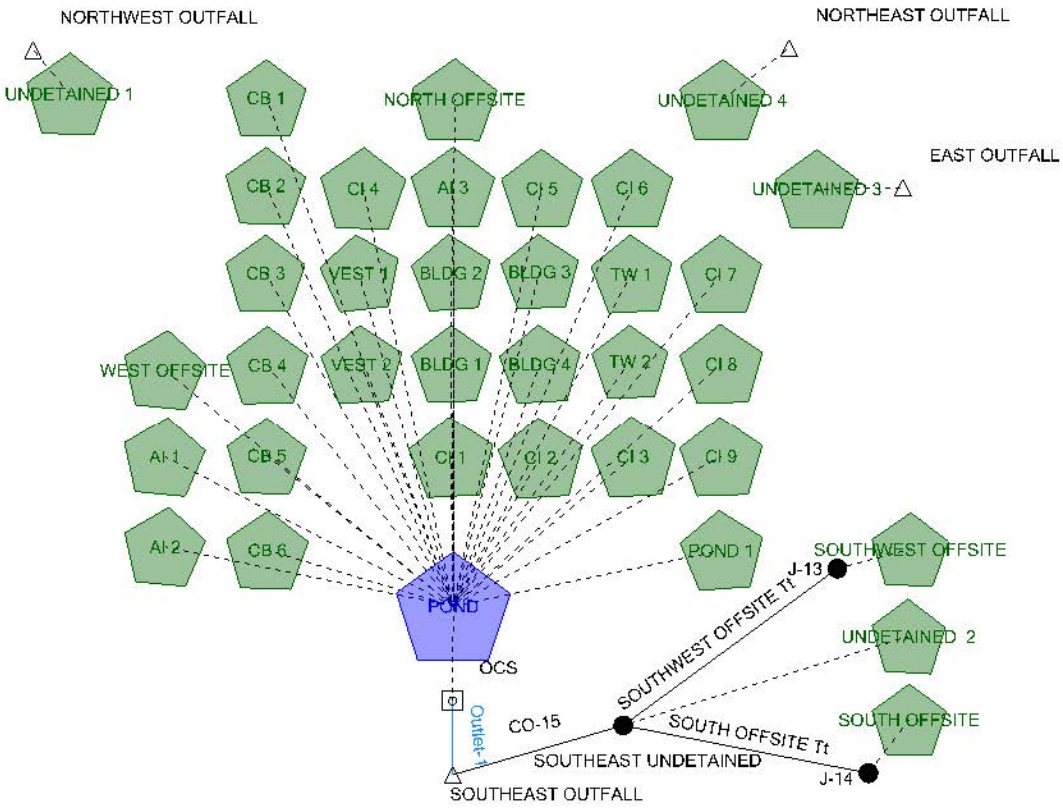
REVISIONS

NO.	DATE	DESCRIPTION



Post-Developed Routing Map

SECTION 4

Pre-Developed Times-of-Concentration and

Times-of-Travel Calculations

Subsection: Time of Concentration Calculations
Label: WEST OFFSITE

Return Event: 10 years
Storm Event: 10YR

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	190.00 ft
Manning's n	0.011
Slope	0.016 ft/ft
2 Year 24 Hour Depth	3.6 in
Average Velocity	1.52 ft/s
Segment Time of Concentration	0.035 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.100 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

Subsection: Channel Routing Summary
Label: WEST OFFSITE Tt

Return Event: 10 years
Storm Event: 10YR

Infiltration	
Infiltration Method	No Infiltration

Translation Routing Summary	
Flow (Base)	0.00 ft³/s
Translate	0.100 hours

	Inflow Hydrograph	Outflow Hydrograph
Time Start (hours)...	0.000	0.100
Time Step (hours)...	0.050	0.050
Time End (hours)...	24.000	24.100
Peak Time (hours)...	11.950	12.050
Peak Flow (ft³/s)...	6.47	6.47

Inflow/Outflow Volumes	
Volume (Routing, Inflow)	0.389 ac-ft
Volume (Routing, Unrouted)	0.000 ac-ft
Volume (Routing, Base Flow)	0.000 ac-ft
Volume (Routing, Infiltration)	0.000 ac-ft
Volume (Routing, Outflow)	0.389 ac-ft

Subsection: Time of Concentration Calculations
Label: SOUTHWEST OFFSITE

Return Event: 10 years
Storm Event: 10YR

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	300.00 ft
Manning's n	0.180
Slope	0.018 ft/ft
2 Year 24 Hour Depth	3.6 in
Average Velocity	0.18 ft/s
Segment Time of Concentration	0.453 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	446.43 ft
Is Paved?	True
Slope	0.026 ft/ft
Average Velocity	3.28 ft/s
Segment Time of Concentration	0.038 hours

Segment #3: User Defined Tc	
Time of Concentration	0.100 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.590 hours

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

==== SCS Channel Flow

Tc =	R = Qa / Wp V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n (Lf / V) / 3600
Where:	R= Hydraulic radius Aq= Flow area, square feet Wp= Wetted perimeter, feet V= Velocity, ft/sec Sf= Slope, ft/ft n= Manning's n Tc= Time of concentration, hours Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =	Unpaved surface: V = 16.1345 * (Sf**0.5) Paved Surface: V = 20.3282 * (Sf**0.5) (Lf / V) / 3600
Where:	V= Velocity, ft/sec Sf= Slope, ft/ft Tc= Time of concentration, hours Lf= Flow length, feet

Subsection: Channel Routing Summary
Label: SOUTHWEST OFFSITE Tt

Return Event: 10 years
Storm Event: 10YR

Infiltration	
Infiltration Method	No Infiltration

Translation Routing Summary	
Flow (Base)	0.00 ft³/s
Translate	0.100 hours

	Inflow Hydrograph	Outflow Hydrograph
Time Start (hours)...	0.000	0.100
Time Step (hours)...	0.050	0.050
Time End (hours)...	24.000	24.100
Peak Time (hours)...	12.200	12.300
Peak Flow (ft³/s)...	24.64	24.64

Inflow/Outflow Volumes	
Volume (Routing, Inflow)	2.853 ac-ft
Volume (Routing, Unrouted)	0.000 ac-ft
Volume (Routing, Base Flow)	0.000 ac-ft
Volume (Routing, Infiltration)	0.000 ac-ft
Volume (Routing, Outflow)	2.853 ac-ft

Subsection: Time of Concentration Calculations
Label: SOUTHEAST

Return Event: 10 years
Storm Event: 10YR

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	300.00 ft
Manning's n	0.240
Slope	0.007 ft/ft
2 Year 24 Hour Depth	3.6 in
Average Velocity	0.10 ft/s
Segment Time of Concentration	0.815 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	163.17 ft
Is Paved?	False
Slope	0.014 ft/ft
Average Velocity	1.91 ft/s
Segment Time of Concentration	0.024 hours

Segment #3: Length and Velocity	
Hydraulic Length	1,929.00 ft
Velocity	6.00 ft/s
Segment Time of Concentration	0.089 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.928 hours

==== User Defined Length & Velocity

Tc =	(Lf / V) / 3600
Where:	Tc= Time of concentration, hours Lf= Flow length, feet V= Velocity, ft/sec

==== SCS Channel Flow

Tc =	R = Qa / Wp V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n (Lf / V) / 3600
Where:	R= Hydraulic radius Aq= Flow area, square feet Wp= Wetted perimeter, feet V= Velocity, ft/sec Sf= Slope, ft/ft n= Manning's n Tc= Time of concentration, hours Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =	Unpaved surface: V = 16.1345 * (Sf**0.5) Paved Surface: V = 20.3282 * (Sf**0.5) (Lf / V) / 3600
Where:	V= Velocity, ft/sec Sf= Slope, ft/ft Tc= Time of concentration, hours Lf= Flow length, feet

Subsection: Time of Concentration Calculations
Label: SOUTH OFFSITE

Return Event: 10 years
Storm Event: 10YR

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	300.00 ft
Manning's n	0.240
Slope	0.043 ft/ft
2 Year 24 Hour Depth	3.6 in
Average Velocity	0.21 ft/s
Segment Time of Concentration	0.398 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	147.45 ft
Is Paved?	False
Slope	0.034 ft/ft
Average Velocity	2.97 ft/s
Segment Time of Concentration	0.014 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.411 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Subsection: Channel Routing Summary
Label: SOUTH OFFSITE Tt

Return Event: 10 years
Storm Event: 10YR

Infiltration	
Infiltration Method	No Infiltration

Translation Routing Summary	
Flow (Base)	0.00 ft³/s
Translate	0.600 hours

	Inflow Hydrograph	Outflow Hydrograph
Time Start (hours)...	0.000	0.600
Time Step (hours)...	0.050	0.050
Time End (hours)...	24.000	24.600
Peak Time (hours)...	12.150	12.750
Peak Flow (ft³/s)...	2.53	2.53

Inflow/Outflow Volumes	
Volume (Routing, Inflow)	0.222 ac-ft
Volume (Routing, Unrouted)	0.000 ac-ft
Volume (Routing, Base Flow)	0.000 ac-ft
Volume (Routing, Infiltration)	0.000 ac-ft
Volume (Routing, Outflow)	0.222 ac-ft

Subsection: Time of Concentration Calculations
Label: NORTHWEST

Return Event: 10 years
Storm Event: 10YR

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	300.00 ft
Manning's n	0.240
Slope	0.013 ft/ft
2 Year 24 Hour Depth	3.6 in
Average Velocity	0.13 ft/s
Segment Time of Concentration	0.635 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	495.38 ft
Is Paved?	False
Slope	0.006 ft/ft
Average Velocity	1.25 ft/s
Segment Time of Concentration	0.110 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.745 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Subsection: Time of Concentration Calculations
Label: NORTHEAST

Return Event: 10 years
Storm Event: 10YR

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	205.56 ft
Manning's n	0.150
Slope	0.022 ft/ft
2 Year 24 Hour Depth	3.6 in
Average Velocity	0.22 ft/s
Segment Time of Concentration	0.264 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.264 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

