FIREPOINT ADDITION
DRAINAGE PLAN

CITY OF
WICHITA

Presented to:
City of Wichita, Kansas

Prepared by:
Ameritrack West, Inc.

Date:
February 17, 2010

Adopted: February 23, 2007

CITY OF WICHITA

Public Works, Engineering Division
Final Drainage Plan Submittal Checklist

Reviewer: _____ Date: _____

Subdivision Name: Firepoint Addition Location: E½, S32, T26S, R2E

Total Land Area Of Ownership: 26.25 Acres

Type: ____Residential __X__Commercial ____Industrial ____Recreation ____Municipal ____Other

Applicant: Webb Road, LLC Contact: Christian Abbah Phone #: 634-2600

Engineer: Amerstock West, Inc. Contact: Bryce Barkus, P.E. Phone # 778-2215

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	X		"Supplemental Info"		
B. Discussion of development, existing conditions, and proposed impacts on stormwater, wetland, riparian, and flood plain	X		"Description"		
C. Discussion of offsite conditions	X		"Description"		
D. Summary of runoff calculations (pre/post development) No increase in peak discharge for all storm series		X	No Detention Provided Onsite		
E. Narrative description of the type and function of the permanent best management practices that are incorporated into the site design	X		"Description"		
F. Copy of the plat	X		"Supplemental Info"		
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.)	X		Existing Contours, flow arrows, street grades and typical road section are either shown on "Drainage Map" or in "Supplemental"		
H. Professional Engineer seal, signature and date on cover of report	X				
I. CD of drainage plan in PDF format (one file) and one paper copy bound with this checklist included behind the cover	X				

	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)	X		"Supplemental Info"		
B. Runoff Method (Rational, Hydrograph Method, or other approved methods by Engineering)	X		"Description"		
C. Existing topography (no greater than 2-foot contours, 1-foot recommend)	X		"Drainage Map"		
D. Total Site Area and Total Impervious Area (acres)	X		"Drainage Map" and "Description"		
E. Benchmarks used for site control	X		"Drainage Map"		
F. Streams, creeks, and waterway labeled	X		"Drainage Map"		
G. Predominant soils from USDA soil surveys, and/or on site soil borings	X		"Supplemental Info"		
H. Location and boundaries of natural features such as wetlands, lakes, and ponds with the normal water elevation noted	X		"Drainage Map"		
I. Location of existing roads, buildings, parking lots and other impervious areas.	X		"Drainage Map"		

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J. Location of existing utilities (e.g., water, sewer, gas, electric) and easements	X		"Drainage Map"		
K. Location of existing conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	X		"Drainage Map"		
L. Flow paths	X		"Drainage Map"		
M. Location and dimensions of existing channels, bridges or culvert crossings	X		"Drainage Map"		
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	X		"Hydrology"		
O. Assumed pre-developed runoff curve numbers	X		"Hydrology"		
P. Existing time of concentrations used in calculations	X		"Hydrology"		
Q. Evaluate immediate downstream drainage capacity, not to exceed more than 0.25 miles downstream of site	X		"Description" and "Hydraulics"		
R. Existing structural elevations (e.g., invert of pipes, manholes, etc.)	X		"Description" and "Hydraulics"		
S. Cross-section data for open channels	X		"Drainage Map"		
T. Ground water elevations, if applicable		X	No Ground Water Issues Expected		

	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)	X		"Hydrology" and "Hydraulics"		
B. Proposed time of concentrations used in calculations	X		"Hydrology"		
C. Assumed post-developed runoff curve numbers	X		"Hydrology"		
D. Proposed contours for detention facilities (to equal area used in outlet rating curves)		X	No Detention Provided On Site		
E. Preliminary sizing calculations for stormwater controls including contributing drainage area, storage, and outlet configuration	X		"Hydraulics"		
F. Stage-storage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities		X	No Detention Provided on site		
G. Final analysis of potential upstream/downstream impact/effects of project, where necessary	X		"Hydrology" and "Hydraulics"		
H. Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.)	X		"Hydraulics"		
I. Design water surface elevations and normal pool elevation for ponds.	X		"Drainage Map"		
J. Typical detail for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc. To include height, width, elevation, and/or diameter.		X	Will be determined later		
K. Proposed limits of clearing and grading	X		"Drainage Map"		
L. Location of existing and proposed roads, buildings, parking lots and other impervious areas.		X	Will be determined later		
M. Location of existing and proposed utilities (e.g., water, sewer) and easements		X	Existing is shown		
N. Location of existing and proposed conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow		X	Existing is shown		
O. Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings	X		"Drainage Map"		

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P. Preliminary selection and location of stormwater controls		x	Will be determined later		
Q. Emergency overflow structure's flow path		x	No Detention Provided		
R. Detention facility provides one-foot of freeboard above the HWL and emergency outfall shown (top of berm elevation shown)		x	No Detention Provided		
S. The 100-year 24-hour HWL delineated on the plan for detention pond		x	No Detention Provided		
T. Lowest opening elevations table on the plat for structures located adjacent to channels or ponds		x	Not needed		
U. Stormwater Management Facilities located within a Reserve		x	No Detention Provided		
V. Maintenance responsibility of stormwater management facility shall be specified in the platters text. (e.g. HOA, Lot Owners Association, or lot)		x	No Detention Provided		
W. Off-site drainage easements or agreements required, where necessary		x	Not needed		

	Applicant			Engr	
Tab 4. Floodplain Submittal	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Provide source of flood profile		x	Copy of FIRM in "Supplemental Info"		
B. Nearest base flood elevations		x			
C. Delineation of pre-developed regulatory floodplain/floodway limits		x			
D. Delineation of post-developed regulatory floodplain and floodway limits		x			
E. Floodplain boundary determination per elevation (project limits shown)		x			
F. Provide source of floodway data table and discharges		x			
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		x			
H. Provide regulatory floodway and four natural profile models (10,50,100, and 500-yr) for existing and future watershed conditions		x			
I. Location of floodplain/floodway limits and relationship of site to upstream/downstream properties (floodplain limits to be per elevation and scaled location)		x			
J. Flood plains and floodways located within a Reserve, where necessary		x			

	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)		X	Not needed		
B. Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Flood Plain Fill, Levee, Water Appropriations, Dam safety permit, etc.)		x	Not needed		
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.		x	Not needed		
D. Kansas Department of Transportation		X	Not needed		
E. Sedgwick County Right-of-way Permit		X	Not needed		

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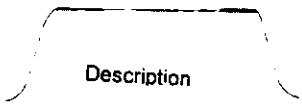
Description

FIREPOINT ADDITION
DRAINAGE PLAN

GENERAL

The Firepoint Addition is a 26.25 acre commercial subdivision located directly northeast of K-96 between Rock Road and Webb Road in the City of Wichita in Sedgwick County, Kansas. The site lies in the East Half of Section 32, Township 26 South, Range 2 East of the Sixth Principal Meridian. The property was originally platted as part of the Mediterranean Addition. The property is bounded by 34th Street and Comotara Industrial Park to the north, a detention pond and commercial property to the west, K-96 to the south and southwest, and commercial property on the east. The development of this property will have no additional impact to storm water above what has already been accounted for with the Mediterranean Plaza Addition improvements. The two existing detention ponds were sized to detain the runoff from this property.

The Rational Method was used to calculate the runoff values from each basin for existing and proposed conditions. HY8 and Microstation Geopak were used to size the culverts and storm sewer, respectively. The 5-Year Storm Event was used to size the storm sewer lines and inlets. Fifteen minutes was used as the minimum time of concentration. See the "Hydrology" and "Hydraulics" sections for more detailed information on the basin runoff, culverts and storm sewer calculations.

This property is being platted into three commercial lots. Due to the nature of this type of development, determining the locations of site features, such as buildings, paving, landscaping and storm sewer, is difficult at this point in the development process. Therefore, we have only made assumptions as to the percent of impervious area and proposed slopes. We sized the storm sewer at Toben Street to accommodate additional runoff from the lots with the intent that additional storm sewer inlets and piping will be extended. The City will be able to review the individual lot development plans prior to building permits being issued.

No new on-site detention is proposed for this property since the two existing detention ponds are sized to accommodate the development on this site.

Any time grading work is to be performed on this property, Best Management Practices shall be used to help protect from erosion. Silt fence,

ditch checks, inlet protections, construction entrances and back of curb protection are among the BMPs to be used on this site.

EXISTING CONDITIONS

The site generally drains to the southeast or to the southwest to two existing detention ponds. The property is almost entirely short grass pasture, with a wooded area along the west property line. The site soils are primarily Rosehill silty clay with 1-3 percent slopes which is a Hydrologic Soil Group D soil. An USDA soil survey map is included in the "Supplemental Info" section.

The entirety of the property lies within a FEMA defined Zone X according to the February 2, 2007 maps. A copy of the FIRMette is attached in the "Supplemental Info" section.

The basin crests outlined in the Mediterranean Addition Drainage Plan were maintained. Approximately 64.6 acres drain into an existing ditch on the property from the north through an existing 8'x4' RCB under 34th Street. Another 1.7 acres drain onto the property from the north from the Comotara Industrial Park, and an additional 27.2 acres drain into the existing drainage channel that runs along the east and southeast of the property from commercial properties to the east. The existing impervious area on the property is approximately 0.45 acres.

We reviewed the original Mediterranean Plaza Addition drainage plan which was provided to us by the City of Wichita. From these documents, we were able to determine the HW100 elevations in the ponds which are labeled on the drainage map.

PROPOSED CONDITIONS

Basin A consists of the western half of Toben Street adjacent to Lot 1, Block A of the Firepoint Addition. Basin A will drain along the curb and gutter of Toben Street to a proposed curb inlet (Node 300, see "Drainage Map") where water will be taken via RCB to the detention pond directly west of the project site. Approximately 0.99 acres of developed commercial area drains west into Basin A via a 36" PVC pipe collected at a curb inlet (Node 310) and then into the open ditch and RCB that services Basins B & C. Basin A has an area of approximately 0.41 acres will be impervious after improvements.

Basin B consists of the eastern half of Toben Street adjacent to Lot 1, Block A of the Firepoint Addition. Basin B will drain along the curb and gutter of Toben Street to a proposed curb inlet (Node 290) where water will be taken via

RCB to the detention pond directly west of the project site. Basin B has an area of approximately 0.41 acres for which all will be impervious after improvements.

Basin C consists of Lot 1, Block A of the Firepoint Addition. Basin C will drain west towards an open ditch currently existing on the property and will then drain into the RCB that is accommodating Basins A & B, after which it will drain into the detention pond directly west of the project site. Approximately 64.6 acres of developed commercial area drain south into the open ditch in Basin C via an 8' x 4' RCB under 34th Street. Basin C has an area of approximately 5.58 acres. Assuming 85% impervious area after improvements, Basin C will have an impervious area of 4.74 acres.

Basin D consists of the western half of Toben Street adjacent to Lot 2, Block A of the Firepoint Addition (see "Drainage Map"). Basin D will drain along the curb and gutter of Toben Street to a proposed curb inlet (Node 200) where water will be taken via RCP to the detention pond directly west of the project site. Basin D has an area of approximately 0.80 acres for which all will be impervious after improvements.

Basin E consists of the eastern half of Toben Street adjacent to Lot 2, Block A of the Firepoint Addition. Basin E will drain along the curb and gutter of Toben Street to a proposed curb inlet (Node 210) where water will be taken via RCP to the detention pond directly west of the project site. Basin E has an area of approximately 0.77 acres for which all will be impervious after improvements.

