Adopted: February 23, 2007

CITY OF WICHITA

Public Works, Engineering Division
Final Drainage Plan Submittal Checklist

Reviewer: _____ Date: 11-5-07

Subdivision Name: CHAUTAUQUA ADDITION Location: 26TH ST. N. & CHAUTAUQUA

Total Land Area Of Ownership: _____ Acres

Type: X Residential _____ Commercial _____ Industrial _____ Recreation _____ Municipal _____ Other

Applicant: MENNONITE HOUSING Contact: _____ Phone #: _____

Engineer: CERTIFIED ENG. DESIGN Contact: HALEN FOREARLE Phone # 262-8808

Please check the appropriate box: I = Included; NA = Non-Applicable; R= Required prior to development
(If "NA" is checked, an explanation must be entered)

	Applicant			Engr	
Tab 1. Project Narrative	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Site Location Map, using USGS Map				✓	
B. Discussion of development, existing conditions, and proposed impacts on stormwater, wetland, riparian, and flood plain				✓	
C. Discussion of offsite conditions					✓
D. Summary of runoff calculations (pre/post development) No increase in peak discharge for all storm series				✓	
E. Narrative description of the type and function of the permanent best management practices that are incorporated into the site design					
F. Copy of the plat				✓	
G. Preliminary grading plan (The final grading plan shall be sealed, signed and dated prior to Engineering receiving the final sanitary sewer plans. One plan sheet and PDF shall be submitted to the Subdivision Engineer.)				✓	
H. Professional Engineer seal, signature and date on cover of report				✓	
I. CD of drainage plan in PDF format (one file) and one paper copy bound with this checklist included behind the cover				✓	

	Applicant			Engr	
Tab 2. Existing Conditions Runoff Calculations	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Copy of applicable orthophoto showing proposed project boundaries (preferable in color)				✓	
B. Runoff Method (Rational, Hydrograph Method, or other approved methods by Engineering)				✓	
C. Existing topography (no greater than 2-foot contours, 1-foot recommend)				✓	
D. Total Site Area and Total Impervious Area (acres)				✓	
E. Benchmarks used for site control				✓	
F. Streams, creeks, and waterway labeled					✓
G. Predominant soils from USDA soil surveys, and/or on site soil borings				✓	
H. Location and boundaries of natural features such as wetlands, lakes, and ponds with the normal water elevation noted				✓	
I. Location of existing roads, buildings, parking lots and other impervious areas.				✓	

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J. Location of existing utilities (e.g., water, sewer, gas, electric) and easements				✓	
K. Location of existing conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow				✓	
L. Flow paths				✓	
M. Location and dimensions of existing channels, bridges or culvert crossings					✓
N. Existing conditions hydrologic analysis for runoff rates, volumes and velocities showing methodologies used and supporting calculations (2, 5, 10, 25 & 100 year, 24-hour storm events) or Critical Duration				✓	
O. Assumed pre-developed runoff curve numbers				✓	
P. Existing time of concentrations used in calculations				✓	
Q. Evaluate immediate downstream drainage capacity, not to exceed more than 0.25 miles downstream of site					✓
R. Existing structural elevations (e.g., invert of pipes, manholes, etc.)					✓
S. Cross-section data for open channels					✓
T. Ground water elevations, if applicable					✓

	Applicant			Engr	
Tab 3. Post-Development Hydrologic Analysis	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Proposed (post-development) conditions hydrologic and hydraulic analysis for runoff rates, volumes, HGL, and velocities showing the methodologies used and supporting calculations for all applicable design storms (2, 5, 10, 25 & 100 year, 24-hour storm events)				✓	
B. Proposed time of concentrations used in calculations				✓	
C. Assumed post-developed runoff curve numbers				✓	
D. Proposed contours for detention facilities (to equal area used in outlet rating curves)					✓
E. Preliminary sizing calculations for stormwater controls including contributing drainage area, storage, and outlet configuration					✓
F. Stage-storage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities					✓
G. Final analysis of potential upstream/downstream impact/effects of project, where necessary					✓
H. Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.)					✓
I. Design water surface elevations and normal pool elevation for ponds.					✓
J. Typical detail for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc. To include height, width, elevation, and/or diameter.					✓
K. Proposed limits of clearing and grading					✓
L. Location of existing and proposed roads, buildings, parking lots and other impervious areas.					
M. Location of existing and proposed utilities (e.g., water, sewer) and easements				✓	
N. Location of existing and proposed conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow			EXISTING STREETS	✓	
O. Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings					✓

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P. Preliminary selection and location of stormwater controls					✓
Q. Emergency overflow structure's flow path					✓
R. Detention facility provides one-foot of freeboard above the HWL and emergency outfall shown (top of berm elevation shown)					✓
S. The 100-year 24-hour HWL delineated on the plan for detention pond					✓
T. Lowest opening elevations table on the plat for structures located adjacent to channels or ponds					✓
U. Stormwater Management Facilities located within a Reserve					✓
V. Maintenance responsibility of stormwater management facility shall be specified in the platters text. (e.g. HOA, Lot Owners Association, or lot)					✓
W. Off-site drainage easements or agreements required, where necessary			DEDICATED BY PLAT	✓	

	Applicant			Engr	
Tab 4. Floodplain Submittal	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Provide source of flood profile					✓
B. Nearest base flood elevations					✓
C. Delineation of pre-developed regulatory floodplain/floodway limits					✓
D. Delineation of post-developed regulatory floodplain and floodway limits					✓
E. Floodplain boundary determination per elevation (project limits shown)					✓
F. Provide source of floodway data table and discharges					✓
G. Provide all hydrologic and hydraulic study information for site-specific floodplain studies, unnumbered Zone A area elevation determinations and flood plain map revisions or required permits					✓
H. Provide regulatory floodway and four natural profile models (10,50,100, and 500-yr) for existing and future watershed conditions					✓
I. Location of floodplain/floodway limits and relationship of site to upstream/downstream properties (floodplain limits to be per elevation and scaled location)					✓
J. Flood plains and floodways located within a Reserve, where necessary					✓

	Applicant			Engr	
Tab 5. Federal, State and Local Permits (to be provided prior to construction unless otherwise specified)	**I/R**	**NA**	**Explanation / Location in Plan**	**I/R**	**NA**
					✓
A. US Army Corps of Engineers - Regulatory program permits (404 water quality certification)					✓
B. Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Flood Plain Fill, Levee, Water Appropriations, Dam safety permit, etc.)					✓
C. Federal Emergency Management Agency (FEMA) Letter of Map Changes (LOMA, LOMR, LOMR-f, CLOMR, etc.) Shall be included and approved when project modifies the limits of the floodway.					✓
D. Kansas Department of Transportation					✓
E. Sedgwick County Right-of-way Permit					✓

