

PRELIMINARY DRAINAGE REPORT

FOR

K-96 & GREENWICH NORTH
Wichita, Sedgwick County, Kansas

MARCH 2013

PRELIMINARY DRAINAGE REPORT

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Wichita, Sedgwick County, Kansas

MARCH 2013

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General Information

Location

The subject property is in the City of Wichita, Sedgwick County, Kansas. The site is located at K-96 on the east side of Greenwich Road. The development is bounded by Greenwich Road to the west and K-96 Highway to the south. The site is south of the Greenwich Business Center. The site is in the west half of Section 3, Township 27 South, Range 2 East of the 6th P.M. The plat area is 105.6 acres as shown on the pre-plat, Appendix A. The site is shown on the USGS Quadrangle Map, Appendix B. The site is also shown on the aerial photograph, Appendix C.

Datum

The site is shown in NAVD 88 datum.

Soils

According to the USDA NRCS Soil Survey, Appendix D, the site contains the following soil groups:

- Rosehill silty clay, 1 to 3 percent slopes, HSG "D"
- Goessel silty clay, 1 to 3 percent slopes, HSG "D"
- Irwin silty clay loam, 1 to 3 percent slopes, HSG "D"

The HSG used to select curve numbers is HSG "D."

Flood Insurance Rate Map (FIRM)

The site is shown on the FEMA FIRM Panel 20173C0377E, Sedgwick County Kansas and Incorporated Areas, Effective February 2, 2007, Appendix E. The site is in the City of Wichita, Community Number 200328. The entire site is in Zone X (unshaded), areas outside of the 0.2% annual chance flood. The nearest Zone A floodplains, areas of 100-year flooding, are approximately 100' southwest of the site or ½-mile south of the site.

Groundwater

According to the Kansas Geological Survey Water Wells Map (located at <http://www.kgs.ku.edu/Magellan/WaterWell/index.html> and referenced in March 2013,) the static water level of existing wells on site is approximately 22 feet deep.

Existing Development

Description

The site is currently undeveloped, but was planned for limited industrial/commercial land use. The area of this plat was included in the Greenwich Business Center Addition Drainage Reports with the most recent report dated November 2011.

Drainage Characteristics

The basins onsite drain to West Fork Fourmile Creek. Slopes across the site range from 0.1% to 3.0%.

The site is divided into two drainage basins in this drainage report, Basin E lies in the West Drainage Basin and Basin B lies in the East drainage basin. Both basins drain to stormwater sewer under K-96 and Greenwich. The stormwater sewer systems are not large enough to handle undeveloped flow, so all detention provided reduces the peak flow rate to the capacity of the stormwater system.

The West Basin consists of Sub-Basin A2 which is north of 29th Street and east of Greenwich Road and is unplatted, Sub-Basin B is north of 29th Street and west of Greenwich Road and is unplatted, Sub-Basin C is south of 29th and west of Greenwich Road and is developed as Regency Park Addition. Sub-Basins D1, Upper D2 and Lower D2 are north of the site, south of 29th Street, east of Greenwich Road and platted as Greenwich Business Center. The site is shown on the Existing Conditions Drainage Plan, Appendix F. The West Basin drains to the south into an existing 2-6"x3' RCB under K-96. In the previous drainage report, there was a total of 64.0 acre-feet in the drainage basin divided amongst Sub-Basins A1, A2, B, Upper D2, Lower D2, and E. Sub-Basin E, which is made up entirely of the site, had 19.5 acre-feet. A summary of the storage volumes is shown in Table 1.

The East Basin is divided into Sub-Basin A which includes a portion of the platted Greenwich Business Center Addition. Sub-Basin B includes the site. Sub-Basin C includes a portion of the platted Fairmont Addition. The basin drains to the southwest to an existing 2-48" RCP that lows under K-96 Highway. The East Basin is planned to have a total of 30.3 acre-feet of storage in Sub-Basins A, B, and C. Sub-Basin B that contains a portion of the site is anticipated to have 17.0 acre-feet of detention.

The Corps of Engineers' HEC-HMS software was used to calculate hydrographs/peak flow rates from the watersheds in the Greenwich Business Center Drainage Report dated January 2007. The previous drainage reports on Greenwich Business Center calculated additional storage in each basin to reduce the runoff to the capacity of the undersized structures under K-96 Highway.

Table 1. Detention Volume Summary.

Location	Basin Area (acres)	Existing/Previously Planned Volume (ac-ft)	Post-Project Volume (ac-ft)
West Sub-Basin E	62.7	19.5	25.1*
West Basin	215.6	64.0	69.6*
East - Sub-Basin B	44.2	17.0	17.0
East Basin	128.5	30.3	30.3

* An additional 5.6 acre-feet of storage may be provided to mitigate for other offsite detention requirements.

Utilities

There is existing water and sanitary sewer service adjacent to the site. There is an existing stormwater sewer system that conveys runoff from north to south along Greenwich Road. An existing 60" RCP system outlets into an open channel that will become the proposed detention. This system conveys runoff from Greenwich Road to the site.

Proposed Development

Description

The proposed site will develop as 11 lots for limited industrial/commercial land use as previously planned. A proposed street through the site will provide access to each lot.

Drainage Characteristics

The site will continue to drain as previously planned. The shapes of the detention facilities have changed with the proposed development.

The detention basins in the West Basin, in Sub-Basin E may provide an additional 5.6 acre-feet of detention in order to provide detention for future development in the basin. The area of this future development is shown on the Drainage and Utility Plan, Appendix G.

Utilities

The proposed utility layout is shown on the Drainage and Utility Plan, Appendix G. Proposed water lines will run along each street. Sanitary sewer will be provided to serve each lot. Stormwater sewer will be constructed to convey runoff from the streets into the detention ponds. An open channel will convey runoff along the east property line to the detention pond. An RCB has been sized to convey runoff from the proposed channel to the proposed detention in the event a road is extended in the future, Appendix H. An open channel has been sized to convey runoff along the east property line, Appendix I

Lowest Opening

The lowest openings of proposed buildings will be set as pond shapes and outlet structures are finalized.

Water Quality

With the increase of impervious area of approximately 89.8 acres, the site will be required to meet water quality requirements. The final design of the ponds has not been decided, if the ponds are wet ponds they will provide the required water quality volume. If the ponds are dry ponds, then a system of measures such as the dry detention or proprietary devices will be determined. The volume required will be approximately 8.9 acre-feet. Calculations were done in Microsoft Excel, Appendix JI.

Channel Protection

The channel protection volume required for the site is 13.6 acre-feet, Appendix K. The channel protection volume will be stored in the proposed detention ponds onsite.

Federal, State, and Local Permits

US Army Corps of Engineers

The site will not modify any jurisdictional streams or wetlands. The Army Corps of Engineers was previously contacted on this property, Appendix K.

Kansas Department of Agriculture – Division of Water Resources

There are no proposed changes to a stream, floodplain, or pond with a drainage area of more than 160 acres.

FEMA

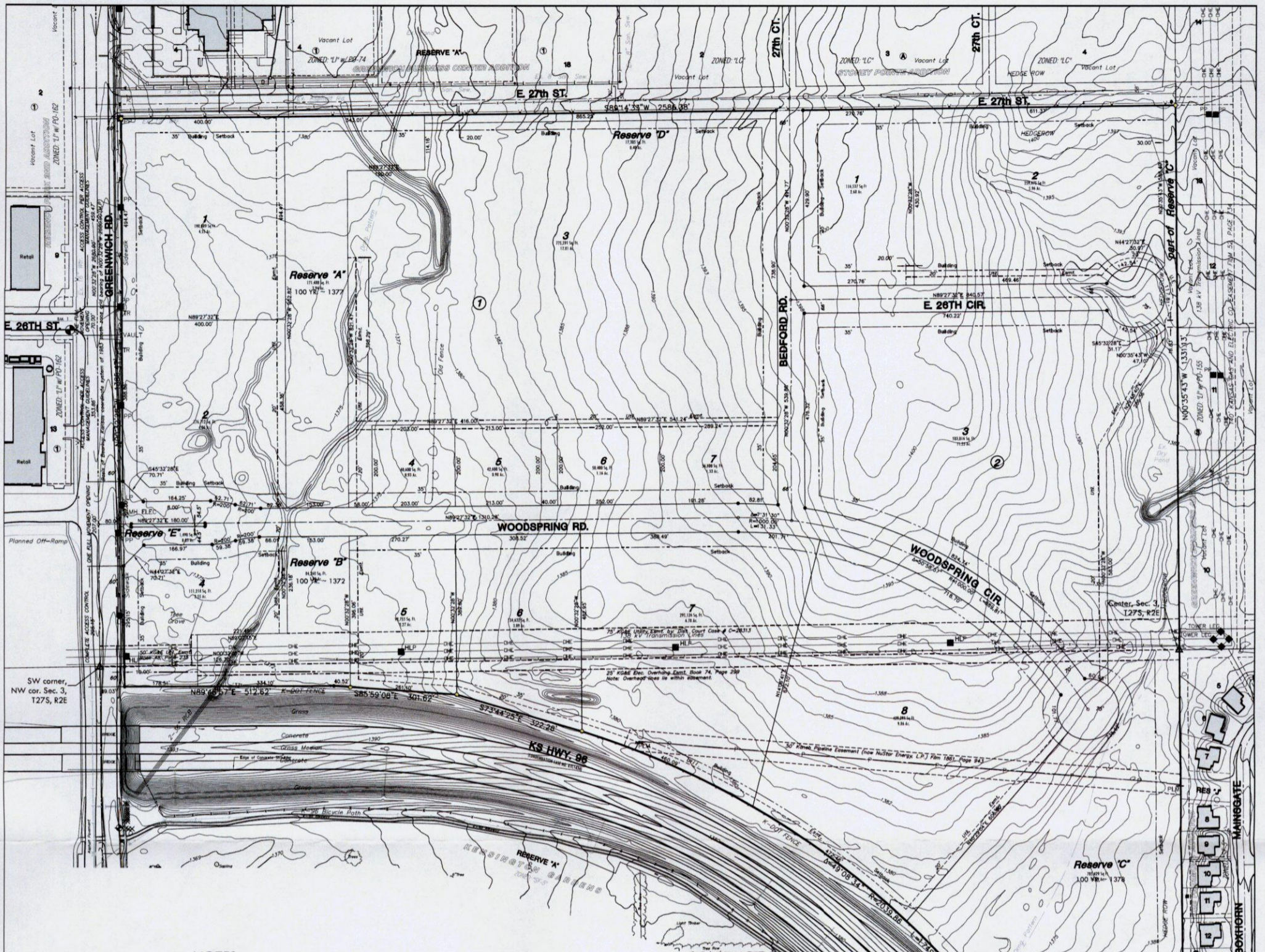
The site will not modify any FEMA floodplains. No FEMA permits will be required.