Basin F consists of approximately the western half of Lot 2, Block A of the Firepoint Addition. Basin F will drain southwest into a drop inlet (Node 220) where it will be taken via the RCP servicing Basins D & E to the detention pond directly west of the project site. Approximately 0.60 acres areas of developed commercial area drain into Basin F from the Comotara Industrial Park on the north. Basin F has an area of approximately 7.83 acres. Assuming 85% impervious area after improvements, Basin F will have an impervious area of 6.66 acres.

Basin G consists of approximately the northwest third of Lot 1, Block B of the Firepoint Addition (see "Drainage Map"). Basin G drains southwest into the ditch along K-96. Basin G has an area of 0.25 acres. Assuming 85% impervious area after improvements, Basin G will have an impervious area of 0.21 acres.

Basin H consists of approximately the southeast two thirds of Lot 1, Block B of the Firepoint Addition. Basin H drains to the southwest into the ditch along K-96. Basin H has an area of 0.60 acres. Assuming 85% impervious area after improvements, Basin F will have an impervious area of 0.51 acres.

Basin I consists of the southern half of Toben Street adjacent to Lot 2, Block A of the Firepoint Addition. Basin I will drain east via curb and gutter along Toben Street to a curb inlet (Node 110) where it will be taken via RCP to the detention pond southeast of the property. Basin I has an area of approximately 0.37 acres for which all will be impervious after improvements.

Basin J consists of the northern half of Toben Street adjacent to Lot 2, Block A of the Firepoint Addition. Basin J drains east via curb and gutter along Toben Street to a curb inlet (Node 100) where it will be taken via RCP to the detention pond southeast of the property. Basin J has an area of approximately 0.39 acres for which all will be impervious after improvements.

Basin K consists of the portion of Lot 2, Block A of the Firepoint Addition (see "Drainage Map"). Basin K drains south-southeast to a proposed drop inlet where it is taken via RCP to the detention pond southeast of the property. Basin K has an area of approximately 2.93 acres. Assuming 85% impervious area after improvements, Basin K will have an impervious area of 2.49 acres.

Basin L consists of the portion of Lot 2, Block A of the Firepoint Addition that lies east of the basin crest delineating Basins K & L. Basin L drains south-southeast to the drainage channel that runs along the east and southeast of the property. From there, water is taken through an existing 2-60"x38" HERCP under Toben Street to the detention pond that lies south east of the property. Basin L has an area of approximately 5.93 acres. Assuming 85% impervious are after improvements, Basin L will have an impervious area of 2.49 acres.

Hydrology

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

FIREPOINT ADDITION
Hydrology

Prepared by: JGF
2/17/2010

BASIN A

Manual Input

Total Area 0.41 Acres

Soil Group	**A** (% of Total Area)	**B** (% of Total Area)	**C** (% of Total Area)	**D** (% of Total Area)	**Total**
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.41	0.41

Land Use	**Commercial** (% of Total Area)	**Industrial** (% of Total Area)	**Multi-Family** (% of Total Area)	**Public** (% of Total Area)	**Single Family** (% of Total Area)	**Vacant/Agriculture** (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	0.41
Future	100%	0%	0%	0%	0%	0%
Acres	0.41	0.00	0.00	0.00	0.00	0.00

	Existing	**Future**	
Length of Flow	35 ft	400 ft	
Slope	7.00 %	1.00 %	
Waterflow Desc	short grass pasture	pavement	15 min <= Tc <= 24 hrs
Avg Velocity	1.33 ft/sec	3.00 ft/sec	
Tc	0.01 hours	0.04 hours	

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Benton, KS 67017

FIREPOINT ADDITION
Hydrology

Prepared by: JGF
2/17/2010

Runoff Coefficients * Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.80	0.41	0.84
5	0.56	4.62	0.41	1.06
10	0.61	5.21	0.41	1.30
25	0.64	6.06	0.41	1.59
50	0.67	6.73	0.41	1.85
100	0.70	7.40	0.41	2.12

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.41	1.06
5	0.69	4.62	0.41	1.31
10	0.73	5.21	0.41	1.56
25	0.75	6.06	0.41	1.86
50	0.77	6.73	0.41	2.12
100	0.80	7.40	0.41	2.43

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Benton, KS 67017

FIREPOINT ADDITION
Hydrology

Prepared by: JGF
2/17/2010

BASIN B

Manual Input

Total Area 0.41 Acres

Soil Group	**A** (% of Total Area)	**B** (% of Total Area)	**C** (% of Total Area)	**D** (% of Total Area)	**Total**
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.41	0.41

Land Use	**Commercial** (% of Total Area)	**Industrial** (% of Total Area)	**Multi-Family** (% of Total Area)	**Public** (% of Total Area)	**Single Family** (% of Total Area)	**Vacant/Agriculture** (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	0.41
Future	100%	0%	0%	0%	0%	0%
Acres	0.41	0.00	0.00	0.00	0.00	0.00

	Existing	**Future**	
Length of Flow	35 ft	400 ft	
Slope	7.00 %	1.00 %	
Waterflow Desc	short grass pasture	pavement	15 min <= Tc <= 24 hrs
Avg Velocity	1.33 ft/sec	3.00 ft/sec	
Tc	0.01 hours	0.04 hours	

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FIREPOINT ADDITION
Hydrology

Prepared by: JGF
2/17/2010

Runoff Coefficients * Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.80	0.41	0.84
5	0.56	4.62	0.41	1.06
10	0.61	5.21	0.41	1.30
25	0.64	6.06	0.41	1.59
50	0.67	6.73	0.41	1.85
100	0.70	7.40	0.41	2.12

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.41	1.06
5	0.69	4.62	0.41	1.31
10	0.73	5.21	0.41	1.56
25	0.75	6.06	0.41	1.86
50	0.77	6.73	0.41	2.12
100	0.80	7.40	0.41	2.43

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FIREPOINT ADDITION
Hydrology

Prepared by: JGF
2/17/2010

BASIN C

Manual Input

Total Area 5.58 Acres

Soil Group	**A** (% of Total Area)	**B** (% of Total Area)	**C** (% of Total Area)	**D** (% of Total Area)	**Total**
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	5.58	5.58

Land Use	**Commercial** (% of Total Area)	**Industrial** (% of Total Area)	**Multi-Family** (% of Total Area)	**Public** (% of Total Area)	**Single Family** (% of Total Area)	**Vacant/Agriculture** (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	5.58
Future	100%	0%	0%	0%	0%	0%
Acres	5.58	0.00	0.00	0.00	0.00	0.00

	Existing	**Future**	
Length of Flow	700 ft	700 ft	
Slope	2.00 %	1.00 %	
Waterflow Desc	short grass pasture	pavement	15 min <= Tc <= 24 hrs
Avg Velocity	0.45 ft/sec	2.00 ft/sec	
Tc	0.43 hours	0.10 hours	

Runoff Coefficients * Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	2.87	5.58	8.65
5	0.56	3.57	5.58	11.16
10	0.61	4.07	5.58	13.85
25	0.64	4.79	5.58	17.11
50	0.67	5.35	5.58	20.00
100	0.70	5.90	5.58	23.05

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	5.58	14.42
5	0.69	4.62	5.58	17.79
10	0.73	5.21	5.58	21.22
25	0.75	6.06	5.58	25.36
50	0.77	6.73	5.58	28.92
100	0.80	7.40	5.58	33.03

Am[illegible]rack [illegible], Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

BASIN D

Manual Input

Total Area 0.80 Acres

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.80	0.80

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	0.80
Future	100%	0%	0%	0%	0%	0%
Acres	0.80	0.00	0.00	0.00	0.00	0.00

	Existing	Future
Length of Flow	35 ft	700 ft
Slope	2.00 %	1.00 %
Waterflow Desc	short grass pasture	pavement
Avg Velocity	0.45 ft/sec	3.00 ft/sec
Tc	0.02 hours	0.06 hours

15 min <= Tc <= 24 hrs

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12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

Runoff Coefficients * Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.80	0.80	1.64
5	0.56	4.62	0.80	2.07
10	0.61	5.21	0.80	2.54
25	0.64	6.06	0.80	3.10
50	0.67	6.73	0.80	3.61
100	0.70	7.40	0.80	4.14

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.80	2.07
5	0.69	4.62	0.80	2.55
10	0.73	5.21	0.80	3.04
25	0.75	6.06	0.80	3.64
50	0.77	6.73	0.80	4.15
100	0.80	7.40	0.80	4.74

Jack, Inc
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

Hydrology

Prepared by
2/17/2010

BASIN E

Manual Input

Total Area 0.77 Acres

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.77	0.77

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	0.77
Future	100%	0%	0%	0%	0%	0%
Acres	0.77	0.00	0.00	0.00	0.00	0.00

	Existing	Future
Length of Flow	35 ft	700 ft
Slope	2.00 %	1.00 %
Waterflow Desc	short grass pasture	pavement
Avg Velocity	0.45 ft/sec	3.00 ft/sec
Tc	0.02 hours	0.06 hours

15 min <= Tc <= 24 hrs

Runoff Coefficients * Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.80	0.77	1.58
5	0.56	4.62	0.77	1.99
10	0.61	5.21	0.77	2.45
25	0.64	6.06	0.77	2.99
50	0.67	6.73	0.77	3.47
100	0.70	7.40	0.77	3.99

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.77	1.99
5	0.69	4.62	0.77	2.45
10	0.73	5.21	0.77	2.93
25	0.75	6.06	0.77	3.50
50	0.77	6.73	0.77	3.99
100	0.80	7.40	0.77	4.56

Amerirack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

Hydrology

Prepared by
2/17/2010

BASIN F

Manual Input

Total Area 7.83 Acres

Soil Group	**A** (% of Total Area)	**B** (% of Total Area)	**C** (% of Total Area)	**D** (% of Total Area)	**Total**
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	7.83	7.83

Land Use	**Commercial** (% of Total Area)	**Industrial** (% of Total Area)	**Multi-Family** (% of Total Area)	**Public** (% of Total Area)	**Single Family** (% of Total Area)	**Vacant/Agriculture** (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	7.83
Future	100%	0%	0%	0%	0%	0%
Acres	7.83	0.00	0.00	0.00	0.00	0.00

	Existing	**Future**
Length of Flow	830 ft	830 ft
Slope	2.50 %	2.00 %
Waterflow Desc	short grass pasture	pavement
Avg Velocity	0.53 ft/sec	2.00 ft/sec
Tc	0.44 hours	0.12 hours

15 min <= Tc <= 24 hrs

Amer[illegible]ack [illegible], Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

Runoff Coefficients * Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	2.87	7.83	12.13
5	0.56	3.57	7.83	15.65
10	0.61	4.07	7.83	19.44
25	0.64	4.79	7.83	24.00
50	0.67	5.35	7.83	28.07
100	0.70	5.90	7.83	32.34

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	7.83	20.23
5	0.69	4.62	7.83	24.96
10	0.73	5.21	7.83	29.78
25	0.75	6.06	7.83	35.59
50	0.77	6.73	7.83	40.58
100	0.80	7.40	7.83	46.35

Ar[redacted]ack [redacted], Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

BASIN G

[redacted] Manual Input

Total Area [redacted] 0.25 Acres

Soil Group	**A** (% of Total Area)	**B** (% of Total Area)	**C** (% of Total Area)	**D** (% of Total Area)	**Total**
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.25	0.25

