

Introduction

This report provides information and supporting documentation to support the "Drainage Plan" for Messiah Baptist Church Addition to Sedgwick County, Kansas. The site is located within Section 3, of TWP-27-S, R-2-E.

The "Drainage Plan" being submitted herein is intended to serve as a guide for the design of streets and storm water sewer improvements. Modifications to structures, pipes, etc, may be made as necessary during the final design in order to obtain the most economical design and construction possible.

Peak Flow Analysis

The peak flow rates for the defined basins were computed using the "Rational Method". The Rational "C" coefficients were assigned to the basins according to land use.

Basin #1

The existing land use for drainage basin #1 is open space. A rational "C" value of 0.40 was assigned to this basin. There are no proposed changes to this basin.

Area = 3.3 acres
Time of Concentration = 15 min.
I2 = 3.83 in/hr
I10 = 5.22 in/hr
I100 = 7.37 in/hr

Q = CIA
Q2 = 5.1 cfs
Q10 = 6.9 cfs
Q100 = 9.7 cfs

Basin #2 and #3

The existing basin will be divided during development. The existing land use for these basins is undeveloped open space. A rational "C" value of 0.40 was assigned for existing conditions. Basin #3 will have minimal improvements, with a developed "C" value of 0.42. Basin #2 will have an increase of 5 impervious acres. A weighted rational "C" value based on area, of 0.56 was assigned for developed conditions. A detention facility will be installed within basin #2.

Existing Runoff

Area = 15.1 acres
Time of Concentration = 25 min.
I2 = 2.96 in/hr
I10 = 4.13 in/hr
I100 = 5.90 in/hr

Q = CIA
Q2 = 17.9 cfs
Q10 = 24.9 cfs
Q100 = 35.6 cfs

Developed Runoff (Basin #2)

Area = 11.9 acres
Time of Concentration = 25 min.
I2 = 2.96 in/hr
I10 = 4.13 in/hr
I100 = 5.90 in/hr

Q = CIA
Q2 = 19.7 cfs
Q10 = 27.5 cfs
Q100 = 39.7 cfs

Developed Runoff (Basin #3)

Area = 3.2 acres
Time of Concentration = 15 min.
I2 = 3.83 in/hr
I10 = 5.22 in/hr
I100 = 7.37 in/hr

Q = CIA
Q2 = 5.1 cfs
Q10 = 7.0 cfs
Q100 = 9.9 cfs

Basin #4 and #5

The existing basin will be divided during development. The existing land use for these basins is undeveloped open space. A rational "C" value of 0.40 was assigned for existing conditions. Basin #5 will have minimal improvements, with a developed "C" value of 0.42. Basin #4 will have an increase of 5 impervious acres. A weighted rational "C" value based on area, of 0.61 was assigned for developed conditions. A detention facility will be installed within basin #4.

Existing Runoff

Area = 19.7 acres
Time of Concentration = 25 min.
I2 = 2.96 in/hr
I10 = 4.13 in/hr
I100 = 5.90 in/hr

Q = CIA
Q2 = 23.3 cfs
Q10 = 32.5 cfs
Q100 = 46.5 cfs

Developed Runoff (Basin #4)

Area = 11.9 acres
Time of Concentration = 25 min.
I2 = 2.96 in/hr
I10 = 4.13 in/hr
I100 = 5.90 in/hr

Q = CIA
Q2 = 29.8 cfs
Q10 = 41.6 cfs
Q100 = 59.4 cfs

Developed Runoff (Basin #5)

Area = 3.2 acres
Time of Concentration = 15 min.
I2 = 3.83 in/hr
I10 = 5.22 in/hr
I100 = 7.37 in/hr

Q = CIA
Q2 = 5.1 cfs
Q10 = 7.0 cfs
Q100 = 9.9 cfs

Table with 4 columns: (CFS), (INCHES), (AC-FT), CUMULATIVE AREA = 0.02 sq MI

10 KK POND1

HYDROGRAPH ROUTING DATA table with columns: STATION, ELEVATION, AREA, LOW-LEVEL OUTLET, SPILLWAY

COMPUTED STORAGE-ELEVATION DATA table with columns: STORAGE, ELEVATION

COMPUTED OUTFLOW-ELEVATION DATA table with columns: OUTFLOW, ELEVATION

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA table with columns: STORAGE, OUTFLOW, ELEVATION

HYDROGRAPH AT STATION POND1 table with columns: PEAK FLOW TIME, (CFS), (INCHES), (AC-FT)

PEAK STORAGE TIME table with columns: (AC-FT), (INCHES), (AC-FT), CUMULATIVE AREA = 0.02 sq MI

OPERATION STATION table with columns: OPERATION, STATION, PEAK FLOW, TIME OF PEAK, AVERAGE FLOW FOR MAXIMUM PERIOD, BASIN AREA, MAXIMUM STAGE, TIME OF MAX STAGE