Consulting Engineer Initials HDF

DRAINAGE PLAN
AND
SUPPORTING CALCULATIONS

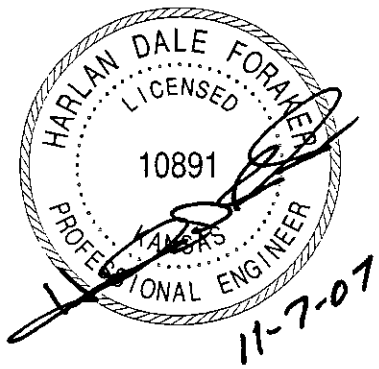
FOR
CHAUTAUQUA ADDITION
WICHITA, KANSAS

PREPARED FOR:
MENNONITE HOUSING LLC
2145 NORTH TOPEKA
WICHITA, KS 67214-1140

NOVEMBER 6, 2007

PREPARED BY:

CERTIFIED ENGINEERING DESIGN, P.A.
810 WEST DOUGLAS, SUITE C
WICHITA, KANSAS 67203-6105
(316)262-8808 PHONE
(316)262-1669 FAX



CERTIFIED ENGINEERING DESIGN, P.A
810 West Douglas,Suite C
Wichita, KS 67203-6105
(316)262-8808 Office
(316)262-1669 Fax

LETTER OF TRANSMITTAL

DATE: November 5, 2007

TO: Ms. Vicky Huang, P.E.
Engineering Division
455 North Main
Wichita, KS 67202

RE: Drainage Plan
Chataqua Addition
Wichita, KS

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

I. PROJECT NARRATIVE

The site is located west of Hillside Avenue and within the previously vacated right-of-way of 26th Street North. The site is currently undeveloped with lawn grass cover. The SCS soil type present within Chautauqua Addition is Urban land –Farnum complex and Farnum loam which are SCS Type B Soils.

II. EXISTING CONDITIONS RUNOFF CALCULATIONS

The rational method will be used to determine the peak discharges from the subareas of the study area. Rational 'C' Factors were assigned to the existing site and proposed improvements from "Interim Drainage and Storm Sewer Policy for Design Criteria and Documentation" for the City of Wichita, Kansas.

The rainfall intensity tables for the Sedgwick County, Kansas which were obtained from the Kansas Department of Transportation were utilized to determine the rainfall intensity for the 2 and 100 year design storms.

The Soil Conservation Service TR-55 manual was used to compute the Time of Concentration for the drainage subareas. A design assumptions was made as follows that the minimum subarea time of concentration is 15 minutes

Soil types were determined from the SCS Soil Survey for Sedgwick County, Kansas.

The developed drainage subareas have been delineated on the 1" = 40' site and topographic mapping survey performed for this site.

Design Storm Events Evaluated: 2, 5, 10, 25, 50 and 100 yr. storm events

The runoff calculations for the street, drainage channel design, drainage pipe design and detention pond storage have been completed utilizing the 5 year storm. A check of the drainage system has been made using the 100 year storm event.

The following tables summarize the peak discharges for existing conditions for the offsite drainage subbasin of 2.70 acres and the two proposed lots within Chautauqua Addition which each have an area of 0.15 acres and a combined total area of 0.30 acres.

EXISTING PEAK RUNOFF					
Description	C	Tc	I	Area	Q(cfs)
Existing Drainage SubArea(2 yr.)	.20	15	4.06	0.34	0.28
Existing Drainage SubArea(5 yr.)	.22	15	5.21	0.34	0.39
Existing Drainage SubArea(10 yr.)	.28	15	6.08	0.34	0.58
Existing Drainage Subarea(25 yr.)	.32	15	6.95	0.34	0.76
Existing Drainage SubArea(50 yr.)	.35	15	7.97	0.34	0.95
Existing Drainage SubArea(100 yr.)	.41	15	8.98	0.34	1.25

The existing runoff from the undeveloped site drainage from west to east and into the existing curb and gutter for Chautauqua Street. The existing 2 year storm event peak discharge for the north subbasin of 0.30 acres is 0.28 cfs. The existing 100 year storm event peak discharge for the south subbasin of 0.30 acres is 1.25 cfs.

III. POST DEVELOPMENT HYDROLOGIC ANALYSIS

Design Storm Events Evaluated: 2, 5, 10, 25, 50 and 100 yr. storm events

The runoff calculations for the street, drainage channel design, drainage pipe design and detention pond storage have been completed utilizing the 5 year storm. A check of the drainage system has been made using the 100 year storm event.

Storm sewer was analyzed for full flow conditions was using "Flowmaster" by Haestad Methods Inc.

The following tables summarize the peak discharges for developed conditions for the two lots within Chautauqua Addition. Lot 1 has a drainage area of 0.19

acresand Lot 2 has a drainage area of 0.15 acres. The total drainage area for Chautauqua Addition is 0.34 acres.

DEVELOPED PEAK RUNOFF					
Description	C	Tc	I	Area	Q(cfs)
Developed Lot 1 SubArea(2 yr.)	.52	15	4.06	0.19	0.40
Developed Lot 1 SubArea(5 yr.)	.54	15	5.21	0.19	0.53
Developed Lot 1 SubArea(10 yr.)	.59	15	6.08	0.19	0.68
Developed Lot 1 SubArea(25 yr.)	.63	15	6.95	0.19	0.83
Developed Lot 1 SubArea(50 yr.)	.65	15	7.97	0.19	0.98
Developed Lot 1 SubArea(100 yr.)	.67	15	8.98	0.19	1.14
Developed Lot 2 SubArea(2 yr.)	.52	15	4.06	0.15	0.32
Developed Lot 2 SubArea(5 yr.)	.54	15	5.21	0.15	0.42
Developed Lot 2 SubArea(10 yr.)	.59	15	6.08	0.15	0.54
Developed Lot 2 SubArea(25 yr.)	.63	15	6.95	0.15	0.66
Developed Lot 2 SubArea(50 yr.)	.65	15	7.97	0.15	0.78
Developed Lot 2 SubArea(100 yr.)	.67	15	8.98	0.15	0.90

The developed peak discharge for the 2 year storm event from Lot 1. Block 1, Chautauqua Addition is 0.40 cfs. The developed peak discharge for the 100 year storm event from Lot 1, Block 1, Chautauqua Addition is 1.14 cfs. The developed peak discharge for the 2 year storm event from Lot 2. Block 1, Chautauqua Addition is 0.32 cfs. The developed peak discharge for the 100 year storm event from Lot 2, Block 1, Chautauqua Addition is 0.90 cfs.