Summary

The site will develop as 11 commercial/industrial lots as was originally planned. The site provides the same volume of detention as was previously anticipated in the Greenwich Business Center Drainage Reports. In addition, the proposed plan provides detention for a portion of land south of K-96 that is to be developed in the future. Water Quality and Channel Protection volumes will be accounted for when the final detention facilities are designed

Appendix A

Pre-Plat



NOTES

- LOCATION: Located in northeast Wichita, northeast of the intersection of Kansas Highway 96 and Greenwich Road in an area of vacant land surrounded by mixed uses: industrial to the west, single family residential to the southeast, commercial to the south and southwest, offices to the west, and medical facilities to the north.
- LOT TOTAL: 11
- ANNEXATION: City of Wichita (Ordinance No. 49-178, dated 12-23-2011)
- EXISTING: Vacant industrial land
- PROPOSED USES: Destination sports complex, Regional Commercial, Regional Retail, Hotels, & Family Entertainment.
- ZONING: LI - Limited Industrial by ZON2000-23, ZON2000-62, and ZON2004-69 with CUP DP-333 (CUP2013-00006)
- PLAT AREA = 105.64 acres, more or less
- SURVEY DATE: October 2008 (by MKEC)
- PUBLIC UTILITIES: Municipal water and sanitary sewer shall be extended to the site from the west from existing mains lines along Greenwich Road. All proposed municipal water and sanitary sewer will lie within easements or rights-of-way.
- EASEMENTS: Easements shall be positioned in order to encompass all existing and proposed utilities alignments. All easements containing sanitary sewer, and or storm sewer lines shall not be less than 20 feet in width; easements containing municipal water lines shall not be less than 10 feet in width; franchise utilities shall be contained within easements not less than 5 feet. All existing easements shall remain to encompass all existing pipelines and electric overhead lines.
- ACCESS CONTROLS: Complete access controls shall be maintained along the right-of-way of Kansas Highway 96. Access points for along Greenwich Road shall be placed accordingly. Complete access controls except two full movement openings, as shown.
- PIPELINE: Existing Nustar Pipeline is located in proposed Lots 7 and 8, Block 2, and Reserve "C" of subject property. They maintain a 50 foot easement upon the subject property as indicated. Habitable structures shall not encroach into their easement or building setback.
- PUBLIC IMPROVEMENTS: The development infrastructure and facilities shall be built publicly.
- RESERVES: Reserves "A", "B", "C", "D", and "E" are platted for berms, landscaping, irrigation, open space, monuments, sidewalks, and utilities in designated locations (by easements). Reserves "A", "B", and "C" are also platted for drainage. The reserves shall be owned and maintained by the development owner and/or a lot owner's association.
- FLOOD ZONE: According to FEMA FIRM Map 2013C0377E, effective date February 2, 2007; this property lies within flood ZONE "X" - "Areas determined to be outside the 0.2% annual chance floodplain".
- MINIMUM PADS (Lowest Opening): As shown hereon and as finalized on the final drainage plan.
- DRAINAGE: A drainage plan has been developed for this plat. All drainage easements and rights-of-way shall remain at established grades or as modified with the approval of applicable City or County Engineer, and unobstructed to allow for the conveyance of stormwater.

LEGAL DESCRIPTION

The South Half of the Northwest Quarter of Section 3, Township 27 South, Range 2 East of the Sixth Principal Meridian, Wichita, Sedgewick County, Kansas, EXCEPT that part dedicated for street right-of-way, TOGETHER WITH A tract of land in the Southwest Quarter of Section 3, Township 27 South, Range 2 East of the Sixth Principal Meridian, Wichita, Sedgewick County, Kansas more particularly described as follows: COMMENCING at the Northwest corner of the Southwest Quarter of Section 3, Township 27 South, Range 2 East of the Sixth Principal Meridian, thence N89°07'30"E along the North line of said Southwest Quarter, a distance of 50.00 feet to the POINT OF BEGINNING; thence bearing N89°07'30"E along the North line of said Southwest Quarter, a distance of 2,597.70 feet to the Northeast corner of said Southwest Quarter; thence bearing S00°33'35"E along the East line of said Southwest Quarter, a distance of 1,815.28 feet to the intersection of the North Right of Way of K-96 Highway; thence along the North Right-of-Way of the K-96 Highway the following courses and distances: N24°08'09"W a distance of 532.89 feet to the Point of Curvature of a curve to the left with a radius of 2,039.86 feet and a chord distance of 1,696.46 feet bearing N48°12'42"W; thence along said curve to the left through a central angle of 49°08'34", an arc distance of 1,749.60 feet; thence bearing N73°44'11"W a distance of 322.28 feet; thence bearing N85°58'54"W, a distance of 301.62 feet; thence bearing S89°49'11"W, a distance of 522.46 feet; thence bearing N00°43'07"W, parallel with the West line of said Southwest Quarter a distance of 49.03 feet to the POINT OF BEGINNING.

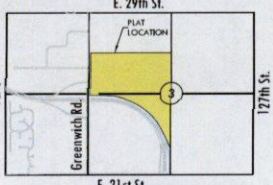
LEGEND

- - BUSH
- - EDGE OF TREES
- - DECIDUOUS TREE
- - SHED
- - MANHOLE ELECTRIC
- PP - POWER POLE
- - POWER POLE WITH LIGHT
- - ELECTRIC BOX
- - ELECTRIC TRANSFORMER
- - LIGHT POLE
- - FIRE HYDRANT
- - WATER VALVE
- - WATER METER
- - WATER SPROUT
- - IRRIGATION CONTROL VALVE
- - WATER METER VAULT
- - STORM WATER MANHOLE
- - SANITARY SEWER MANHOLE
- - CLEAN OUT
- TR - TELEPHONE RISER
- - CABLE TV RISER
- - FIBER OPTICS INDICATOR SIGN
- - GRATE INLET
- - GAS METER
- - GAS VALVE
- - SEE 1/2" REBAR/MKEC CUS-39
- - PROPERTY CORNER FOUND
- △ - SECTION CORNER FOUND
- P - PLATTED
- M - MEASURED
- CM - CALCULATED FROM MEASURED
- D - DEEDED
- - EASEMENT
- - BUILDING SETBACK
- - FENCE
- - STORM SEWER PIPE
- - WATER LINE
- - SANITARY SEWER LINE
- - GAS LINE
- - TELEPHONE LINE
- - UNDERGROUND CABLE TV LINE
- - UNDERGROUND ELECTRIC LINE
- - OVERHEAD TELEPHONE
- - OVERHEAD ELECTRIC
- - PIPELINE
- - BUILDING

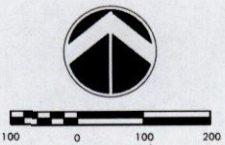
BENCH MARK

BM 1 - Brass disc in top of south curb of 26th Street North, 67' west of centerline Greenwich Road, 20' of centerline 26th Street. Elev = 1379.44 (NAVD 88)

LOTS	BLOCK	ELEVATION NAVD88
1, 2, 3, 4	1	1380.00
4 & 5	2	1375.00
3 & 8	2	1381.00



VICINITY MAP



Basis of Bearing: Kansas coordinate system of 1983 south zone grid bearing of N00°32'20"W on the west line of the NW 1/4, Section 3, T27S, R2E.
This plat is surveyed and platted on NAD83 using Kansas state plane south zone coordinates, modified to the surface, having a combined adjustment scale factor of 1.000120014401728

PRELIMINARY PLAT

A portion of the NW & SW 1/4, Sec. 8, T27S, R2E, 6th P.M.