Subsection: Time of Concentration Calculations
Label: NORTH OFFSITE

Return Event: 10 years
Storm Event: 10YR

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	235.00 ft
Manning's n	0.150
Slope	0.010 ft/ft
2 Year 24 Hour Depth	3.6 in
Average Velocity	0.16 ft/s
Segment Time of Concentration	0.402 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.402 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

Subsection: Channel Routing Summary
Label: NORTH OFFSITE Tt

Return Event: 10 years
Storm Event: 10YR

Infiltration	
Infiltration Method	No Infiltration

Translation Routing Summary	
Flow (Base)	0.00 ft³/s
Translate	0.100 hours

	Inflow Hydrograph	Outflow Hydrograph
Time Start (hours)...	0.000	0.100
Time Step (hours)...	0.050	0.050
Time End (hours)...	24.000	24.100
Peak Time (hours)...	12.100	12.200
Peak Flow (ft³/s)...	3.44	3.44

Inflow/Outflow Volumes	
Volume (Routing, Inflow)	0.301 ac-ft
Volume (Routing, Unrouted)	0.000 ac-ft
Volume (Routing, Base Flow)	0.000 ac-ft
Volume (Routing, Infiltration)	0.000 ac-ft
Volume (Routing, Outflow)	0.301 ac-ft

Subsection: Time of Concentration Calculations
Label: EAST

Return Event: 10 years
Storm Event: 10YR

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	300.00 ft
Manning's n	0.240
Slope	0.026 ft/ft
2 Year 24 Hour Depth	3.6 in
Average Velocity	0.17 ft/s
Segment Time of Concentration	0.486 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	190.36 ft
Is Paved?	False
Slope	0.025 ft/ft
Average Velocity	2.55 ft/s
Segment Time of Concentration	0.021 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.507 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Post-Developed Times-of-Concentration and Times-of-Travel Calculations

Subsection: Time of Concentration Calculations
Label: WEST OFFSITE

Return Event: 10 years
Storm Event: 10YR

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	190.00 ft
Manning's n	0.011
Slope	0.016 ft/ft
2 Year 24 Hour Depth	3.6 in
Average Velocity	1.52 ft/s
Segment Time of Concentration	0.035 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.100 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

Subsection: Time of Concentration Calculations
Label: SOUTHWEST OFFSITE

Return Event: 10 years
Storm Event: 10YR

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	300.00 ft
Manning's n	0.180
Slope	0.018 ft/ft
2 Year 24 Hour Depth	3.6 in
Average Velocity	0.18 ft/s
Segment Time of Concentration	0.453 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	446.43 ft
Is Paved?	True
Slope	0.026 ft/ft
Average Velocity	3.28 ft/s
Segment Time of Concentration	0.038 hours

Segment #3: User Defined Tc	
Time of Concentration	0.100 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.590 hours

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

==== SCS Channel Flow

Tc =	R = Qa / Wp V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n (Lf / V) / 3600
Where:	R= Hydraulic radius Aq= Flow area, square feet Wp= Wetted perimeter, feet V= Velocity, ft/sec Sf= Slope, ft/ft n= Manning's n Tc= Time of concentration, hours Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =	Unpaved surface: V = 16.1345 * (Sf**0.5) Paved Surface: V = 20.3282 * (Sf**0.5) (Lf / V) / 3600
Where:	V= Velocity, ft/sec Sf= Slope, ft/ft Tc= Time of concentration, hours Lf= Flow length, feet

Subsection: Channel Routing Summary
Label: SOUTHWEST OFFSITE Tt

Return Event: 10 years
Storm Event: 10YR

Infiltration	
Infiltration Method	No Infiltration

Translation Routing Summary	
Flow (Base)	0.00 ft³/s
Translate	0.100 hours

	Inflow Hydrograph	Outflow Hydrograph
Time Start (hours)...	0.000	0.100
Time Step (hours)...	0.050	0.050
Time End (hours)...	96.000	96.100
Peak Time (hours)...	12.200	12.300
Peak Flow (ft³/s)...	24.64	24.64

Inflow/Outflow Volumes	
Volume (Routing, Inflow)	2.869 ac-ft
Volume (Routing, Unrouted)	0.000 ac-ft
Volume (Routing, Base Flow)	0.000 ac-ft
Volume (Routing, Infiltration)	0.000 ac-ft
Volume (Routing, Outflow)	2.869 ac-ft

Subsection: Time of Concentration Calculations
Label: SOUTH OFFSITE

Return Event: 10 years
Storm Event: 10YR

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	300.00 ft
Manning's n	0.240
Slope	0.043 ft/ft
2 Year 24 Hour Depth	3.6 in
Average Velocity	0.21 ft/s
Segment Time of Concentration	0.398 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	147.45 ft
Is Paved?	False
Slope	0.034 ft/ft
Average Velocity	2.98 ft/s
Segment Time of Concentration	0.014 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.411 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:

V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Subsection: Channel Routing Summary
Label: SOUTH OFFSITE Tt

Return Event: 10 years
Storm Event: 10YR

Infiltration	
Infiltration Method	No Infiltration

Translation Routing Summary	
Flow (Base)	0.00 ft³/s
Translate	0.600 hours

	Inflow Hydrograph	Outflow Hydrograph
Time Start (hours)...	0.000	0.600
Time Step (hours)...	0.050	0.050
Time End (hours)...	96.000	96.600
Peak Time (hours)...	12.150	12.750
Peak Flow (ft³/s)...	2.53	2.53

Inflow/Outflow Volumes	
Volume (Routing, Inflow)	0.224 ac-ft
Volume (Routing, Unrouted)	0.000 ac-ft
Volume (Routing, Base Flow)	0.000 ac-ft
Volume (Routing, Infiltration)	0.000 ac-ft
Volume (Routing, Outflow)	0.224 ac-ft

Subsection: Time of Concentration Calculations
Label: NORTH OFFSITE

Return Event: 10 years
Storm Event: 10YR

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	235.00 ft
Manning's n	0.150
Slope	0.010 ft/ft
2 Year 24 Hour Depth	3.6 in
Average Velocity	0.16 ft/s
Segment Time of Concentration	0.402 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.402 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

Subsection: Time of Concentration Calculations
Label: UNDETAINED 2

Return Event: 10 years
Storm Event: 10YR

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	300.00 ft
Manning's n	0.240
Slope	0.020 ft/ft
2 Year 24 Hour Depth	3.6 in
Average Velocity	0.15 ft/s
Segment Time of Concentration	0.540 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	485.00 ft
Is Paved?	False
Slope	0.029 ft/ft
Average Velocity	2.75 ft/s
Segment Time of Concentration	0.049 hours

Segment #3: Length and Velocity	
Hydraulic Length	87.00 ft
Velocity	6.00 ft/s
Segment Time of Concentration	0.004 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.593 hours

==== User Defined Length & Velocity

Tc =	(Lf / V) / 3600
Where:	Tc= Time of concentration, hours Lf= Flow length, feet V= Velocity, ft/sec

==== SCS Channel Flow

Tc =	R = Qa / Wp V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n (Lf / V) / 3600
Where:	R= Hydraulic radius Aq= Flow area, square feet Wp= Wetted perimeter, feet V= Velocity, ft/sec Sf= Slope, ft/ft n= Manning's n Tc= Time of concentration, hours Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =	Unpaved surface: V = 16.1345 * (Sf**0.5) Paved Surface: V = 20.3282 * (Sf**0.5) (Lf / V) / 3600
Where:	V= Velocity, ft/sec Sf= Slope, ft/ft Tc= Time of concentration, hours Lf= Flow length, feet

Subsection: Time of Concentration Calculations
Label: UNDETAINED 3

Return Event: 10 years
Storm Event: 10YR

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	272.70 ft
Manning's n	0.240
Slope	0.048 ft/ft
2 Year 24 Hour Depth	3.6 in
Average Velocity	0.21 ft/s
Segment Time of Concentration	0.353 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.471 hours

==== SCS Channel Flow

Tc =

R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:

R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

SECTION 5

FlexTable: Catchment Table (Predev_Northeast.ppc)

Current Time: 0.000 hours

Label	Time of Concentration (Composite) (hours)	SCS CN	Area (User Defined) (acres)	Outflow Node
NORTH OFFSITE	0.402	84.000	1.030	J-1
NORTHEAST	0.264	78.000	0.740	NORTHEAST OUTFALL

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
NORTH OFFSITE	2YR	2	0.172	12.150	1.98
NORTH OFFSITE	5YR	5	0.245	12.100	2.80
NORTH OFFSITE	10YR	10	0.301	12.100	3.44
NORTH OFFSITE	25YR	25	0.377	12.100	4.29
NORTH OFFSITE	50YR	50	0.436	12.100	4.92
NORTH OFFSITE	100YR	100	0.494	12.100	5.56
NORTHEAST	2YR	2	0.097	12.050	1.37
NORTHEAST	5YR	5	0.144	12.050	2.05
NORTHEAST	10YR	10	0.181	12.050	2.58
NORTHEAST	25YR	25	0.233	12.050	3.30
NORTHEAST	50YR	50	0.273	12.050	3.85
NORTHEAST	100YR	100	0.313	12.050	4.40

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
NORTHEAST OUTFALL	2YR	2	0.269	12.150	2.91
NORTHEAST OUTFALL	5YR	5	0.388	12.150	4.21
NORTHEAST OUTFALL	10YR	10	0.482	12.150	5.21
NORTHEAST OUTFALL	25YR	25	0.610	12.150	6.56
NORTHEAST OUTFALL	50YR	50	0.708	12.100	7.60
NORTHEAST OUTFALL	100YR	100	0.807	12.100	8.64
J-1	2YR	2	0.172	12.150	1.98
J-1	5YR	5	0.245	12.100	2.80
J-1	10YR	10	0.301	12.100	3.44
J-1	25YR	25	0.377	12.100	4.29
J-1	50YR	50	0.436	12.100	4.92
J-1	100YR	100	0.494	12.100	5.56

SECTION 6

FlexTable: Catchment Table (Postdev_Northeast.ppc)