The combined peak developed discharge from the Lot 1 and 2, Block 1, Chautauqua Addition is as follows:

COMBINED DEVELOPED PEAK DISCHARGE					
Description	c	Tc	I	Area	Q(cfs)
Developed Combined SubArea(2 yr.)	.52	15	4.06	0.34	0.72
Developed Combined SubArea(5 yr.)	.54	15	5.21	0.34	0.96
Developed Combined SubArea(10 yr.)	.59	15	6.08	0.34	1.22
Developed Combined SubArea(25 yr.)	.63	15	6.95	0.34	1.49
Developed Combined SubArea(50 yr.)	.65	15	7.97	0.34	1.76
Developed Comb. SubArea(100 yr.)	.67	15	8.98	0.34	2.05

The developed combined peak runoff for the 2 year storm event is 0.72 cfs which is an increase of 0.44 cfs from the existing peak discharge fo 0.28 cfs. The developed combined peak runoff for the 100 year storm event is 2.05 cfs which is an increase of 0.80 cfs from the existing peak discharge of 1.25 cfs. The existing drainage system for Chautauqua Addition consists of curb and gutter which carries the surface flow within the east curb of Chautauqua Street to the north to

27th Street North. Drainage within 27th Street North is then east to Hillside Avenue. The

existing conveyance capacity of the curb and gutter within Chautauqua Street and 27th Street North should be adequate to accommodate the increase in the peak runoff from the development of Lot 1 and 2, Block 1, Chautauqua Addition.

IV. FLOODPLAIN SUBMITTAL – No FEMA floodplain is located on this plat.

V. FEDERAL, STATE AND LOCAL PERMITS

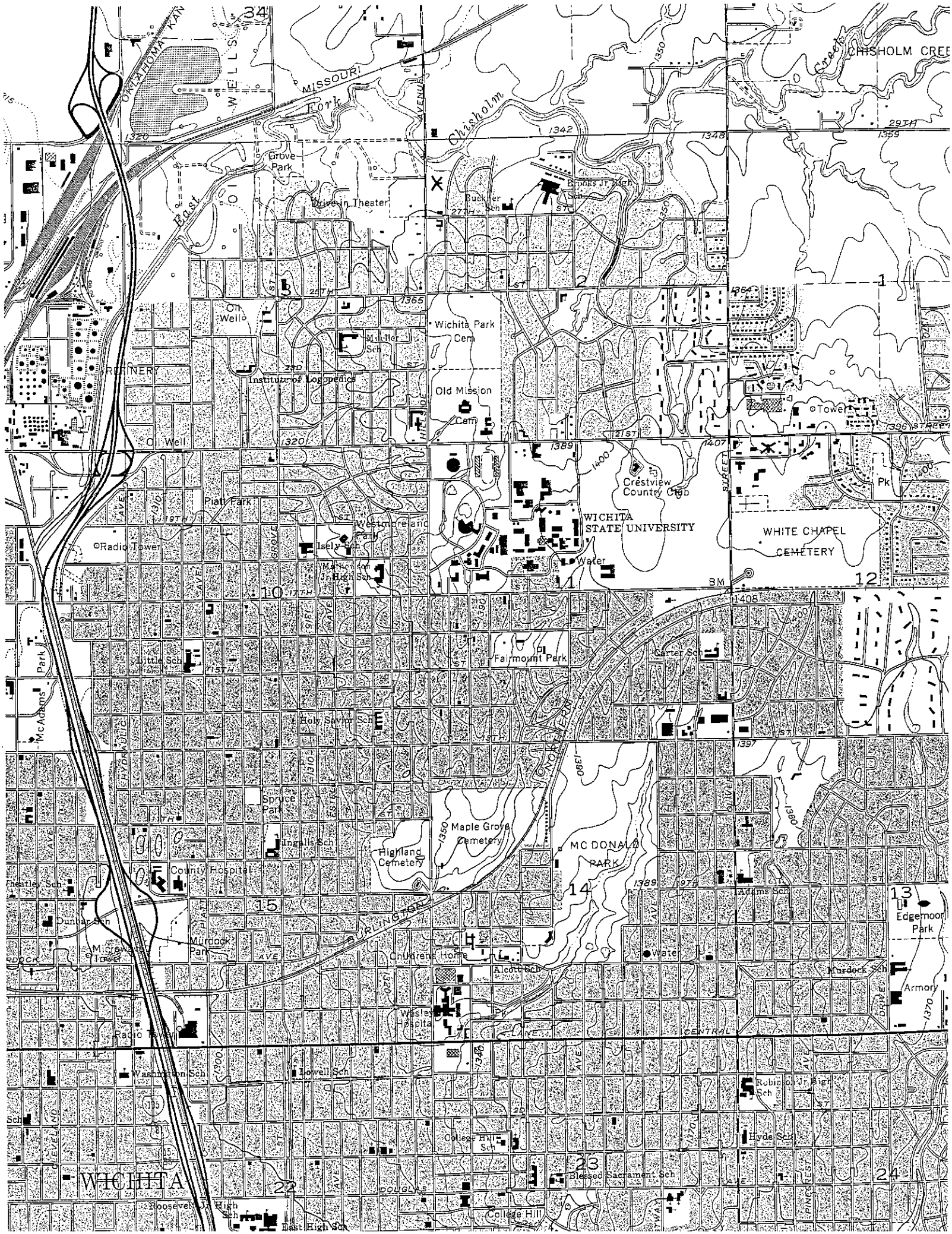
A. US Army Corp of Engineers-Not Applicable
B. Kansas Dept. of Agriculture-Not Applicable
C. FEMA- Not Applicable
D. Kansas Department of Transportation-Not Applicable
E. Sedgwick County Right-of-Way Permit-Not Applicable

