PRELIMINARY DRAINAGE PLAN AND SUPPORTING CALCULATIONS

FOR

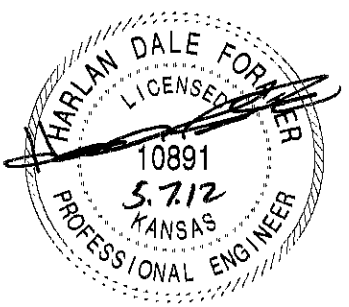
BRUCE HARRIS ADDITION
WICHITA, KANSAS

PREPARED FOR:
HARRIS3 LLOC
BRUCE R. HARRIS, MANAGER
1223 N. ROCK RD, BLDG G, STE 300
WICHITA, KS 67206

MAY 7TH, 2012

PREPARED BY:

CERTIFIED ENGINEERING DESIGN, P.A.
1935 WEST MAPLE
WICHITA, KANSAS 67213-3311
(316)262-8808 PHONE
(316)262-1669 FAX



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1935 West Maple
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(316)262-8808 Office
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LETTER OF TRANSMITTAL

DATE: May 7th, 2012

TO: Mr. Scott Lindebak, P.E.
Engineering Division
City of Wichita
7th Floor, City Hall
455 N. Main
Wichita, KS 67202

RE: Drainage Plan
Bruce Harris Addition
Wichita, KS

FROM: Harlan D. Foraker, P.E. HDF

cc: Mr. Mark Savoy, Savoy Company, P.A.

I. TAB 1 – PROJECT NARRATIVE:

Discussion of Development

The goal of this report is to analyze the existing drainage patterns and design the proposed drainage system to serve the Bruce Harris Addition in Wichita, KS. This site is located on the east side of N. West St., about 350 ft north of the intersection of W. 3rd St. and N. West St. This site is currently developed as residential property with native grass cover. The SCS soil type present on the site is the Urban Land-Canadian Complex and is an unrated SCS soil type. The proposed improvements include adding a 15,800 s.f. building with parking area to the proposed lot. The total area of the proposed lot is 0.93 acres. An aerial photograph of the proposed plat site is located in the Appendix.

Offsite Conditions

It appears that 0.21 acres of offsite drainage enters the site from the north. The north property line of the site will match existing ground for proposed conditions and continue to allow the offsite drainage to flow east or west along the north property line. A copy of the USGS map is located in the Appendix.

Description of Best Management Practices

The total disturbed area will be less than 1 acre. This means that water quality is not required for this site. Therefore there are no permanent structural stormwater management facilities incorporated into the site design.

Summary of Runoff Calculations

The proposed runoff calculations cause an increase in peak discharge for all storm series when compared with existing runoff calculations. However, since the proposed site area does not add an additional 1 acre of impervious area, no detention is required. Table 1 shows existing and developed runoff calculations.

Existing & Proposed Peak Runoff	
Description	Q (cfs)
Existing Basin A (2 yr.)	1.23
Existing Basin A (5 yr.)	1.66
Existing Basin A (10 yr.)	2.36
Existing Basin A (25 yr.)	2.89
Existing Basin A (100 yr.)	4.59
Proposed Basin A (2 yr.)	2.09
Proposed Basin A (5 yr.)	3.39
Proposed Basin A (10 yr.)	3.96
Proposed Basin A (25 yr.)	4.65
Proposed Basin A (100 yr.)	5.87

TABLE 1 – EXISTING AND PROPOSED RUNOFF CALCULATIONS

II. TAB 2 – EXISTING CONDITIONS RUNOFF CALCULATIONS

Runoff Method

The rational method was used to compute the peak discharges for existing and proposed conditions. Rational 'C' factors were assigned to the existing site and proposed improvements from the City of Wichita Storm Water Manual. Rainfall intensity tables from the same manual were utilized to determine the rainfall intensity for the 2, 5, 10, 25, and 100 year design storms. The Soil Conservation Service TR-55 manual was used to compute the time of concentration for the drainage areas. A design assumption was made as follows: that the minimum time of concentration is 15 minutes.

Soil Types were determined from the Natural Resource Conservation Soil Survey website. The SCS soil type present is the Urban Land-Canadian Complex, which is an unrated SCS soil type. Therefore, it was assumed that this soil is an SCS type D soil.

Existing Conditions

The proposed plat site has been outlined as two existing drainage basins labeled "A" and "B". Drainage basin "A" sheet flows to the west across the site where it enters West St. and then dumps into existing storm sewer along West St. Drainage basin "A"

is 0.22 acres with 0.09 acres of impervious area, and it has an average land slope near 1%. Drainage basin "B" sheet flows to the east across the property line. Drainage basin "B" is 0.70 acres with .04 acres of impervious area, and it has an average land slope near 1%. A summary of the existing drainage calculations can be seen in Table 2. The existing drainage basins can be seen on the 1" = 20' Existing Drainage Map located in the Appendix.

Existing Peak Runoff					
Description	C	Tc	I (in./hr)	Area (acres)	Q (cfs)
Existing Basin A (2 yr.)	0.50	15	3.83	0.22	0.42
Existing Basin A (5 yr.)	0.54	15	4.56	0.22	0.54
Existing Basin A (10 yr.)	0.62	15	5.22	0.22	0.71
Existing Basin A (25 yr.)	0.64	15	6.06	0.22	0.85
Existing Basin A (100 yr.)	0.76	15	7.37	0.22	1.23
Existing Basin B (2 yr.)	0.3	15	3.83	0.70	0.80
Existing Basin B (5 yr.)	0.35	15	4.56	0.70	1.12
Existing Basin B (10 yr.)	0.45	15	5.22	0.70	1.64
Existing Basin B (25 yr.)	0.48	15	6.06	0.70	2.04
Existing Basin B (100 yr.)	0.65	15	7.37	0.70	3.35
Offsite Drainage (2 yr.)	0.57	15	3.83	0.21	0.46
Offsite Drainage (5 yr.)	0.61	15	4.56	0.21	0.58
Offsite Drainage (10 yr.)	0.66	15	5.22	0.21	0.72
Offsite Drainage (25 yr.)	0.68	15	6.06	0.21	0.87
Offsite Drainage (100 yr.)	0.79	15	7.37	0.21	1.22

Table 2 – Existing Runoff Calculations

The total 100 yr peak discharge for the existing site is 4.59 cfs.