K-96 & GREENWICH NORTH

OWNER: Medical Practice Association Properties, LLC

Att: Lorene Valentine 1010 N. Kansas, Suite: 3049,

Wichita, KS 67206

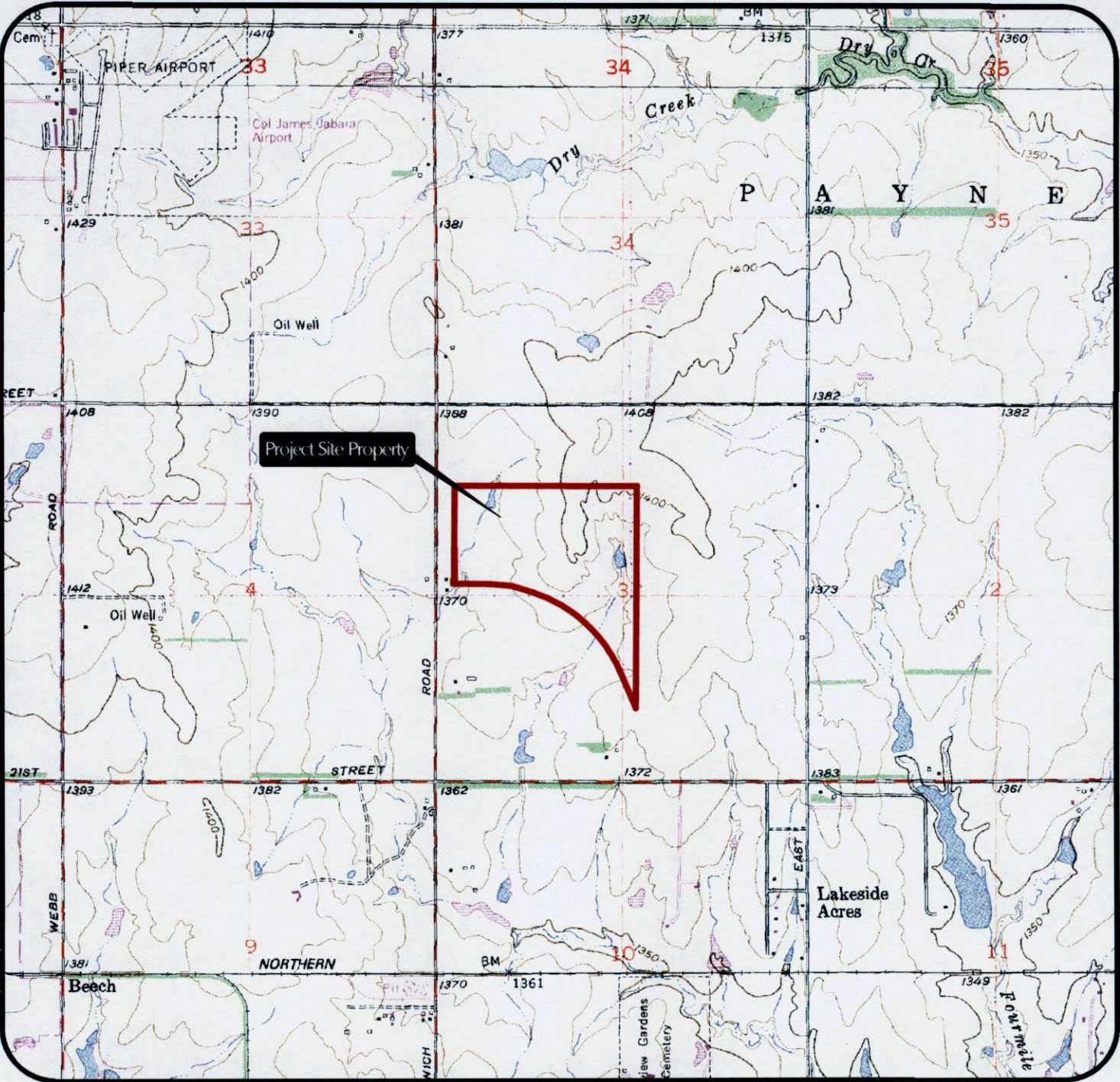
316-293-3526

MKEC
ENGINEERING
CONSULTANTS, INC.
411 N. WEBB ROAD
WICHITA, KS. 67208
316-684-9600

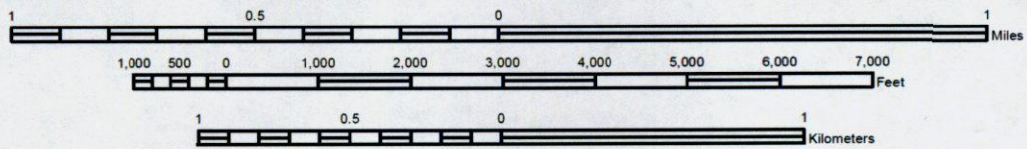
Appendix B

USGS Quadrangle Map

Path: I:\Projects\2012\1201010283 K-96 & Greenwich\5-Civil\GIS\SWPPP - K96 and Greenwich North Quad.mxd - Date: 3/14/2013



Project Site Property



SEC: 3
TWP: T27S
RNG: R2E

K-96 and Greenwich North

Project Name:
USGS Quadrangle
Sheet Title:

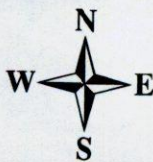


JGD	3/14/2013
Drawn By:	Date:
KLA	1201010283
Design / Review:	Job No.:

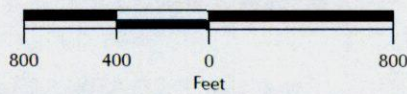
Appendix C

Aerial Photograph

Path: J:\Projects\2012\1201010283 K-96 & Greenwich15-Civil\GIS\SWPPP - K96 and Greenwich North Aerial.mxd - Date: 3/14/2013



SEC: 3
TWP: T27S
RNG: R2E



K-96 and Greenwich North

Project Name:

2011 Aerial Photography

Sheet Title:



JGD

3/14/2013

Drawn By:

Date:

KLA

1201010283

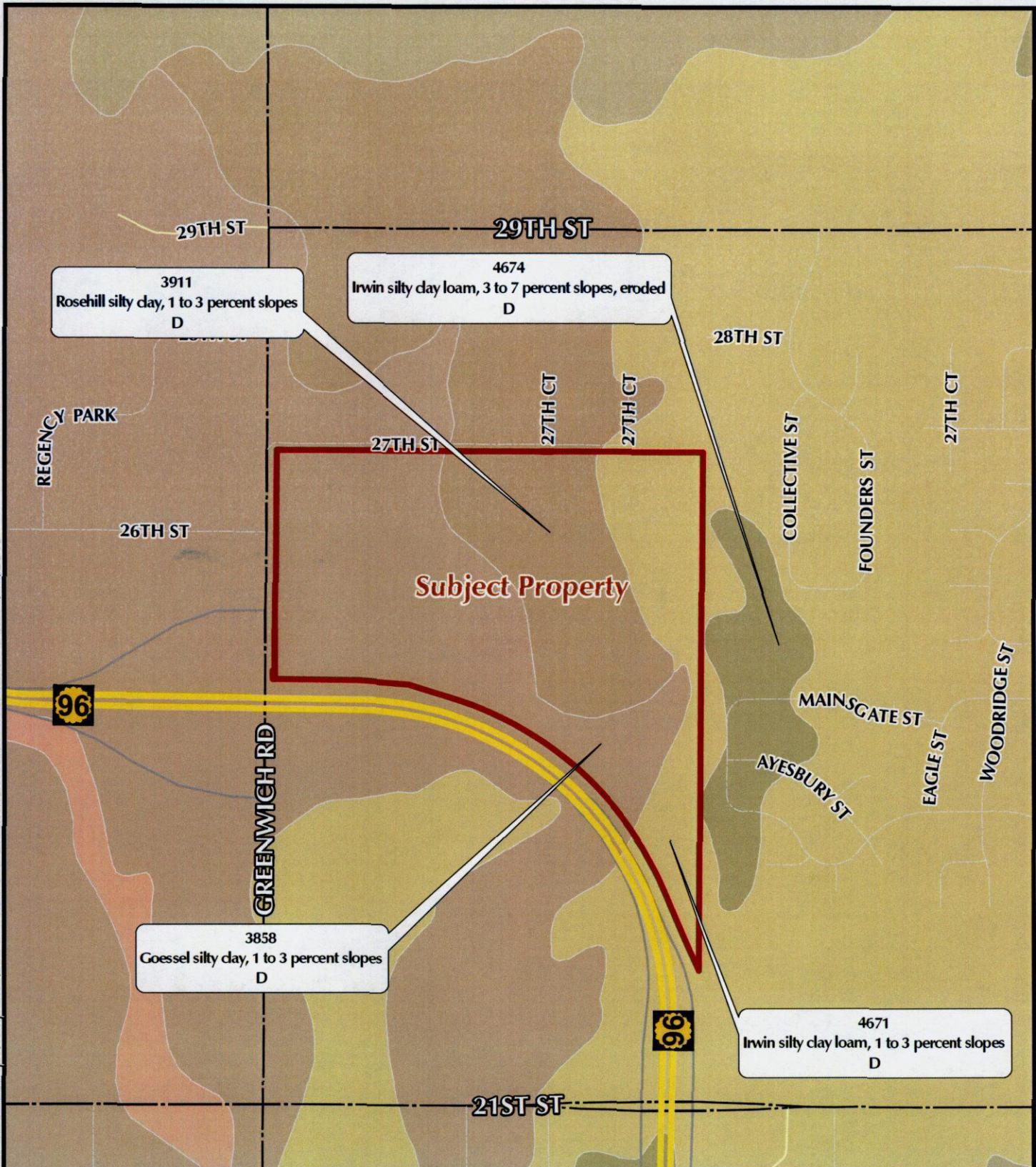
Design / Review:

Job No.:

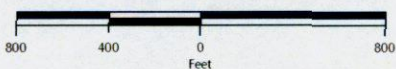
Appendix D

Soil Survey

Path: L:\GIS\Maps\Templates\SWPPP - K96 and Greenwich North NRCS.mxd - Date: 3/14/2013



SEC: 3
TWP: T27S
RNG: R2E



K-96 and Greenwich North

Project Name:

NRCS Soil Survey

Sheet Title:



JGD

3/14/2013

Drawn By:

Date:

KLA

1201010283

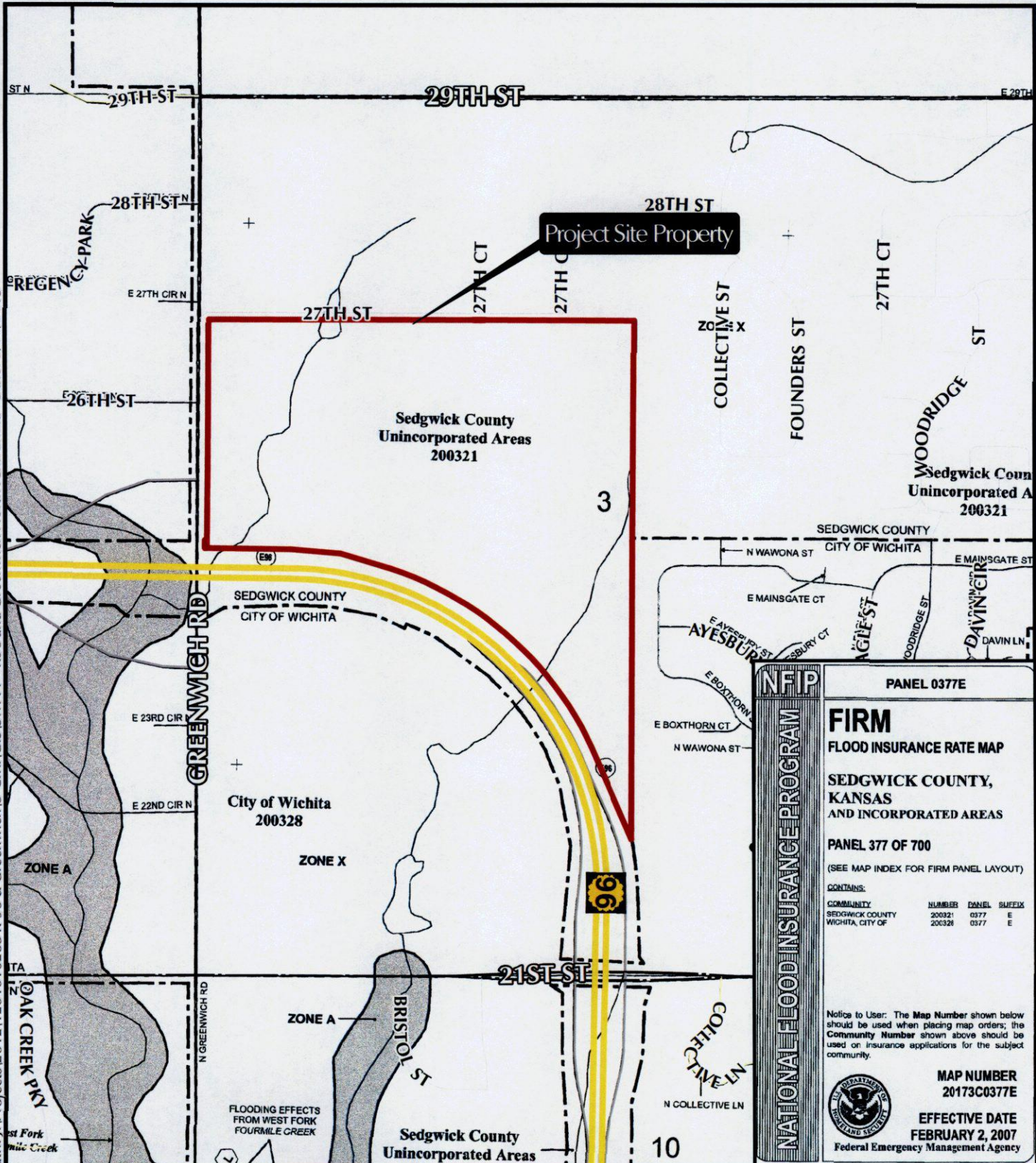
Design / Review:

Job No.:

Appendix E

FEMA Flood Insurance Rate Map (FIRM)

Path: J:\Projects\2012\1201010283 K-96 & Greenwich\5-Civil\GIS\SWPPP - K96 and Greenwich North FEMA.mxd - Date: 3/14/2013



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS AND INCORPORATED AREAS

PANEL 377 OF 700
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

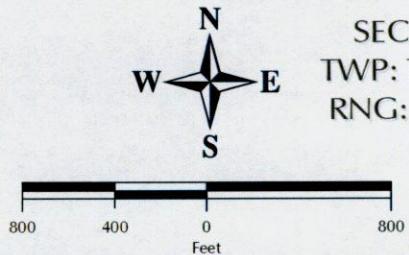
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SEDGWICK COUNTY	200321	0377	E
WICHITA, CITY OF	200328	0377	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
20173C0377E

EFFECTIVE DATE
FEBRUARY 2, 2007
Federal Emergency Management Agency



SEC: 3
TWP: T27S
RNG: R2E

K-96 and Greenwich North

Project Name:

FEMA FIRM

Sheet Title:



JGD | 3/14/2013

Drawn By: | Date:

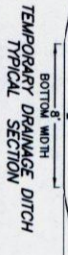
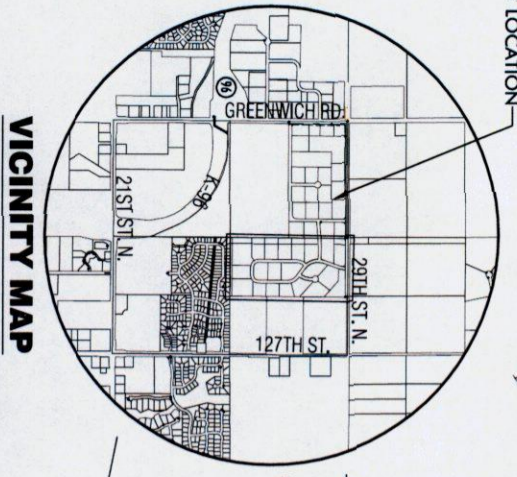
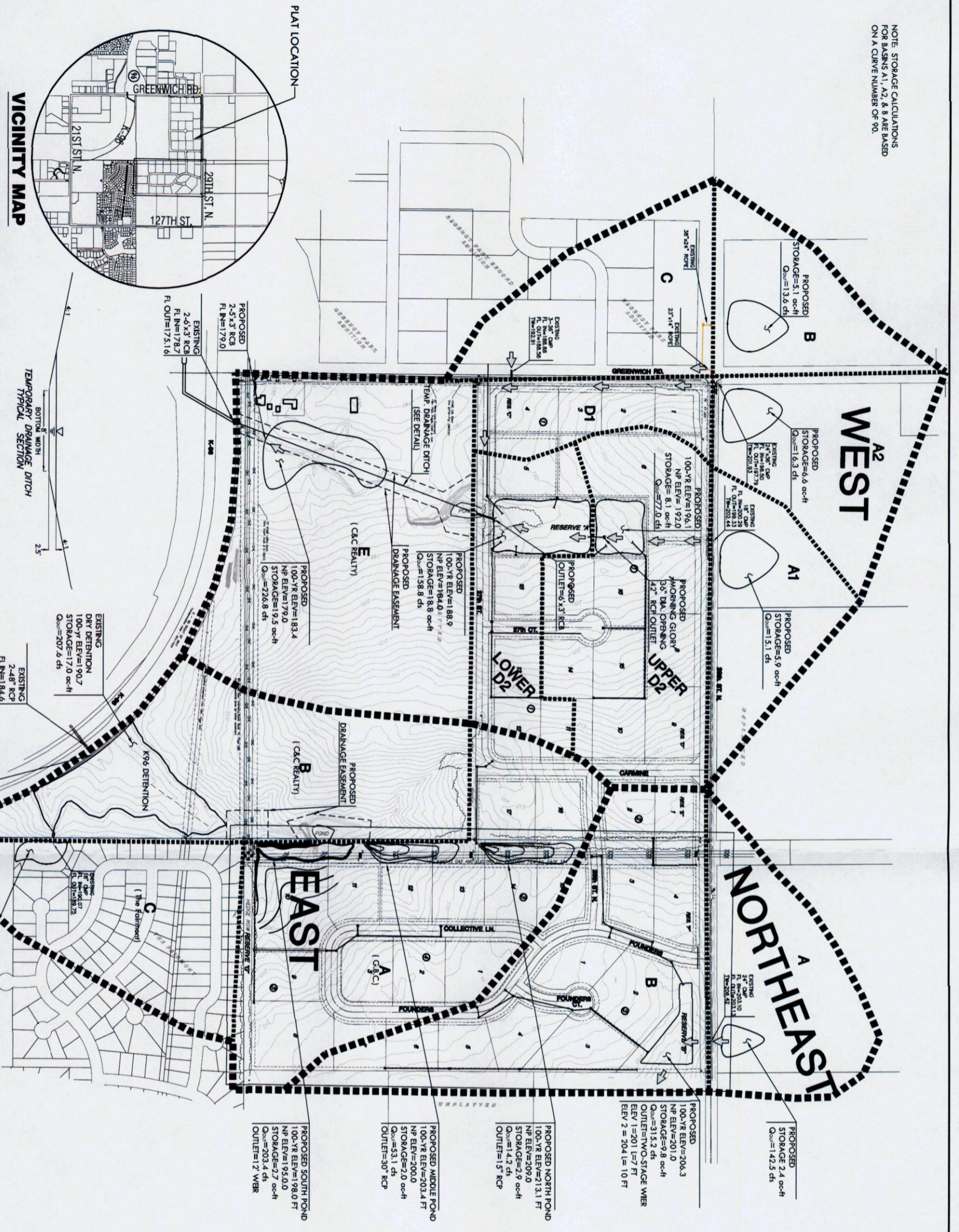
KLA | 1201010283

Design / Review: | Job No.:

Appendix F

Existing Conditions Drainage Map

NOTE: STORAGE CALCULATIONS FOR BASINS A1, A2, & B ARE BASED ON A CURVE NUMBER OF 90.



WEST

NORTHEAST

EAST

PROPOSED DETENTION PLAN

GREENWICH BUSINESS CENTER ADDITION

OWNER / DEVELOPER: Ritchie Development Corporation 8100 E. 22nd North, #1000 Wichita, KS 67226-2310 (316) 684-7300

NOTES

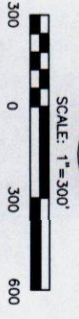
1. ZONING: Existing - SF-20 and RR
2. ANNEXATION: An application for annexation shall be submitted to the City of Wichita
3. PUBLIC UTILITIES: Shall be extended to site by partitions
4. EXISTING USE: Vacant land and Cultivated Fields
5. PLAT AREA: Gross=158.91 Ac. Net=155.65 Ac.
6. SURVEY DATE: May 12th, 2005 (by MKEC)
7. MINIMUM PADS: As shown on the Final Drainage Plan
8. LOT TOTAL - 42
9. RESERVE USES: Open space, drainage, utilities, in designated locations, monuments, landscaping, and irrigation.