Current Time: 0.000 hours

Label	Time of Concentration (Composite) (hours)	SCS CN	Area (User Defined) (acres)	Outflow Node
UNDETAINED 4	0.100	78.000	0.120	NORTHEAST OUTFALL

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
UNDETAINED 4	2YR	2	0.016	11.950	0.28
UNDETAINED 4	5YR	5	0.023	11.950	0.42
UNDETAINED 4	10YR	10	0.029	11.950	0.53
UNDETAINED 4	25YR	25	0.038	11.950	0.68
UNDETAINED 4	50YR	50	0.044	11.950	0.79
UNDETAINED 4	100YR	100	0.051	11.950	0.90

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
NORTHEAST OUTFALL	2YR	2	0.016	11.950	0.28
NORTHEAST OUTFALL	5YR	5	0.023	11.950	0.42
NORTHEAST OUTFALL	10YR	10	0.029	11.950	0.53
NORTHEAST OUTFALL	25YR	25	0.038	11.950	0.68
NORTHEAST OUTFALL	50YR	50	0.044	11.950	0.79
NORTHEAST OUTFALL	100YR	100	0.051	11.950	0.90

SECTION 7

FlexTable: Catchment Table (Predev_East.ppc)

Current Time: 0.000 hours

Label	Time of Concentration (Composite) (hours)	SCS CN	Area (User Defined) (acres)	Outflow Node
EAST	0.507	78.000	2.570	EAST OUTFALL

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
EAST	2YR	2	0.334	12.200	3.31
EAST	5YR	5	0.498	12.200	4.99
EAST	10YR	10	0.628	12.200	6.30
EAST	25YR	25	0.807	12.200	8.10
EAST	50YR	50	0.945	12.200	9.46
EAST	100YR	100	1.085	12.200	10.83

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
EAST OUTFALL	2YR	2	0.334	12.200	3.31
EAST OUTFALL	5YR	5	0.498	12.200	4.99
EAST OUTFALL	10YR	10	0.628	12.200	6.30
EAST OUTFALL	25YR	25	0.807	12.200	8.10
EAST OUTFALL	50YR	50	0.945	12.200	9.46
EAST OUTFALL	100YR	100	1.085	12.200	10.83

SECTION 8

FlexTable: Catchment Table (Postdev_East.ppc)

Current Time: 0.000 hours

Label	Time of Concentration (Composite) (hours)	SCS CN	Area (User Defined) (acres)	Outflow Node
UNDETAINED 3	0.471	78.000	0.940	EAST OUTFALL

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
UNDETAINED 3	2YR	2	0.123	12.150	1.26
UNDETAINED 3	5YR	5	0.183	12.150	1.91
UNDETAINED 3	10YR	10	0.231	12.150	2.42
UNDETAINED 3	25YR	25	0.297	12.150	3.11
UNDETAINED 3	50YR	50	0.348	12.150	3.64
UNDETAINED 3	100YR	100	0.399	12.150	4.17

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
EAST OUTFALL	2YR	2	0.123	12.150	1.26
EAST OUTFALL	5YR	5	0.183	12.150	1.91
EAST OUTFALL	10YR	10	0.231	12.150	2.42
EAST OUTFALL	25YR	25	0.297	12.150	3.11
EAST OUTFALL	50YR	50	0.348	12.150	3.64
EAST OUTFALL	100YR	100	0.399	12.150	4.17

SECTION 9

FlexTable: Catchment Table (Predev_Southeast.ppc)

Current Time: 0.000 hours

Label	Time of Concentration (Composite) (hours)	SCS CN	Area (User Defined) (acres)	Outflow Node
SOUTH OFFSITE	0.411	78.000	0.910	J-2
SOUTHEAST	0.928	78.000	24.390	SOUTHEAST OUTFALL
SOUTHWEST OFFSITE	0.590	95.000	7.330	J-3
WEST OFFSITE	0.100	92.000	1.070	J-4

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
SOUTHEAST	2YR	2	3.152	12.500	20.89
SOUTHEAST	5YR	5	4.698	12.500	31.57
SOUTHEAST	10YR	10	5.922	12.500	39.94
SOUTHEAST	25YR	25	7.614	12.400	51.43
SOUTHEAST	50YR	50	8.916	12.400	60.27
SOUTHEAST	100YR	100	10.240	12.400	69.19
WEST OFFSITE	2YR	2	0.243	11.950	4.18
WEST OFFSITE	5YR	5	0.326	11.950	5.49
WEST OFFSITE	10YR	10	0.389	11.950	6.47
WEST OFFSITE	25YR	25	0.473	11.950	7.77
WEST OFFSITE	50YR	50	0.536	11.950	8.74
WEST OFFSITE	100YR	100	0.599	11.950	9.71
SOUTHWEST OFFSITE	2YR	2	1.844	12.200	16.26
SOUTHWEST OFFSITE	5YR	5	2.419	12.200	21.06
SOUTHWEST OFFSITE	10YR	10	2.853	12.200	24.64
SOUTHWEST OFFSITE	25YR	25	3.432	12.200	29.38
SOUTHWEST OFFSITE	50YR	50	3.867	12.200	32.93
SOUTHWEST OFFSITE	100YR	100	4.302	12.200	36.47
SOUTH OFFSITE	2YR	2	0.119	12.150	1.33
SOUTH OFFSITE	5YR	5	0.176	12.150	2.01
SOUTH OFFSITE	10YR	10	0.222	12.150	2.53
SOUTH OFFSITE	25YR	25	0.286	12.150	3.24
SOUTH OFFSITE	50YR	50	0.335	12.150	3.79
SOUTH OFFSITE	100YR	100	0.384	12.150	4.33

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
SOUTHEAST OUTFALL	2YR	2	5.354	12.400	36.81
SOUTHEAST OUTFALL	5YR	5	7.614	12.400	52.45
SOUTHEAST OUTFALL	10YR	10	9.379	12.400	64.55
SOUTHEAST OUTFALL	25YR	25	11.796	12.400	80.98
SOUTHEAST OUTFALL	50YR	50	13.644	12.400	93.44
SOUTHEAST OUTFALL	100YR	100	15.516	12.400	105.98
J-3	2YR	2	1.844	12.200	16.26
J-3	5YR	5	2.419	12.200	21.06
J-3	10YR	10	2.853	12.200	24.64
J-3	25YR	25	3.432	12.200	29.38
J-3	50YR	50	3.867	12.200	32.93
J-3	100YR	100	4.302	12.200	36.47
J-2	2YR	2	0.119	12.150	1.33
J-2	5YR	5	0.176	12.150	2.01
J-2	10YR	10	0.222	12.150	2.53

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
J-2	25YR	25	0.286	12.150	3.24
J-2	50YR	50	0.335	12.150	3.79
J-2	100YR	100	0.384	12.150	4.33
J-4	2YR	2	0.243	11.950	4.18
J-4	5YR	5	0.326	11.950	5.49
J-4	10YR	10	0.389	11.950	6.47
J-4	25YR	25	0.473	11.950	7.77
J-4	50YR	50	0.536	11.950	8.74
J-4	100YR	100	0.599	11.950	9.71

SECTION 10

FlexTable: Catchment Table (Postdev_Southeast.ppc)

Current Time: 0.000 hours

Label	Time of Concentration (Composite) (hours)	SCS CN	Area (User Defined) (acres)	Outflow Node
AI 1	0.100	78.000	0.140	POND
AI 2	0.100	98.000	1.200	POND
AI 3	0.100	78.000	0.290	POND
BLDG 1	0.100	98.000	0.780	POND
BLDG 2	0.100	98.000	0.830	POND
BLDG 3	0.100	98.000	1.040	POND
BLDG 4	0.100	98.000	0.900	POND
CB 1	0.100	90.000	2.040	POND
CB 2	0.100	98.000	1.030	POND
CB 3	0.100	98.000	1.070	POND
CB 4	0.100	98.000	1.080	POND
CB 5	0.100	98.000	1.150	POND
CB 6	0.100	98.000	1.290	POND
CI 1	0.100	98.000	0.100	POND
CI 2	0.100	98.000	0.170	POND
CI 3	0.100	98.000	0.230	POND
CI 4	0.100	86.000	1.270	POND
CI 5	0.100	86.000	0.380	POND
CI 6	0.100	89.000	0.650	POND
CI 7	0.100	89.000	0.500	POND
CI 8	0.100	85.000	0.240	POND
CI 9	0.100	98.000	0.440	POND
NORTH OFFSITE	0.402	84.000	1.030	POND
POND 1	0.100	78.000	2.840	POND
SOUTH OFFSITE	0.411	78.000	0.910	J-14
SOUTHWEST OFFSITE	0.590	95.000	7.330	J-13
TW 1	0.100	98.000	0.070	POND
TW 2	0.100	98.000	0.070	POND
UNDETAINED 2	0.593	78.000	10.240	SOUTHEAST UNDETAINED
VEST 1	0.100	98.000	0.040	POND
VEST 2	0.100	98.000	0.030	POND
WEST OFFSITE	0.100	92.000	1.070	POND