Land Use	**Commercial** (% of Total Area)	**Industrial** (% of Total Area)	**Multi-Family** (% of Total Area)	**Public** (% of Total Area)	**Single Family** (% of Total Area)	**Vacant/Agriculture** (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	0.25
Future	100%	0%	0%	0%	0%	0%
Acres	0.25	0.00	0.00	0.00	0.00	0.00

	Existing	**Future**
Length of Flow	70 ft	70 ft
Slope	3.50 %	2.00 %
Waterflow Desc	short grass pasture	pavement
Avg Velocity	0.69 ft/sec	2.00 ft/sec
Tc	0.03 hours	0.01 hours

15 min <= Tc <= 24 hrs

Allentrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

Runoff Coefficients * Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.80	0.25	0.51
5	0.56	4.62	0.25	0.65
10	0.61	5.21	0.25	0.79
25	0.64	6.06	0.25	0.97
50	0.67	6.73	0.25	1.13
100	0.70	7.40	0.25	1.30

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.25	0.65
5	0.69	4.62	0.25	0.80
10	0.73	5.21	0.25	0.95
25	0.75	6.06	0.25	1.14
50	0.77	6.73	0.25	1.30
100	0.80	7.40	0.25	1.48

BASIN H

Manual Input

Total Area 0.60 Acres

Soil Group	**A** (% of Total Area)	**B** (% of Total Area)	**C** (% of Total Area)	**D** (% of Total Area)	**Total**
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.60	0.60

Land Use	**Commercial** (% of Total Area)	**Industrial** (% of Total Area)	**Multi-Family** (% of Total Area)	**Public** (% of Total Area)	**Single Family** (% of Total Area)	**Vacant/Agriculture** (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	0.60
Future	100%	0%	0%	0%	0%	0%
Acres	0.60	0.00	0.00	0.00	0.00	0.00

	Existing	**Future**
Length of Flow	170 ft	170 ft
Slope	3.50 %	2.00 %
Waterflow Desc	short grass pasture	pavement
Avg Velocity	0.69 ft/sec	2.00 ft/sec
Tc	0.07 hours	0.02 hours

15 min <= Tc <= 24 hrs

AmericTrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

Hydrology

Prepared by
2/17/2010

Runoff Coefficients * Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.80	0.60	1.23
5	0.56	4.62	0.60	1.55
10	0.61	5.21	0.60	1.91
25	0.64	6.06	0.60	2.33
50	0.67	6.73	0.60	2.71
100	0.70	7.40	0.60	3.11

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.60	1.55
5	0.69	4.62	0.60	1.91
10	0.73	5.21	0.60	2.28
25	0.75	6.06	0.60	2.73
50	0.77	6.73	0.60	3.11
100	0.80	7.40	0.60	3.55

BASIN I

Manual Input

Total Area 0.37 Acres

Soil Group	**A** (% of Total Area)	**B** (% of Total Area)	**C** (% of Total Area)	**D** (% of Total Area)	**Total**
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.37	0.37

Land Use	**Commercial** (% of Total Area)	**Industrial** (% of Total Area)	**Multi-Family** (% of Total Area)	**Public** (% of Total Area)	**Single Family** (% of Total Area)	***Vacant*/Agriculture** (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	0.37
Future	100%	0%	0%	0%	0%	0%
Acres	0.37	0.00	0.00	0.00	0.00	0.00

	Existing		**Future**	
Length of Flow	35	ft	470	ft
Slope	3.00	%	1.00	%
Waterflow Desc	short grass pasture		pavement	
Avg Velocity	0.60	ft/sec	3.00	ft/sec
Tc	0.02	hours	0.04	hours

15 min <= Tc <= 24 hrs

Allenbrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

FREEPOINT ADDITION
Hydrology

Prepared by:
2/17/2010

Runoff Coefficients * Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.80	0.37	0.76
5	0.56	4.62	0.37	0.96
10	0.61	5.21	0.37	1.18
25	0.64	6.06	0.37	1.44
50	0.67	6.73	0.37	1.67
100	0.70	7.40	0.37	1.92

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.37	0.96
5	0.69	4.62	0.37	1.18
10	0.73	5.21	0.37	1.41
25	0.75	6.06	0.37	1.68
50	0.77	6.73	0.37	1.92
100	0.80	7.40	0.37	2.19

Al[illegible]rack [illegible], Inc
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

BASIN J

Manual Input

Total Area 0.39 Acres

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.39	0.39

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	0.39
Future	100%	0%	0%	0%	0%	0%
Acres	0.39	0.00	0.00	0.00	0.00	0.00

	Existing	Future
Length of Flow	35 ft	500 ft
Slope	3.00 %	2.00 %
Waterflow Desc	short grass pasture	pavement
Avg Velocity	0.60 ft/sec	3.00 ft/sec
Tc	0.02 hours	0.05 hours

15 min <= Tc <= 24 hrs

Ar[illegible]rack [illegible], Inc[illegible]
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

Runoff Coefficients * Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.80	0.39	0.80
5	0.56	4.62	0.39	1.01
10	0.61	5.21	0.39	1.24
25	0.64	6.06	0.39	1.51
50	0.67	6.73	0.39	1.76
100	0.70	7.40	0.39	2.02

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.39	1.01
5	0.69	4.62	0.39	1.24
10	0.73	5.21	0.39	1.48
25	0.75	6.06	0.39	1.77
50	0.77	6.73	0.39	2.02
100	0.80	7.40	0.39	2.31

A[illegible]rack[illegible], Inc
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

BASIN K

Manual Input

Total Area 2.93 Acres

Soil Group	**A** (% of Total Area)	**B** (% of Total Area)	**C** (% of Total Area)	**D** (% of Total Area)	**Total**
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	2.93	2.93

Land Use	**Commercial** (% of Total Area)	**Industrial** (% of Total Area)	**Multi-Family** (% of Total Area)	**Public** (% of Total Area)	**Single Family** (% of Total Area)	**Vacant/Agriculture** (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	2.93
Future	100%	0%	0%	0%	0%	0%
Acres	2.93	0.00	0.00	0.00	0.00	0.00

	Existing	**Future**
Length of Flow	650 ft	650 ft
Slope	3.00 %	2.00 %
Waterflow Desc	short grass pasture	pavement
Avg Velocity	0.60 ft/sec	2.00 ft/sec
Tc	0.30 hours	0.09 hours

15 min <= Tc <= 24 hrs

Ar[illegible]rack [illegible], Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

Hydrology

2/17/2010

Runoff Coefficients * Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.48	2.93	5.51
5	0.56	4.26	2.93	6.99
10	0.61	4.82	2.93	8.61
25	0.64	5.63	2.93	10.56
50	0.67	6.26	2.93	12.29
100	0.70	6.88	2.93	14.11

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	2.93	7.57
5	0.69	4.62	2.93	9.34
10	0.73	5.21	2.93	11.14
25	0.75	6.06	2.93	13.32
50	0.77	6.73	2.93	15.18
100	0.80	7.40	2.93	17.35

BASIN L

Manual Input

Total Area 5.93 Acres

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	5.93	5.93

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	0%	0%	0%	0%	0%	100%
Acres	0.00	0.00	0.00	0.00	0.00	5.93
Future	100%	0%	0%	0%	0%	0%
Acres	5.93	0.00	0.00	0.00	0.00	0.00

	Existing	Future
Length of Flow	830 ft	830 ft
Slope	3.00 %	2.00 %
Waterflow Desc	short grass pasture	pavement
Avg Velocity	0.60 ft/sec	2.00 ft/sec
Tc	0.38 hours	0.12 hours

15 min <= Tc <= 24 hrs

Am[illegible]ack [illegible], Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

Runoff Coefficients * Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.54	3.07	5.93	9.83
5	0.56	3.80	5.93	12.62
10	0.61	4.32	5.93	15.63
25	0.64	5.07	5.93	19.24
50	0.67	5.65	5.93	22.45
100	0.70	6.23	5.93	25.86

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	5.93	15.32
5	0.69	4.62	5.93	18.90
10	0.73	5.21	5.93	22.55
25	0.75	6.06	5.93	26.95
50	0.77	6.73	5.93	30.73
100	0.80	7.40	5.93	35.11

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

FIREPOINT ADDITION
Hydrology

Prepared by: JGF
2/17/2010

Off-site 1

Small area to the west of Basin A

Manual Input

Total Area 0.99 Acres

Soil Group	**A**	**B**	**C**	**D**	**Total**
	(% of Total Area)	(% of Total Area)	(% of Total Area)	(% of Total Area)	
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.99	0.99

Land Use	**Commercial**	**Industrial**	**Multi-Family**	**Public**	**Single Family**	**Vacant/Agriculture**
	(% of Total Area)	(% of Total Area)	(% of Total Area)	(% of Total Area)	(% of Total Area)	(% of Total Area)
Existing	100%	0%	0%	0%	0%	0%
Acres	0.99	0.00	0.00	0.00	0.00	0.00
Future	100%	0%	0%	0%	0%	0%
Acres	0.99	0.00	0.00	0.00	0.00	0.00

	Existing	**Future**	
Length of Flow	235 ft	235 ft	
Slope	2.00 %	2.00 %	
Waterflow Desc	pavement	pavement	15 min <= Tc <= 24 hrs
Avg Velocity	2.00 ft/sec	2.00 ft/sec	
Tc	0.03 hours	0.03 hours	

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

FIREPOINT ADDITION
Hydrology

Prepared by: JGF
2/17/2010

Runoff Coefficients * Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.99	2.56
5	0.69	4.62	0.99	3.16
10	0.73	5.21	0.99	3.77
25	0.75	6.06	0.99	4.50
50	0.77	6.73	0.99	5.13
100	0.80	7.40	0.99	5.86

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.99	2.56
5	0.69	4.62	0.99	3.16
10	0.73	5.21	0.99	3.77
25	0.75	6.06	0.99	4.50
50	0.77	6.73	0.99	5.13
100	0.80	7.40	0.99	5.86

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

Prepared by: JGF
2/17/2010

Off-site 2

Large area to the north of Basin C

Manual Input

Total Area 64.60 Acres

Soil Group	A (% of Total Area)	B (% of Total Area)	C (% of Total Area)	D (% of Total Area)	Total
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	64.60	64.60

Land Use	Commercial (% of Total Area)	Industrial (% of Total Area)	Multi-Family (% of Total Area)	Public (% of Total Area)	Single Family (% of Total Area)	Vacant/Agriculture (% of Total Area)
Existing	100%	0%	0%	0%	0%	0%
Acres	64.60	0.00	0.00	0.00	0.00	0.00
Future	100%	0%	0%	0%	0%	0%
Acres	64.60	0.00	0.00	0.00	0.00	0.00

	Existing	Future	
Length of Flow	1500 ft	1500 ft	
Slope	2.00 %	2.00 %	
Waterflow Desc	pavement	pavement	15 min <= Tc <= 24 hrs
Avg Velocity	2.00 ft/sec	2.00 ft/sec	
Tc	0.21 hours	0.21 hours	

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

FIREPOINT ADDITION
Hydrology

Prepared by: JGF
2/17/2010

Runoff Coefficients * Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	64.60	166.93
5	0.69	4.62	64.60	205.93
10	0.73	5.21	64.60	245.69
25	0.75	6.06	64.60	293.61
50	0.77	6.73	64.60	334.76
100	0.80	7.40	64.60	382.43