VI. SUMMARY DISCUSSION:

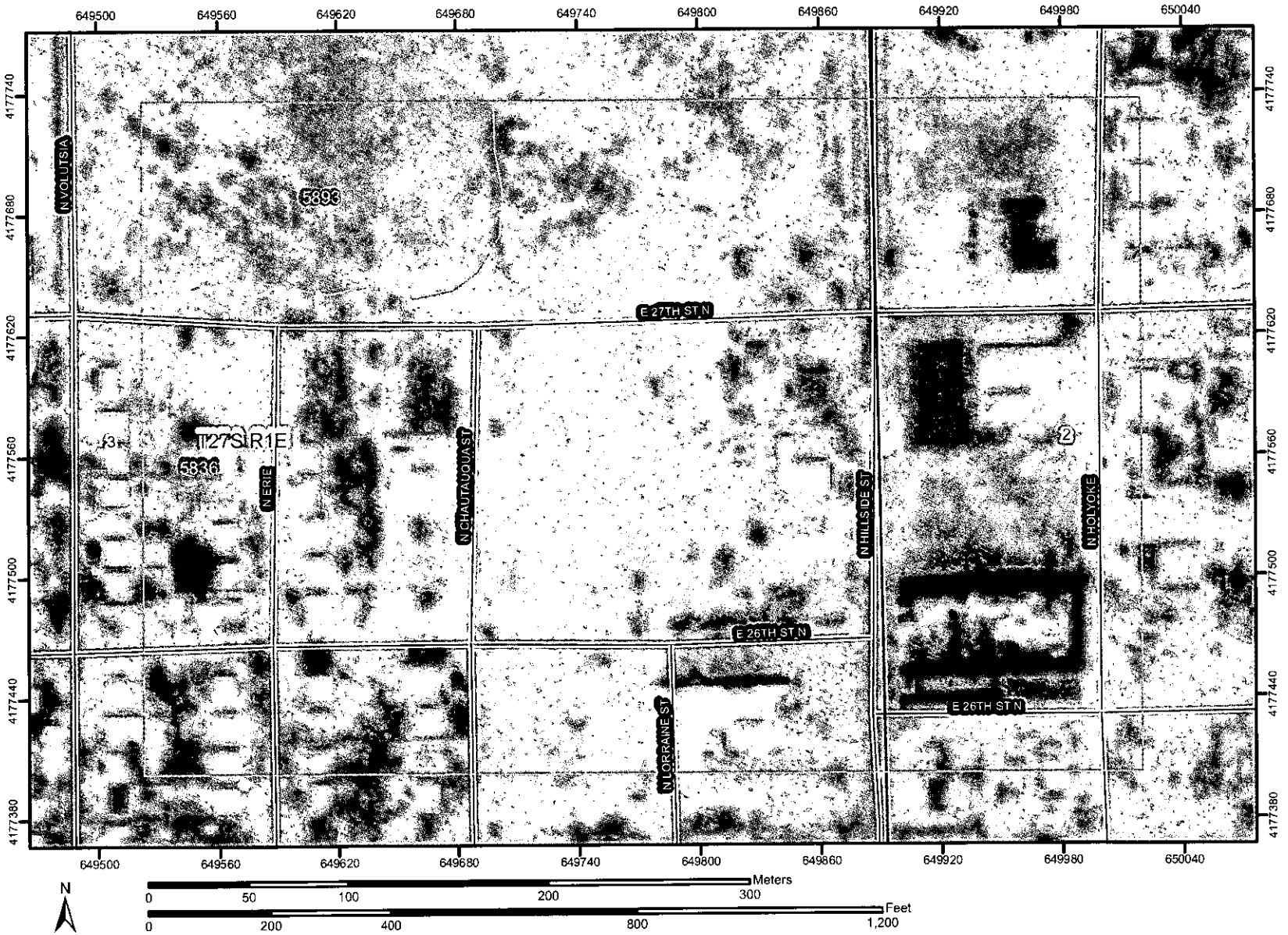
A summary discussion of the offsite drainage peak discharge, existing peak discharge from the proposed development area and the developed peak discharge for each developed drainage basin or combination of drainage basins has been previously presented in Sections II and III for the analysis of peak drainage discharge.

VII. APPENDIX I:

All charts, graphs, tables including a 1"=40' scale drainage plan map are included for review.


OKLAHOMA KAN
MISSOURI
Fork
Chisholm
CHISHOLM CREE
Creek
WELLS
AVENUE
Grove Park
East
Drive-in Theater
Buckner Sch
Brooks Jr. High Sch
27TH ST
29TH
Oil Wells
Wichita Park Cem
Mueller Sch
REFINERY
Institute of Logopedics
3RD
Old Mission Cem
HILLSIDE
Tower
21ST
STREET
Oil Well
Crestview Country Club
Pk
Platt Park
Westmoreland Park
Radio Tower
Isely Sch
WICHITA STATE UNIVERSITY
WHITE CHAPEL CEMETERY
Water
BM
Marshall Jr. High Sch
Little Sch
Fairmount Park
Carter Sch
McAdams Park
Holy Savior Sch
Spruce Park
Ingalis Sch
Maple Grove Cemetery
Highland Cemetery
MC DONALD PARK
County Hospital
Theatley Sch
Dunbar Sch
Murdock Park
Adams Sch
Edgemoor Park
Armory
Alcott Sch
Wesley Hospital
Radio Tower
Washington Sch
Lowell Sch
Robinson Jr. High Sch
Hyde Sch
College Hill Sch
Blessed Sacrament Sch
Roosevelt Jr. High Sch
East High Sch
College Hill
WICHITA

Soil Map–Sedgwick County, Kansas
(CHAUTAUQUA ADDITION)



Map Unit Legend

Sedgwick County, Kansas (KS173)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
5836	Urban land-Farnum complex, 0 to 3 percent slopes	36.9	90.1%
5893	Farnum loam, 1 to 3 percent slopes	4.1	9.9%
Totals for Area of Interest (AOI)		41.0	100.0%

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features

Public Land Survey
- Township and Range
- Section

Municipalities
- Cities
- Urban Areas

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails

Roads
- Interstate Highways
- US Routes
- State Highways
- Local Roads
- Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

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

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 3, Dec 21, 2006

Date(s) aerial images were photographed: 3/20/1996

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.