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
CI 4	2YR	2	0.231	11.950	4.13
CI 4	5YR	5	0.324	11.950	5.70
CI 4	10YR	10	0.395	11.950	6.88
CI 4	25YR	25	0.491	11.950	8.46
CI 4	50YR	50	0.564	11.950	9.64
CI 4	100YR	100	0.637	11.950	10.81
CB 1	2YR	2	0.432	11.950	7.54
CB 1	5YR	5	0.587	11.950	10.07
CB 1	10YR	10	0.705	11.950	11.95
CB 1	25YR	25	0.864	11.950	14.45
CB 1	50YR	50	0.983	11.950	16.32
CB 1	100YR	100	1.103	11.950	18.18
CB 5	2YR	2	0.323	11.950	5.01
CB 5	5YR	5	0.414	11.950	6.37
CB 5	10YR	10	0.483	11.950	7.39
CB 5	25YR	25	0.575	11.950	8.75
CB 5	50YR	50	0.644	11.950	9.76
CB 5	100YR	100	0.713	11.950	10.78
CB 3	2YR	2	0.300	11.950	4.67
CB 3	5YR	5	0.386	11.950	5.93
CB 3	10YR	10	0.450	11.950	6.88
CB 3	25YR	25	0.535	11.950	8.14
CB 3	50YR	50	0.599	11.950	9.08
CB 3	100YR	100	0.663	11.950	10.03
AI 1	2YR	2	0.018	11.950	0.33
AI 1	5YR	5	0.027	11.950	0.49
AI 1	10YR	10	0.034	11.950	0.62
AI 1	25YR	25	0.044	11.950	0.79
AI 1	50YR	50	0.052	11.950	0.92
AI 1	100YR	100	0.059	11.950	1.05
CB 4	2YR	2	0.303	11.950	4.71
CB 4	5YR	5	0.389	11.950	5.99
CB 4	10YR	10	0.454	11.950	6.94
CB 4	25YR	25	0.540	11.950	8.22
CB 4	50YR	50	0.605	11.950	9.17
CB 4	100YR	100	0.670	11.950	10.12
CB 6	2YR	2	0.362	11.950	5.62
CB 6	5YR	5	0.465	11.950	7.15
CB 6	10YR	10	0.542	11.950	8.29
CB 6	25YR	25	0.645	11.950	9.81
CB 6	50YR	50	0.722	11.950	10.95
CB 6	100YR	100	0.800	11.950	12.09
CB 2	2YR	2	0.289	11.950	4.49
CB 2	5YR	5	0.371	11.950	5.71
CB 2	10YR	10	0.433	11.950	6.62

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
CB 2	25YR	25	0.515	11.950	7.84
CB 2	50YR	50	0.577	11.950	8.75
CB 2	100YR	100	0.639	11.950	9.65
AI 2	2YR	2	0.337	11.950	5.23
AI 2	5YR	5	0.432	11.950	6.65
AI 2	10YR	10	0.504	11.950	7.71
AI 2	25YR	25	0.600	11.950	9.13
AI 2	50YR	50	0.672	11.950	10.19
AI 2	100YR	100	0.744	11.950	11.25
AI 3	2YR	2	0.038	11.950	0.69
AI 3	5YR	5	0.057	11.950	1.02
AI 3	10YR	10	0.071	11.950	1.28
AI 3	25YR	25	0.092	11.950	1.64
AI 3	50YR	50	0.107	11.950	1.90
AI 3	100YR	100	0.123	11.950	2.17
CI 5	2YR	2	0.069	11.950	1.24
CI 5	5YR	5	0.097	11.950	1.71
CI 5	10YR	10	0.118	11.950	2.06
CI 5	25YR	25	0.147	11.950	2.53
CI 5	50YR	50	0.169	11.950	2.88
CI 5	100YR	100	0.191	11.950	3.23
CI 6	2YR	2	0.133	11.950	2.33
CI 6	5YR	5	0.182	11.950	3.14
CI 6	10YR	10	0.219	11.950	3.74
CI 6	25YR	25	0.269	11.950	4.54
CI 6	50YR	50	0.307	11.950	5.14
CI 6	100YR	100	0.345	11.950	5.73
CI 7	2YR	2	0.102	11.950	1.79
CI 7	5YR	5	0.140	11.950	2.41
CI 7	10YR	10	0.168	11.950	2.88
CI 7	25YR	25	0.207	11.950	3.49
CI 7	50YR	50	0.236	11.950	3.95
CI 7	100YR	100	0.266	11.950	4.41
CI 8	2YR	2	0.042	11.950	0.75
CI 8	5YR	5	0.059	11.950	1.05
CI 8	10YR	10	0.073	11.950	1.27
CI 8	25YR	25	0.091	11.950	1.57
CI 8	50YR	50	0.104	11.950	1.79
CI 8	100YR	100	0.118	11.950	2.02
CI 9	2YR	2	0.123	11.950	1.92
CI 9	5YR	5	0.159	11.950	2.44
CI 9	10YR	10	0.185	11.950	2.83
CI 9	25YR	25	0.220	11.950	3.35
CI 9	50YR	50	0.246	11.950	3.74
CI 9	100YR	100	0.273	11.950	4.12

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
CI 3	2YR	2	0.065	11.950	1.00
CI 3	5YR	5	0.083	11.950	1.27
CI 3	10YR	10	0.097	11.950	1.48
CI 3	25YR	25	0.115	11.950	1.75
CI 3	50YR	50	0.129	11.950	1.95
CI 3	100YR	100	0.143	11.950	2.16
CI 2	2YR	2	0.048	11.950	0.74
CI 2	5YR	5	0.061	11.950	0.94
CI 2	10YR	10	0.071	11.950	1.09
CI 2	25YR	25	0.085	11.950	1.29
CI 2	50YR	50	0.095	11.950	1.44
CI 2	100YR	100	0.105	11.950	1.59
CI 1	2YR	2	0.028	11.950	0.44
CI 1	5YR	5	0.036	11.950	0.55
CI 1	10YR	10	0.042	11.950	0.64
CI 1	25YR	25	0.050	11.950	0.76
CI 1	50YR	50	0.056	11.950	0.85
CI 1	100YR	100	0.062	11.950	0.94
POND 1	2YR	2	0.372	11.950	6.71
POND 1	5YR	5	0.554	11.950	10.00
POND 1	10YR	10	0.698	11.950	12.55
POND 1	25YR	25	0.897	11.950	16.02
POND 1	50YR	50	1.050	11.950	18.65
POND 1	100YR	100	1.206	11.950	21.28
TW 1	2YR	2	0.020	11.950	0.31
TW 1	5YR	5	0.025	11.950	0.39
TW 1	10YR	10	0.029	11.950	0.45
TW 1	25YR	25	0.035	11.950	0.53
TW 1	50YR	50	0.039	11.950	0.59
TW 1	100YR	100	0.043	11.950	0.66
BLDG 3	2YR	2	0.292	11.950	4.53
BLDG 3	5YR	5	0.375	11.950	5.76
BLDG 3	10YR	10	0.437	11.950	6.69
BLDG 3	25YR	25	0.520	11.950	7.91
BLDG 3	50YR	50	0.582	11.950	8.83
BLDG 3	100YR	100	0.645	11.950	9.75
BLDG 4	2YR	2	0.252	11.950	3.92
BLDG 4	5YR	5	0.324	11.950	4.99
BLDG 4	10YR	10	0.378	11.950	5.79
BLDG 4	25YR	25	0.450	11.950	6.85
BLDG 4	50YR	50	0.504	11.950	7.64
BLDG 4	100YR	100	0.558	11.950	8.44
TW 2	2YR	2	0.020	11.950	0.31
TW 2	5YR	5	0.025	11.950	0.39
TW 2	10YR	10	0.029	11.950	0.45

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
TW 2	25YR	25	0.035	11.950	0.53
TW 2	50YR	50	0.039	11.950	0.59
TW 2	100YR	100	0.043	11.950	0.66
VEST 1	2YR	2	0.011	11.950	0.17
VEST 1	5YR	5	0.014	11.950	0.22
VEST 1	10YR	10	0.017	11.950	0.26
VEST 1	25YR	25	0.020	11.950	0.30
VEST 1	50YR	50	0.022	11.950	0.34
VEST 1	100YR	100	0.025	11.950	0.37
BLDG 2	2YR	2	0.233	11.950	3.62
BLDG 2	5YR	5	0.299	11.950	4.60
BLDG 2	10YR	10	0.349	11.950	5.34
BLDG 2	25YR	25	0.415	11.950	6.31
BLDG 2	50YR	50	0.465	11.950	7.05
BLDG 2	100YR	100	0.515	11.950	7.78
VEST 2	2YR	2	0.008	11.950	0.13
VEST 2	5YR	5	0.011	11.950	0.17
VEST 2	10YR	10	0.013	11.950	0.19
VEST 2	25YR	25	0.015	11.950	0.23
VEST 2	50YR	50	0.017	11.950	0.25
VEST 2	100YR	100	0.019	11.950	0.28
BLDG 1	2YR	2	0.219	11.950	3.40
BLDG 1	5YR	5	0.281	11.950	4.32
BLDG 1	10YR	10	0.328	11.950	5.01
BLDG 1	25YR	25	0.390	11.950	5.93
BLDG 1	50YR	50	0.437	11.950	6.62
BLDG 1	100YR	100	0.484	11.950	7.31
SOUTHWEST OFFSITE	2YR	2	1.855	12.200	16.26
SOUTHWEST OFFSITE	5YR	5	2.434	12.200	21.06
SOUTHWEST OFFSITE	10YR	10	2.869	12.200	24.64
SOUTHWEST OFFSITE	25YR	25	3.451	12.200	29.38
SOUTHWEST OFFSITE	50YR	50	3.889	12.200	32.93
SOUTHWEST OFFSITE	100YR	100	4.327	12.200	36.47
SOUTH OFFSITE	2YR	2	0.119	12.150	1.33
SOUTH OFFSITE	5YR	5	0.178	12.150	2.01
SOUTH OFFSITE	10YR	10	0.224	12.150	2.53
SOUTH OFFSITE	25YR	25	0.287	12.150	3.24
SOUTH OFFSITE	50YR	50	0.336	12.150	3.79
SOUTH OFFSITE	100YR	100	0.386	12.150	4.33
WEST OFFSITE	2YR	2	0.244	11.950	4.18
WEST OFFSITE	5YR	5	0.326	11.950	5.49
WEST OFFSITE	10YR	10	0.389	11.950	6.47
WEST OFFSITE	25YR	25	0.473	11.950	7.77
WEST OFFSITE	50YR	50	0.536	11.950	8.74
WEST OFFSITE	100YR	100	0.600	11.950	9.71

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
NORTH OFFSITE	2YR	2	0.173	12.150	1.98
NORTH OFFSITE	5YR	5	0.246	12.100	2.80
NORTH OFFSITE	10YR	10	0.303	12.100	3.44
NORTH OFFSITE	25YR	25	0.379	12.100	4.29
NORTH OFFSITE	50YR	50	0.438	12.100	4.92
NORTH OFFSITE	100YR	100	0.496	12.100	5.56
UNDETAINED 2	2YR	2	1.343	12.250	12.03
UNDETAINED 2	5YR	5	1.999	12.250	18.18
UNDETAINED 2	10YR	10	2.518	12.250	22.98
UNDETAINED 2	25YR	25	3.236	12.250	29.55
UNDETAINED 2	50YR	50	3.788	12.250	34.55
UNDETAINED 2	100YR	100	4.349	12.250	39.58