BENCH MARK

BM #1
 Brass Disc on top of curb in front of fire hydrant,
 Lot 1, Block 1, Seecy Park Addition, on Addition
 to Wichita, Sedgewick County, KS
 Elev.=191.56 (City of Wichita)
 1378.96 (NGVD 29)

LEGEND

- ▲ - Sec. Corner
- - Prop. Prop. Corner
- - GAS METER
- - SANITARY SEWER MANHOLE
- - POWER POLE / GUY ANCHOR
- - ELECTRIC BOX
- - SIGN
- - GATE
- - TRENDS
- - EDGE OF TREES
- - POLE
- - HIGH TENSION POWER LINE
- - FIRE HYDRANT
- - WATER VALVE
- - WATER METER
- - TELEPHONE RISER
- - FENCE
- - STORM SEWER PIPE
- - WATER LINE
- - SANITARY SEWER LINE
- - GAS LINE
- - TELEPHONE LINE
- - OVERHEAD ELECTRIC
- - ZONED PARCELS
- - STREET DEDICATION WIDTH VARIES 60' ALONG S.L. 75' AT INTERSECTION
- - WATERSHED BOUNDARIES
- - DRAINAGE BOUNDARIES
- - DRAINAGE AREAS
- - WATERSHED AREAS
- - FLOW DIRECTION



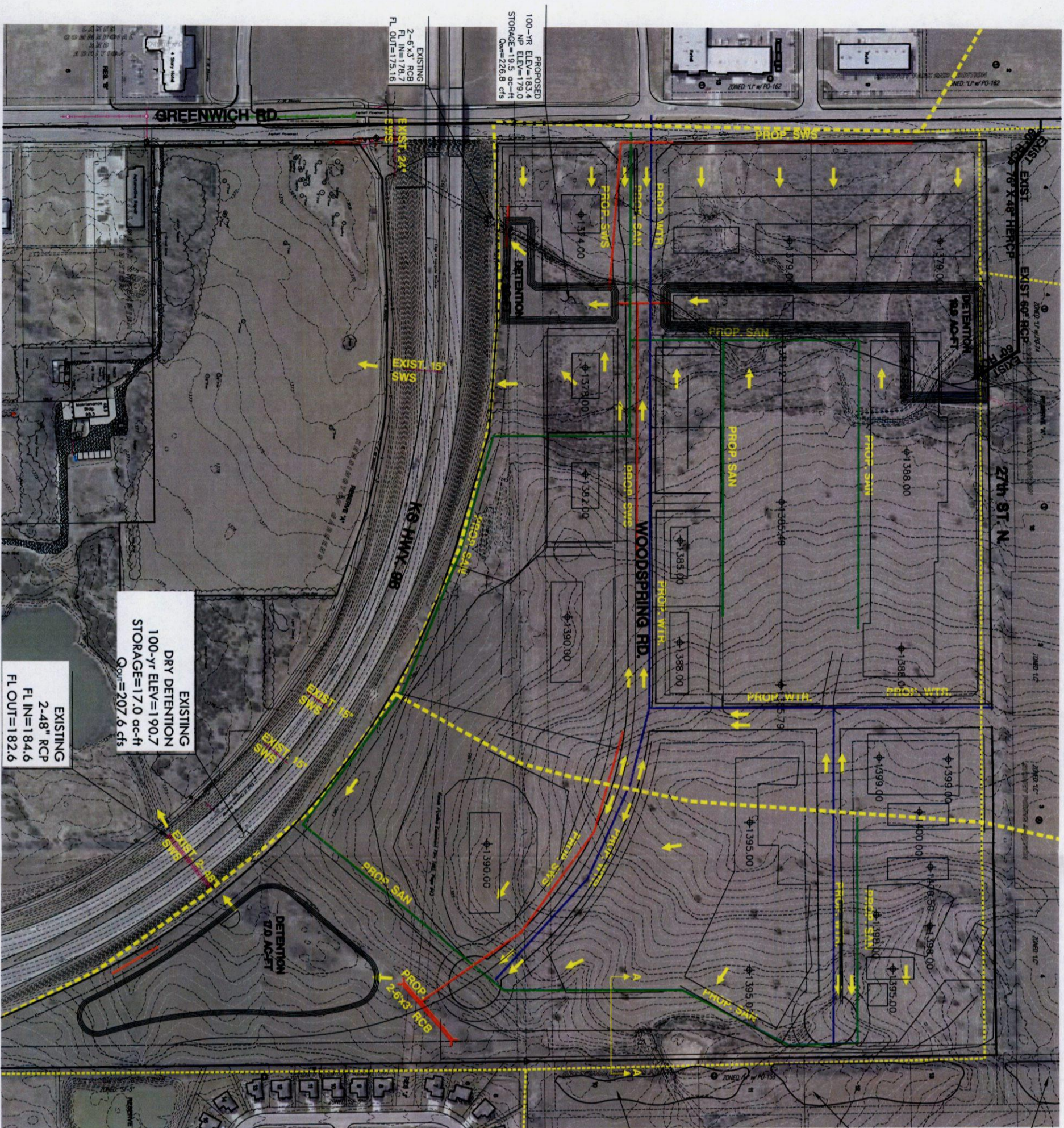
REVISED - JANUARY 2007
 ADDED KCE POND IN THE EAST WATERSHED.
 MODIFIED OUTLET STRUCTURES IN THE WEST AND
 NORTHEAST WATERSHEDS.

Date: August, 2005

MKEC
 ENGINEERING
 CONSULTANTS, INC.

Appendix G

Drainage and Utility Plan



EXISTING
2-48" RCP
FL IN=184.6
FL OUT=182.6

EXISTING
DRY DETENTION
100-yr ELEV=190.7
STORAGE=17.0 ac-ft
Q_{out}=207.6 cfs

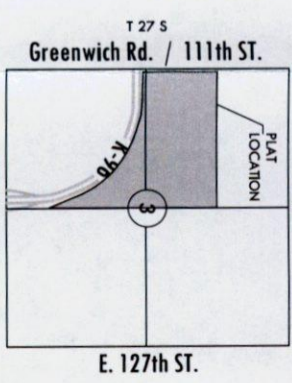
PROPOSED
100-yr ELEV=183.4
NP ELEV=179.0
STORAGE=19.5 ac-ft
Q_{out}=226.8 cfs

EXISTING
2-6"x3" RCB
FL IN=178.7
FL OUT=173.16

PROPOSED NORTH
POND 100-yr
ELEV=213.1 FT
NP ELEV=209.0
STORAGE=2.9 ac-ft
Q_{out}=14.2 cfs
OUTLET=15" RCP

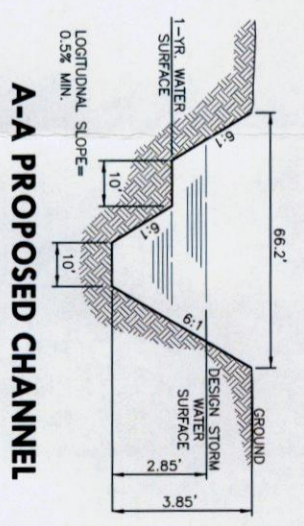
PROPOSED MIDDLE POND
100-yr ELEV=203.4 FT
NP ELEV=200.0
STORAGE=2.0 ac-ft
Q_{out}=53.1 cfs
OUTLET=30" RCP

PROPOSED SOUTH POND
100-yr ELEV=198.0 FT
NP ELEV=195.0 FT
STORAGE=2.7 ac-ft
Q_{out}=203.4 cfs
OUTLET=12" WEIR



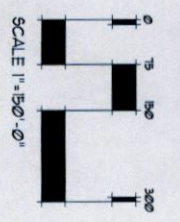
VICINITY MAP

- LEGEND**
- W — EXISTING WATER LINE
 - S — EXISTING STORM SEWER
 - SS — EXISTING SANITARY SEWER
 - UGT — EXISTING UNDERGROUND TELEPHONE
 - UGE — EXISTING UNDERGROUND ELECTRICAL
 - G — EXISTING GAS LINE
 - TV — EXISTING CABLE LINE
 - — PROPERTY LINE
 - — PROPOSED WATER LINE
 - — PROPOSED SANITARY SEWER LINE
 - — PROPOSED SWS / RCB
 - — FLOW ARROWS
 - — PROPOSED DRAINAGE BOUNDARY



A-A PROPOSED CHANNEL

UTILITY PLAN



MKEC
ENGINEERING
CONSULTANTS, INC.
411 N. WEBB ROAD
WICHITA, K.S. 67206
316-684-9600

PRELIMINARY
NOT FOR
CONSTRUCTION

**PRELIMINARY UTILITY PLAN FOR
K96 & GREENWICH**

PROJECT NUMBER: 12283
SHEET TITLE: DRAINAGE & UTILITY PLAN
SHEET NO: 1 of 2

DATE: MARCH 2013
DESIGNED: KLA / CMU / GJA
DRAWN: KLA / CMU / GJA
CHECKED: KLA / CMU / GJA

PROJECT NUMBER: 12283
SHEET TITLE: DRAINAGE & UTILITY PLAN
SHEET NO: 1 of 2

Appendix H
RCB Sizing Calculations

Culvert Report

Future Woodspring Rd.

Invert Elev Dn (ft) = 1376.00
 Pipe Length (ft) = 100.00
 Slope (%) = 0.32
 Invert Elev Up (ft) = 1376.32
 Rise (in) = 36.0
 Shape = Box
 Span (in) = 72.0
 No. Barrels = 2
 n-Value = 0.013
 Inlet Edge = Projecting
 Coeff. K,M,c,Y,k = 0.0145, 1.75, 0.0419, 0.64, 0.5

Embankment

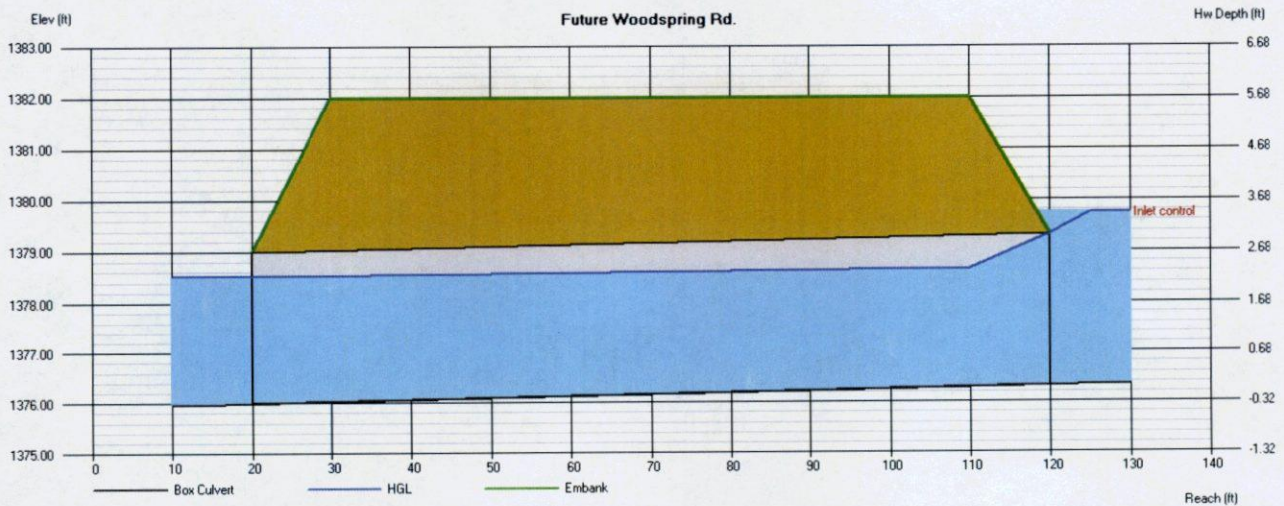
Top Elevation (ft) = 1382.00
 Top Width (ft) = 80.00
 Crest Width (ft) = 80.00