Ground Water Elevations

According to the Kansas Geological Survey's Kansas Water Well Database, the static water surface elevation of the ground water in this area is around 15-20 ft. A Static Water Level Map of Existing Wells is located in the Appendix.

III. TAB 3 – POST-DEVELOPMENT HYDROLOGIC ANALYSIS

Developed Conditions

The proposed plat site will contain a 15,800 s.f. building with parking area. For proposed conditions, this site has been divided into 4 drainage basins labeled 1, 2, 3, and 4. Drainage basins 1 and 3 drain out the existing drives to the east onto West St., where the runoff dumps into an existing curb inlet. Drainage basins 2 and 4 sheet flow across the proposed property lines. The runoff from drainage basins 2 and 4 is very minimal and will have no adverse impact on surrounding properties. A summary of the developed drainage calculations can be seen in Table 3. The developed drainage basin can be seen on the 1"=20' Proposed Drainage Map located in the Appendix.

Proposed Peak Runoff					
Description	C	Tc	I (in./hr)	Area (acres)	Q (cfs)
Proposed Basin 1 (2 yr.)	0.86	15	2.83	0.28	0.68
Proposed Basin 1 (5 yr.)	0.86	15	4.56	0.28	1.10
Proposed Basin 1 (10 yr.)	0.87	15	5.22	0.28	1.27
Proposed Basin 1 (25 yr.)	0.87	15	6.06	0.28	1.48
Proposed Basin 1 (100 yr.)	0.88	15	7.37	0.28	1.82
Proposed Basin 2 (2 yr.)	0.30	15	2.83	0.1	0.08
Proposed Basin 2 (5 yr.)	0.35	15	4.56	0.1	0.16
Proposed Basin 2 (10 yr.)	0.45	15	5.22	0.1	0.23
Proposed Basin 2 (25 yr.)	0.48	15	6.06	0.1	0.29
Proposed Basin 2 (100 yr.)	0.65	15	7.37	0.1	0.48
Proposed Basin 3 (2 yr.)	0.87	15	2.83	0.52	1.28
Proposed Basin 3 (5 yr.)	0.87	15	4.56	0.52	2.06
Proposed Basin 3 (10 yr.)	0.87	15	5.22	0.52	2.36
Proposed Basin 3 (25 yr.)	0.88	15	6.06	0.52	2.77
Proposed Basin 3 (100 yr.)	0.89	15	7.37	0.52	3.41
Proposed Basin 4 (2 yr.)	0.50	15	2.83	0.03	0.04
Proposed Basin 4 (5 yr.)	0.53	15	4.56	0.03	0.07
Proposed Basin 4 (10 yr.)	0.60	15	5.22	0.03	0.09
Proposed Basin 4 (25 yr.)	0.62	15	6.06	0.03	0.11
Proposed Basin 4 (100 yr.)	0.73	15	7.37	0.03	0.16

Table 3 – Proposed Runoff Calculations

The total 100 yr peak discharge for the proposed site is 5.87 cfs. This gives an increase in the peak discharge of about 1.28 cfs for the 100 yr design storm. Since the proposed development will not add 1 acre of impervious area, no detention is required. The proposed building will have a finished floor elevation of 1310.15. This means that most of the runoff from the site will drain to the west onto West St. Therefore, more runoff will drain to West St. from this property than existing conditions allowed. However, the increase in runoff is not large enough to cause a substantial increase in discharge.

Stormwater Quality

The proposed land disturbance will be less than 1 acre. Therefore no stormwater quality will be required for this site.

IV. TAB 4 – FLOODPLAIN SUBMITTAL

FEMA Floodplain Boundary

There is no FEMA floodplain located on this property. A copy of the FEMA floodplain map is attached for review in the Appendix.