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
J-13	2YR	2	1.855	12.200	16.26
J-13	5YR	5	2.434	12.200	21.06
J-13	10YR	10	2.869	12.200	24.64
J-13	25YR	25	3.451	12.200	29.38
J-13	50YR	50	3.889	12.200	32.93
J-13	100YR	100	4.327	12.200	36.47
J-14	2YR	2	0.119	12.150	1.33
J-14	5YR	5	0.178	12.150	2.01
J-14	10YR	10	0.224	12.150	2.53
J-14	25YR	25	0.287	12.150	3.24
J-14	50YR	50	0.336	12.150	3.79
J-14	100YR	100	0.386	12.150	4.33
SOUTHEAST OUTFALL	2YR	2	8.150	12.300	29.59
SOUTHEAST OUTFALL	5YR	5	11.053	12.300	40.76
SOUTHEAST OUTFALL	10YR	10	13.298	12.300	49.92
SOUTHEAST OUTFALL	25YR	25	16.345	12.300	62.86
SOUTHEAST OUTFALL	50YR	50	18.657	12.300	72.86
SOUTHEAST OUTFALL	100YR	100	20.986	12.300	83.04
SOUTHEAST UNDETAINED	2YR	2	3.318	12.300	28.11
SOUTHEAST UNDETAINED	5YR	5	4.610	12.300	38.91
SOUTHEAST UNDETAINED	10YR	10	5.611	12.300	47.17
SOUTHEAST UNDETAINED	25YR	25	6.975	12.300	58.31
SOUTHEAST UNDETAINED	50YR	50	8.013	12.300	66.72

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
SOUTHEAST UNDETAINED	100YR	100	9.062	12.300	75.16

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
POND (IN)	2YR	2	5.087	11.950	81.13	(N/A)	(N/A)
POND (OUT)	2YR	2	4.833	16.400	1.64	969.77	3.717
POND (IN)	5YR	5	6.750	11.950	106.71	(N/A)	(N/A)
POND (OUT)	5YR	5	6.443	15.550	2.55	970.53	4.868
POND (IN)	10YR	10	8.014	11.950	125.97	(N/A)	(N/A)
POND (OUT)	10YR	10	7.687	14.600	3.71	971.00	5.612
POND (IN)	25YR	25	9.715	11.950	151.69	(N/A)	(N/A)
POND (OUT)	25YR	25	9.370	13.800	5.62	971.60	6.604
POND (IN)	50YR	50	10.999	11.950	170.98	(N/A)	(N/A)
POND (OUT)	50YR	50	10.644	13.550	7.23	972.04	7.355
POND (IN)	100YR	100	12.288	11.950	190.26	(N/A)	(N/A)
POND (OUT)	100YR	100	11.924	13.350	8.96	972.48	8.108

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Summary for Hydrograph Addition at 'SOUTHEAST OUTFALL'

Upstream Link	Upstream Node
CO-15	SOUTHEAST UNDETAINED
Outlet-1	POND

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	SOUTHEAST UNDETAINED	3.318	12.300	28.11
Flow (From)	Outlet-1	4.833	16.400	1.64
Flow (In)	SOUTHEAST OUTFALL	8.150	12.300	29.59

Summary for Hydrograph Addition at 'SOUTHEAST OUTFALL'

Upstream Link	Upstream Node
CO-15	SOUTHEAST UNDETAINED
Outlet-1	POND

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	SOUTHEAST UNDETAINED	4.610	12.300	38.91
Flow (From)	Outlet-1	6.443	15.550	2.55
Flow (In)	SOUTHEAST OUTFALL	11.053	12.300	40.76

Summary for Hydrograph Addition at 'SOUTHEAST OUTFALL'

Upstream Link	Upstream Node
CO-15	SOUTHEAST UNDETAINED
Outlet-1	POND

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	SOUTHEAST UNDETAINED	5.611	12.300	47.17
Flow (From)	Outlet-1	7.687	14.600	3.71
Flow (In)	SOUTHEAST OUTFALL	13.298	12.300	49.92

Summary for Hydrograph Addition at 'SOUTHEAST OUTFALL'

Upstream Link	Upstream Node
CO-15	SOUTHEAST UNDETAINED
Outlet-1	POND

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	SOUTHEAST UNDETAINED	6.975	12.300	58.31
Flow (From)	Outlet-1	9.370	13.800	5.62
Flow (In)	SOUTHEAST OUTFALL	16.345	12.300	62.86

Summary for Hydrograph Addition at 'SOUTHEAST OUTFALL'

Upstream Link	Upstream Node
CO-15	SOUTHEAST UNDETAINED
Outlet-1	POND

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	SOUTHEAST UNDETAINED	8.013	12.300	66.72
Flow (From)	Outlet-1	10.644	13.550	7.23
Flow (In)	SOUTHEAST OUTFALL	18.657	12.300	72.86

Summary for Hydrograph Addition at 'SOUTHEAST OUTFALL'

Upstream Link	Upstream Node
CO-15	SOUTHEAST UNDETAINED
Outlet-1	POND

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	SOUTHEAST UNDETAINED	9.062	12.300	75.16
Flow (From)	Outlet-1	11.924	13.350	8.96
Flow (In)	SOUTHEAST OUTFALL	20.986	12.300	83.04

Summary for Hydrograph Addition at 'SOUTHEAST UNDETAINED'

Upstream Link	Upstream Node
SOUTH OFFSITE Tt	J-14
<Catchment to Outflow Node>	UNDETAINED 2
SOUTHWEST OFFSITE Tt	J-13

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	SOUTH OFFSITE Tt	0.119	12.750	1.33
Flow (From)	UNDETAINED 2	1.343	12.250	12.03
Flow (From)	SOUTHWEST OFFSITE Tt	1.855	12.300	16.26
Flow (In)	SOUTHEAST UNDETAINED	3.318	12.300	28.11

Summary for Hydrograph Addition at 'SOUTHEAST UNDETAINED'

Upstream Link	Upstream Node
SOUTH OFFSITE Tt	J-14
<Catchment to Outflow Node>	UNDETAINED 2
SOUTHWEST OFFSITE Tt	J-13

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	SOUTH OFFSITE Tt	0.178	12.750	2.01
Flow (From)	UNDETAINED 2	1.999	12.250	18.18
Flow (From)	SOUTHWEST OFFSITE Tt	2.434	12.300	21.06
Flow (In)	SOUTHEAST UNDETAINED	4.610	12.300	38.91

Summary for Hydrograph Addition at 'SOUTHEAST UNDETAINED'

Upstream Link	Upstream Node
SOUTH OFFSITE Tt	J-14
<Catchment to Outflow Node>	UNDETAINED 2
SOUTHWEST OFFSITE Tt	J-13

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	SOUTH OFFSITE Tt	0.224	12.750	2.53
Flow (From)	UNDETAINED 2	2.518	12.250	22.98
Flow (From)	SOUTHWEST OFFSITE Tt	2.869	12.300	24.64
Flow (In)	SOUTHEAST UNDETAINED	5.611	12.300	47.17

Summary for Hydrograph Addition at 'SOUTHEAST UNDETAINED'

Upstream Link	Upstream Node
SOUTH OFFSITE Tt	J-14
<Catchment to Outflow Node>	UNDETAINED 2
SOUTHWEST OFFSITE Tt	J-13

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	SOUTH OFFSITE Tt	0.287	12.750	3.24
Flow (From)	UNDETAINED 2	3.236	12.250	29.55
Flow (From)	SOUTHWEST OFFSITE Tt	3.451	12.300	29.38
Flow (In)	SOUTHEAST UNDETAINED	6.975	12.300	58.31

Summary for Hydrograph Addition at 'SOUTHEAST UNDETAINED'

Upstream Link	Upstream Node
SOUTH OFFSITE Tt	J-14
<Catchment to Outflow Node>	UNDETAINED 2
SOUTHWEST OFFSITE Tt	J-13

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	SOUTH OFFSITE Tt	0.336	12.750	3.79
Flow (From)	UNDETAINED 2	3.788	12.250	34.55
Flow (From)	SOUTHWEST OFFSITE Tt	3.889	12.300	32.93
Flow (In)	SOUTHEAST UNDETAINED	8.013	12.300	66.72

Summary for Hydrograph Addition at 'SOUTHEAST UNDETAINED'

Upstream Link	Upstream Node
SOUTH OFFSITE Tt	J-14
<Catchment to Outflow Node>	UNDETAINED 2
SOUTHWEST OFFSITE Tt	J-13

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	SOUTH OFFSITE Tt	0.386	12.750	4.33
Flow (From)	UNDETAINED 2	4.349	12.250	39.58
Flow (From)	SOUTHWEST OFFSITE Tt	4.327	12.300	36.47
Flow (In)	SOUTHEAST UNDETAINED	9.062	12.300	75.16

Subsection: Elevation-Area Volume Curve
Label: POND

Return Event: 10 years
Storm Event: 10YR

Elevation (ft)	Planimeter (ft²)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
967.00	0.0	1.208	0.000	0.000	0.000
968.00	0.0	1.304	3.767	1.256	1.256
969.00	0.0	1.403	4.060	1.353	2.609
970.00	0.0	1.505	4.361	1.454	4.063
971.00	0.0	1.608	4.669	1.556	5.619
972.00	0.0	1.714	4.982	1.661	7.280
973.00	0.0	1.822	5.303	1.768	9.047
973.50	0.0	1.888	5.565	0.927	9.975

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	967.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	81.13 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	1.64 ft³/s	Time to Peak (Flow, Outlet)	16.400 hours

Elevation (Water Surface, Peak)	969.77 ft
Volume (Peak)	3.717 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	5.087 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	4.833 ac-ft
Volume (Retained)	0.253 ac-ft
Volume (Unrouted)	-0.002 ac-ft
Error (Mass Balance)	0.0 %

