

DRAINAGE REPORT

FOR

MOORINGS ELEVENTH ADDITION
Wichita, Kansas

OCTOBER 2008



Public Works, Engineering Division Final Drainage Plan Submittal Checklist

| | |
|--|-------------------------------|
| Reviewer: _____ | Date: _____ |
| Subdivision Name: _____ | Location: _____ |
| Total Land Area Of Ownership: _____ Acres | |
| Type: _____ Residential _____ Commercial _____ Industrial _____ Recreation _____ Municipal _____ Other | |
| Applicant: _____ | Contact: _____ Phone #: _____ |
| Engineer: _____ | Contact: _____ Phone #: _____ |

Please check the appropriate box:

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

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

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



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

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



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

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

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

Tab 1. Project Narrative

A. Location

The subject property is in the City of Wichita, Sedgwick County, Kansas. The proposed development is southwest of the intersection of Meridian Avenue and 53rd Street North at the intersection of Portwest and Crystal Beach. The site lies in the northwest quarter of Section 24, Township 26 South, Range 1 west. Moorings 10th Addition is east of the site. The site is shown on the USGS Map, Figure 1.1.

B. Discussion of Development

Moorings Eleventh Addition will be developed as eleven residential lots. The plat area is 10.2 acres.

C. Discussion of Offsite

Moorings 10th is east of the development and Crystal Lake is south and west of the development.

D. Summary of Runoff

Drainage considerations for this plat were addressed when Moorings 10th Addition was platted. *Drainage Report for Moorings 10th Addition, Wichita, Kansas June 2007* should be referenced for runoff calculations. This development is part of a larger common plan of development for this area. Detention for the 124.8 acres, which includes Moorings Eleventh Addition, was accounted for in the Moorings 10th development. The pre- and post-development flow rates are shown below.

Comparison of Pre and Post-Development Flow Rates

| Description | Design Storm Flows (cfs) | | | | |
|------------------------------|--------------------------|------|-------|-------|--------|
| | 2-Yr | 5-Yr | 10-Yr | 25-Yr | 100-Yr |
| Pre-project Flow to Channel | 111 | 191 | 249 | 342 | 483 |
| Post-project Flow to Channel | 106 | 183 | 238 | 327 | 462 |

E. Best Management Practices

The site will be seeded or sodded after construction of grading and utilities are complete. During construction best management practices will be followed to comply with state and federal stormwater regulations.

F. Plat

The plat is included, Figure 1.2.

G. Preliminary Grading Plan

The preliminary lot grading plan is included, Figure 1.3.