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	64.60	166.93
5	0.69	4.62	64.60	205.93
10	0.73	5.21	64.60	245.69
25	0.75	6.06	64.60	293.61
50	0.77	6.73	64.60	334.76
100	0.80	7.40	64.60	382.43

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

FIREPOINT ADDITION
Hydrology

Prepared by: JGF
2/17/2010

Off-site 3

Small area north of Basin F

Manual Input

Total Area 0.60 Acres

Soil Group	**A** (% of Total Area)	**B** (% of Total Area)	**C** (% of Total Area)	**D** (% of Total Area)	**Total**
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	0.60	0.60

Land Use	**Commercial** (% of Total Area)	**Industrial** (% of Total Area)	**Multi-Family** (% of Total Area)	**Public** (% of Total Area)	**Single Family** (% of Total Area)	**Vacant/Agriculture** (% of Total Area)
Existing	100%	0%	0%	0%	0%	0%
Acres	0.60	0.00	0.00	0.00	0.00	0.00
Future	100%	0%	0%	0%	0%	0%
Acres	0.60	0.00	0.00	0.00	0.00	0.00

	Existing	**Future**	
Length of Flow	125 ft	125 ft	
Slope	2.00 %	2.00 %	
Waterflow Desc	pavement	pavement	15 min <= Tc <= 24 hrs
Avg Velocity	2.00 ft/sec	2.00 ft/sec	
Tc	0.02 hours	0.02 hours	

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

FIREPOINT ADDITION
Hydrology

Prepared by: JGF
2/17/2010

Runoff Coefficients * Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.60	1.55
5	0.69	4.62	0.60	1.91
10	0.73	5.21	0.60	2.28
25	0.75	6.06	0.60	2.73
50	0.77	6.73	0.60	3.11
100	0.80	7.40	0.60	3.55

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	0.60	1.55
5	0.69	4.62	0.60	1.91
10	0.73	5.21	0.60	2.28
25	0.75	6.06	0.60	2.73
50	0.77	6.73	0.60	3.11
100	0.80	7.40	0.60	3.55

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

FIREPOINT ADDITION
Hydrology

Prepared by: JGF
2/17/2010

Off-site 4

Small area north of Basin K

Manual Input

Total Area 1.12 Acres

Soil Group	**A** (% of Total Area)	**B** (% of Total Area)	**C** (% of Total Area)	**D** (% of Total Area)	**Total**
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	1.12	1.12

Land Use	**Commercial** (% of Total Area)	**Industrial** (% of Total Area)	**Multi-Family** (% of Total Area)	**Public** (% of Total Area)	**Single Family** (% of Total Area)	**Vacant/Agriculture** (% of Total Area)
Existing	100%	0%	0%	0%	0%	0%
Acres	1.12	0.00	0.00	0.00	0.00	0.00
Future	100%	0%	0%	0%	0%	0%
Acres	1.12	0.00	0.00	0.00	0.00	0.00

	Existing	**Future**	
Length of Flow	125 ft	125 ft	
Slope	2.00 %	2.00 %	
Waterflow Desc	pavement	pavement	15 min <= Tc <= 24 hrs
Avg Velocity	2.00 ft/sec	2.00 ft/sec	
Tc	0.02 hours	0.02 hours	

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

FIREPOINT ADDITION
Hydrology

Prepared by: JGF
2/17/2010

Runoff Coefficients * Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	1.12	2.89
5	0.69	4.62	1.12	3.57
10	0.73	5.21	1.12	4.26
25	0.75	6.06	1.12	5.09
50	0.77	6.73	1.12	5.80
100	0.80	7.40	1.12	6.63

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	1.12	2.89
5	0.69	4.62	1.12	3.57
10	0.73	5.21	1.12	4.26
25	0.75	6.06	1.12	5.09
50	0.77	6.73	1.12	5.80
100	0.80	7.40	1.12	6.63

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

Prepared by: JGF
2/17/2010

Off-site 5

Area east of Basin K

Manual Input

Total Area 27.15 Acres

Soil Group	**A** (% of Total Area)	**B** (% of Total Area)	**C** (% of Total Area)	**D** (% of Total Area)	**Total**
	0%	0%	0%	100%	100%
Acres	0.00	0.00	0.00	27.15	27.15

Land Use	**Commercial** (% of Total Area)	**Industrial** (% of Total Area)	**Multi-Family** (% of Total Area)	**Public** (% of Total Area)	**Single Family** (% of Total Area)	**Vacant/Agriculture** (% of Total Area)
Existing	100%	0%	0%	0%	0%	0%
Acres	27.15	0.00	0.00	0.00	0.00	0.00
Future	100%	0%	0%	0%	0%	0%
Acres	27.15	0.00	0.00	0.00	0.00	0.00

	Existing	**Future**	
Length of Flow	1100 ft	1100	
Slope	2.00 %	2.00 %	
Waterflow Desc	pavement	pavement	15 min <= Tc <= 24 hrs
Avg Velocity	2.00 ft/sec	2.00 ft/sec	
Tc	0.15 hours	0.15 hours	

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

FIREPOINT ADDITION
Hydrology

Prepared by: JGF
2/17/2010

Runoff Coefficients * Soil Group D

Return Period (Years)	Commercial	Industrial	Multi-Family	Public	Single Family	Vacant/Agriculture
2	0.68	0.68	0.70	0.49	0.50	0.54
5	0.69	0.69	0.73	0.51	0.54	0.56
10	0.73	0.73	0.79	0.56	0.62	0.61
25	0.75	0.75	0.81	0.59	0.66	0.64
50	0.77	0.77	0.83	0.62	0.70	0.67
100	0.80	0.80	0.86	0.66	0.76	0.70

Existing Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	27.15	70.16
5	0.69	4.62	27.15	86.55
10	0.73	5.21	27.15	103.26
25	0.75	6.06	27.15	123.40
50	0.77	6.73	27.15	140.69
100	0.80	7.40	27.15	160.73

Future Conditions

Return Period (Years)	Runoff Coefficient *	Rainfall Intensity (in/hr)	Area (Acres)	Runoff (cfs)
2	0.68	3.80	27.15	70.16
5	0.69	4.62	27.15	86.55
10	0.73	5.21	27.15	103.26
25	0.75	6.06	27.15	123.40
50	0.77	6.73	27.15	140.69
100	0.80	7.40	27.15	160.73

Hydraulics

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

FIREPOINT ADDITION
Hydraulics
Inlets

Prepared by: BLB
2/17/2010

Curb Inlets

Node	Qin	Qmax (L=5')	Qmax (L=10')	Use L=
100	1.18	11	22	5
110	1.24	11	22	5
200	2.55	11	22	5
210	2.45	11	22	5
290	1.31	11	22	5
300	1.31	11	22	5
310	3.16	11	22	5

Area Inlets

Basin	Node	Q100	Size	Perimeter	Ponding Depth
K *	120	17.35	2'x2'	8	0.81
F *	220	46.35	2'x2'	8	1.55

* Each of these locations are shown as area inlets but actually will be a series of pipe and inlets for which the limits are unknown at this time

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

FIREPOINT ADDITION
Hydraulics
SWS Line #1

Prepared by: BLB
2/17/2010

ID	Type	Elevation	Junction Loss	Discharge	Cumulative Q	Freeboard	Min Invert Elevation
SWS90	Outlet	1416.00	0.13	0.00	0.00	0.00	1410.46
SWS100	Curb	1416.78	0.11	1.18	11.76	3.96	1411.41
SWS110	Curb	1416.78	0.03	1.24	10.58	3.46	1411.75
SWS120	Grate	1417.00	0.43	9.34	9.34	2.89	1412.00

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

FIREPOINT ADDITION
Hydraulics
SWS Line #1

Prepared by: BLB
2/17/2010

ID	US Node	DS Node	Rise	Actual Length	Manning's N	Slope	Discharge	Capacity	Velocity	HGL US	HGL DS	US Junction Loss	Invert US	Invert DS	US Freeboard
L1	SWS100	SWS90	1.50	29.96	0.012	3.06	11.76	21.40	11.71	1412.82	1411.39	0.11	1411.41	1410.46	3.96
L2	SWS110	SWS100	1.50	45.00	0.012	0.51	10.58	8.72	6.14	1413.32	1412.82	0.03	1411.75	1411.51	3.46
L3	SWS120	SWS110	1.50	31.00	0.012	0.45	9.34	8.20	5.42	1414.11	1413.32	0.43	1412.00	1411.85	2.89

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

FIREPOINT ADDITION
Hydraulics
SWS Line #2

Prepared by: BLB
2/17/2010

ID	Type	Elevation	Junction Loss	Discharge	Cumulative Q	Freeboard	Min Invert Elevation
SWS190	Outlet	1409.70	0.13	0.00	0.00	0.00	1406.70
SWS200	Curb	1414.66	0.01	2.55	29.96	4.89	1406.86
SWS210	Curb	1414.66	0.03	2.45	27.41	4.83	1407.09
SWS220	Grate	1417.25	0.24	24.96	24.96	7.17	1407.30

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

FIREPOINT ADDITION
Hydraulics
SWS Line #2

Prepared by: BLB
2/17/2010

ID	US Node	DS Node	Rise	Actual Length	Manning's N	Slope	Discharge	Capacity	Velocity	HGL US	HGL DS	US Junction Loss	Invert US	Invert DS	US Freeboard
L4	SWS200	SWS190	3.00	36.94	0.012	0.42	29.96	50.38	7.06	1409.77	1409.70	0.01	1406.86	1406.70	4.89
L5	SWS210	SWS200	3.00	45.00	0.012	0.49	27.41	54.21	7.24	1409.83	1409.77	0.03	1407.09	1406.86	4.83
L6	SWS220	SWS210	3.00	22.51	0.012	0.44	24.96	51.59	6.83	1410.09	1409.83	0.24	1407.30	1407.19	7.17

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

FIREPOINT ADDITION
Hydraulics
SWS Line #3

Prepared by: BLB
2/17/2010

ID	Type	Elevation	Junction Loss	Discharge	Cumulative Q	Freeboard	Min Invert Elevation
SWS280	Outlet	1412.75	0.13	0.00	0.00	0.00	1405.50
SWS290	Curb	1418.25	1.76	1.31	213.09	3.89	1409.80
SWS291	Other	1417.00	0.64	205.93	205.93	1.92	1410.00
SWS300	Curb	1418.25	0.00	1.31	5.85	3.88	1409.90
SWS310	Curb	1418.25	0.09	4.54	4.54	3.87	1413.36

Ameritrack West, Inc.
12469 SW 15th Street, P.O. Box 9
Benton, KS 67017

FIREPOINT ADDITION
Hydraulics
SWS Line #3

Prepared by: BLB
2/17/2010

ID	US Node	DS Node	Rise	Actual Length	Manning's N	Slope	Discharge	Capacity	Velocity	HGL US	HGL DS	US Junction Loss	Invert US	Invert DS	US Freeboard
L7	SWS290	SWS280	4.00	407.16	0.012	1.05	213.09	636.94	14.72	1414.36	1407.34	1.76	1409.80	1405.50	3.89
L8	SWS291	SWS290	4.00	39.43	0.012	0.49	205.93	435.78	11.24	1415.08	1414.36	0.64	1410.00	1409.80	1.92
L9	SWS300	SWS290	3.00	44.99	0.012	0.21	5.85	35.75	3.51	1414.37	1414.36	0.00	1409.90	1409.80	3.88
L10	SWS310	SWS300	3.00	25.69	0.012	12.02	4.54	269.43	13.62	1414.38	1414.37	0.09	1413.36	1410.00	3.87