CHAUTAUQUA ADDITION

1:9385

11/7/2007

CHAUTAUQUA ADDITION

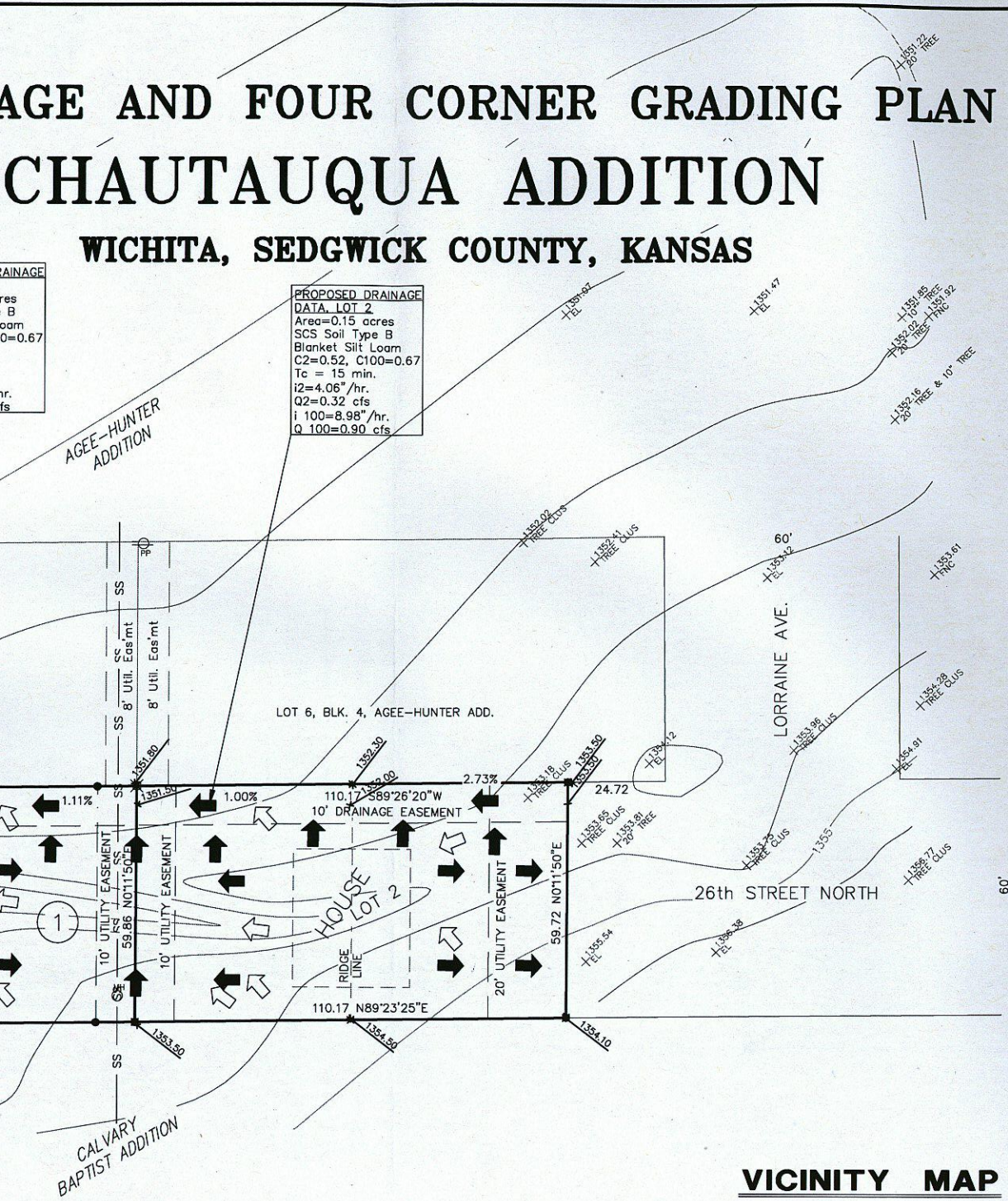
1:9385

11/7/2007

AGE AND FOUR CORNER GRADING PLAN

CHAUTAUQUA ADDITION

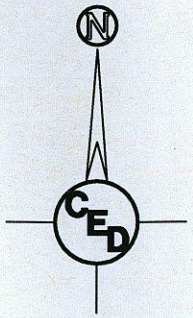
WICHITA, SEDGWICK COUNTY, KANSAS



DRANGLE MAP

Sec. 3, T27S, R1E

VICINITY MAP



GRAPHIC SCALE

-40 0 20 40 80

(IN FEET)

Horizontal: 1 inch = 40 ft.

DRAINAGE KEY

- = Existing flow direction
- = Proposed flow direction
- = Proposed ridge line
- = Proposed ridge line
- = Existing contour line

LEGEND

- ● – Set 5/8" rebar & "Armstrong" cap
- ○ – Found 1" iron pipe
- ⊠ – Found chiseled in concrete
- PP – Power pole
- MH – Manhole
- WM – Water meter
- M – Measured distance
- P – Plat distance
- CM– Calculated from measured distance

HARLAN DALE FORAKER
LICENSED
10891
KANSAS
PROFESSIONAL ENGINEER
11-7-07

TABLE I

INITIAL DESIGN STORM FREQUENCY

Land Use	Initial Design Storm Return Period
1. Residential and Public Park Areas	2 years
2. General Commercial Areas	5 years
3. Public Building Areas	5 years
4. Industrial Areas	5 years
5. High Value Downtown Business Areas	5 years
6. Major Airport Terminal Areas	5 years

TABLE II

ALLOWABLE PAVEMENT ENCROACHMENT FOR INITIAL DESIGN STORM

Street Classification	Allowed Encroachment
1. Local	No curb overtopping. Flow may spread across crown.
2. Collector	No curb overtopping. One 8' lane width must be free of water.
3. Arterial	No curb overtopping. One 8' through lane width in each direction must be free of water.
4. Expressways and Freeways	No curb overtopping. Encroachment permitted in not more than one through lane width in each direction.

was compatible

An additional requirement to the initial system criteria is that the runoff from the 100-year frequency major storm for time of concentrations identical to the initial system design must be retained within public rights-of-way in all cases. This 100-year frequency major storm requirement must be evaluated for projects in existing developed areas and when identified as prohibitive because of estimated costs, the consultant shall provide criteria recommendations to the City Engineer for such projects which will provide a reasonable cost/benefit ratio for the project.

C. Chapter 2 Comments and Modifications ~~"Precipitation"~~

1. Precipitation intensity for the various durations and frequencies shall be as shown in the table attached to this document and identified as "Attachment A". When intensities are required for durations not shown in the table in the range between 2-hour and 24-hour durations, such intensities shall be computed as straight line interpolations.

SOIL LEGEND

SYMBOL	HYDROLOGIC GROUP	NAME
Aa	B	Albion-Shellabarger sandy loams, 1 to 4 percent slopes
Ab	B	Albion and Shellabarger sandy loans, 7 to 15 percent slopes
Ba	C	Blanket silt loam, 0 to 1 percent slopes
Bb	C	Blanket silt loan, 1 to 3 percent slopes
Ca	B	Canadian fine sandy loan
Cb	B	Canadian-Waldeck fine sandy loams
Cc	D	Carwile fine sandy loam
Cd	B	Clark-Ost clay loams, 1 to 4 percent slopes
Ce	C	Clime silty clay, 3 to 6 percent slopes
Ea	B	Elandco silt loam
Eb	B	Elandco silt loam, occasionally flooded
Ec	B	Elandco silt loam, frequently flooded
Fa	B	Farnum loam, 0 to 1 percent slopes
Fb	B	Farnum loam, 1 to 3 percent slopes
Fc	B	Farnum loam, sandy substratum, 0 to 1 percent slopes
Ga	D	Goessel silty clay, 0 to 1 percent slopes
Gb	D	Goessel silty clay, 1 to 2 percent slopes
Ia	D	Irwin silty clay loam, 1 to 3 percent slopes
Ib	D	Irwin silty clay loam, 3 to 6 percent slopes
Ic	D	Irwin silty clay loam, 2 to 6 percent slopes, eroded
La	C	Lesho loam
Lb	A	Lincoln soils
Ma	B	Milan loam, 1 to 3 percent slopes
Mb	B	Milan form, 3 to 6 percent slopes
Mc	B	Milan clay loam, 2 to 6 percent slopes, eroded
Na	B	Naron fine sandy loam
Oc	D	Owens clay loam, 1 to 3 percent slopes
Od	D	Owens-Rock outcrop complex, 3 to 10 percent slopes
Pa		Pits
Pb	D	Plevna fine sandy loam
Pc	A	Pratt loamy fine sand, undulating
Pd	A	Pratt-Tivoli complex, rolling
Ra	D	Renfrow silty clay loam, 1 to 3 percent slopes
Rb	D	Renfrow silty clay loam, 3 to 6 percent slopes
Rc	D	Renfrow-Owens clay loams, 1 to 4 percent slopes
Rd	D	Rosehill silty clay, 1 to 3 percent slopes
Sa	B	Shellabarger sandy loam, 1 to 3 percent slopes
Sb	B	Shellabarger sandy loam, 3 to 6 percent slopes
Sc	B	Shellabarger sandy loam, 3 to 6 percent slopes, eroded
Ta	D	Tabler silty clay loam
Tb	D	Tabler-Drummond complex
Ua	B	Urban land-Canadian complex
Ub	B	Urban land-Elandco complex
Uc	B	Urban land-Farnum complex, 0 to 3 percent slopes
Ud	D	Urban land-Irwin complex, 1 to 3 percent slopes
Ue	D	Urban land-Tabler complex
Va	B	Vanoss silt loam, 0 to 1 percent slopes
Vb	B	Vanoss silt loam, 1 to 3 percent slopes
Vc	B	Vanoss silt loam, 3 to 6 percent slopes
Vd	B	Vanoss silt loam, 3 to 6 percent slopes, eroded
Ve	D	Vernon sandy loam, 1 to 3 percent slopes
Vf	D	Vernon sandy loam, 3 to 6 percent lopes
Wa	C	Waldeck sandy loam
Wb	D	Waurika silt loam