V. TAB 5 – FEDERAL, STATE, AND LOCAL PERMITS

A. US Army Corps of Engineers

Not Applicable

B. Kansas Department of Agriculture

Not Applicable

C. Federal Emergency Management Agency (FEMA)

Not Applicable

D. Kansas Department of Transportation

Not Applicable

E. Sedgwick County Right-of-way Permit

Not Applicable

APPENDIX

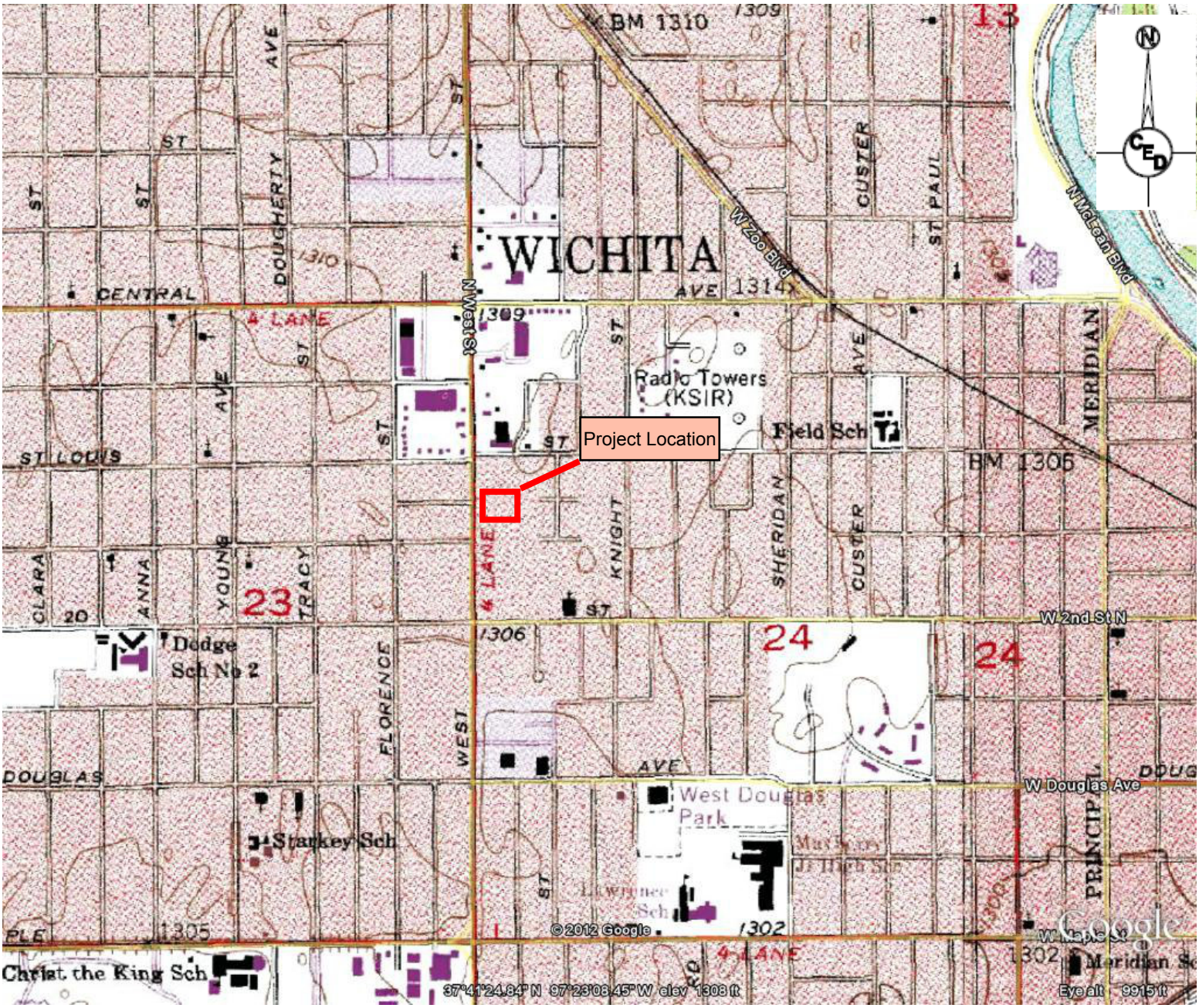
GENERAL MAPS

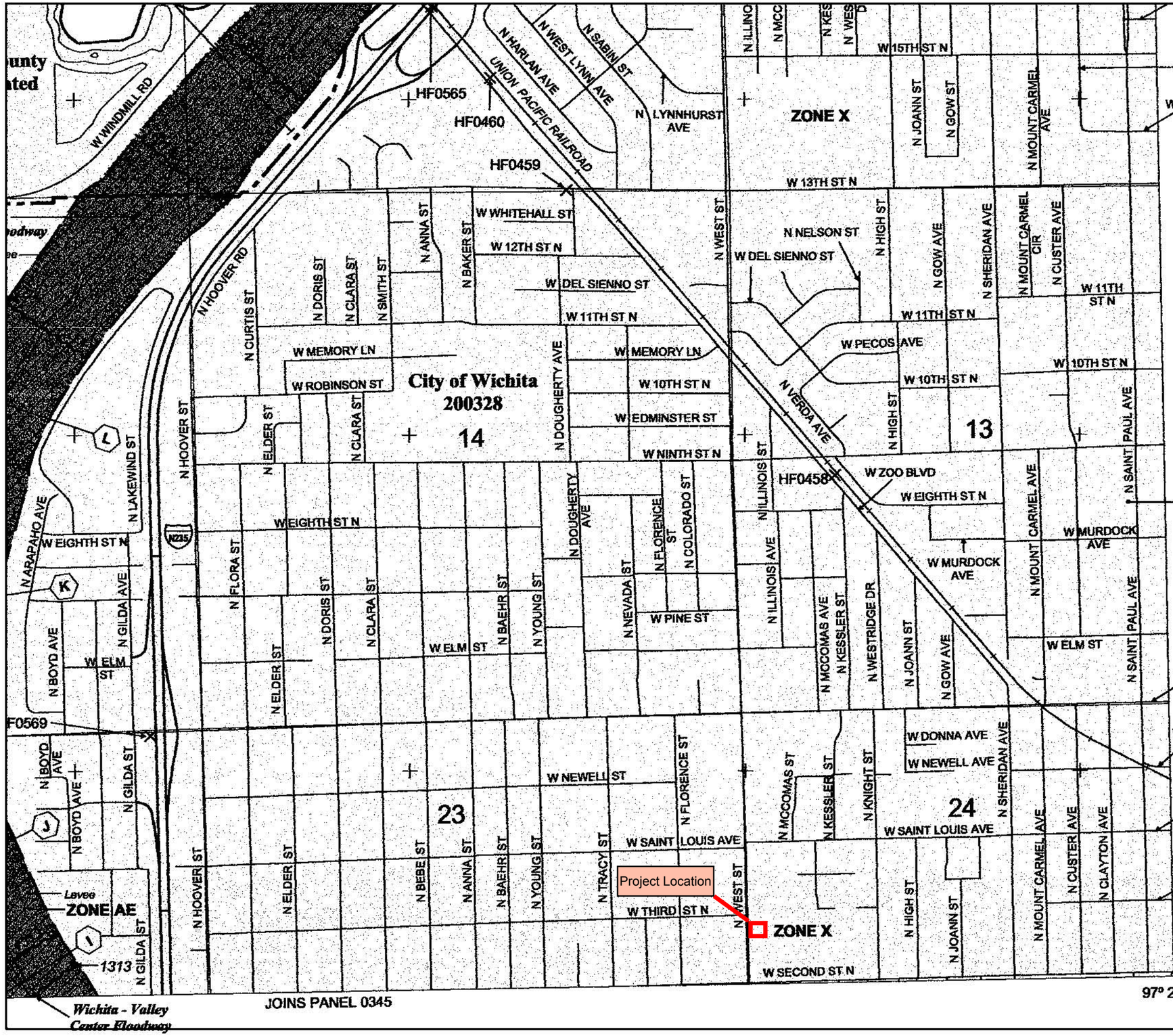
Aerial Photo

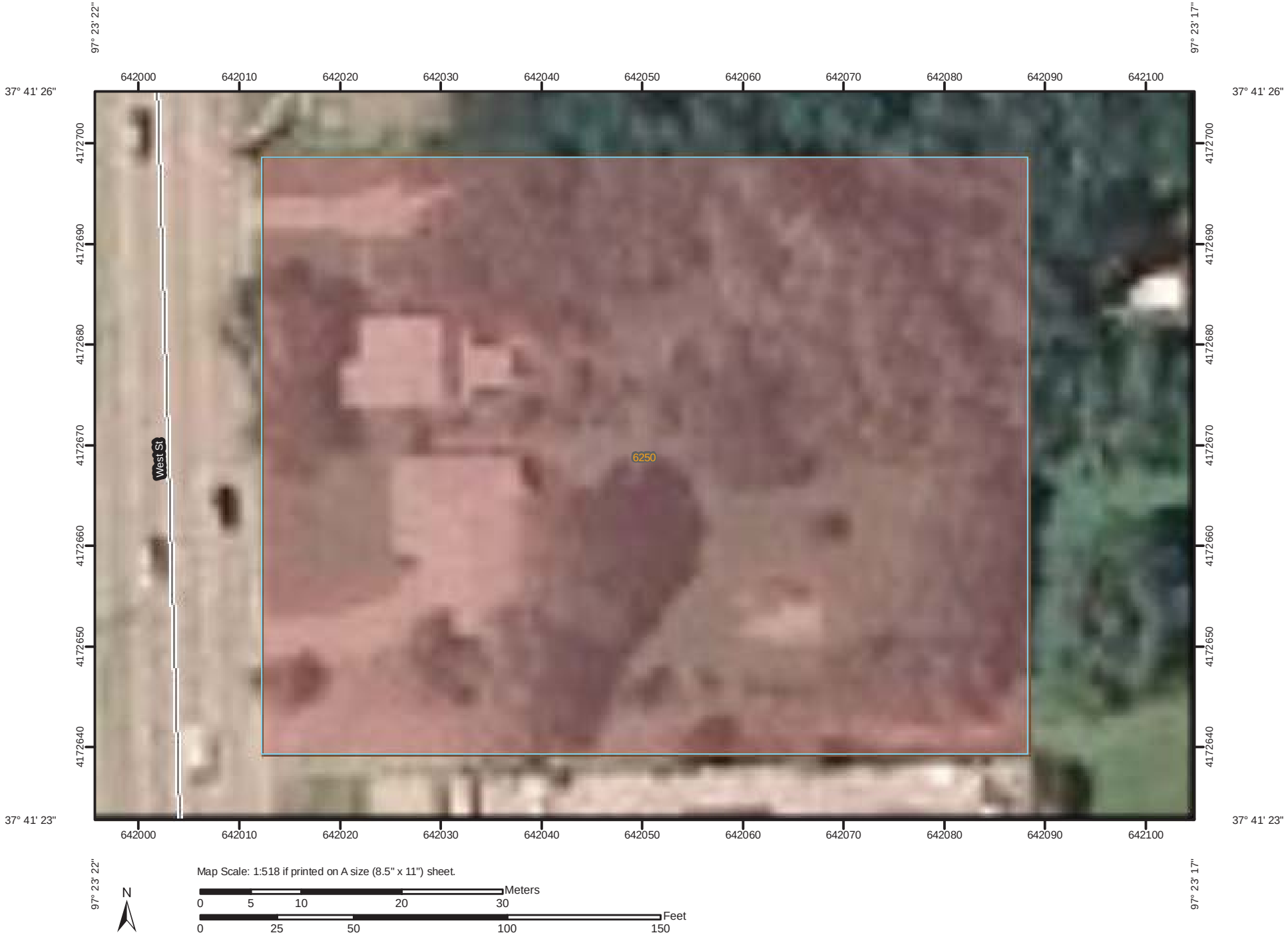
Bruce Harris Addition
350 ft N. of the Intersection of W. 3rd St. N. and N. West St.
Wichita, Kansas, 67203
CED Job # 20122031

Quad Map

Bruce Harris Addition
350 ft N. of the Intersection of W. 3rd St. N. and N. West St.
Wichita, Kansas, 67203
CED Job # 20122031






97° 23' 22"
97° 23' 17"
642000
642010
642020
642030
642040
642050
642060
642070
642080
642090
642100
37° 41' 26"
37° 41' 23"
4172700
4172690
4172680
4172670
4172660
4172650
4172640
West St
6250
Map Scale: 1:518 if printed on A size (8.5" x 11") sheet.
N
Meters
0 5 10 20 30
Feet
0 25 50 100 150

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- Urban land-Canadian complex, 0 to 3 percent slopes
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:518 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 14N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Sedgwick County, Kansas
Survey Area Data: Version 7, Nov 30, 2010

Date(s) aerial images were photographed: 6/20/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Name

Map Unit Name— Summary by Map Unit — Sedgwick County, Kansas (KS173)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
6250	Urban land-Canadian complex, 0 to 3 percent slopes	Urban land-Canadian complex, 0 to 3 percent slopes	1.1	100.0%
Totals for Area of Interest			**1.1**	**100.0%**

