EXECUTIVE SUMMARY - J.R. SANDLIAN ADDITION EXISTING DRAINAGE CONDITIONS

Site Description

The J.R. Sandlian Addition is approximately 7.97 acres located along the west side of Hoover Road, approx. 425 feet north of West 29th Street North, in the City of Wichita, Sedgwick County, Kansas. The existing site consists of existing buildings and sheds, existing pavements, existing gravel areas, and a grassed area located in the western portion of the site. The existing site is used for wrecking and salvage. There are no proposed improvements planned for this site. Platting of the site was a requirement of a zone change to allow the owner to use western portion of the property for wrecking/salvage.

Drainage Study Purpose and Methodology

The purpose of this drainage study is to illustrate the existing stormwater drainage conditions in accordance with the City of Wichita's stormwater policy. The runoff computations were performed using the Rational Method. The runoff coefficients and time of concentrations were derived using methodologies defined by "Chapter 4: Hydrologic Analysis" in "Volume 2: Technical Guidance" of the "City of Wichita / Sedgwick County: Stormwater Manual" published on March 16, 2011.

Existing Drainage Conditions

The USDA web soil survey indicates the site mainly consists of "Pratt" loamy fine sand (Hydrologic Soil Group "A"). However, the northwest area of site consists of "Tabler" silt clay loam (Hydrologic Soil Group "D"). The site receives off-site runoff (approx. 2.0 acres) from the undeveloped land to the north. The off-site and on-site runoff is conveyed through the site along existing, natural drainage paths. The site is relatively flat and appears to collect stormwater in several locations. The existing runoff discharges from the site at two locations. The first discharge point includes runoff from drainage basins C and D (see attached Exhibit A) and is an eroded swale located approximately 250 feet west of the Southeast property corner. The second discharge point includes runoff from drainage basins A and B and is a low point located approximately 125-feet north of the Southwest property corner. In addition, there is a small drainage area that directs existing runoff to the ditch running adjacent to Hoover Road.

Existing Hydrologic Characteristics

Table - 1: Basin Characteristics

Basin	Land Use Type	A (ac)	Soil Class Name	HSG	% Use	C_2	C_5	C_{10}	C_{100}
A	Undeveloped	0.31	Pratt/Tabler	A/D	73.8	0.52	0.54	0.59	0.68
	Gravel	0.11			26.2	0.24	0.26	0.33	0.48
Off-Site	**Basin Area >>**	**0.42**	**Weighted C values >>**			**0.45**	**0.47**	**0.52**	**0.63**
B	Undeveloped	3.78	Pratt/Tabler	A/D	90.0	0.52	0.54	0.59	0.68
	Gravel	0.42			10.0	0.24	0.26	0.33	0.48
On-Site	**Basin Area >>**	**4.20**	**Weighted C values >>**			**0.49**	**0.51**	**0.56**	**0.66**
C	Undeveloped	1.37	Pratt	A	87.3	0.52	0.54	0.59	0.68
	Gravel	0.17			10.8	0.24	0.26	0.33	0.48
	Roof	0.03			1.9	0.80	0.85	0.90	0.93
Off-Site	**Basin Area >>**	**1.57**	**Weighted C values >>**			**0.50**	**0.52**	**0.57**	**0.66**
D	Undeveloped	1.79	Pratt	A	49.4	0.52	0.54	0.59	0.68
	Gravel	1.62			44.8	0.24	0.26	0.33	0.48
	Paved Parking	0.10			2.8	0.87	0.88	0.90	0.93
	Roof	0.11			3.0	0.80	0.85	0.90	0.93
On-Site	**Basin Area >>**	**3.62**	**Weighted C values >>**			**0.41**	**0.43**	**0.49**	**0.61**
E	Undeveloped	0.07	Pratt	A	63.6	0.52	0.54	0.59	0.68
	Gravel	0.04			36.4	0.24	0.26	0.33	0.48
Off-Site	**Basin Area >>**	**0.11**	**Weighted C values >>**			**0.42**	**0.44**	**0.50**	**0.61**
F	Urban Lawn	0.00	Pratt	A	0.0	0.08	0.09	0.13	0.23
	Gravel	0.00			0.0	0.24	0.26	0.33	0.48
	Paved Parking	0.12			80.0	0.87	0.88	0.90	0.93
	Roof	0.03			20.0	0.80	0.85	0.90	0.93
On-Site	**Basin Area >>**	**0.15**	**Weighted C values >>**			**0.86**	**0.87**	**0.90**	**0.93**

Methodology for determining Rational Runoff Coeffients is based on "Chapter 4 - Hydrologic Analysis" in Volume 2 - "Technical Guidance" of the City of Wichita / Sedgwick County - "Stormwater Manual", published March 16, 2011.