CURRENT DATE: 02-16-2010
CURRENT TIME: 22:06:16

FILE DATE: 02-16-2010
FILE NAME: CULVERT

Approx. 113' Extension of Existing 8'x6' RCB

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA: INLET ELEV. (ft)	SITE DATA: OUTLET ELEV. (ft)	SITE DATA: CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	1410.00	1405.50	445.02	1 RCB	8.00	6.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: CULVERT DATE: 02-16-2010

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1410.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1411.36	38.2	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1412.16	76.5	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1412.82	114.7	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1413.44	153.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1414.00	191.2	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1414.20	205.9	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1415.02	267.7	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1415.51	305.9	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1416.00	344.2	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1416.50	382.4	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CULVERT DATE: 02-16-2010

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1410.00	0.000	0.00	0.00	0.00
1411.36	0.000	38.24	0.00	0.00
1412.16	0.000	76.48	0.00	0.00
1412.82	0.000	114.72	0.00	0.00
1413.44	0.000	152.96	0.00	0.00
1414.00	0.000	191.20	0.00	0.00
1414.20	0.000	205.90	0.00	0.00
1415.02	0.000	267.68	0.00	0.00
1415.51	0.000	305.92	0.00	0.00
1416.00	0.000	344.16	0.00	0.00
1416.50	0.000	382.40	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 02-16-2010
CURRENT TIME: 22:06:16

FILE DATE: 02-16-2010
FILE NAME: CULVERT

PERFORMANCE CURVE FOR CULVERT 1 - 1(8.00 (ft) BY 6.00 (ft)) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	1410.00	0.00	0.00	0-NF	0.00	0.00	0.00	1.50	0.00	0.00
38.24	1411.36	1.36	1.36	1-S2n	0.59	0.89	0.49	1.50	9.68	0.00
76.48	1412.16	2.16	2.16	1-S2n	0.90	1.42	0.82	1.50	11.67	0.00
114.72	1412.82	2.82	2.82	1-S2n	1.21	1.86	1.21	1.50	11.83	0.00
152.96	1413.44	3.44	3.44	1-S2n	1.45	2.25	1.47	1.50	12.99	0.00
191.20	1414.00	4.00	4.00	1-S2n	1.70	2.61	1.61	1.50	14.81	0.00
205.90	1414.21	4.21	4.21	1-S2n	1.79	2.75	1.81	1.50	14.20	0.00
267.68	1415.02	5.02	5.02	1-S2n	2.14	3.27	2.18	1.50	15.34	0.00
305.92	1415.51	5.51	5.51	1-S2n	2.36	3.58	2.41	1.50	15.90	0.00
344.16	1416.00	6.00	6.00	5-S2n	2.56	3.87	2.63	1.50	16.37	0.00
382.40	1416.50	6.50	6.50	5-S2n	2.76	4.15	2.84	1.50	16.84	0.00

El. inlet face invert 1410.00 ft El. outlet invert 1405.50 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	0.00 ft
INLET ELEVATION	1410.00 ft
OUTLET STATION	445.00 ft
OUTLET ELEVATION	1405.50 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0101
CULVERT LENGTH ALONG SLOPE	445.02 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	BOX
BARREL SPAN	8.00 ft
BARREL RISE	6.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE (30-75 DEG. FLARE)
INLET DEPRESSION	NONE

CURRENT DATE: 02-16-2010
CURRENT TIME: 22:06:16

FILE DATE: 02-16-2010
FILE NAME: CULVERT

TAILWATER

CONSTANT WATER SURFACE ELEVATION
1407.00

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED	
EMBANKMENT TOP WIDTH	41.00	ft
CREST LENGTH	200.00	ft
OVERTOPPING CREST ELEVATION	1418.25	ft

CURRENT DATE: 02-16-2010
CURRENT TIME: 22:12:02

FILE DATE: 02-16-2010
FILE NAME: CULVERT

Existing Structure @ SE corner of Lot 1, Block A

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA: INLET ELEV. (ft)	SITE DATA: OUTLET ELEV. (ft)	SITE DATA: CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	1410.00	1409.90	70.00	2 RCPE	5.00	3.17	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: CULVERT DATE: 02-16-2010

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1410.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1411.12	19.6	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1411.63	39.2	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1412.05	58.7	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1412.43	78.3	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1412.78	97.9	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1412.91	105.5	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1413.43	137.1	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1413.74	156.6	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1414.07	176.2	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1414.42	195.8	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CULVERT DATE: 02-16-2010

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1410.00	0.000	0.00	0.00	0.00
1411.12	0.000	19.58	0.00	0.00
1411.63	0.000	39.16	0.00	0.00
1412.05	0.000	58.74	0.00	0.00
1412.43	0.000	78.32	0.00	0.00
1412.78	0.000	97.90	0.00	0.00
1412.91	0.000	105.50	0.00	0.00
1413.43	0.000	137.06	0.00	0.00
1413.74	0.000	156.64	0.00	0.00
1414.07	0.000	176.22	0.00	0.00
1414.42	0.000	195.80	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 02-16-2010 FILE DATE: 02-16-2010
CURRENT TIME: 22:12:02 FILE NAME: CULVERT

PERFORMANCE CURVE FOR CULVERT 1 - 2(5.00 (ft) BY 3.17 (ft)) RCPE

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	1410.00	0.00	0.00	0-NF	0.00	0.00	0.00	-0.40	0.00	0.00
19.58	1411.12	1.00	1.12	2-M2c	0.87	0.73	0.73	-0.40	4.21	0.00
39.16	1411.63	1.46	1.63	2-M2c	1.26	1.05	1.05	-0.40	5.12	0.00
58.74	1412.05	1.86	2.05	2-M2c	1.58	1.31	1.31	-0.40	5.78	0.00
78.32	1412.43	2.22	2.43	2-M2c	1.90	1.53	1.53	-0.40	6.33	0.00
97.90	1412.78	2.56	2.78	2-M2c	2.20	1.73	1.73	-0.40	6.85	0.00
105.50	1412.91	2.69	2.91	2-M2c	2.33	1.80	1.80	-0.40	7.03	0.00
137.06	1413.43	3.24	3.43	2-M2c	3.17	2.08	2.08	-0.40	7.77	0.00
156.64	1413.74	3.60	3.74	2-M2c	3.17	2.24	2.24	-0.40	8.18	0.00
176.22	1414.07	3.99	4.07	2-M2c	3.17	2.38	2.38	-0.40	8.66	0.00
195.80	1414.42	4.42	4.42	2-M2c	3.17	2.51	2.51	-0.40	9.08	0.00

El. inlet face invert 1410.00 ft El. outlet invert 1409.90 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	0.00 ft
INLET ELEVATION	1410.00 ft
OUTLET STATION	70.00 ft
OUTLET ELEVATION	1409.90 ft
NUMBER OF BARRELS	2
SLOPE (V/H)	0.0014
CULVERT LENGTH ALONG SLOPE	70.00 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	ELLIPTICAL
BARREL SPAN	5.00 ft
BARREL RISE	3.17 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQ. EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 02-16-2010
CURRENT TIME: 22:12:02

FILE DATE: 02-16-2010
FILE NAME: CULVERT

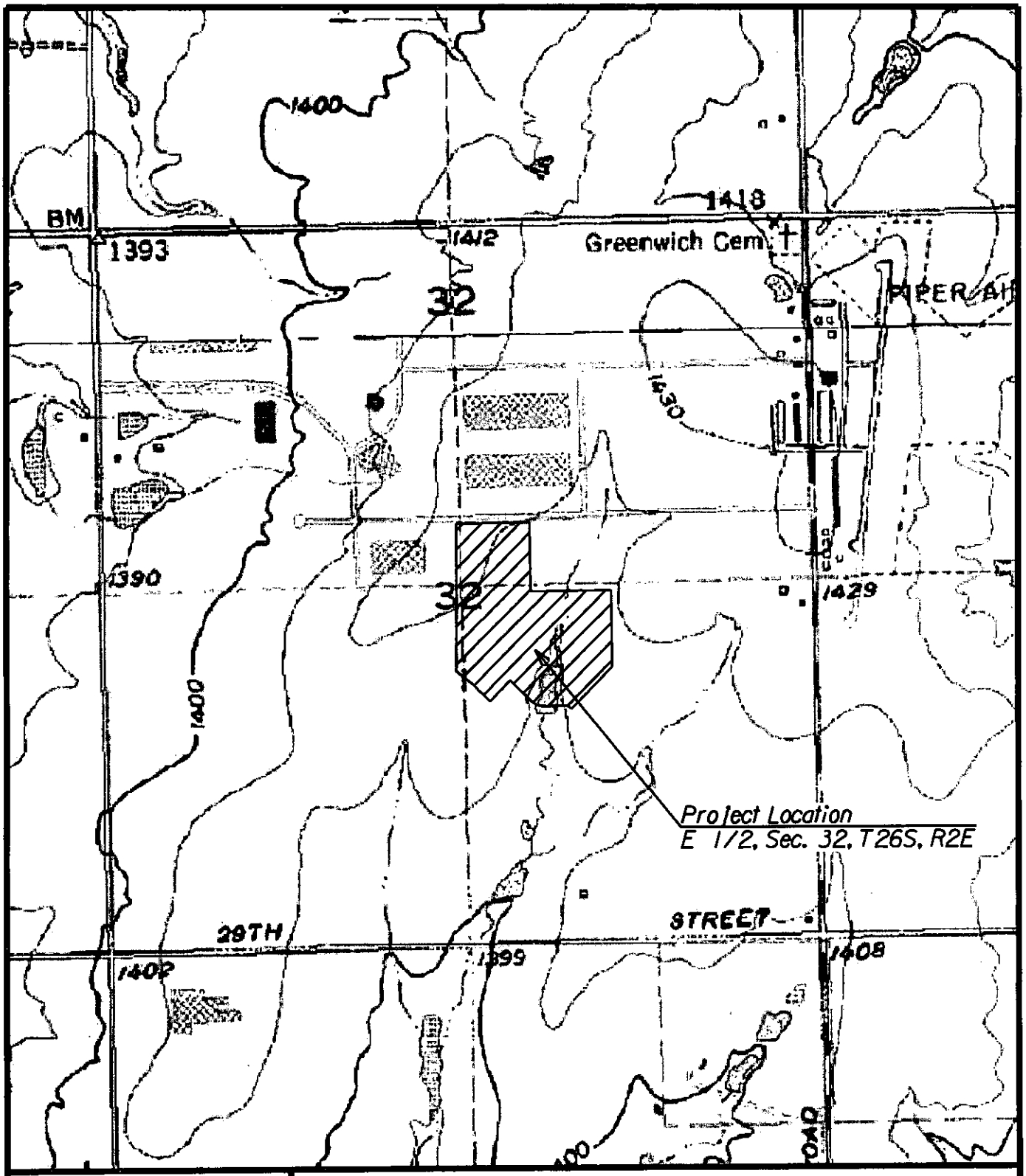
TAILWATER

CONSTANT WATER SURFACE ELEVATION
1409.50

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	GRAVEL
EMBANKMENT TOP WIDTH	41.00 ft
CREST LENGTH	200.00 ft
OVERTOPPING CREST ELEVATION	1416.00 ft

Supplemental
Info



Ameritrack WEST

AMERITRACK WEST, INC.
12469 SW 15th Benton, KS 67017
O: 316-778-2215 F: 316-778-1204