Subsection: Level Pool Pond Routing Summary
Label: POND (IN)

Return Event: 5 years
Storm Event: 5YR

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	967.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	106.71 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	2.55 ft³/s	Time to Peak (Flow, Outlet)	15.550 hours

Elevation (Water Surface, Peak)	970.53 ft
Volume (Peak)	4.868 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	6.750 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	6.443 ac-ft
Volume (Retained)	0.305 ac-ft
Volume (Unrouted)	-0.001 ac-ft
Error (Mass Balance)	0.0 %

Subsection: Level Pool Pond Routing Summary
Label: POND (IN)

Return Event: 10 years
Storm Event: 10YR

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	967.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	125.97 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	3.71 ft³/s	Time to Peak (Flow, Outlet)	14.600 hours

Elevation (Water Surface, Peak)	971.00 ft
Volume (Peak)	5.612 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	8.014 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	7.687 ac-ft
Volume (Retained)	0.326 ac-ft
Volume (Unrouted)	-0.001 ac-ft
Error (Mass Balance)	0.0 %

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	967.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	151.69 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	5.62 ft³/s	Time to Peak (Flow, Outlet)	13.800 hours

Elevation (Water Surface, Peak)	971.60 ft
Volume (Peak)	6.604 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	9.715 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	9.370 ac-ft
Volume (Retained)	0.344 ac-ft
Volume (Unrouted)	-0.001 ac-ft
Error (Mass Balance)	0.0 %

Subsection: Level Pool Pond Routing Summary
Label: POND (IN)

Return Event: 50 years
Storm Event: 50YR

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	967.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	170.98 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	7.23 ft³/s	Time to Peak (Flow, Outlet)	13.550 hours

Elevation (Water Surface, Peak)	972.04 ft
Volume (Peak)	7.355 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	10.999 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	10.644 ac-ft
Volume (Retained)	0.354 ac-ft
Volume (Unrouted)	-0.001 ac-ft
Error (Mass Balance)	0.0 %

Subsection: Level Pool Pond Routing Summary
Label: POND (IN)

Return Event: 100 years
Storm Event: 100YR

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	967.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	190.26 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	8.96 ft³/s	Time to Peak (Flow, Outlet)	13.350 hours

Elevation (Water Surface, Peak)	972.48 ft
Volume (Peak)	8.108 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	12.288 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	11.924 ac-ft
Volume (Retained)	0.363 ac-ft
Volume (Unrouted)	-0.001 ac-ft
Error (Mass Balance)	0.0 %

Composite Outlet Structure Detailed Report: OCS

Element Details

Label	OCS	Notes	

Headwater Range

Headwater Type	Use Pond for Headwater Range	Maximum (Headwater)	973.50 ft
Pond	POND	Increment (Headwater)	0.50 ft
Minimum (Headwater)	967.00 ft		

SpotElevation (ft)

Tailwater Setup

Tailwater Type	Free Outfall

Tailwater Tolerances

Maximum Iterations	30	Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft	Flow Tolerance (Minimum)	0.001 ft³/s
Headwater Tolerance (Maximum)	0.50 ft	Flow Tolerance (Maximum)	10.000 ft³/s
Tailwater Tolerance (Minimum)	0.01 ft		

Outlet Structure

Outlet Structure Type	Weir

Outlet Structure (IDs and Direction)

Outlet ID	Weir - 1	Downstream ID	Tailwater
Flow Direction	Forward Flow Only	Notes	

Outlet Structure (Advanced)

Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

Outlet Structure (Weir)

Weir	Rectangular Weir	Rectangular Weir	Suppressed
Vary Coefficient with Depth	False	Weir Length	0.50 ft
Weir Coefficient	3.33 (ft^0.5)/s		

Outlet Structure (Common)

Elevation	970.00 ft

Outlet Structure (Weir, Advanced)

User Defined Table	False

Composite Outlet Structure Detailed Report: OCS

Outlet Structure			
Outlet Structure Type	Orifice		

Outlet Structure (IDs and Direction)			
Outlet ID	Orifice - 1	Downstream ID	Tailwater
Flow Direction	Forward Flow Only	Notes	

Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

Outlet Structure (Orifice)			
Orifice	Circular Orifice	Orifice Coefficient	0.620
Number of Openings	3	Orifice Diameter	1.9 in

Outlet Structure (Common)	
Elevation	967.00 ft

Outlet Structure			
Outlet Structure Type	Orifice		

Outlet Structure (IDs and Direction)			
Outlet ID	Orifice - 2	Downstream ID	Tailwater
Flow Direction	Forward Flow Only	Notes	

Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

Outlet Structure (Orifice)			
Orifice	Circular Orifice	Orifice Coefficient	0.620
Number of Openings	3	Orifice Diameter	1.9 in

Outlet Structure (Common)	
Elevation	967.33 ft

Outlet Structure			
Outlet Structure Type	Orifice		

Outlet Structure (IDs and Direction)			
Outlet ID	Orifice - 3	Downstream ID	Tailwater
Flow Direction	Forward Flow Only	Notes	

Outlet Structure (Advanced)

Composite Outlet Structure Detailed Report: OCS

Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

Outlet Structure (Orifice)			
Orifice	Circular Orifice	Orifice Coefficient	0.620
Number of Openings	3	Orifice Diameter	1.9 in

Outlet Structure (Common)	
Elevation	967.67 ft

Outlet Structure	
Outlet Structure Type	Orifice

Outlet Structure (IDs and Direction)			
Outlet ID	Orifice - 4	Downstream ID	Tailwater
Flow Direction	Forward Flow Only	Notes	

Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

Outlet Structure (Orifice)			
Orifice	Circular Orifice	Orifice Coefficient	0.620
Number of Openings	3	Orifice Diameter	1.9 in

Outlet Structure (Common)	
Elevation	968.00 ft

SECTION 11

Design Procedure Form: Extended Wet Detention Basin (EWDB)
Main Worksheet

Designer: JR Willhite
Checked By: _____
Company: Carlson Consulting Engineers, Inc.
Date: 6/20/2013
Project: Walmart Supercenter
Location: SEC of 25th and California

I. Basin Water Quality Volume		
Step 1) Tributary area to EWDB, A_T (ac)	A_T (ac) =	22.05
Step 2) Calculate WQv using methodology in Section 6	WQv (ac-ft) =	1.588
IIa. Permanent Pool Volume, Method		
Step 1) Average 14 day wet season rainfall, R_{14} (in)	R_{14} (in) =	2.2 (KC Metro Area)
Step 2) Rational runoff coefficient, C C = 0.3 + 0.6 * I I = percent impervious area divided by 100	C =	0.71
Step 3) Permanent pool volume by Method 1, V_{P1} (ac-ft) $V_{P1} = (C * A_T * R_{14})/12$	V_{P1} (ac-ft) =	2.87
IIb. Permanent Pool Volume, Method		
Step 1) Ratio of basin volume to runoff volume, $V_{B/R}$ (from Figure 12; $V_{B/R}$ should be >= 4.0)	$V_{B/R}$ =	4.00
Step 2) Mean storm depth, S_d (in)	S_d (in) =	0.6 (KC Metro Area)
Step 3) Impervious tributary area, A_I (ac)	A_I (ac) =	15.07
Step 4) Permanent pool volume by Method 2, V_{P2} (ac-ft) $V_{P2} = (V_{B/R} * S_d * A_I)/12$	V_{P2} (ac-ft) =	3.01
IIc. Permanent Pool Design Volume		
Step 1) Design permanent pool volume, V_P, as larger of volumes calculated in IIa and IIb plus 20%	V_P (ac-ft) =	3.62
Step 2) Average permanent pool depth, Z_P (ft)	Z_P (ft) =	3.49
Step 3) Permanent pool surface area, A_P (ac)	A_P (ac) =	1.04

IIIa. Water Quality Outlet Type

Step 1) Set water quality outlet type: — Outlet Type = 2

Type 1 = single orifice
Type 2 = perforated riser or plate
Type 3 = v-notch weir

Step 2) Proceed to part IIIb, IIIc, or IIId based on water quality outlet type selected

IIIb. Water Quality Pool Outlet, Single Orifice

Step 1) Depth of water quality volume above permanent pool, Z_{WQ} (ft) — Z_{WQ} (ft) = -

Step 2) Average head of water quality volume over invert of orifice, H_{WQ} (ft)

$H_{WQ} = 0.5 * Z_{WQ}$ — H_{WQ} (ft) = -

Step 3) Average water quality outflow rate, Q_{WQ} (cfs)

$Q_{WQ} = (WQv * 43{,}560)/(40 * 3{,}600)$ — Q_{WQ} (cfs) = -

Step 4) Set value of orifice discharge coefficient, C_o

$C_o = 0.66$ when thickness of riser/weir plate is = or < orifice diameter
$C_o = 0.80$ when thickness of riser/weir plate is > orifice diameter — C_o = -

Step 5) Water quality outlet orifice diameter (minimum of 1/2 inch), D_o (in)

$D_o = 12 * 2 * (Q_{WQ}/(C_o * \pi * (2 * g * H)^{0.5}))^{0.5}$ — D_o (in) = -

(If orifice diameter < 4 inches, use outlet type 2 or 3)

Step 6) To size outlet orifice for EWDB with an irregular stage-volume relationship, use the Single Orifice Worksheet

IIIc. Water Quality Outlet, Perforated Riser

Step 1) Depth of water quality volume above permanent pool, Z_{WQ} (ft) — Z_{WQ} (ft) = 1.25

Step 2) Recommended maximum outlet area per row, A_o (in^2)

$Ao = WQv/(0.013 * Z_{WQ}^2 + 0.22 * Z_{WQ} - 0.10)$ — A_o (in^2) = 8.129

Step 3) Circular perforation diameter per row assuming a single column, D_1 (in) — D_1 (in) = 3.217

Step 4) Number of columns, n_c — n_c = 3

Step 5) Design circular perforation diameter (between 1 and 2 inches), D_{perf} (in) — D_{perf} (in) = 1.9