Description

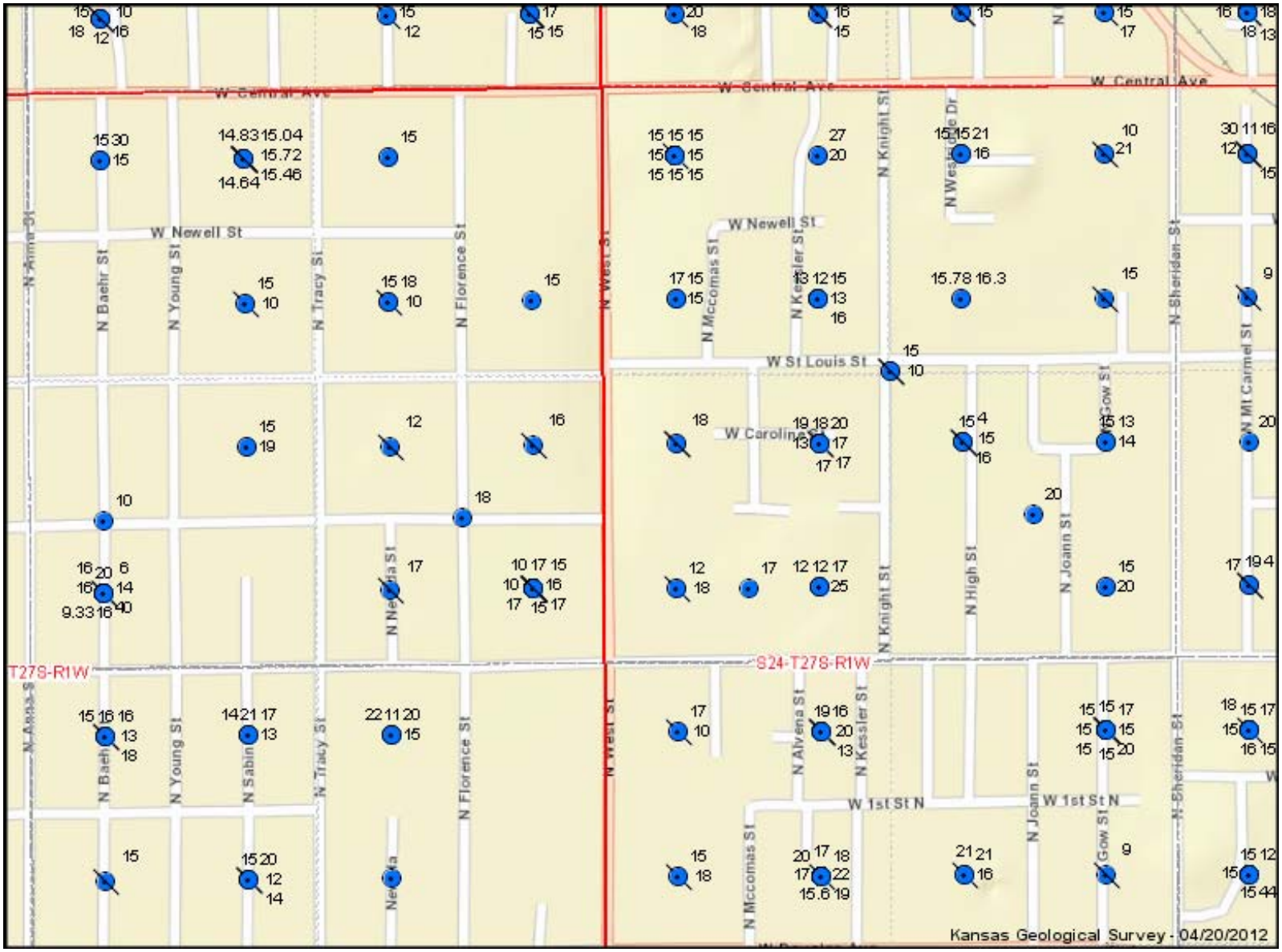
A soil map unit is a collection of soil areas or nonsoil areas (miscellaneous areas) delineated in a soil survey. Each map unit is given a name that uniquely identifies the unit in a particular soil survey area.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Static Water Level Depth of Surrounding Wells (ft)



EXISTING AND DEVELOPED DRAINAGE MAPS

SITE BENCH MARK:
Square "□" cut top of curb
Elevation = 1307.56 (NAVD 88)

Lot 1
Ashford Addition

Owner:
Hunan Restaurant & Club Inc.
446 N. West St.
Wichita, Ks. 67203

Owner:
Saratoga Services Inc.
P.O. Box 12976
Wichita, Ks. 67277

OFFSITE DRAINAGE DATA
TOTAL AREA = 0.21 acres
IMPERVIOUS AREA = 0.10 acres
SCS SOIL TYPE D
URBAN LAND-CANADIAN COMPLEX
C 100 = 0.79
Tc = 15 min.
i 100 = 7.37"/hr
Q 100 = 1.22 cfs

EXISTING DRAINAGE DATA-A
TOTAL AREA = 0.22 acres
IMPERVIOUS AREA = 0.09 acres
SCS SOIL TYPE D
URBAN LAND-CANADIAN COMPLEX
C 100 = 0.76
Tc = 15 min.
i 100 = 7.37"/hr
Q 100 = 1.23 cfs

EXISTING DRAINAGE DATA-B
TOTAL AREA = 0.70 acres
IMPERVIOUS AREA = 0.04 acres
SCS SOIL TYPE D
URBAN LAND-CANADIAN COMPLEX
C 100 = 0.65
Tc = 15 min.
i 100 = 7.37"/hr
Q 100 = 3.35 cfs

DRAINAGE LEGEND
- Existing Drainage Flow Direction (Concentrated)
- Existing Drainage Flow Direction (Sheet Flow)
- (A) Existing Drainage Subarea
- Existing Flowline Path
- Existing Drainage Boundary

Owner:
Connie J. Hart
438 N. West St.
Wichita, Ks. 67203

Owner:
Harris 3 LLC
1223 N. Rock Road
Wichita, Ks. 67206

REV.	DESCRIPTION	DATE

GRAPHIC SCALE
20' 0 20'
(IN FEET)
1"=20'