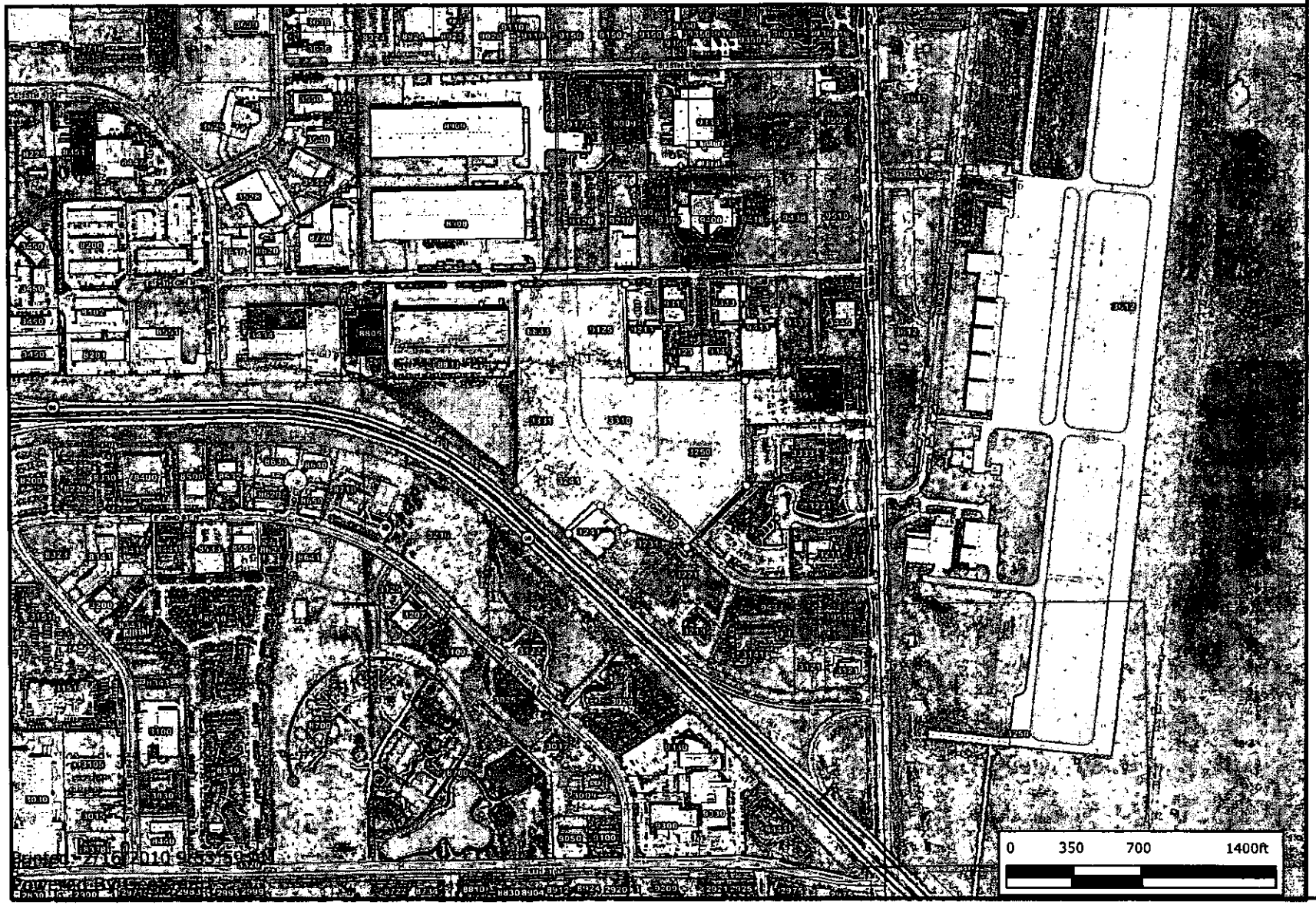
USGS VICINITY MAP

FIREPOINT ADDITION
WICHITA, KANSAS

Project No.
463

FIREPOINT ADDITION

Ameritrack West, Inc.

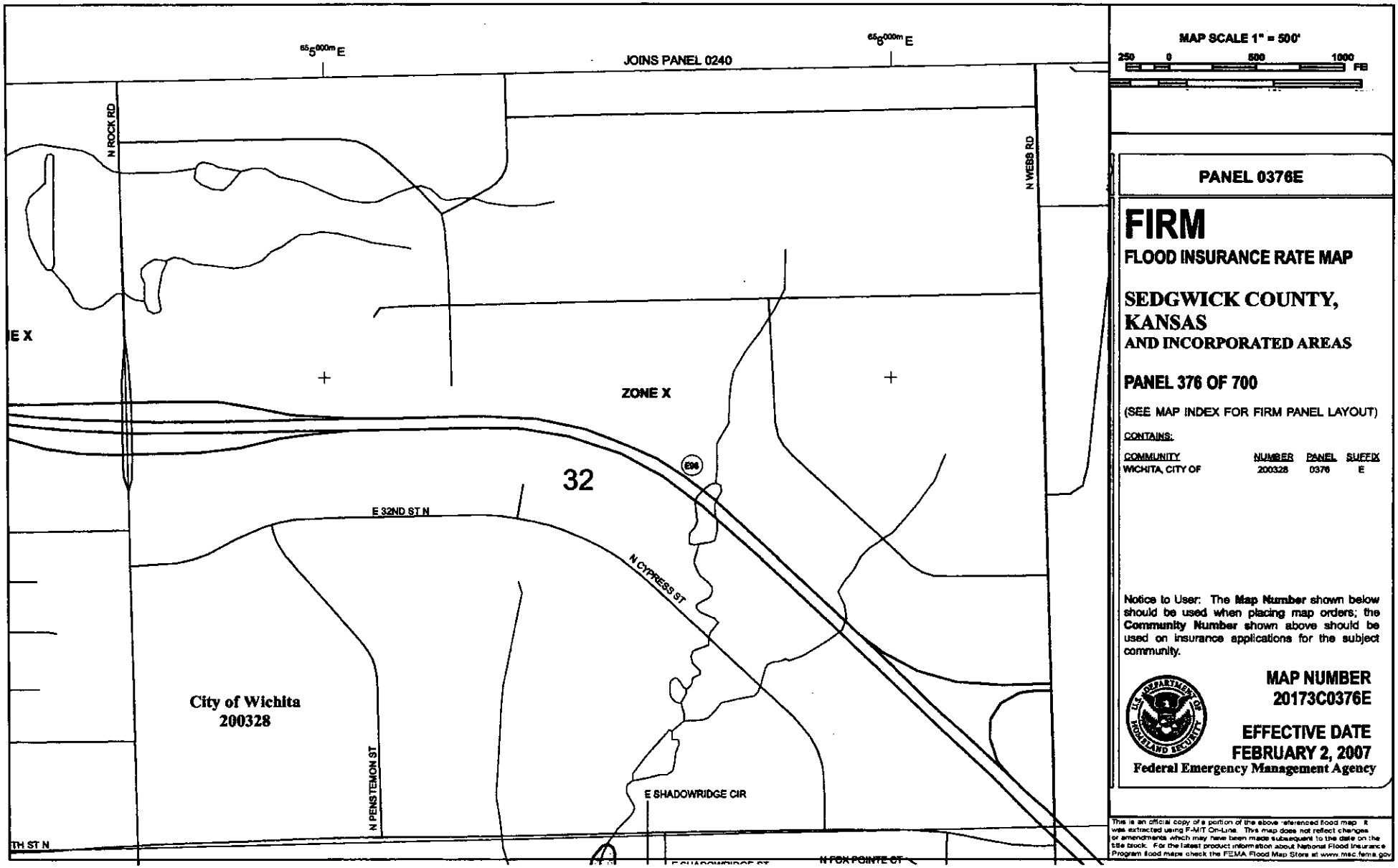


- City Limit Boundaries
- Property Parcels
- Parks
- Airports
- City Limits
- Small Cities
- Sedgwick County
- Wichita

Printed: 7/16/2010 9:53:59 AM

Powered by GIS

CITY OF WICHITA



MAP SCALE 1" = 500'

250 0 500 1000 FEET

PANEL 0376E

FIRM

FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS AND INCORPORATED AREAS

PANEL 376 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

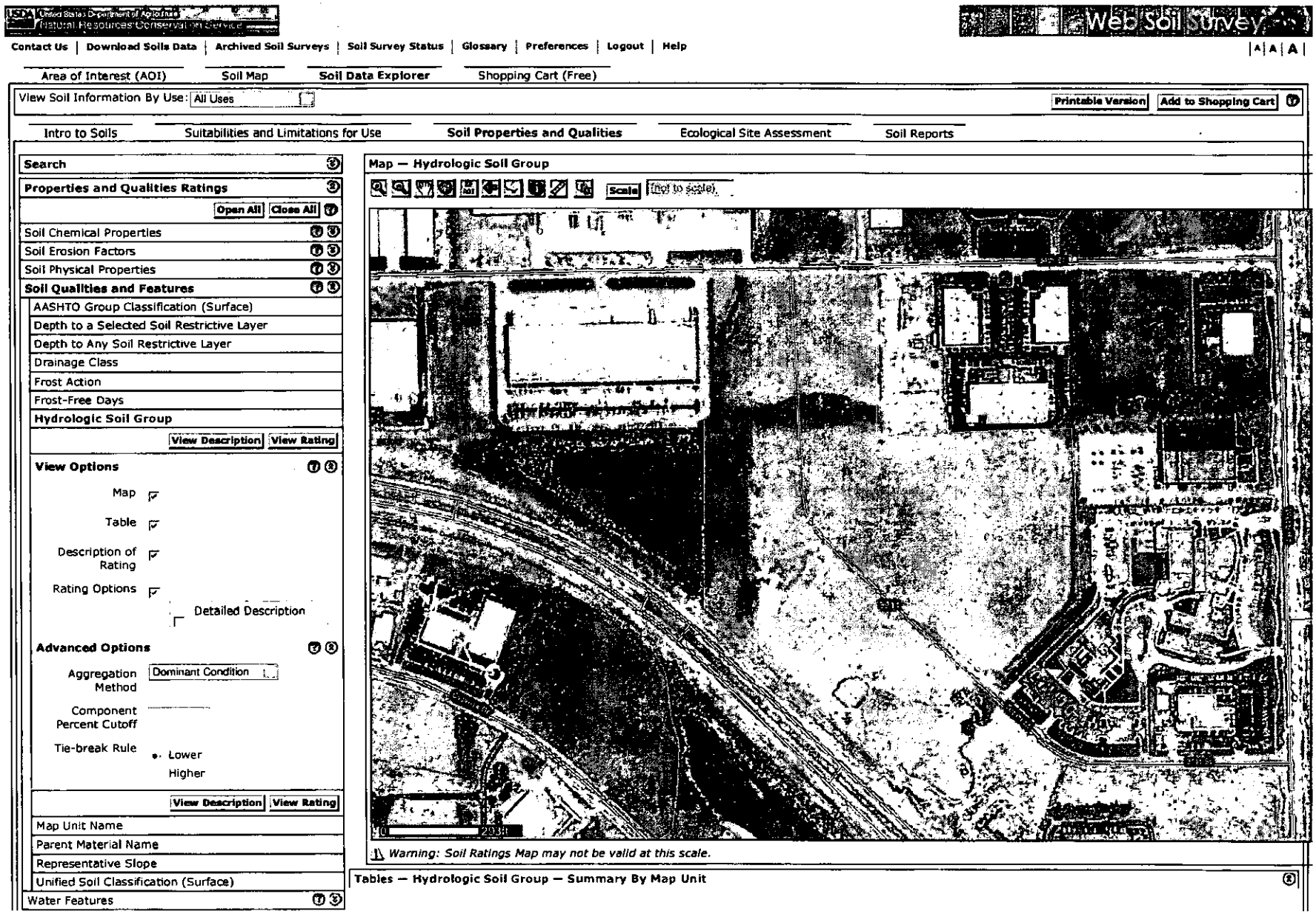
COMMUNITY	NUMBER	PANEL	SUFFIX
WICHITA, CITY OF	200328	0376	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
20173C0376E