Calculations

Qmin (cfs) = 200.00
 Qmax (cfs) = 200.00
 Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 200.00
 Qpipe (cfs) = 200.00
 Qovertop (cfs) = 0.00
 Veloc Dn (ft/s) = 6.60
 Veloc Up (ft/s) = 7.13
 HGL Dn (ft) = 1378.53
 HGL Up (ft) = 1378.66
 Hw Elev (ft) = 1379.73
 Hw/D (ft) = 1.14
 Flow Regime = Inlet Control



Appendix I

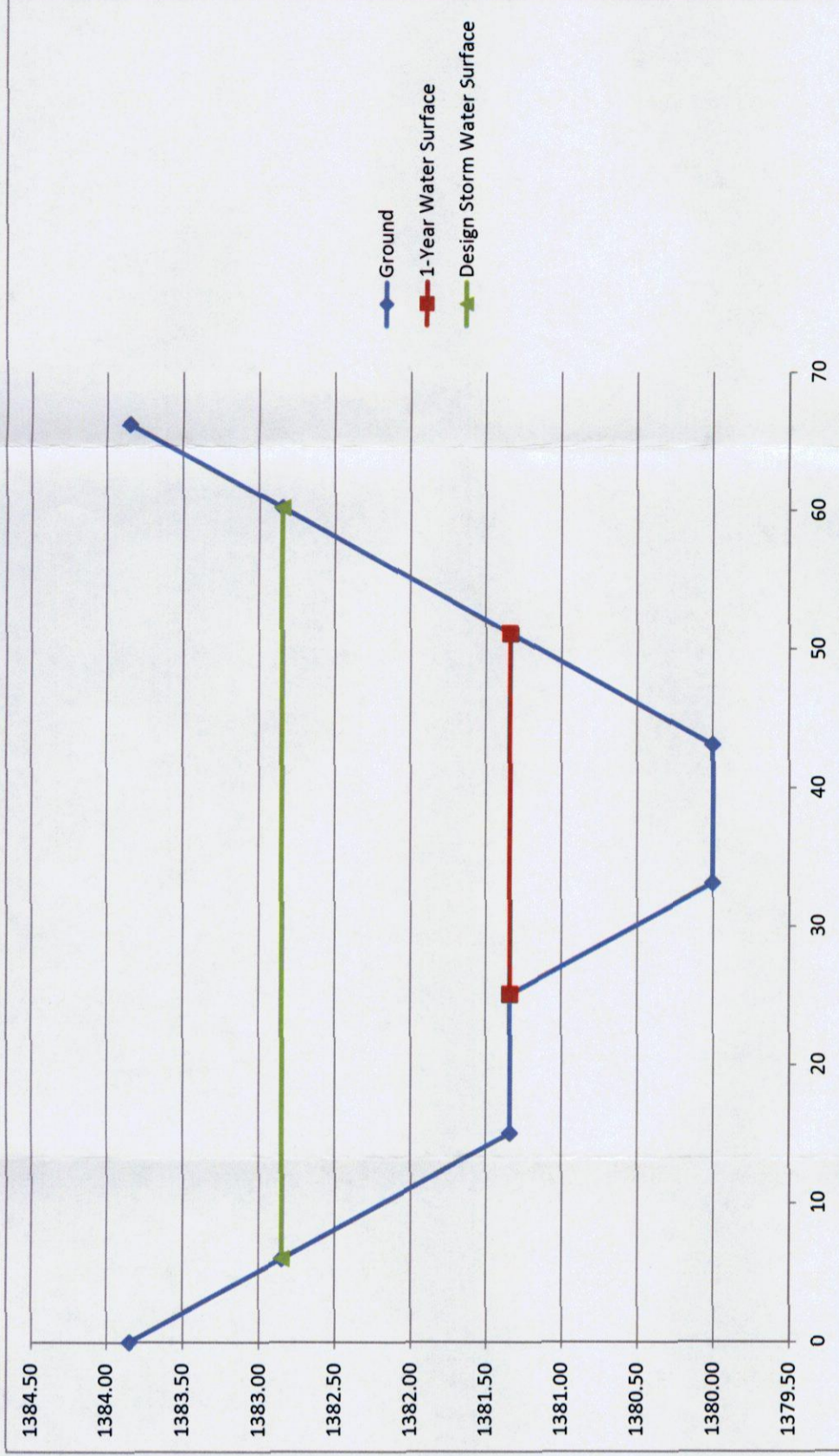
Open Channel Calculations

Compound Channel Sizing Spreadsheet

S Channel Slope (ft/ft) 0.005
 FB Freeboard (ft) 1
 Bottom Elevation 1380

Auxiliary Channel Sizing for the 1-year Storm using Manning's Equation	
BA	Auxiliary Channel Bottom Width (ft)] 10
SA	Auxiliary Channel Side Slope :1 6
QA	Auxiliary Channel Flow Rate (cfs) 80
nA	Auxiliary Channel Manning's n 0.03
Qn/(1.49S ^{1/2})	Auxiliary Channel Qn/(1.49S ^{1/2}) 22.78
DA	Auxiliary Channel Minimum Depth (ft.) 1.34
AA	Auxiliary Channel Area (sq. ft.) 24.12
WPA	Auxiliary Channel Wetted Perimeter (ft) 26.28
RA	Auxiliary Radius 0.92
AR ^{2/3} A	Auxiliary AR ^{2/3} 22.78
WA	Auxiliary Channel Top Width 26.05
VA	Auxiliary Velocity (ft/s) 3.32
SA	Auxiliary Shear (lb/ft ²) 0.42

*Estimated



Total Width (ft)	66.2
Total Depth (ft)	3.85

Primary Channel Sizing using Manning's Equation	
BP	Primary Channel Bottom Width (ft)] 10
SP	Primary Channel Side Slope :1 6
Q	Total Flow Rate (cfs) 280
nP	Primary Channel Manning's n 0.03
Qn/(1.49S ^{1/2})	Aux. Channel Qn/(1.49S ^{1/2}) 79.73
DP	Primary Channel Depth (ft.) 1.51
AP	Primary Channel Area (sq. ft.) 28.78
WPP	Primary Channel Wetted Perimeter (ft) 2.32
AT	Total Area 52.90
WPT	Total Wetted Perimeter 28.59
RT	Total R 1.85
AR ^{2/3} T	Total AR ^{2/3} 79.73
DT	Total Depth 2.85
VP	Primary Velocity (ft/s) 5.29
SP	Primary Shear (lb/ft ²) 0.89

Appendix J

Water Quality Calculations

**Curve Number Calculations
K-96 and Greenwich**

Estimate Imperviousness per Land Use

HSG A			HSG B			HSG C			HSG D		
Land Use	Average % Impervious	Area (ac)	Land Use	Average % Impervious	Area (ac)	Land Use	Average % Impervious	Area (ac)	Land Use	Average % Impervious	Area (ac)
Commercial and Business	85%		Commercial and Business	85%		Commercial and Business	85%		Commercial and Business	85%	105.6
Industrial	72%		Industrial	72%		Industrial	72%		Industrial	72%	
Residential 1/8 acre or less (townhouse)	65%		Residential 1/8 acre or less (townhouse)	65%		Residential 1/8 acre or less (townhouse)	65%		Residential 1/8 acre or less (townhouse)	65%	
Residential 1/4 acre	38%		Residential 1/4 acre	38%		Residential 1/4 acre	38%		Residential 1/4 acre	38%	
Residential 1/3 acre	30%		Residential 1/3 acre	30%		Residential 1/3 acre	30%		Residential 1/3 acre	30%	
Residential 1/2 acre	25%		Residential 1/2 acre	25%		Residential 1/2 acre	25%		Residential 1/2 acre	25%	
Residential 1 acre	20%		Residential 1 acre	20%		Residential 1 acre	20%		Residential 1 acre	20%	
Residential 2 acres	12%		Residential 2 acres	12%		Residential 2 acres	12%		Residential 2 acres	12%	
Impervious Area (acres)		0	Impervious Area (acres)		0	Impervious Area (acres)		0	Impervious Area (acres)		89.76

Composite Curve Number (CN)

HSG A			HSG B			HSG C			HSG D		
Land Use	CN	Area (ac)	Land Use	CN	Area (ac)	Land Use	CN	Area (ac)	Land Use	CN	Area (ac)
Pre-Developed or Undisturbed Pervious	55		Pre-Developed or Undisturbed Pervious	71		Pre-Developed or Undisturbed Pervious	80		Pre-Developed or Undisturbed Pervious	84	
Developed or Disturbed Pervious	71		Developed or Disturbed Pervious	80		Developed or Disturbed Pervious	84		Developed or Disturbed Pervious	88	15.84
Impervious	98	0	Impervious	98	0	Impervious	98	0	Impervious	98	89.76
Composite Curve Number HSG A (CN)	0.0	0	Composite Curve Number HSG B (CN)	0.0	0	Composite Curve Number HSG C (CN)	0.0	0	Composite Curve Number HSG D (CN)	96.5	105.6

Total Weighted Composite Curve Number (CN)	96.5
Total Area (A) (acres)	105.6

Water Quality Volume Calculations K-96 and Greenwich

Volumetric Runoff Coefficients by Land Use and Hydraulic Soil Group

Land Use	Hydrologic Soil Group								Total Area (ac)
	A		B		C		D		
	Area (ac)	R _v	Area (ac)	R _v	Area (ac)	R _v	Area (ac)	R _v	
Undisturbed		0.02		0.03		0.04		0.05	0
Disturbed Pervious		0.15		0.20		0.22	15.84	0.25	15.84
Impervious Cover		0.95		0.95		0.95	89.76	0.95	89.76
Total Area (ac)	0.00		0.00		0.00		105.6		105.6
Volumetric Runoff Coefficient (R _v)	0.00		0.00		0.00		0.85		0.85

Rainfall Depth (P) (in)	1.2
Water Quality Protection Volume (WQ _v) (ac-ft)	8.92
Water Quality Protection Volume (Q _{ww}) (in)	1.01
Redevelopment	No