BRUCE HARRIS ADDITION

WICHITA, KS
SEDGWICK COUNTY, KS

CERTIFIED ENGINEERING DESIGN, P.A.
CIVIL ENGINEERING SERVICES

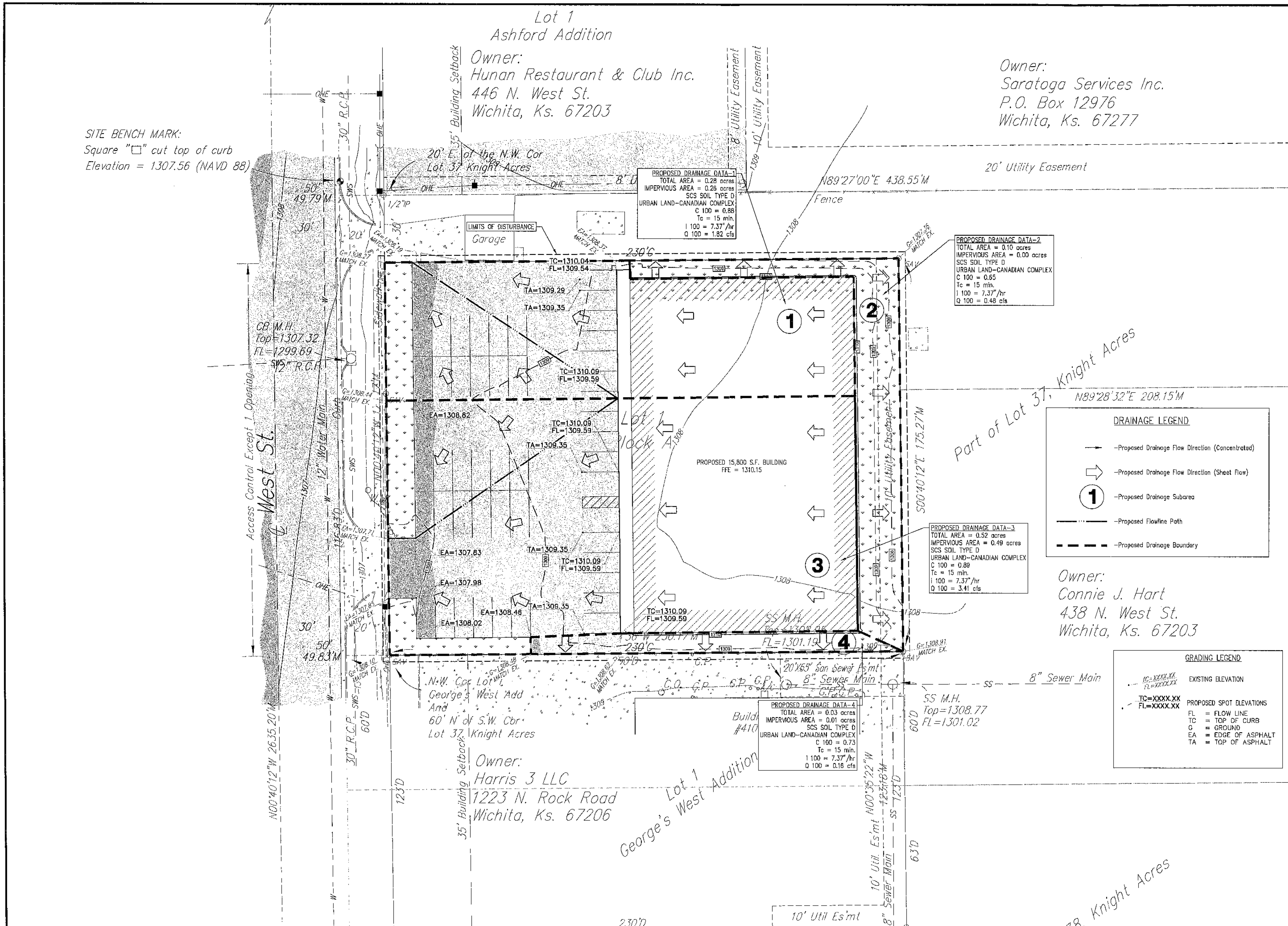
1935 WEST MAPLE STREET
WICHITA, KANSAS 67213
PH.(316)262-8808 FAX.(316)262-1669

HARLAN DALE FORAKER
LICENSED
10891
5.7.12
KANSAS
PROFESSIONAL ENGINEER

PROJECT NO.: 20122031
ISSUE DATE: 04/23/12
CONTACT: L. MILLS / H. FORAKER
CHECKED BY:

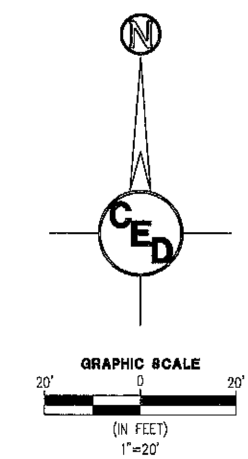
EXISTING DRAINAGE MAP

1 OF 2



Lot 1
Ashford Addition
Owner:
Hunan Restaurant & Club Inc.
446 N. West St.
Wichita, Ks. 67203
Owner:
Saratoga Services Inc.
P.O. Box 12976
Wichita, Ks. 67277
SITE BENCH MARK:
Square "□" cut top of curb
Elevation = 1307.56 (NAVD 88)
35' Building Setback
8' Utility Easement
10' Utility Easement
20' Utility Easement
20' E. of the N.W. Cor
Lot 37 Knight Acres
N89°27'00"E 438.55'M
Fence
LIMITS OF DISTURBANCE
Garage
230'C
PROPOSED DRAINAGE DATA-1
TOTAL AREA = 0.28 acres
IMPERVIOUS AREA = 0.26 acres
SCS SOIL TYPE D
URBAN LAND-CANADIAN COMPLEX
C 100 = 0.88
Tc = 15 min.
I 100 = 7.37"/hr
Q 100 = 1.82 cfs
PROPOSED DRAINAGE DATA-2
TOTAL AREA = 0.10 acres
IMPERVIOUS AREA = 0.00 acres
SCS SOIL TYPE D
URBAN LAND-CANADIAN COMPLEX
C 100 = 0.65
Tc = 15 min.
i 100 = 7.37"/hr
Q 100 = 0.48 cfs
PROPOSED DRAINAGE DATA-3
TOTAL AREA = 0.52 acres
IMPERVIOUS AREA = 0.49 acres
SCS SOIL TYPE D
URBAN LAND-CANADIAN COMPLEX
C 100 = 0.89
Tc = 15 min.
i 100 = 7.37"/hr
Q 100 = 3.41 cfs
PROPOSED DRAINAGE DATA-4
TOTAL AREA = 0.03 acres
IMPERVIOUS AREA = 0.01 acres
SCS SOIL TYPE D
URBAN LAND-CANADIAN COMPLEX
C 100 = 0.73
Tc = 15 min.
I 100 = 7.37"/hr
Q 100 = 0.16 cfs
CB M.H.
Top=1307.32
FL=1299.69
12" R.C.P.
30" R.C.P.
12" Water Main
West St.
Access Control Except 1 Opening
N00°40'12"W 2635.20'M
TC=1310.04
FL=1309.54
TA=1309.29
TA=1309.35
TC=1310.09
FL=1309.59
EA=1308.82
TA=1309.35
EA=1307.83
EA=1307.98
EA=1308.46
EA=1308.02
Lot 1
Block A
PROPOSED 15,800 S.F. BUILDING
FFE = 1310.15
1
2
3
4
N89°28'32"E 208.15'M
Part of Lot 37, Knight Acres
S00°40'12"E 175.21'M
SS M.H.
FL=1301.19
N.W. Cor Lot 1,
George's West Add
And
60' N. of S.W. Cor
Lot 37 Knight Acres
20'X55' San Sewer Es'mt
8" Sewer Main
SS M.H.
Top=1308.77
FL=1301.02
Owner:
Connie J. Hart
438 N. West St.
Wichita, Ks. 67203
Owner:
Harris 3 LLC
1223 N. Rock Road
Wichita, Ks. 67206
Lot 1
George's West Addition
10' Util. Es'mt
10' Util Es'mt
38, Knight Acres
230'D
123'D
63'D
60'D
DRAINAGE LEGEND
—Proposed Drainage Flow Direction (Concentrated)
—Proposed Drainage Flow Direction (Sheet Flow)
—Proposed Drainage Subarea
—Proposed Flowline Path
—Proposed Drainage Boundary
GRADING LEGEND
EXISTING ELEVATION
TC=XXXX.XX
FL=XXXX.XX
PROPOSED SPOT ELEVATIONS
FL = FLOW LINE
TC = TOP OF CURB
G = GROUND
EA = EDGE OF ASPHALT
TA = TOP OF ASPHALT

REV.	DESCRIPTION	DATE



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PROPOSED DRAINAGE MAP

RAINFALL INTENSITY TABLE AND RATIONAL C VALUES

1988 Drainage Criteria Manual
City of Wichita, Kansas
Rainfall Intensity Table for Sedgwick County, KS

The following tabulation contains rainfall intensity in inches per hour as derived from ESSA Weather Bureau Technical Paper 40 Modified to NWS Hydro-35, 1977 During First Hour.

Table 1 Rainfall Intensity Table (Duration 15 min – 120 min)

DURATION, in hours	DURATION, in minutes	RETURN PERIOD						
		1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
0.0833	5	4.18	5.57	6.53	7.41	8.52	9.48	10.32
0.1000	6	3.99	5.32	6.25	7.09	8.16	9.09	9.89
0.1167	7	3.81	5.09	5.99	6.81	7.84	8.74	9.50
0.1333	8	3.66	4.89	5.75	6.55	7.55	8.42	9.15
0.1500	9	3.52	4.70	5.54	6.31	7.28	8.13	8.83
0.1667	10	3.39	4.52	5.34	6.09	7.04	7.86	8.54
0.1833	11	3.27	4.36	5.16	5.89	6.81	7.61	8.27
0.2000	12	3.18	4.21	4.99	5.71	6.60	7.38	8.02
0.2167	13	3.05	4.08	4.84	5.53	6.41	7.17	7.79
0.2333	14	2.96	3.95	4.69	5.37	6.23	6.97	7.57
0.2500	15	2.87	3.83	4.56	5.22	6.06	6.78	7.37
0.2667	16	2.78	3.72	4.43	5.08	5.90	6.60	7.18
0.2833	17	2.71	3.61	4.31	4.95	5.75	6.44	7.00
0.3000	18	2.63	3.51	4.20	4.83	5.61	6.29	6.84
0.3167	19	2.56	3.42	4.10	4.71	5.47	6.14	6.68
0.3333	20	2.50	3.33	4.00	4.60	5.35	6.00	6.53
0.3500	21	2.44	3.25	3.90	4.50	5.23	5.87	6.39
0.3667	22	2.38	3.17	3.81	4.40	5.12	5.75	6.26
0.3833	23	2.32	3.10	3.73	4.31	5.01	5.63	6.13
0.4000	24	2.27	3.03	3.65	4.22	4.91	5.52	6.01
0.4167	25	2.22	2.96	3.57	4.13	4.81	5.41	5.90
0.4333	26	2.20	2.90	3.50	4.05	4.72	5.31	5.79
0.4500	27	2.16	2.84	3.43	3.98	4.63	5.21	5.69
0.4667	28	2.14	2.78	3.37	3.90	4.55	5.12	5.59
0.4833	29	2.11	2.72	3.30	3.83	4.47	5.03	5.49
0.5000	30	2.08	2.67	3.24	3.76	4.39	4.94	5.40
0.5167	31	2.05	2.62	3.19	3.70	4.32	4.86	5.32
0.5333	32	2.02	2.57	3.10	3.63	4.25	4.79	5.22
0.5500	33	1.99	2.52	3.05	3.57	4.18	4.71	5.14
0.5667	34	1.96	2.48	3.01	3.51	4.11	4.63	5.07
0.5833	35	1.93	2.44	2.98	3.46	4.05	4.56	5.00
0.6000	36	1.91	2.39	2.93	3.41	3.99	4.50	4.93
0.6167	37	1.89	2.35	2.88	3.36	3.93	4.43	4.86
0.6333	38	1.87	2.32	2.84	3.31	3.87	4.37	4.79
0.6500	39	1.85	2.28	2.80	3.26	3.82	4.31	4.73
0.6667	40	1.83	2.24	2.76	3.22	3.76	4.25	4.66
0.6833	41	1.81	2.21	2.72	3.17	3.71	4.19	4.60
0.7000	42	1.79	2.18	2.68	3.13	3.66	4.13	4.54
0.7167	43	1.77	2.14	2.64	3.09	3.61	4.08	4.49
0.7333	44	1.75	2.11	2.61	3.05	3.57	4.03	4.43