*** NORMAL END OF HEC-1 ***

HEC-1 INPUT PAGE 1
LINE ID: 1 MESSIAH BAPTIST CHURCH, 2 WEST BASIN POND, 3 159497, 4 0000 300, 5 KK WEST, 6 SA -018, 7 PH 0 0 0.86 1.8425 3.73 4.6 5.04 5.94 6.96 8.16

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1G, HEC1GB, AND HEC1GX. THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

HEC-1 INPUT PAGE 1
LINE ID: 10 KK POND1, 11 RS 1 ELEV 1378, 12 SA 0 1.3, 13 SE 1378 1381, 14 SL 1379 3.14 .67 .5, 15 SS 1380 10 2.8 1.5

HEC-1 INPUT PAGE 1
LINE ID: 1 MESSIAH BAPTIST CHURCH, 2 WEST BASIN POND, 3 159497, 4 0000 300, 5 KK EAST, 6 SA -058, 7 PH 100 0 0.86 1.8425 3.73 4.6 5.04 5.94 6.96 8.16

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LINE ID: 1 MESSIAH BAPTIST CHURCH, 2 EAST BASIN POND, 3 159497, 4 0000 300, 5 KK EAST, 6 SA -058, 7 PH 100 0 0.86 1.8425 3.73 4.6 5.04 5.94 6.96 8.16

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PRINT CONTROL
PLOT CONTROL
HYDROGRAPH TIME DATA
ENGLISH UNITS
COMPUTATION INTERVAL 0.02 HOURS
TOTAL TIME BASE 4.98 HOURS

5 KK WEST

SUBBASIN RUNOFF DATA
SUBBASIN CHARACTERISTICS
PRECIPITATION DATA
SCS LOSS RATE
SCS DIMENSIONLESS UNITGRAPH

VALUE EXCEEDS TABLE IN LOGLOG table with columns: UNIT HYDROGRAPH, 115 END-OF-PERIOD ORDNATES

HYDROGRAPH AT STATION WEST
TOTAL RAINFALL = 5.68, TOTAL LOSS = 2.29, TOTAL EXCESS = 3.40

HYDROGRAPH TIME DATA
ENGLISH UNITS
COMPUTATION INTERVAL 0.02 HOURS
TOTAL TIME BASE 4.98 HOURS

5 KK EAST

SUBBASIN RUNOFF DATA
SUBBASIN CHARACTERISTICS
PRECIPITATION DATA
SCS LOSS RATE
SCS DIMENSIONLESS UNITGRAPH

VALUE EXCEEDS TABLE IN LOGLOG table with columns: UNIT HYDROGRAPH PARAMETERS, 115 END-OF-PERIOD ORDNATES

HYDROGRAPH AT STATION EAST

TOTAL RAINFALL = 5.66, TOTAL LOSS = 2.19, TOTAL EXCESS = 3.50

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	24-HR (INCHES)	72-HR (INCHES)	4.98-HR (CFS)
54	2.78	11	3.357	5	11

CUMULATIVE AREA = 0.03 SQ MI

10 KK POND1

HYDROGRAPH ROUTING DATA

11 RS STORAGE ROUTING

NOTES	NUMBER OF SUBREACHES
ITYP	ELEV TYPE OF INITIAL CONDITION
RSVIC	1377.00 INITIAL CONDITION
X	0.00 MORNING R AND D COEFFICIENT

12 SA AREA 0.0 1.0 1.3

13 SE ELEVATION 1377.00 1378.00 1381.00

14 SL LOW-LEVEL OUTLET

ELEV	ELEVATION AT CENTER OF OUTLET
1379.00	
CAREA	3.14 CROSS-SECTIONAL AREA
COOL	0.67 COEFFICIENT
EXPL	4.50 EXPONENT OF HEAD

15 SS SPILLWAY

CREL	SPILLWAY CREST ELEVATION
1380.00	
SPWID	10.00 SPILLWAY WIDTH
COM	2.00 WEIR COEFFICIENT
EXPW	1.50 EXPONENT OF HEAD

COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	0.33	3.77
ELEVATION	1377.00	1378.00	1381.00

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	0.00	0.00	15.67	15.83	16.00	16.16	16.34	16.51	16.69	16.87
ELEVATION	1377.00	1379.00	1379.86	1379.88	1379.90	1379.92	1379.94	1379.96	1379.98	1380.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.33	1.38	2.36	2.38	2.41	2.43	2.45	2.48	2.50
OUTFLOW	0.00	0.00	0.00	15.67	15.83	16.00	16.16	16.34	16.51	16.69
ELEVATION	1377.00	1378.00	1379.00	1379.86	1379.88	1379.90	1379.92	1379.94	1379.96	1379.98

HYDROGRAPH AT STATION POND1

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	24-HR (INCHES)	72-HR (INCHES)	4.98-HR (CFS)
20	3.55	6	1.923	3	6