620.442.0461

(3 pages)

ATTACHMENT D

DRAINAGE CRITERIA

CITY OF WICHITA, KANSAS

RECOMMENDED RUNOFF COEFFICIENTS FOR RATIONAL METHOD
AND PERCENT IMPERVIOUS FOR UNIT HYDROGRAPH METHOD

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
1. Business:					
Downtown Areas	95	0.84	0.85	0.87	0.91
Neighborhood Areas	70	0.68	0.69	0.73	0.80
2. 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
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
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
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
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
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

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
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
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
3. Industrial:					
Light Areas	70	0.68	0.69	0.73	0.80
Heavy Areas	80	0.74	0.76	0.79	0.84
4. Playgrounds:	15	0.33	0.35	0.42	0.55
5. Schools:	40	0.49	0.51	0.56	0.66
6. Railroad Yard Areas:	30	0.43	0.45	0.50	0.62
7. Undeveloped Urban Areas:					
Offsite Flow Analysis (when land use not defined)	45	0.52	0.54	0.59	0.68
8. Streets:					
Paved	99	0.87	0.88	0.90	0.93
Gravel	00	0.24	0.26	0.33	0.48
9. Drive, Parking Lots and Walks:	96	0.87	0.87	0.88	0.89
10. Roofs:	90	0.80	0.85	0.90	0.93
11. Urban Lawn Areas (See Note No. 1 below):					
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
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
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

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
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

Note No. 1: Coefficients shown in the above table are for pervious open space areas with thick turf which includes pervious areas in parks and cemeteries. Coefficients shown above must be increased 0.02 for use with agricultural pasture areas. Coefficients shown above must be reduced by 0.04 for use with agricultural cultivated areas. Group A soils are well-drained, coarse textured sands with high infiltration rates. Group B soils are moderately well-drained, moderately coarse textured soils with moderate infiltration rates. Group C soils are moderately poor-drained, moderately fine textured soils with slow infiltration rates. Group D soils are poor-drained, fine textured soils with very slow infiltration rates.

GENERAL NOTE: These Rational Formula Coefficients may not be valid for basins 320 acres or larger.

(SECTION 5.10, B. - CONTINUED)

FIGURE 5-3

RAINFALL INTENSITY TABLE for SEDGWICK COUNTY, KANSAS

The following tabulation contains rainfall intensity in inches per hour as derived from ESSA Weather Bureau Technical Paper 40.

DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5	4.67	6.23	8.00	9.34	10.67	12.23	13.79
6	4.35	5.80	7.45	8.70	9.94	11.39	12.84
7	4.09	5.46	7.02	8.19	9.36	10.72	12.09
8	3.88	5.18	6.66	7.77	8.89	10.18	11.48
9	3.71	4.95	6.36	7.43	8.49	9.72	10.96
10	3.56	4.75	6.11	7.13	8.15	9.33	10.52
11	3.43	4.58	5.89	6.87	7.85	8.99	10.14
12	3.32	4.40	5.69	6.64	7.59	8.69	9.80
13	3.21	4.29	5.51	6.43	7.35	8.42	9.50
14	3.12	4.17	5.36	6.25	7.14	8.18	9.23
15	3.04	4.06	5.21	6.08	6.95	7.97	8.98
16	2.96	3.96	5.09	5.93	6.78	7.77	8.76
17	2.90	3.86	4.97	5.79	6.62	7.59	8.55
18	2.83	3.78	4.86	5.67	6.48	7.42	8.37
19	2.77	3.70	4.76	5.55	6.34	7.27	8.19
20	2.72	3.63	4.66	5.44	6.22	7.12	8.03
21	2.67	3.56	4.57	5.34	6.10	6.99	7.88
22	2.62	3.49	4.49	5.24	5.99	6.86	7.74
23	2.57	3.43	4.41	5.15	5.89	6.74	7.60
24	2.53	3.38	4.34	5.07	5.79	6.63	7.48
25	2.49	3.32	4.27	4.99	5.70	6.53	7.36
26	2.45	3.23	4.21	4.91	5.61	6.43	7.25
27	2.42	3.18	4.15	4.84	5.53	6.33	7.14
28	2.38	3.05	4.09	4.77	5.45	6.25	7.04
29	2.35	2.97	4.02	4.68	5.38	6.16	6.95
30	2.32	2.89	3.92	4.56	5.31	6.08	6.79
31	2.29	2.82	3.82	4.44	5.19	6.00	6.62
32	2.26	2.75	3.73	4.33	5.07	5.87	6.45
33	2.24	2.68	3.64	4.23	4.95	5.73	6.30
34	2.19	2.62	3.55	4.13	4.83	5.60	6.16
35	2.14	2.57	3.47	4.04	4.73	5.47	6.02
36	2.09	2.51	3.40	3.95	4.62	5.35	5.89
37	2.05	2.46	3.33	3.87	4.52	5.23	5.76
38	2.00	2.41	3.26	3.79	4.43	5.13	5.64
39	1.96	2.36	3.19	3.71	4.34	5.02	5.53
40	1.92	2.32	3.13	3.64	4.26	4.92	5.42
41	1.89	2.27	3.07	3.57	4.18	4.83	5.32
42	1.85	2.23	3.01	3.51	4.10	4.74	5.22
43	1.82	2.19	2.96	3.44	4.02	4.65	5.13
44	1.78	2.15	2.91	3.38	3.95	4.56	5.03
45	1.75	2.11	2.86	3.32	3.88	4.48	4.95

FIGURE 5-3 (Continued)

DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
46	1.72	2.08	2.81	3.27	3.82	4.41	4.86
47	1.69	2.04	2.76	3.21	3.75	4.33	4.78
48	1.67	2.01	2.72	3.16	3.69	4.26	4.70
49	1.64	1.98	2.67	3.11	3.63	4.19	4.63
50	1.61	1.95	2.63	3.06	3.58	4.13	4.56
51	1.59	1.92	2.59	3.01	3.52	4.06	4.49
52	1.56	1.89	2.55	2.97	3.47	4.00	4.42
53	1.54	1.86	2.51	2.92	3.42	3.94	4.35
54	1.52	1.84	2.48	2.88	3.37	3.88	4.29
55	1.50	1.81	2.44	2.84	3.32	3.83	4.23
56	1.47	1.79	2.41	2.80	3.27	3.77	4.17
57	1.45	1.76	2.37	2.76	3.23	3.72	4.11
58	1.43	1.74	2.34	2.73	3.19	3.67	4.06
59	1.42	1.72	2.31	2.69	3.14	3.62	4.01
60	1.40	1.69	2.28	2.65	3.10	3.57	3.95
61	1.38	1.67	2.25	2.62	3.06	3.53	3.90
62	1.36	1.65	2.22	2.59	3.02	3.48	3.85
63	1.34	1.63	2.20	2.55	2.99	3.44	3.81
64	1.33	1.61	2.17	2.52	2.95	3.40	3.76
65	1.31	1.59	2.14	2.49	2.92	3.35	3.71
66	1.30	1.57	2.12	2.46	2.88	3.31	3.67
67	1.28	1.56	2.09	2.44	2.85	3.27	3.63
68	1.26	1.54	2.07	2.41	2.81	3.24	3.59
69	1.25	1.52	2.05	2.38	2.78	3.20	3.54
70	1.24	1.50	2.02	2.35	2.75	3.16	3.51
71	1.22	1.49	2.00	2.33	2.72	3.13	3.47
72	1.21	1.47	1.98	2.30	2.69	3.09	3.43
73	1.20	1.46	1.96	2.28	2.66	3.06	3.39
74	1.18	1.44	1.94	2.25	2.63	3.03	3.36
75	1.17	1.43	1.92	2.23	2.61	3.00	3.32
76	1.16	1.41	1.90	2.21	2.58	2.96	3.29
77	1.15	1.40	1.88	2.18	2.55	2.93	3.25
78	1.13	1.38	1.86	2.16	2.53	2.90	3.22
79	1.12	1.37	1.84	2.14	2.50	2.88	3.19
80	1.11	1.36	1.82	2.12	2.48	2.85	3.16
81	1.10	1.34	1.81	2.10	2.46	2.82	3.13
82	1.09	1.33	1.79	2.08	2.43	2.79	3.10
83	1.08	1.32	1.77	2.06	2.41	2.76	3.07
84	1.07	1.31	1.75	2.04	2.39	2.74	3.04
85	1.06	1.30	1.74	2.02	2.37	2.71	3.01
86	1.05	1.28	1.72	2.00	2.34	2.69	2.99
87	1.04	1.27	1.71	1.99	2.32	2.66	2.96
88	1.03	1.26	1.69	1.97	2.30	2.64	2.93
89	1.02	1.25	1.68	1.95	2.28	2.62	2.91
90	1.01	1.24	1.66	1.93	2.26	2.59	2.88

ATTACHMENT A CONTINUED
Page 3

DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
91	1.00	1.23	1.65	1.92	2.24	2.57	2.86
92	1.00	1.22	1.63	1.90	2.22	2.55	2.83
93	0.99	1.21	1.62	1.89	2.20	2.53	2.81
94	0.98	1.20	1.61	1.87	2.19	2.51	2.79
95	0.97	1.19	1.59	1.85	2.17	2.49	2.76
96	0.96	1.18	1.58	1.84	2.15	2.46	2.74
97	0.96	1.17	1.57	1.82	2.13	2.44	2.72
98	0.95	1.16	1.56	1.81	2.12	2.42	2.70
99	0.94	1.15	1.54	1.80	2.10	2.41	2.67
100	0.93	1.14	1.53	1.78	2.08	2.39	2.65
101	0.93	1.13	1.52	1.77	2.07	2.39	2.65
102	0.92	1.13	1.51	1.75	2.05	2.35	2.61
103	0.91	1.12	1.50	1.74	2.04	2.33	2.59
104	0.90	1.11	1.49	1.73	2.02	2.31	2.57
105	0.90	1.10	1.47	1.72	2.01	2.30	2.55
106	0.89	1.09	1.46	1.70	1.99	2.28	2.54
107	0.88	1.09	1.45	1.69	1.98	2.26	2.52
108	0.88	1.08	1.44	1.68	1.96	2.25	2.50
109	0.87	1.07	1.43	1.67	1.95	2.23	2.48
110	0.87	1.06	1.42	1.65	1.93	2.21	2.46
111	0.86	1.06	1.41	1.64	1.92	2.20	2.45
112	0.85	1.05	1.40	1.63	1.91	2.18	2.43
113	0.85	1.04	1.39	1.62	1.89	2.17	2.41
114	0.84	1.03	1.38	1.61	1.88	2.15	2.40
115	0.84	1.03	1.37	1.60	1.87	2.14	2.38
116	0.83	1.02	1.36	1.59	1.86	2.12	2.36
117	0.82	1.01	1.36	1.58	1.84	2.11	2.35
118	0.82	1.01	1.35	1.57	1.83	2.09	2.33
119	0.81	1.00	1.34	1.56	1.82	2.08	2.32
120	0.81	0.99	1.33	1.55	1.81	2.07	2.30

DURATION IN HOURS	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
2	0.81	0.99	1.33	1.55	1.81	2.07	2.30
3	0.59	0.72	0.97	1.13	1.32	1.51	1.68
4	0.47	0.58	0.78	0.91	1.06	1.21	1.35
5	0.40	0.49	0.66	0.77	0.89	1.02	1.14
6	0.35	0.42	0.57	0.67	0.78	0.89	0.99
8	0.28	0.34	0.46	0.53	0.62	0.71	0.79
10	0.23	0.29	0.39	0.45	0.52	0.60	0.67
12	0.20	0.25	0.33	0.39	0.45	0.52	0.58
18	0.15	0.18	0.24	0.28	0.33	0.38	0.42
24	0.12	0.15	0.20	0.23	0.27	0.31	0.34

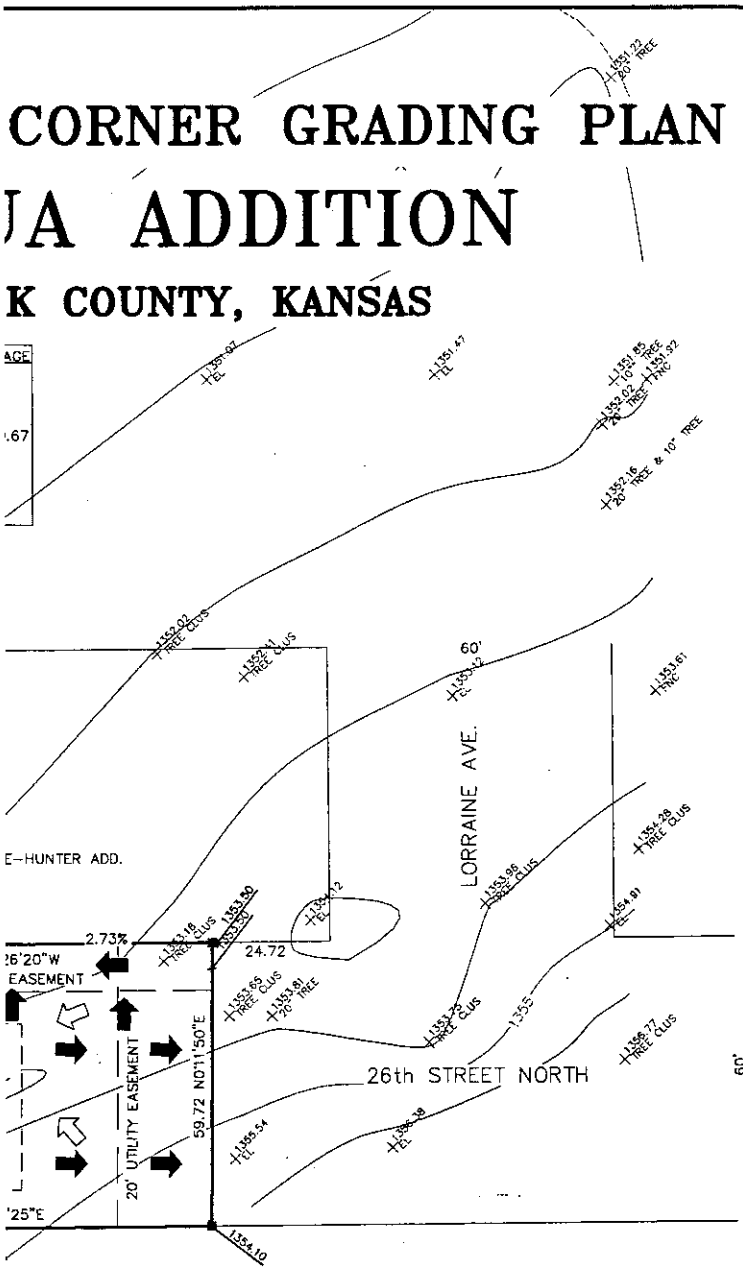
FIGURE 3-3 (Continued)