Table C-1 Rational C Values

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
Business					
Downtown Areas	95	0.84	0.85	0.87	0.91
Neighborhood Areas	70	0.68	0.69	0.73	0.80
Residential Single Family (Soil Group D)					
1/8 Acre	50	0.57	0.61	0.66	0.79
1/4 Acre	38	0.50	0.54	0.62	0.76
1/3 Acre	30	0.46	0.50	0.59	0.73
1/2 Acre	25	0.42	0.48	0.56	0.72
3/4 Acre	22	0.42	0.46	0.55	0.71
1 Acre	20	0.41	0.45	0.54	0.71
Residentia Multi-Family (Soil Group D)					
Multi-Unit (detached)	60	0.62	0.66	0.72	0.82
Multi-Unit (attached)	65	0.64	0.68	0.73	0.83
Apartments	75	0.70	0.73	0.79	0.86
Residential Single Family (Soil Group C)					
1/8 Acre	50	0.55	0.58	0.64	0.73
1/4 Acre	38	0.48	0.51	0.57	0.68
1/3 Acre	30	0.43	0.46	0.53	0.65
1/2 Acre	25	0.40	0.43	0.50	0.63
3/4 Acre	22	0.39	0.42	0.49	0.62
1 Acre	20	0.37	0.40	0.48	0.61
Residential Multi-Family (Soil Group C)					
Multi-Unit (detached)	60	0.60	0.63	0.69	0.77
Multi-Unit (attached)	65	0.63	0.66	0.71	0.79
Apartments	75	0.68	0.72	0.77	0.83
Residential Single Family (Soil Group B)					
1/8 Acre	50	0.52	0.54	0.59	0.67
1/4 Acre	38	0.44	0.46	0.52	0.61
1/3 Acre	30	0.39	0.41	0.47	0.57
1/2 Acre	25	0.36	0.38	0.44	0.54
3/4 Acre	22	0.34	0.36	0.42	0.52
1 Acre	20	0.33	0.35	0.40	0.51
Residential Multi-Family (Soil Group B)					
Multi-Unit (detached)	60	0.58	0.60	0.65	0.72
Multi-Unit (attached)	65	0.61	0.64	0.68	0.75
Apartments	75	0.67	0.70	0.74	0.80
Single Family (Soil Group A)					
1/8 Acre	50	0.47	0.50	0.54	0.60
1/4 Acre	38	0.39	0.41	0.45	0.52
1/3 Acre	30	0.33	0.35	0.39	0.47
1/2 Acre	25	0.30	0.31	0.35	0.44

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
3/4 Acre	22	0.28	0.29	0.33	0.42
1 Acre	20	0.26	0.28	0.32	0.40
Multi-Family (Soil Group A)					
Multi-Unit (detached)	60	0.55	0.57	0.61	0.67
Multi-Unit (attached)	65	0.58	0.60	0.64	0.70
Apartments	75	0.65	0.68	0.72	0.77
Industrial					
Light Areas	70	0.68	0.69	0.73	0.80
Heavy Areas	80	0.74	0.76	0.79	0.84
Playgrounds	15	0.33	0.35	0.42	0.55
Schools	40	0.49	0.51	0.56	0.66
Railroad Yard Areas	30	0.43	0.45	0.50	0.62
Undeveloped Urban Areas					
Offsite Flow Analysis (when land use not defined)	45	0.52	0.54	0.59	0.68
Streets					
Paved	99	0.87	0.88	0.90	0.93
Gravel	00	0.24	0.26	0.33	0.48
Drive, Parking Lots and Walks:	96	0.87	0.87	0.88	0.89
Roofs	90	0.80	0.85	0.90	0.93
Urban Lawn Areas (Soil Group A)					
Slope less than 1%	00	0.08	0.09	0.13	0.23
Slope 1% to 4%	00	0.12	0.13	0.17	0.27
Slope more than 4%	00	0.16	0.17	0.21	0.31
Urban Lawn Areas (Soil Group B)					
Slope less than 1%	00	0.16	0.18	0.24	0.37
Slope 1% to 4%	00	0.20	0.22	0.28	0.41
Slope more than 4%	00	0.24	0.26	0.32	0.45
Urban Lawn Areas (Soil Group C)					
Slope less than 1%	00	0.24	0.27	0.35	0.51
Slope 1% to 4%	00	0.26	0.29	0.37	0.53
Slope more than 4%	00	0.28	0.31	0.39	0.55
Urban Lawn Areas (Soil Group D)					
Slope less than 1%	00	0.28	0.33	0.43	0.63
Slope 1% to 4%	00	0.30	0.35	0.45	0.65
Slope more than 4%	00	0.32	0.37	0.47	0.67