EFFECTIVE DATE
FEBRUARY 2, 2007

Federal Emergency Management Agency


USDA United States Department of Agriculture
Natural Resources Conservation Service
Web Soil Survey
Contact Us | Download Soils Data | Archived Soil Surveys | Soil Survey Status | Glossary | Preferences | Logout | Help
Area of Interest (AOI)
Soil Map
Soil Data Explorer
Shopping Cart (Free)
View Soil Information By Use: All Uses
Printable Version
Add to Shopping Cart
Intro to Soils
Suitabilities and Limitations for Use
Soil Properties and Qualities
Ecological Site Assessment
Soil Reports
Search
Properties and Qualities Ratings
Open All
Close All
Soil Chemical Properties
Soil Erosion Factors
Soil Physical Properties
Soil Qualities and Features
AASHTO Group Classification (Surface)
Depth to a Selected Soil Restrictive Layer
Depth to Any Soil Restrictive Layer
Drainage Class
Frost Action
Frost-Free Days
Hydrologic Soil Group
View Description
View Rating
View Options
Map
Table
Description of Rating
Rating Options
Detailed Description
Advanced Options
Aggregation Method
Dominant Condition
Component Percent Cutoff
Tie-break Rule
Lower
Higher
View Description
View Rating
Map Unit Name
Parent Material Name
Representative Slope
Unified Soil Classification (Surface)
Water Features
Map — Hydrologic Soil Group
Scale
(not to scale)
Warning: Soil Ratings Map may not be valid at this scale.
Tables — Hydrologic Soil Group — Summary By Map Unit

Summary by Map Unit — Sedgwick County, Kansas

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3911	Rosehill silty clay, 1 to 3 percent slopes	D	30.6	100.0%
Totals for Area of Interest			**30.6**	**100.0%**

Description — Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options — Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Lower

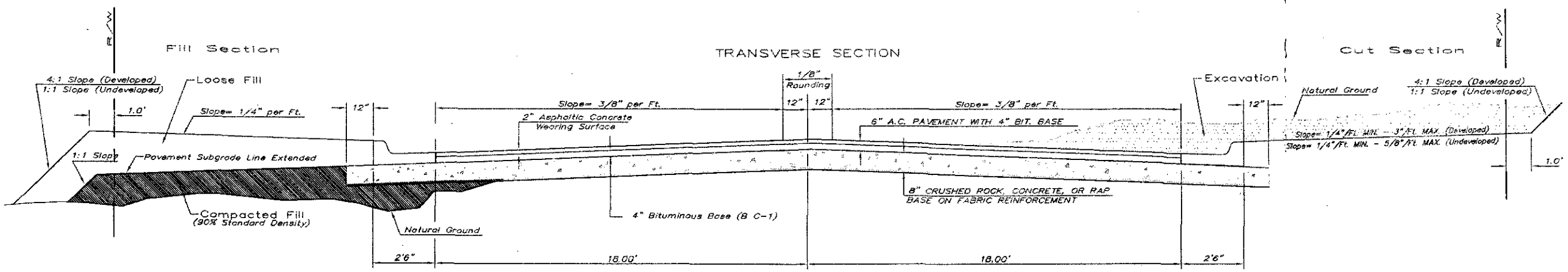
RAINFALL INTENSITY TABLE

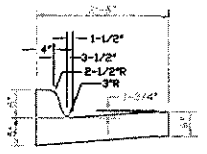
SEDGWICK COUNTY
KANSAS

THIS TABLE CONTAINS AVERAGE RAINFALL INTENSITIES
IN INCHES PER HOUR.

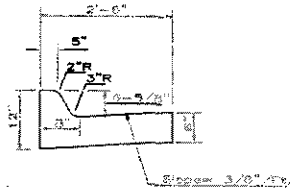
DURATION,	RETURN PERIOD						
HR:MIN	1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
0:05	4.91	5.64	6.64	7.38	8.48	9.34	10.20
0:06	4.62	5.34	6.33	7.07	8.15	9.00	9.84
0:07	4.38	5.09	6.08	6.80	7.86	8.69	9.52
0:08	4.17	4.87	5.85	6.56	7.60	8.41	9.22
0:09	4.00	4.68	5.63	6.33	7.34	8.14	8.93
0:10	3.84	4.50	5.43	6.11	7.10	7.87	8.64
0:11	3.70	4.34	5.25	5.90	6.86	7.61	8.36
0:12	3.56	4.19	5.07	5.71	6.64	7.36	8.09
0:13	3.44	4.05	4.91	5.53	6.43	7.14	7.84
0:14	3.33	3.92	4.76	5.36	6.24	6.92	7.61
0:15	3.22	3.80	4.62	5.21	6.06	6.73	7.40
0:16	3.12	3.69	4.49	5.07	5.91	6.56	7.21
0:17	3.03	3.58	4.37	4.94	5.76	6.40	7.04
0:18	2.94	3.48	4.26	4.82	5.63	6.26	6.88
0:19	2.85	3.39	4.16	4.71	5.50	6.12	6.74
0:20	2.77	3.30	4.06	4.60	5.38	5.99	6.60
0:21	2.70	3.22	3.97	4.50	5.27	5.87	6.47
0:22	2.63	3.14	3.88	4.41	5.17	5.76	6.35
0:23	2.56	3.07	3.80	4.32	5.07	5.65	6.23
0:24	2.50	3.00	3.72	4.23	4.97	5.54	6.12
0:25	2.44	2.93	3.64	4.15	4.88	5.44	6.01
0:26	2.38	2.87	3.57	4.07	4.79	5.35	5.90
0:27	2.33	2.81	3.50	4.00	4.70	5.26	5.80
0:28	2.27	2.75	3.44	3.92	4.62	5.17	5.71
0:29	2.23	2.69	3.37	3.86	4.54	5.08	5.61
0:30	2.18	2.64	3.31	3.79	4.47	4.99	5.52
0:31	2.14	2.59	3.26	3.72	4.39	4.91	5.43
0:32	2.09	2.54	3.20	3.66	4.32	4.83	5.34
0:33	2.05	2.50	3.14	3.60	4.25	4.76	5.26
0:34	2.02	2.45	3.09	3.54	4.18	4.68	5.18
0:35	1.98	2.41	3.04	3.48	4.12	4.61	5.10
0:36	1.94	2.37	2.99	3.43	4.05	4.54	5.02
0:37	1.91	2.33	2.94	3.38	3.99	4.47	4.95
0:38	1.88	2.29	2.90	3.32	3.93	4.40	4.87
0:39	1.85	2.25	2.85	3.27	3.87	4.34	4.80
0:40	1.82	2.22	2.81	3.23	3.82	4.28	4.73
0:41	1.79	2.18	2.77	3.18	3.76	4.22	4.67
0:42	1.76	2.15	2.73	3.13	3.71	4.16	4.60
0:43	1.73	2.12	2.69	3.09	3.66	4.10	4.54
0:44	1.71	2.09	2.65	3.05	3.61	4.04	4.48
0:45	1.68	2.06	2.62	3.01	3.56	3.99	4.42

TYPICAL 41' B–B PAVEMENT DETAILS

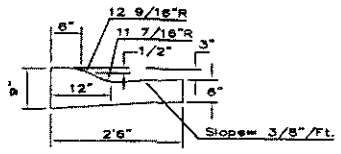




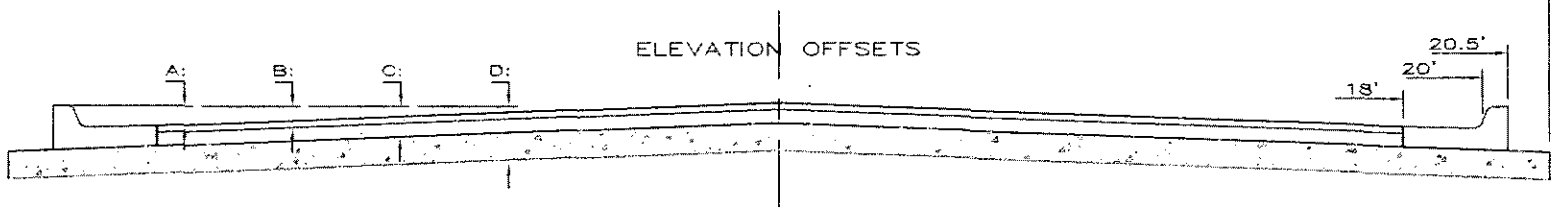
STATE CURB
MODIFIED TYPE I
COMBINED CURB & GUTTER



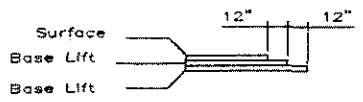
COMBINED CURB & GUTTER



COMBINED ROLL TYPE CURB & GUTTER



	DISTANCE FROM CENTERLINE (LT. & RT.)												
	0'	2'	4'	6'	8'	10'	12'	14'	16'	18'	20'	20.5'	21.5'
A: Top of Curbs to Top of Surface Lift	-.05	-0.01	0.05	0.11	0.18	0.24	0.30	0.36	0.43	0.49	–	–	–
B: Top of Curbs to Top of Upper Base Lift	0.11	0.16	0.22	0.28	0.34	0.40	0.47	0.53	0.59	0.65	–	–	–
C: Top of Curbs to Top of C. R. Subgrade	0.44	0.49	0.55	0.61	0.67	0.73	0.80	0.86	0.92	0.98	1.05	1.06	1.07



TRANSVERSE CONSTRUCTION JOINTS

Transverse construction joints shall be constructed in flexible base pavements at locations where pavement joins existing flexible base pavement as shown by the detail. All costs associated with the construction of the transverse joint shall be included in the bid price for Square Yards 4" ASPHALTIC CONCRETE (2" BITUMINOUS BASE).

General Notes

FABRIC BASE REINFORCEMENT SHALL BE B X 1100 GEOGRID AS MANUFACTURED BY TENSAR CORPORATION OR APPROVED EQUAL. FABRIC BASE REINFORCEMENT SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. CRUSHED ROCK SHALL BE UNIFORMLY GRADED FROM 1–1/2" MAXIMUM SIZE TO NOT MORE THAN 10% PASSING A NO. 200 SIEVE. ROCK QUALITY SHALL BE THE SAME AS SPECIFIED FOR COARSE AGGREGATE FOR CONCRETE MIXES.

ROCK BASE IS TO BE COMPACTED AND SMOOTHED WITH A STEEL FACED ROLLER PROIR TO PLACEMENT OF ASPHALT. TACK COAT *WILL NOT* BE APPLIED TO ROCK BASE.