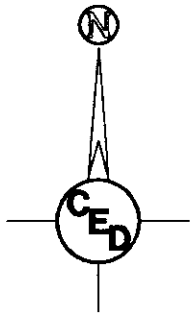
DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
91	1.00	1.23	1.65	1.92	2.24	2.57	2.86
92	1.00	1.22	1.63	1.90	2.22	2.55	2.83
93	0.99	1.21	1.62	1.89	2.20	2.53	2.81
94	0.98	1.20	1.61	1.87	2.19	2.51	2.79
95	0.97	1.19	1.59	1.85	2.17	2.49	2.76
96	0.96	1.18	1.58	1.84	2.15	2.46	2.74
97	0.96	1.17	1.57	1.82	2.13	2.44	2.72
98	0.95	1.16	1.56	1.81	2.12	2.42	2.70
99	0.94	1.15	1.54	1.80	2.10	2.41	2.67
100	0.93	1.14	1.53	1.78	2.08	2.39	2.65
101	0.93	1.13	1.52	1.77	2.07	2.39	2.65
102	0.92	1.13	1.51	1.75	2.05	2.35	2.61
103	0.91	1.12	1.50	1.74	2.04	2.33	2.59
104	0.90	1.11	1.49	1.73	2.02	2.31	2.57
105	0.90	1.10	1.47	1.72	2.01	2.30	2.55
106	0.89	1.09	1.46	1.70	1.99	2.28	2.54
107	0.88	1.09	1.45	1.69	1.98	2.26	2.52
108	0.88	1.08	1.44	1.68	1.96	2.25	2.50
109	0.87	1.07	1.43	1.67	1.95	2.23	2.48
110	0.87	1.06	1.42	1.65	1.93	2.21	2.46
111	0.86	1.06	1.41	1.64	1.92	2.20	2.45
112	0.85	1.05	1.40	1.63	1.91	2.18	2.43
113	0.85	1.04	1.39	1.62	1.89	2.17	2.41
114	0.84	1.03	1.38	1.61	1.88	2.15	2.40
115	0.84	1.03	1.37	1.60	1.87	2.14	2.38
116	0.83	1.02	1.36	1.59	1.86	2.12	2.36
117	0.82	1.01	1.36	1.58	1.84	2.11	2.35
118	0.82	1.01	1.35	1.57	1.83	2.09	2.33
119	0.81	1.00	1.34	1.56	1.82	2.08	2.32
120	0.81	0.99	1.33	1.55	1.81	2.07	2.30
121	0.80	0.99	1.32	1.54	1.80	2.05	2.29
122	0.80	0.98	1.31	1.53	1.78	2.04	2.27
123	0.79	0.97	1.30	1.52	1.77	2.03	2.26
124	0.79	0.97	1.30	1.51	1.76	2.01	2.24
125	0.78	0.96	1.29	1.50	1.75	2.00	2.23
126	0.78	0.96	1.28	1.49	1.74	1.99	2.22
127	0.77	0.95	1.27	1.48	1.73	1.98	2.20

CORNER GRADING PLAN

JA ADDITION

K COUNTY, KANSAS





GRAPHIC SCALE

-40 0 20 40 80

(IN FEET)

Horizontal: 1 inch = 40 ft.

DRAINAGE KEY

- = Existing flow direction
- = Proposed flow direction
- = Proposed ridge line
- = Proposed ridge line
- = Existing contour line

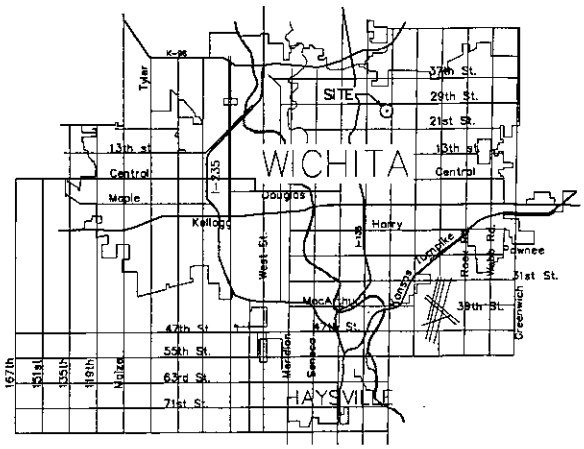
HARLAN DALE FORAKER LICENSED 10891 KANSAS PROFESSIONAL ENGINEER

11-7-07

LEGEND

- • – Set 5/8" rebar & "Armstrong" cap
- ○ – Found 1" iron pipe
- ⊠ – Found chiseled in concrete
- PP – Power pole
- MH – Manhole
- WM – Water meter
- M – Measured distance
- P – Plat distance
- CM– Calculated from measured distance
- ——— – Property line
- ——— – Right of Way line
- — — — — – Easement line
- ———W——— – Water line
- —— SS —— SS —— – Sanitary Sewer line

VICINITY MAP



MENNONITE HOUSING REHABILITATION SERVICES, INC.

CHAUTAUQUA ADDITION

WICHITA, KANSAS

CED PROJ. NO.: 20071575

CERTIFIED ENGINEERING DESIGN, P.A.

CED

810 WEST DOUGLAS, SUITE C

WICHITA, KANSAS 67203

PH.(316)262-8808 FAX.(316)262-1669

DESIGNED: HDF	SCALE: 1"=20'	SHEET 1
DRAWN: BKS	DATE: 9/07	
CHECKED: HDF	CED FILE: 32406.DWG	TOTAL 1