Appendix K

Channel Protection Volume Calculations

Water Quality Volume Calculations
K-96 and Greenwich

Rainfall Depth (P) (in)	2.80
Volumetric Runoff Coefficient (R _v)	0.85
Total Area (A) (ac)	105.60
Pond and Swamp Areas (% of Drainage Area)	0.00
Pond & Swamp Adjustment Factors (F _p)	1.00
Water Quality Protection Volume (Q _{wq}) (in)	2.37
Curve Number (CN)	96.5
Potential Maximum Abstraction (S)	0.36
Initial Abstraction (I _a)	0.07
Initial Abstraction/Rainfall Depth (I _a /P)	0.03
Time of Concentration (T _c) (min)	25.10
Time of Concentration (T _c) (hr)	0.42
Unit Peak Discharge (q _u) (csm/in) (Figure 4-6)	700.00
Water Quality Peak Flow (Q _{wq}) (cfs)	273.27
Rainfall Excess (Q) (in)	2.41
Peak Discharge (Q _p)	278.05
Ratio of Outflow to Inflow (q _o /q _i) (Figure 4-17)	0.03
Ratio of Storage Volume to Runoff Volume (V _s /V _r)	0.64
Channel Protection Volume (CP _v) (ac-ft)	13.57
Redevelopment	No

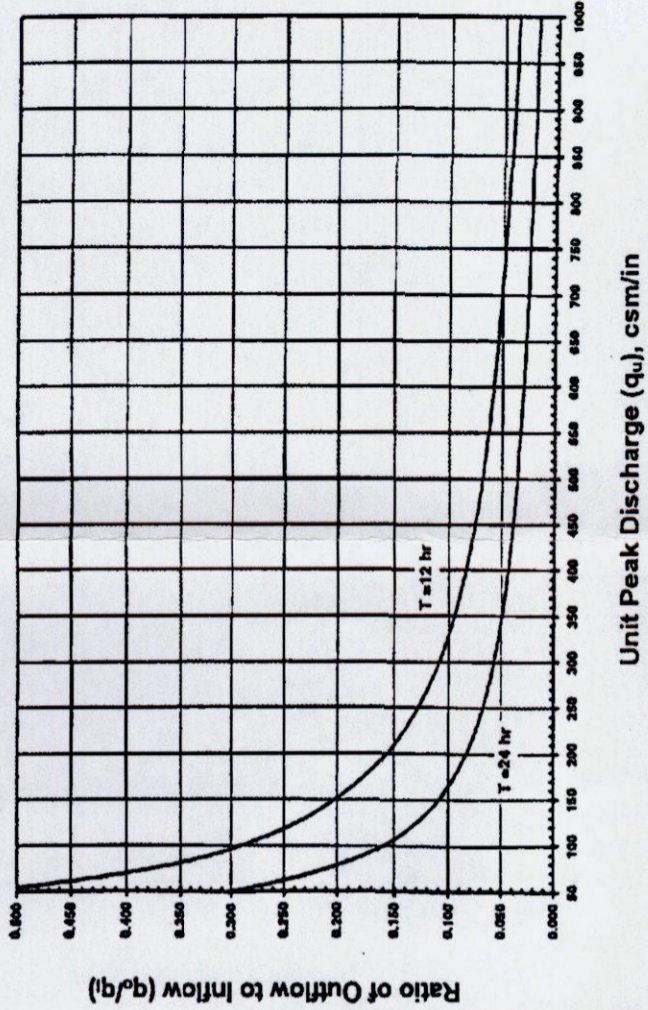


Figure 4-17 Detention Time vs Discharge Ratios
(Source: MDE, 1998)

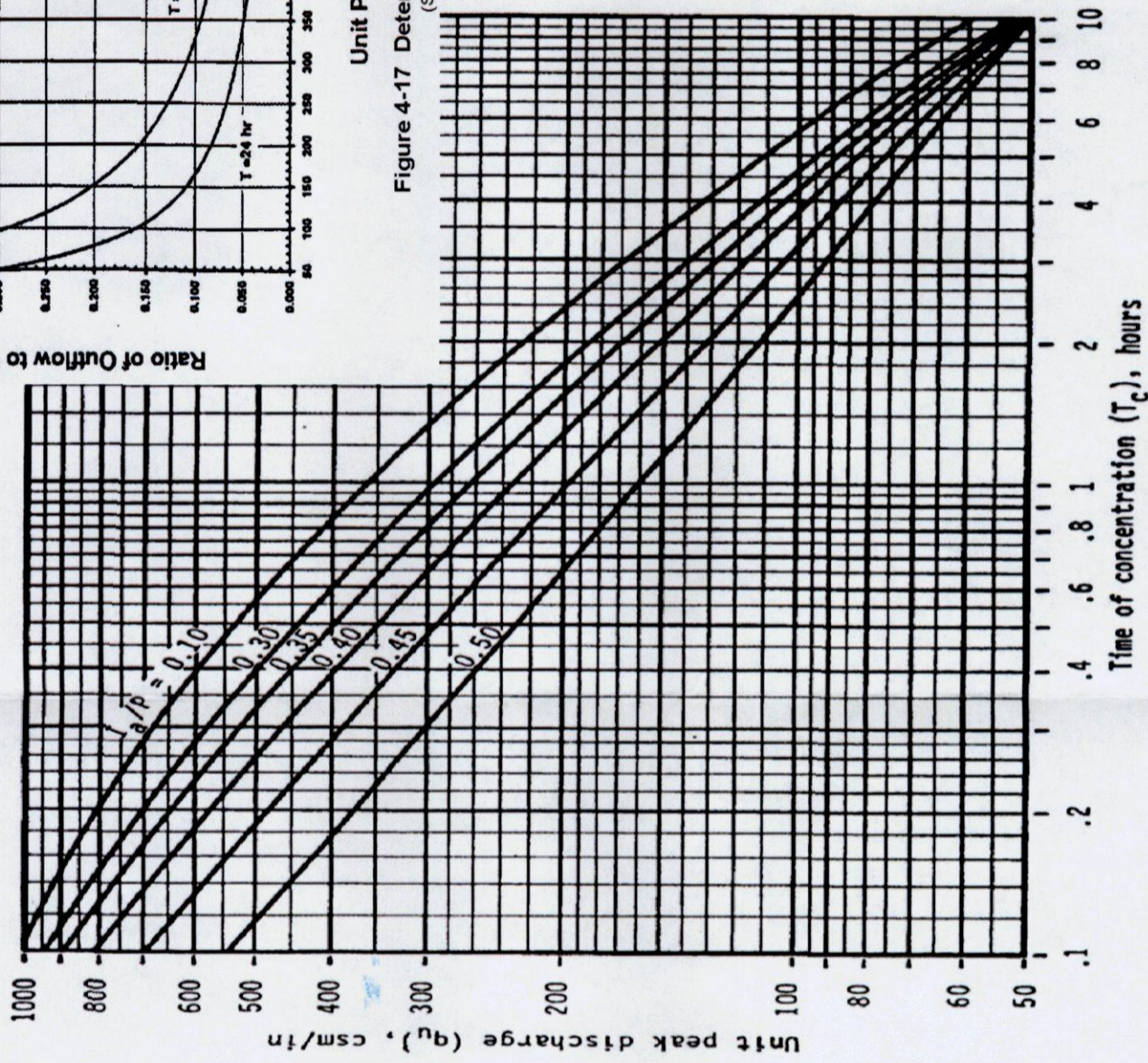


Figure 4-6 SCS Type II Unit Peak Discharge Graph
(Source: SCS, TR-55, Second Edition, June 1986)

Appendix L

Army Corps of Engineers Correspondence



DEPARTMENT OF THE ARMY
KANSAS CITY DISTRICT, CORPS OF ENGINEERS
STATE REGULATORY PROGRAM OFFICE - KANSAS
2710 N.E. SHADY CREEK ACCESS ROAD
EL DORADO, KANSAS 67042

*Copies to
Kara
Gregg A. /
m/s*

REPLY TO
ATTENTION OF:

December 1, 2004

Kansas State Regulatory Office
(200500206)
(Butler, KS, NPR)

Mr. Mark Buckingham
MKEC Engineering Consultants, Inc.
411 North Webb Road
Wichita, Kansas 67206

Dear Mr. Buckingham:

This is in response to your letter received on November 2, 2004, requesting a concurrence with a preliminary wetland delineation conducted by Mr. Gregg Armstrong of Geotechnical Services, Inc. for a 160-acre tract known as the Mollet Property. The site is located in Section 6, Township 27 south, Range 3 east, Butler County, Kansas.

The Corps of Engineers has jurisdiction over all waters of the United States. Discharges of dredged or fill material in waters of the United States, including wetlands, require prior authorization from the Corps under Section 404 of the Clean Water Act (33 USC 1344). The implementing regulation for this Act is found at 33 CFR 320-330.

The enclosed Jurisdictional Determination (JD) form describes the extent of waters of the United States on the project site. Also, the enclosed Notification of Administrative Appeal Options and Process and Request for Appeal form (FORM) describes your options in Section 1 of the FORM. If you choose to appeal, and you have new information concerning the elevation of the OHWM, you should complete Section # II of the FORM and return the FORM to this office. If you choose to appeal, but have no new information, please submit the completed FORM directly to U.S. Army Corps of Engineers, Commander, Northwestern Division (ATTN: CENWD-CM-OR), 12565 West Center Road, Omaha, NE 68144-3869.

We concur with the preliminary wetland delineation, which concludes, "no jurisdictional waters of the United States were identified within the project boundaries". Therefore, Department of the Army permit authorization would not be required for any proposed work within the delineated site. Other Federal, state and/or local permits may be required, however, and you should verify this yourself.

Mr. Thomas A. McCabe, Regulatory Specialist, reviewed the information furnished and made this determination. If you have any questions concerning this matter, please feel free to

contact Mr. McCabe at 316-322-8247 (FAX 316-322-8259).