Step 6) Horizontal perforation column spacing when $n_c > 1$, center to center, S_c — S_c (in) = 4.00

If D_{perf} >/= 1.0 in, $S_c = 4$

Step 7) Number of rows (4" vertical spacing between perforations, center to center), n_r — n_r = 4

IIId. Water Quality Outlet, V-Notch Weir[6]

Step 1) Depth of water quality volume above permanent pool, Z_{WQ} (ft) — Z_{WQ} (ft) = -

Step 2) Average head of water quality pool volume over invert of v-notch, HWQ (ft)
$H_{WQ} = 0.5 * Z_{WQ}$ — H_{WQ} (ft) = -

Step 3) Average water quality pool outflow rate, Q_{WQ} (cfs)
$Q_{WQ} = (WQv * 43{,}560)/(40 * 3{,}600)$ — Q_{WQ} (cfs) = -

Step 4) V-notch weir coefficient, C_v — C_v = -

Step 5) V-notch weir angle, θ (deg)
$\theta = 2 * (180/\pi) * \arctan(Q_{WQ}/(C_v * H_{WQ}^{5/2}))$
V-notch angle should be at least 20 degrees. Set to 20 degrees if calculated angle is smaller. — θ (deg) = -

Step 6) V-notch weir top width, W_v (ft) — W_v (ft) = -
$W_v = 2 * Z_{WQ} * TAN(\theta/2)$

Step 7) To calculate v-notch angle for EWDB with an irregular stage-volume relationship, use the V-notch Weir Worksheet

IV. Trash Racks

Step 1) Total outlet area, A_{ot} (in^2) — A_{ot} (in^2) = 30.89

Step 2) Required trash rack open area, A_t (in^2)
$A_t = A_{ot} * 77 * e^{(-0.124 * D)}$ for single orifice outlet
$A_t = (A_{ot}/2) * 77 * e^{(-0.124 * D)}$ for orifice plate or perforated riser outlet
$A_t = 4 * A_{ot}$ for v-notch weir outlet — A_t (in^2) = 944.64

V. Forebay

Step 1) Volume should equal at least 10% of WQv — Min Vol_{FB} (ac-ft) = 0.159

Step 2) Forebay depth, Z_{FB} (ft) — Z_{FB} (ft) = 4.0

Step 3) Minimum forebay surface area, A_{FB} (ac) — Min A_{FB} (ac) = 0.040

Step 4) Paved/hard bottom and sides? — Yes

VI. Littoral Bench

Step 1) Littoral bench should be 25% - 50% of the permanent pool surface area	Min A_{LB} (ac) =	0.26
	Max A_{LB} (ac) =	0.52
Step 2) Approximate minimum and maximum bench widths, assuming circular permanent pool	Min W_{LB} (ft) =	16.1
	Max W_{LB} (ft) =	35.1
Step 3) Design bench width around perimeter of EWDB, W_{LB} (ft)	W_{LB} (ft) =	12*
Step 4) Bench depth below permanent pool surface, Z_{LB} (ft)	Z_{LB} (ft) =	0.5 - 1.0

VII. Basin side slopes

Basin side slopes should be at least 4:1 (H:V)	Side Slope (H:V) =	4:1

VIII. Dam Embankment side slopes

Dam Embankment side slopes should be at least 3:1 (H:V)	Dam Embankment (H:V) =	3:1

IX. Vegetation

Check the method of vegetation planted in the EWDB or describe "other"	X	Native Grass
	___	Irrigated Turf Grass
	___	Native Aquatic Species
	___	Other: ___ _____
		_____

X. Inlet Protection

Indicate method of inlet protection/energy dissipation at EWDB inlet	Rip-Rap

***VI. Step 3:** With a 12' littoral bench, we are providing 0.34 ac, or 27.8% of our permanent pool surface area. This is within the range described in Step 1.

Variable Dictionary

Variable	Units	Definition
A_I	ac	Impervious tributary area
A_{FB}	ac	Forebay surface area
A_{LB}	ac	Littoral bench area
A_o	in^2	Recommended maximum outlet area per row of perforations, for perforated riser or weir plate
A_{ot}	in^2	Total open area of outlet structure
A_P	ac	Pervious tr butary area
A_{PP}	ac	Permanent pool surface area
A_t	in^2	Total required trash rack open area
A_T	ac	Tr butary area to EWDB
C	none	Rational runoff coefficient
C_o	none	Orifice discharge coefficient
C_v	none	V-Notch weir discharge coefficient
D_o	in	Water quality outlet orifice diameter
D_1	in	Circular perforation diameter per row, assuming a single column, for perforated riser or weir plate
D_{perf}	in	Design circular perforation diameter for perforated riser or weir plate
H_{WQ}	ft	Average head of WQv over invert of water quality outlet
I	none	Percent impervious area of tributary area to EWDB divided by 100
n_c	none	Number of columns of perforations for perforated riser or weir plate
n_r	none	Number of rows of perforations for perforated riser or weir plate
θ	deg	V-Notch weir angle
Q_{WQ}	cfs	Average WQv outflow rate
R_{14}	in	Average 14-day wet season rainfall
S_c	in	Horizontal perforation column spacing for perforated riser or weir plate
S_d	in	Mean storm depth
$V_{B/R}$	none	Ratio of basin volume to runoff volume
V_P	ac-ft	Design permanent pool volume, accounts for 20% of basin filling with sediment
V_{P1}	ac-ft	Permanent pool volume as calculated by method 1
V_{P2}	ac-ft	Permanent pool volume as calculated by method 2
Vol_{FB}	ac-ft	Pre-sedimentation forebay volume
W_{LB}	ft	Littoral bench width
W_v	ft	V-notch weir top width
WQv	ac-ft	Water quality volume
Z_{FB}	ft	Forebay depth
Z_{LB}	ft	Littoral bench depth below permanent pool surface
Z_P	ft	Average permanent pool depth
Z_{WQ}	ft	Depth of WQv above invert of outlet

Part IIIb, Step 5) Water quality outlet orifice diameter derivation from Orifice Equation

$Q_{WQ} = C_o * A * (2 * g * H)^{0.5}$ (Orifice Equation)

$Q_{WQ} = C_o * (\pi * D_o^2/4) * (2 * g * H)^{0.5}$ (D_o = orifice diameter in feet)

$D_o = \{4 * Q_{WQ}/[C_o * \pi * (2 * g * H)^{0.5}]\}^{0.5}$ (Solve for D_o, in feet)

$D_o = 12 * 2 * \{Q_{WQ}/[C_o * \pi * (2 * g * H)^{0.5}]\}^{0.5}$ (Simplify and convert D_o to inches)

SECTION 12

FlexTable: Catchment Table (Predev_Northwest.ppc)

Current Time: 0.000 hours

Label	Time of Concentration (Composite) (hours)	SCS CN	Area (User Defined) (acres)	Outflow Node
NORTHWEST	0.745	78.000	3.900	NORTHWEST OUTFALL

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
NORTHWEST	2YR	2	0.506	12.350	3.89
NORTHWEST	5YR	5	0.753	12.350	5.89
NORTHWEST	10YR	10	0.949	12.350	7.45
NORTHWEST	25YR	25	1.220	12.350	9.59
NORTHWEST	50YR	50	1.429	12.300	11.22
NORTHWEST	100YR	100	1.641	12.300	12.87

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
NORTHWEST OUTFALL	2YR	2	0.506	12.350	3.89
NORTHWEST OUTFALL	5YR	5	0.753	12.350	5.89
NORTHWEST OUTFALL	10YR	10	0.949	12.350	7.45
NORTHWEST OUTFALL	25YR	25	1.220	12.350	9.59
NORTHWEST OUTFALL	50YR	50	1.429	12.300	11.22
NORTHWEST OUTFALL	100YR	100	1.641	12.300	12.87

SECTION 13

FlexTable: Catchment Table (Postdev_Northwest.ppc)

Current Time: 0.000 hours

Label	Time of Concentration (Composite) (hours)	SCS CN	Area (User Defined) (acres)	Outflow Node
UNDETAINED 1	0.100	78.000	0.280	NORTHWEST OUTFALL

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
UNDETAINED 1	2YR	2	0.037	11.950	0.66
UNDETAINED 1	5YR	5	0.055	11.950	0.99
UNDETAINED 1	10YR	10	0.069	11.950	1.24
UNDETAINED 1	25YR	25	0.088	11.950	1.58
UNDETAINED 1	50YR	50	0.104	11.950	1.84
UNDETAINED 1	100YR	100	0.119	11.950	2.10

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
NORTHWEST OUTFALL	2YR	2	0.037	11.950	0.66
NORTHWEST OUTFALL	5YR	5	0.055	11.950	0.99
NORTHWEST OUTFALL	10YR	10	0.069	11.950	1.24
NORTHWEST OUTFALL	25YR	25	0.088	11.950	1.58
NORTHWEST OUTFALL	50YR	50	0.104	11.950	1.84
NORTHWEST OUTFALL	100YR	100	0.119	11.950	2.10

SECTION 14

STORM SEWER SIZING

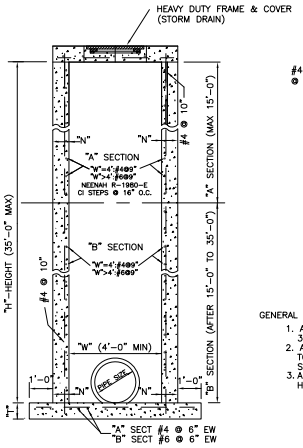
CARLSON CONSULTING ENGINEERS
DATE: JUNE 2013
PROJECT: #6392-00 TOPEKA (E), KANSAS
DESIGN STORM: 10-YR 24 HR. 5.28 IN.