CUMULATIVE AREA = 0.03 SQ MI

RUNOFF SUMMARY

FLOW IN CUBIC FEET PER SECOND

TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD	6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	EAST	54	2.78	11	11	11	11	0.03		
ROUTED TO	POND1	20	3.55	6	6	6	6	0.03	1380.15	3.55

*** NORMAL END OF REC-1 ***

DRAINAGE PLAN

MESSIAH BAPTIST CHURCH ADDITION

SEDGWICK COUNTY, KANSAS

Existing Conditions	Developed Conditions
Area = 3.3 acres	Area = 3.3 acres
Impervious Area = 0 acres	Impervious Area = 0.5 acres
Tc = 15 min.	Tc = 15 min.
C = 0.40	C = 0.48
Q _p = 5.1 cfs	Q _p = 6.1 cfs
Q ₁₀ = 6.9 cfs	Q ₁₀ = 8.3 cfs
Q ₅₀ = 9.7 cfs	Q ₅₀ = 11.7 cfs

Existing Conditions	Developed Conditions
Area = 11.9 acres	Area = 11.9 acres
Impervious Area = 0 acres	Impervious Area = 5 acres
Tc = 25 min.	Tc = 25 min.
C = 0.40	C = 0.56
Q _p = 14.1 cfs	Q _p = 18.7 cfs
Q ₁₀ = 19.6 cfs	Q ₁₀ = 27.5 cfs
Q ₅₀ = 28.1 cfs	Q ₅₀ = 39.3 cfs

Existing Conditions	Developed Conditions
Area = 16.5 acres	Area = 16.5 acres
Impervious Area = 0 acres	Impervious Area = 7 acres
Tc = 25 min.	Tc = 25 min.
C = 0.40	C = 0.61
Q _p = 19.5 cfs	Q _p = 29.8 cfs
Q ₁₀ = 27.2 cfs	Q ₁₀ = 41.6 cfs
Q ₅₀ = 38.9 cfs	Q ₅₀ = 59.4 cfs

Existing Conditions	Developed Conditions
Area = 3.2 acres	Area = 3.2 acres
Impervious Area = 0 acres	Impervious Area = 0.1 acres
Tc = 15 min.	Tc = 15 min.
C = 0.40	C = 0.42
Q _p = 4.9 cfs	Q _p = 5.1 cfs
Q ₁₀ = 5.7 cfs	Q ₁₀ = 7.0 cfs
Q ₅₀ = 8.4 cfs	Q ₅₀ = 9.9 cfs

Existing Conditions	Developed Conditions
Area = 3.2 acres	Area = 3.2 acres
Impervious Area = 0 acres	Impervious Area = 0.1 acres
Tc = 15 min.	Tc = 15 min.
C = 0.40	C = 0.42
Q _p = 4.9 cfs	Q _p = 5.1 cfs
Q ₁₀ = 5.7 cfs	Q ₁₀ = 7.0 cfs
Q ₅₀ = 8.4 cfs	Q ₅₀ = 9.9 cfs

West Pond Design Data
 Peak Storage Volume = 0.82 ac-ft
 Surface Area @ Peak Stage = 1.1 ac.
 24" Outflow Pipe
 E. in = 1378.0 msl
 E. out = 1371.0 msl
 Peak Outflow Rate = 23 cfs

East Pond Design Data
 Peak Storage Volume = 2.0 ac-ft
 Surface Area @ Peak Stage = 1.2 ac.
 24" Outflow Pipe
 E. in = 1377.0 msl
 E. out = 1375.5 msl
 Peak Outflow Rate = 20 cfs

LEGEND:

- (C) = CALCULATED
- (D) = DESCRIBED
- (M) = MEASURED
- = #4 REBAR W/ 'BAUGHMAN' CAP (SET)
- ⊕ = #5 FORGY REBAR (FOUND)
- = 1/2" IRON W/ THIMBLE (FOUND)
- PP = POWER POLE
- ⊕ = SIGN
- ⊕ = STORM DRAIN MANHOLE
- ⊕ = TRAFFIC MANHOLE

OWNER:

MESSIAH BAPTIST CHURCH
 ATTN: PASTOR MARK HOOVER
 2006 S. HILLSIDE
 WICHITA, KANSAS 67211
 (316) 682-9445

LEGAL DESCRIPTION:

THE WEST 40 ACRES OF THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 3, TOWNSHIP 26 SOUTH, RANGE 2 EAST OF THE SIXTH PRINCIPAL MERIDIAN, SEDGWICK COUNTY, KANSAS

BENCH MARK:

GREENWICH AND 21ST NORTH
 CITY OF WICHITA BENCH MARK - DISC
 41' SOUTH AND 58' WEST OF IRON CTR LINE BOTH
 17.0' SW OF ASPHALT, 14.2' EAST OF FACE P.P.
 17.0' WEST OF FACE P.P.
 ELEVATION = 1361.38 (CITY DATUM)

NOTE:

NO RURAL WATER IN AREA.