A TACK COAT OF EMULSIFIED ASPHALT (SC–1H OR CSS–1H) SHALL BE APPLIED AT AN APPROXIMATE RATE OF 0.05 GALLONS PER SQUARE YARD BETWEEN EACH LIFT OF ASPHALTIC MATERIAL.

BITUMINOUS BASE AND ASPHALTIC CONCRETE WEARING SURFACE SHALL BE PLACED WITH A LAYDOWN MACHINE HAVING AUTOMATIC CONTROLS FOR LINE AND GRADE.

CONSTRUCTION JOINTS IN EACH LIFT SHALL BE STAGGERED A MINIMUM DISTANCE OF ONE (1) FOOT FROM JOINTS IN PRECEDING LIFTS AND PLACED SO THAT A JOINT WILL BE CONSTRUCTED ON THE CENTERLINE OF THE TOP LIFT.

THE ASPHALTIC CONCRETE PAVEMENT BETWEEN THE COMBINED CURB AND GUTTER SHALL BE PAID AS SQUARE YARDS OF 6" ASPHALTIC CONCRETE (4" BITUMINOUS BASE.)

Revised: 1–24–00, MCG

CITY OF WICHITA
PUBLIC WORKS
ENGINEERING

41' PAVEMENT
6" ASPHALTIC CONCRETE
W/ CRUSHED ROCK BASE

CITY ENGINEER
JAMES L. ARMOUR, P.E., L.S.
ACTING

PROJECT NUMBER	CFA NUMBER	DATE
XXX–XXXXX	XXXXXX	MM/YY

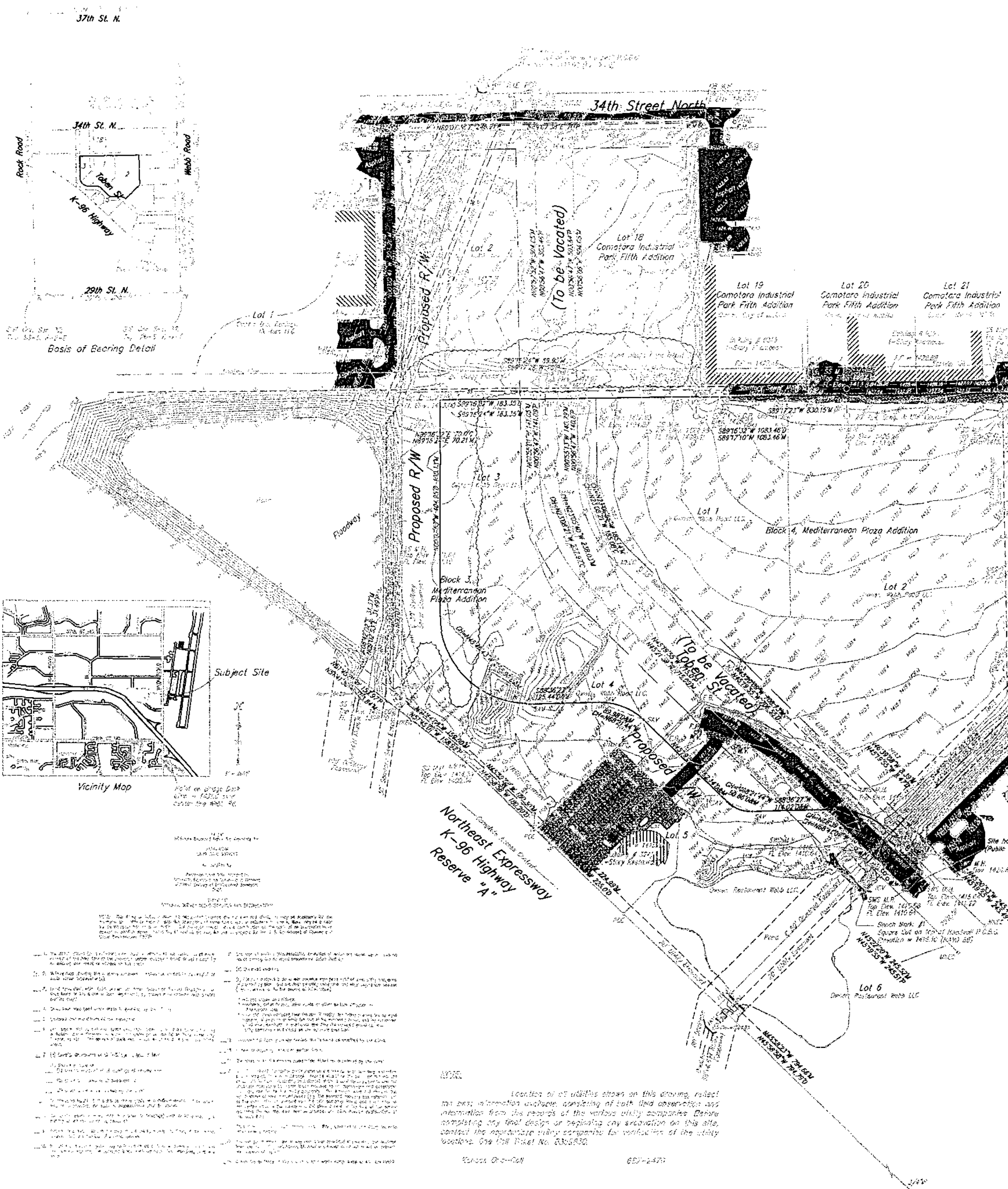
CITY ENGINEER'S OFFICE
CITY HALL – SEVENTH FLOOR
455 NORTH MAIN STREET
WICHITA, KANSAS 67202–1620
(316) 268–4351
(316) 268–4114 FAX

DESIGN	DRAWN
ABC	DEF

SHEET
X OF X

ALT41.DWG

ALTA/ACSM LAND TITLE SURVEY
MENARDS
Wichita, Kansas



NOTES:

1) SURVEY DATE: October 17, 2008.

2) RECORD INFORMATION: Title Commitment No. 1021913 provided by First American Title Insurance Company of Kansas. Dated October 7, 2008

3) Flood Zone Designation: According to the FEMA/FIRM Community Panel No. 20173C0376E, effective February 2, 2007; the property shown hereon is located in unshaded Zone X, an area determined to be outside the 0.2% annual chance floodplain.

4) AREA: 72,815.0 Sq. Ft.±/ 16.71 Acres±

5) EASEMENTS: Easement for Navigable Airspace in the document recorded as Film 629, Page 580. (None Plotable)

6) COVENANTS AND RESTRICTIONS: Contained in/on Film 629, Page 586, Film 1903 Page 371 and DOC/FLM-PG: 28890428.

7) ENCROACHMENTS: No Sanitary Sewer Easements of recorded for manhole stubs along North line.

Beginning at the Northeast corner of said Lot 3; Thence S00°56'47"E on an assumed bearing along the East line of said Lot 3 for a distance of 141.09 feet; Thence continuing along the East line of said Lot 3 on tangent curve to the left, (said curve having a radius of 315 feet, a length of 146.37 feet, a chord bearing of N13°53'32"W and a chord length of 141.17 feet) to the Northeast corner of said Lot 4; Thence continuing along said tangent curve to the left along the East line of said Lot 4, (said curve having a radius of 315 feet, a length of 101.66 feet, a chord bearing of N36°05'12"W and a chord length of 101.22 feet); Thence continuing S45°19'55"E along the East line of said Lot 4 for a distance of 295 feet to the Northeast corner of said Lot 5; Thence continuing S45°19'55"E along the East line of said Lot 5 for a distance of 285.95 feet; Thence S23°38'37"W for a distance of 114.62 feet; Thence on tangent curve to the right, (said curve having a radius of 65 feet, a length of 52.29 feet, a chord bearing of N68°21'44"W and a chord length of 50.95 feet); Thence S45°19'55"W parallel to the Northeast line of said Lot 5 for a distance of 162.14 feet to the Southeast line of said Lot 4; Thence continuing S45°19'55"W parallel to the Northeast line of said Lot 4 for a distance of 53.85 feet; Thence on tangent curve to the left, (said curve having a radius of 115 feet, a length of 92.45 feet, a chord bearing of N08°21'44"W and a chord length of 89.93 feet); Thence S08°38'27"W for a distance of 125.44 feet; Thence on tangent curve to the right, (said curve having a radius of 165 feet, a length of 262.81 feet, a chord bearing of N45°45'43"W and a chord length of 235.99 feet); Thence S00°07'53"W parallel to the West line of said Lot 3 for a distance of 404.95 feet to the North line of said Lot 3; Thence N89°16'33"E along the North line of said Lot 3 for a distance of 183.35 feet to the Point of Beginning.

ALONG WITH a portion of the Toben street right-of-way (to be vacated) described as follows;

Beginning at the Northwest corner of said Lot 1; Thence S00°56'47"E on an assumed bearing along the West line of said Lot 1 for a distance of 140.82 feet; Thence continuing along the West line of said Lot 1 on tangent curve to the left, (said curve having a radius of 245 feet, a length of 189.80 feet, a chord bearing of S23°08'25"E and a chord length of 185.07 feet); Thence S45°19'55"E along the West line of said Lot 1 for a distance of 295 feet to the Southwest corner of said Lot 2; Thence continuing S45°19'55"E along the Southwest line of said Lot 2 for a distance of 411.53 feet to a point on the West line of said Lot 2, said point being 8.47 feet Northwest of the Southerly most corner of said Lot 2; Thence on a non-tangent curve to the left, (said curve having a radius of 135 feet, a length of 107.15 feet, a chord bearing of N68°39'44"W and a chord length of 104.36 feet); Thence S88°35'27"W for a distance of 39.83 feet to a point on the East line of said Lot 5, said point being 288.06 feet Southeast of the Northerly most corner of said Lot 5; Thence N45°19'55"W along the East line of said Lot 5 for a distance of 288.06 feet; Thence continuing N45°19'55"W along the Northeast line of said Lot 4 for a distance of 295 feet; Thence continuing Northwest along the Northeast line of said Lot 4 on tangent curve to the right, (said curve having a radius of 315 feet, a length of 101.66 feet) to the Northeast corner of said Lot 4; Thence continuing Northwest along the East line of said Lot 3 on tangent curve to the right, (said curve having a radius of 315 feet, a length of 142.37 feet, a chord bearing of N13°53'32"W and a chord length of 141.17 feet); Thence continuing N0°56'47"W along the East line of said Lot 3 for a distance of 141.17 feet to the Northeast corner of Lot 3; Thence N89°16'33"E along the North line of said Lot 3 extended for a distance of 70 feet to the Point of Beginning.

State of Kansas)
) SS
Sedgwick County)

TO ALL PARTIES INTERESTED IN TITLE TO THE PREMISES SURVEYED:

Menard, Incorporated, a Kansas Corporation
First American Title Insurance Company of Kansas

This is to certify that this map or plat and the survey on which it is based were made in accordance with the "Minimum Standard Detail Requirements for ALTA/ACSM Land Title Surveys," jointly established and adopted by ALTA and NSPS in 2005, and includes Items 1, 2, 3, 4, 5, 6, 7a, 7b1, 7c, 8, 9, 10, 11b and 17 of Table A thereof. Pursuant to the Accuracy Standards as adopted by ALTA and NSPS and in effect on the date of this certification, undersigned further certifies that in my professional opinion, as a land surveyor registered in the State of Kansas, the Relative Positional Accuracy of this survey does not exceed that which is specified therein.

LENNY D. WOOD REGISTERED LS-1056 KANSAS LAND SURVEYOR

Date: ______________ ______________ Surveyor
Lenny D. Wood