Copies Furnished:

Environmental Protection Agency,
Water Resources Protection Branch
Kansas Department of Wildlife and Parks
Kansas Department of Agriculture

Geotechnical Services, Inc.
ATTN: Gregg Armstrong
4503 East 47th Street South
Wichita, Kansas 67210

JURISDICTIONAL DETERMINATION
U.S. Army Corps of Engineers

Revised 8/13/04

DISTRICT OFFICE: Kansas City District (CENWK)
FILE NUMBER: 200500206

PROJECT LOCATION INFORMATION:

State: Kansas
County: Butler
Center coordinates of site (latitude/longitude): 37 43 59 N / 97 09 00 W
Approximate size of area (parcel) reviewed, including uplands: 160 acres.
Name of nearest waterway: Republican Creek
Name of watershed: Arkansas River

JURISDICTIONAL DETERMINATION

Completed: Desktop determination Date:
Site visit(s) Date(s): December 1, 2004

Jurisdictional Determination (JD):

- Preliminary JD - Based on available information, there appear to be (or) there appear to be no "waters of the United States" and/or "navigable waters of the United States" on the project site. A preliminary JD is not appealable (Reference 33 CFR part 331).
- Approved JD - An approved JD is an appealable action (Reference 33 CFR part 331).
Check all that apply:
- There are "navigable waters of the United States" (as defined by 33 CFR part 329 and associated guidance) within the reviewed area. Approximate size of jurisdictional area:
- There are "waters of the United States" (as defined by 33 CFR part 328 and associated guidance) within the reviewed area. Approximate size of jurisdictional area:
- There are "isolated, non-navigable, intra-state waters or wetlands" within the reviewed area.
 Decision supported by SWANCC/Migratory Bird Rule Information Sheet for Determination of No Jurisdiction.

BASIS OF JURISDICTIONAL DETERMINATION:

- A. Waters defined under 33 CFR part 329 as "navigable waters of the United States":
 The presence of waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.
- B. Waters defined under 33 CFR part 328.3(a) as "waters of the United States":
 (1) The presence of waters, which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide.
 (2) The presence of interstate waters including interstate wetlands¹.
 (3) The presence of other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate commerce including any such waters (check all that apply):
 (i) which are or could be used by interstate or foreign travelers for recreational or other purposes.
 (ii) from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
 (iii) which are or could be used for industrial purposes by industries in interstate commerce.
 (4) Impoundments of waters otherwise defined as waters of the US.
 (5) The presence of a tributary to a water identified in (1) - (4) above.
 (6) The presence of territorial seas.
 (7) The presence of wetlands adjacent² to other waters of the US, except for those wetlands adjacent to other wetlands.

Rationale for the Basis of Jurisdictional Determination (applies to any boxes checked above). *If the jurisdictional water or wetland is not itself a navigable water of the United States, describe connection(s) to the downstream navigable waters. If B(1) or B(3) is used as the Basis of Jurisdiction, document navigability and/or interstate commerce connection (i.e., discuss site conditions, including why the waterbody is navigable and/or how the destruction of the waterbody could affect interstate or foreign commerce). If B(2, 4, 5 or 6) is used as the Basis of Jurisdiction, document the rationale used to make the determination. If B(7) is used as the Basis of Jurisdiction, document the rationale used to make adjacency determination: The grassed waterways within the project site are located above the point of jurisdiction within the tributary system.*

Lateral Extent of Jurisdiction: (Reference: 33 CFR parts 328 and 329)

- Ordinary High Water Mark indicated by:
- clear, natural line impressed on the bank
 - the presence of litter and debris
 - changes in the character of soil
 - destruction of terrestrial vegetation
 - shelving
 - other:
- High Tide Line indicated by:
- oil or scum line along shore objects
 - fine shell or debris deposits (foreshore)
 - physical markings/characteristics
 - tidal gages
 - other:
- Mean High Water Mark indicated by:
- survey to available datum; physical markings; vegetation lines/changes in vegetation types.
- Wetland boundaries, as shown on the attached wetland delineation map and/or in a delineation report prepared by:

Basis For Not Asserting Jurisdiction:

- The reviewed area consists entirely of uplands.
- Unable to confirm the presence of waters in 33 CFR part 328(a)(1, 2, or 4-7).
- Headquarters declined to approve jurisdiction on the basis of 33 CFR part 328.3(a)(3).
- The Corps has made a case-specific determination that the following waters present on the site are not Waters of the United States:
- Waste treatment systems, including treatment ponds or lagoons, pursuant to 33 CFR part 328.3.
 - Artificially irrigated areas, which would revert to upland if the irrigation ceased.
 - Artificial lakes and ponds created by excavating and/or diking dry land to collect and retain water and which are used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing.
 - Artificial reflecting or swimming pools or other small ornamental bodies of water created by excavating and/or diking dry land to retain water for primarily aesthetic reasons.
 - Water-filled depressions created in dry land incidental to construction activity and pits excavated in dry land for the purpose of obtaining fill, sand, or gravel unless and until the construction or excavation operation is abandoned and the resulting body of water meets the definition of waters of the United States found at 33 CFR 328.3(a).
 - Isolated, intrastate wetland with no nexus to interstate commerce.
 - Prior converted cropland, as determined by the Natural Resources Conservation Service. Explain rationale:
 - Non-tidal drainage or irrigation ditches excavated on dry land. Explain rationale:
 - Other (explain):

DATA REVIEWED FOR JURISDICTIONAL DETERMINATION (mark all that apply):

- Maps, plans, plots or plat submitted by or on behalf of the applicant.
- Data sheets prepared/submitted by or on behalf of the applicant.
- This office concurs with the delineation report, dated September 2004, prepared by (company): Geotechnical Services Inc.
- This office does not concur with the delineation report, dated , prepared by (company):
- Data sheets prepared by the Corps.
- Corps' navigable waters' studies:
- U.S. Geological Survey Hydrologic Atlas:
- U.S. Geological Survey 7.5 Minute Topographic maps:
- U.S. Geological Survey 7.5 Minute Historic quadrangles:
- U.S. Geological Survey 15 Minute Historic quadrangles:
- USDA Natural Resources Conservation Service Soil Survey:
- National wetlands inventory maps:
- State/Local wetland inventory maps:
- FEMA/FIRM maps (Map Name & Date):
- 100-year Floodplain Elevation is: (NGVD)
- Aerial Photographs (Name & Date):
- Other photographs (Date):
- Advanced Identification Wetland maps:
- Site visit/determination conducted on:
- Applicable/supporting case law:
- Other information (please specify):

¹Wetlands are identified and delineated using the methods and criteria established in the Corps Wetland Delineation Manual (87 Manual) (i.e., occurrence of hydrophytic vegetation, hydric soils and wetland hydrology).

²The term "adjacent" means bordering, contiguous, or neighboring. Wetlands separated from other waters of the U.S. by man-made dikes or barriers, natural river berms, beach dunes, and the like are also adjacent.

**NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND
REQUEST FOR APPEAL**

Applicant: MKEC Engineering Consultants Inc.- Mollet Property 160-Acre Tract		File Number: 200500206	Date: 12/01/04
Attached is:			See Section below
	A. INITIAL PROFFERED PERMIT (Standard Permit or Letter of Permission)	A	
	B. PROFFERED PERMIT (Standard Permit or Letter of Permission)	B	
	C. PERMIT DENIAL	C	
XX	D. APPROVED JURISDICTIONAL DETERMINATION	D	
	E. PRELIMINARY JURISDICTIONAL DETERMINATION	E	

SECTION II: The following identifies your rights and options regarding a modification, reconsideration, or administrative appeal of the above decision. Additional information may be found at <http://www.usbr.gov/iam/infoc/functions/cw/cc/w/for/Corpsregulations/0306/ERPart33/>

A: INITIAL PROFFERED PERMIT: You may accept or request modification of the permit.

- **ACCEPT:** If you received a Standard Permit, you may sign the permit document and return it to the District Engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- **REQUEST MODIFICATION:** If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the District Engineer. Your objections must be received by the District Engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the District Engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the District Engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit.

- **ACCEPT:** If you received a Standard Permit, you may sign the permit document and return it to the District Engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- **APPEAL:** If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the Division Engineer (address on page 2). This form must be received by the Division Engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the Division Engineer (address on page 2). This form must be received by the Division Engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept the approved JD, appeal the approved JD, or submit new information and request reconsideration of the approved JD.

- **ACCEPT:** You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- **APPEAL:** If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the Division Engineer (address on page 2). This form must be received by the Division Engineer within 60 days of the date of this notice.
- **RECONSIDERATION BASED ON NEW INFORMATION:** You may submit new information to the District Engineer for reconsideration of an approved JD. You must submit the information within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - Fill out this section and return this form to the appropriate office only if submitting a request for modification or reconsideration to the District Engineer, or if submitting a request for Administrative Appeal to the Division Engineer. All such submittals must be made within 60 days of the date of this notice.

Submit the following requests to the District Engineer:

- A. Modification of an INITIAL PROFFERED PERMIT (Item A)
- D. Reconsideration of an APPROVED JURISDICTIONAL DETERMINATION based on NEW INFORMATION (Item D RECONSIDERATION)

Submit the following requests to the Division Engineer:

- B. Administrative Appeal of a PROFFERED PERMIT (Item B)
- C. Administrative Appeal of a PERMIT DENIAL (Item C)
- E. Administrative Appeal of an APPROVED JURISDICTIONAL DETERMINATION (Item E APPEAL)
(Do not request reconsideration of an approved JD based on new information)

(Note: Preliminary Jurisdictional Determinations (Item E) are not appealable. If you have concerns regarding a preliminary Jurisdictional Determination, you can request an approved Jurisdictional Determination.)

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

SUBMITTAL OF NEW OR ADDITIONAL INFORMATION: The District Engineer may accept and consider new information if you request a modification to an initial proffered permit (Part A), or a reconsideration of an approved JD (Part D). An administrative appeal to the Division Engineer is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the administrative record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION

If you have questions regarding this decision and/or the appeal process you may contact:
DISTRICT ENGINEER
Attn: Joseph S. Hughes
Chief Regulatory Branch
U.S. Army Engineer District, Kansas City
601 East 12th Street, Room 706
Kansas City, MO 64106-2896
Telephone: 816-983-3990
(Use this address for submittals to the District Engineer)

If you wish to submit an appeal or have questions regarding the appeal process you may contact:
DIVISION ENGINEER
Attn: Mores V. Bergman
Appeal Review Officer
U.S. Army Engineer Division, Northwestern Division
12565 West Center Road
Omaha, NE 68144-3869
Telephone: 402-697-2533

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

<p>_____ Signature of appellant or agent.</p>	<p>Date:</p>	<p>Telephone number:</p>
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