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Land Use Type (based on Sedgwick Aerials)

A = Drainage Area (based on Sedgwick County Lidar)

HSG = Hydrologic Soil Group (based on USDA web soil survey)

% Used = Precent Land Use Type based on Basin Drainage Area

C_N = Rational Runoff Coefficient for design storm "N" (refer to Stormwater Manual: Appendix C)

These coefficients were weighted for each basin drainage area

Existing Hydrologic Characteristics (continued)

Table - 2: Time of Concentration

Basin	Sheet Flow				Shallow Flow				Open Channel Flow (2-yr Rainfall)								T_C
	L (ft)	n	S (%)	T_S (min)	L (ft)	K	S (%)	T_{SC} (min)	L (ft)	n	B (ft)	m (ft/ft)	A (sf)	P_W (ft)	S (%)	T_{OC} (min)	(min)
A	100	0.15	1.20	11.49	70	7	0.14	4.45									16
B	100	0.15	1.30	11.13	300	7	0.23	14.89	217	0.05	20	100	9.1	63.6	0.51	6.2	32
B+A									282	0.04	2	52	13.1	52.3	0.10	10.0	42
C	100	0.15	1.40	10.81	152	7	0.92	3.77									15
D	100	0.15	0.80	13.52	300	7	1.33	6.19	251	0.05	20	50	9.8	48.5	0.16	10.2	30
C+D	100	0.15	0.80	13.52	300	7	1.33	6.19	251	0.05	20	50	13.4	55.5	0.16	9.1	29
E	100	0.15	1.15	11.69	13	7	1.00	0.31									12
F	84	0.15	2.26	7.76													8

Methodology for determining Time of Concentration is based on "Chapter 4 - Hydrologic Analysis" in Volume 2 - "Technical Guidance" of the City of Wichita / Sedgwick County - "Stormwater Manual", published March 16, 2011.

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Sheet Flow

L = Flow length (based on Sedgwick County Lidar)

n = Manning's sheet flow roughness coefficient (refer to Stormwater Manual: Appendix A-1)

S = Land slope (based on Sedgwick County Lidar)

P_2 = 2-year, 24-hour rainfall (3.5 inches per Stormwater Manual: Table 4.1)

T_S = Sheet flow travel time (refer to Stormwater Manual: Equation 4.5)

$$T_S = (0.42*(n*L)^{0.8})/(P_2^{0.5} * S^{0.4})$$

Shallow Concentration Flow

L = Flow length (based on Sedgwick County Lidar)

K = Velocity Coefficient (refer to Stormwater Manual: Table 4.5)

S = Watercourse slope (based on Sedgwick County Lidar)

T_{SC} = Shallow concentrate flow travel time (subsitute Stormwater Manual: Equation 4.6 into Equation 4.4)

$$T_{SC} = L / (60 * K * S^{0.5})$$

Open Channel Flow

L = Flow length (based on Sedgwick County Lidar)

n = Manning's n Values (refer to Stormwater Manual: Appendix A-2)

B = Width of channel bottom

m = Side slope of channel banks ("m" horizontal feet to 1 vertical foot) (m:1)

A = Cross-sectional flow area (estimated using Manning's Open Channel Flow Equation)

P_W = Wetted perimeter (estimated using Manning's Open channel Flow Equation)

S = Channel slope (based on Sedgwick County Lidar)

T_{OC} = Open Channel flow travel time (subsitute Stormwater Manual: Equation 4.7 into Equation 4.4)

$$T_{OC} = L / (60 * ((1.49/n) * (A/P_W)^{0.667} * S^{0.5}$$

T_C = Time of Concentration (refer to Stormwater Manual: Equation 4.8)

$$T_C = \Sigma T_S + \Sigma T_{SC} + \Sigma T_{OC}$$

Existing Hydrologic Characteristics (continued)

Table - 3: Runoff Rates (Rational Method)

Basin	A (ac)	Tc (min)	2 year			5 year			10 year			100 year		
			I_2 (iph)	C_2	Q_2 (cfs)	I_5 (iph)	C_5	Q_5 (cfs)	I_{10} (iph)	C_{10}	Q_{10} (cfs)	I_{100} (iph)	C_{100}	Q_{100} (cfs)
A	0.42	15	3.83	0.45	0.7	4.56	0.47	0.9	5.22	0.52	1.1	7.37	0.63	1.9
B	4.20	32	2.57	0.49	5.3	3.10	0.54	7.0	3.63	0.59	9.0	5.22	0.68	14.9
A+B	4.62	42	2.18	0.49	4.9	2.68	0.53	6.6	3.13	0.58	8.4	4.54	0.68	14.2
C	1.57	15	3.83	0.50	3.0	4.56	0.52	3.7	5.22	0.57	4.7	7.37	0.66	7.7
D	3.62	30	2.67	0.41	4.0	3.37	0.43	5.3	3.90	0.49	6.9	5.59	0.61	12.2
C+D	5.19	29	2.72	0.44	6.2	3.30	0.46	7.9	3.83	0.51	10.2	5.49	0.62	17.7
E	0.11	15	3.83	0.42	0.2	4.56	0.44	0.2	5.22	0.50	0.3	7.37	0.61	0.5
F	0.15	15	3.83	0.86	0.5	4.56	0.87	0.6	5.22	0.90	0.7	7.37	0.93	1.0
E+F	0.26	15	3.83	0.67	0.7	4.56	0.69	0.8	5.22	0.73	1.0	7.37	0.79	1.5

Methodology for determining Time of Concentration is based on "Chapter 4 - Hydrologic Analysis" in Volume 2 - "Technical Guidance" of the City of Wichita / Sedgwick County - "Stormwater Manual", published March 16, 2011.

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A = Drainage Area (refer to Table - 1)

T_C = Time of Concentration (refer to Table - 2)

Minumin T_C is 15-minutes (limitation per Stormwater Manual on page 4-10)

I_N = Rainfall Intensity for design storm "N" with a duration equal to Tc (refer to Stormwater Manual: Appendix B)

C_N = Weighted Rational Runoff Coefficient for design storm "N" (refer to Table - 1)

Q_N = Rational Runoff Rate for design storm "N" (refer to Stormwater Manual: Equation 4.15)

$Q = C * I * A$