Start Node	Stop Node	Total Flow (ft^3/s)	Capacity (Full Flow) (ft^3/s)	Length (Unified) (ft)	Pipe Size (in)	Slope (%)	Elevation Ground (Start) (ft)	Invert (Upstream) (ft)	Cover (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Downstream) (ft)	Cover (Stop) (ft)	Average Velocity (ft/s)	Manning's Number	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CB 1	CB 2	11.95	24.88	112	24	1.21%	982.40	977.90	2.50	982.40	976.54	3.86	3.80	0.013	981.11	980.80
CB 2	CB 3	18.83	24.88	112	24	1.21%	982.40	976.54	3.86	982.40	975.19	5.21	5.99	0.013	980.46	979.69
CB 3	CB 4	25.71	45.12	112	30	1.21%	982.40	974.69	5.21	982.40	973.33	6.57	5.24	0.013	979.47	979.03
CB 4	CB 5	32.65	45.12	112	30	1.21%	982.40	973.33	6.57	982.40	971.98	7.92	6.65	0.013	978.69	977.98
CB 5	CB 6	55.03	73.36	112	36	1.21%	982.40	971.48	7.92	982.40	970.12	9.28	7.79	0.013	977.04	976.28
CB 6	JB 2	63.32	73.36	160	36	1.21%	982.40	970.12	9.28	984.50	968.19	13.31	8.96	0.013	975.53	974.09
JB 2	CI 1	68.33	73.36	53	36	1.21%	984.50	968.19	13.31	983.35	967.55	12.80	9.67	0.013	973.07	972.51
CI 1	CI 2	68.97	73.36	94	36	1.21%	983.35	967.55	12.80	983.30	966.41	13.89	9.76	0.013	971.77	970.77
CI 2	CI 3	70.06	73.36	148	36	1.21%	983.30	966.41	13.89	983.10	964.62	15.48	9.91	0.013	970.01	968.37
CI 3	HW 1	71.54	74.47	210	36	1.25%	983.10	964.62	15.48	973.50	962.00	8.50	12.00	0.013	967.30	964.36
AI 1	AI 2	7.09	7.11	113	15	1.21%	989.00	985.25	2.50	992.00	983.88	6.87	6.60	0.013	986.32	985.02
AI 2	CB 5	14.8	44.28	278	24	3.83%	992.00	983.13	6.87	982.40	972.48	7.92	12.69	0.013	984.52	977.98
JB 1	JB 2	5.01	74.74	96	24	10.92%	984.55	979.67	2.88	984.50	969.19	13.31	13.53	0.013	980.46	974.09
AI 3	CI 5	4.74	12.35	155	15	3.65%	985.00	981.25	2.50	982.55	975.59	5.71	9.40	0.013	982.13	977.79
CI 5	CI 6	25.71	29.06	36	24	1.65%	982.55	974.84	5.71	982.55	974.24	6.31	10.44	0.013	976.62	976.13
CI 6	CI 7	29.45	52.68	226	30	1.65%	982.55	973.74	6.31	982.45	970.01	9.94	11.03	0.013	975.59	972.54
CI 7	JB 5	32.33	52.68	69	30	1.65%	982.45	970.01	9.94	983.55	968.88	12.18	11.28	0.013	971.95	971.42
JB 5	CI 8	32.78	52.68	156	30	1.65%	983.55	968.88	12.18	983.55	966.30	14.75	11.31	0.013	970.82	968.93
CI 8	CI 9	34.5	52.68	179	30	1.65%	983.55	966.30	14.75	982.90	963.35	17.05	11.44	0.013	968.30	966.51
CI 9	HW 2	43.12	52.58	82	30	1.64%	982.90	963.35	17.05	973.50	962.00	9.00	11.95	0.013	965.54	963.79
JB 4	CI 5	6.69	43.94	128	24	3.77%	984.30	979.67	2.63	982.55	974.84	5.71	10.10	0.013	980.59	977.79
JB 3	CI 4	5.34	34.84	121	24	2.37%	984.50	979.67	2.83	981.80	976.80	3.00	8.03	0.013	980.49	978.49
CI 4	CI 5	12.22	29.06	119	24	1.65%	981.80	976.80	3.00	982.55	974.84	5.71	8.85	0.013	978.06	977.79
TW 1	JB 5	0.45	9.42	53	10	18.49%	985.00	980.35	3.82	983.55	970.55	12.17	8.88	0.013	980.64	971.42
TW 2	CI 8	0.45	14.57	28	10	44.21%	985.00	980.35	3.82	983.55	967.97	14.75	12.08	0.013	980.64	968.93
JB 6	CI 9	5.79	86.28	95	24	14.55%	984.80	977.67	5.13	982.90	963.85	17.05	15.62	0.013	978.52	966.51
OCS	HW 3	23.2	37.58	63	36	0.32%	973.50	960.20	10.30	973.50	960.00	10.50	5.59	0.013	961.89	961.55

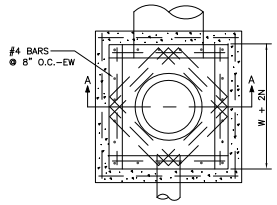
CASTING SELECTION TABLE

CARLSON CONSULTING ENGINEERS
DATE: JUNE 2013
PROJECT: #6392-00 TOPEKA (E), KANSAS
DESIGN STORM: 10-YR 24-HR. 5.28 IN.

SUBAREA	FLOW (cfs)	MAXIMUM PONDING (in)	ORIFICE EQ. AREA REQ'D. (sf)	WEIR EQ. PER. REQ'D. (ft)	EAST JORDON IRON WORKS, INC. (No.)	OPEN AREA (ft)	PERIMETER (ft)	ORIFICE PONDING DEPTH (in)	WEIR PONDING DEPTH (in)
CB 1	11.95	6	3.40	10.15	V-5732-80 (DBL)	3.931	16.000	4.48	4.43
CB 2	6.62	6	1.88	5.62	V-5736-80	2.472	12.750	3.48	3.48
CB 3	6.88	6	1.96	5.84	V-5736-80	2.472	12.750	3.75	3.57
CB 4	6.94	6	1.97	5.89	V-5736-80	2.472	12.750	3.82	3.59
CB 5	7.39	6	2.10	6.28	V-5736-80	2.472	12.750	4.33	3.74
CB 6	8.29	6	2.36	7.04	V-5732-80 (DBL)	3.931	16.000	2.16	3.47



SECTION A–A



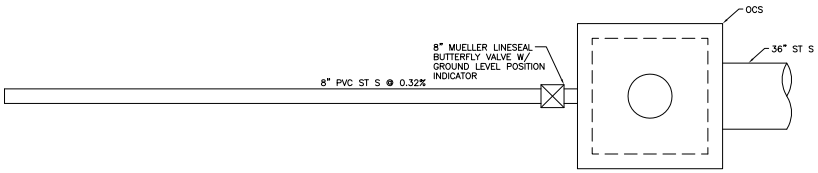
PLAN VIEW

TABLE OF "W" DIMENSIONS			
PIPE SIZE	SKEW OF CROSS DRAIN		
SINGLE	STRAIGHT	30°	45°
24"	4'-0"	4'-0"	4'-10"
30"	4'-0"	4'-7"	5'-8"
36"	4'-0"	5'-3"	6'-5"
42"	5'-3"	5'-11"	7'-3"
48"	5'-10"	6'-7"	8'-0"
60"	7'-0"	7'-10"	9'-8"

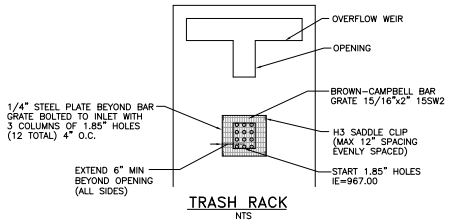
TABLE OF "T" & "N" DIMENSIONS			
SECTION	WIDTH ("W")	"T"	"N"
"A"	BETWEEN 4' & 7'	6" + PIPE THICKNESS	8"
	GREATER THAN 7'	6" + PIPE THICKNESS	8"
"B"	4'	6" + PIPE THICKNESS	8"
	BETWEEN 4' & 7'	6" + PIPE THICKNESS	10"

GENERAL NOTES:

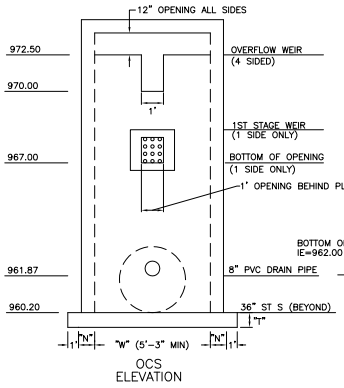
1. ALL EXPOSED CORNERS TO HAVE 3/4" CHAMFER.
2. ALL #4 & #5 REINFORCING BARS TO HAVE 1 1/2" COVER, LARGER SIZES TO HAVE 2" COVER.
3. ALL EXPOSED SURFACES TO BE HAND RUBBED SAND FINISH.



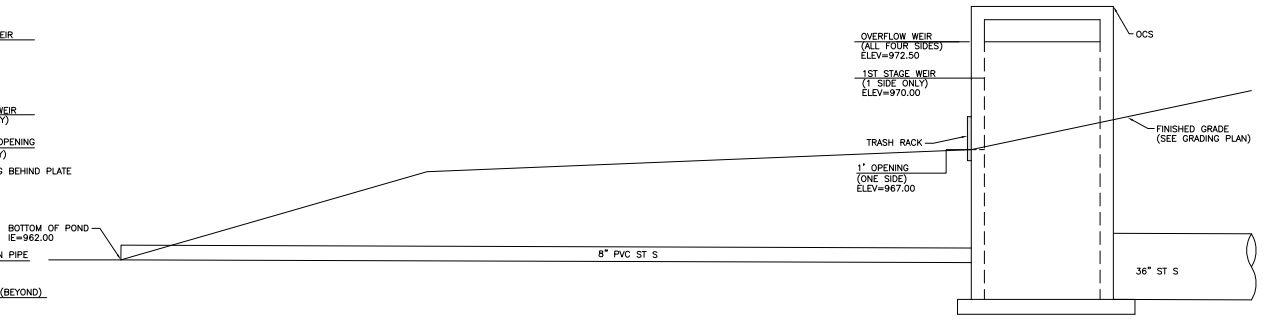
OCS OVERALL PLAN VIEW
NTS



TRASH RACK
NTS



OCS
ELEVATION



OCS OVERALL PROFILE
NTS

OUTLET CONTROL STRUCTURE