H. Professional Engineer Seal

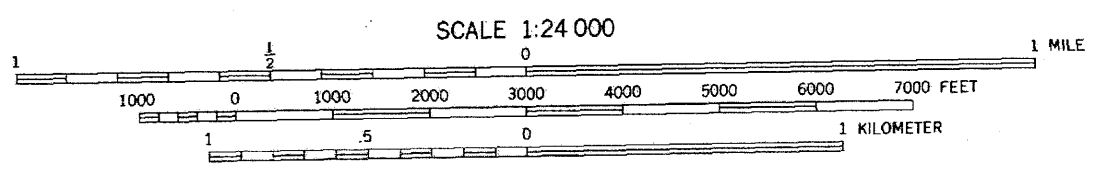
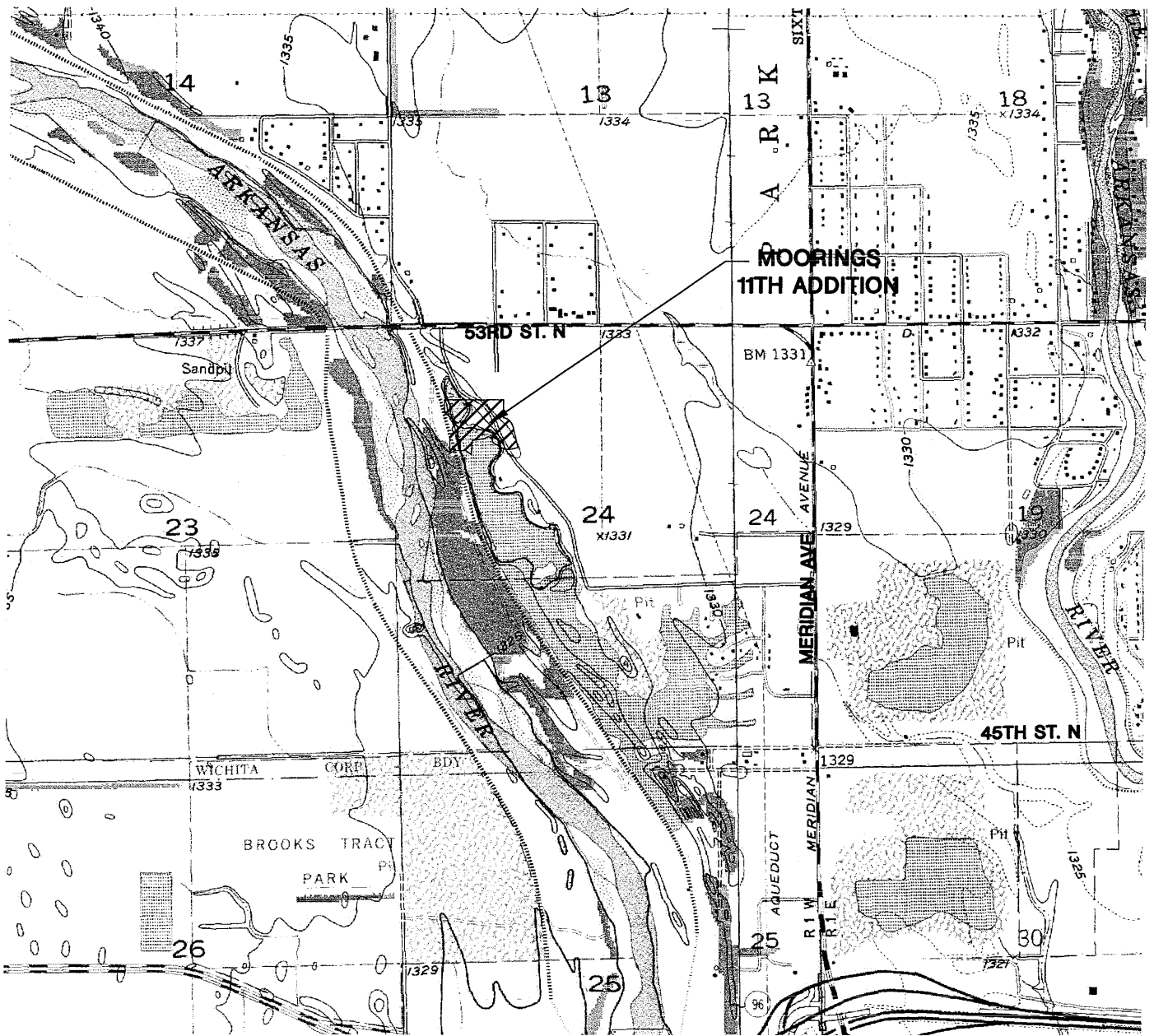
The cover of the report will be signed and dated.

I. CD

A CD of the drainage report in PDF format is attached to the inside front cover of the bound report.

Figure 1.1

USGS Quadrangle Map



SCALE 1:24 000
 CONTOUR INTERVAL 10 FEET
 DOTTED LINES REPRESENT 5-FOOT CONTOURS
 NATIONAL GEODETIC VERTICAL DATUM OF 1929

| | | | |
|---|--|--------------------------------|--|
| MKEC ENGINEERING CONSULTANTS, INC. 411 N. WEBB ROAD WICHITA, KS. 67206 316 - 684 - 9600 | MOORINGS 11TH ADDITION <small>PROJECT NAME</small> | | |
| | MAIZE & VALLEY CENTER QUADRANGLES <small>SHEET TITLE</small> | | |
| <small>DESIGN BY:</small> TMH | <small>DRAWN BY:</small> CMJ | <small>CHECKED BY:</small> TMH | |
| <small>DATE</small> OCTOBER 2008 | <small>JOB NO.</small> 08523 | <small>SHEET/OF</small> 1 / 1 | |

J:\Civil\06608\11th Add\dwg\DRNG\06608QUAD.DWG

Figure 1.2

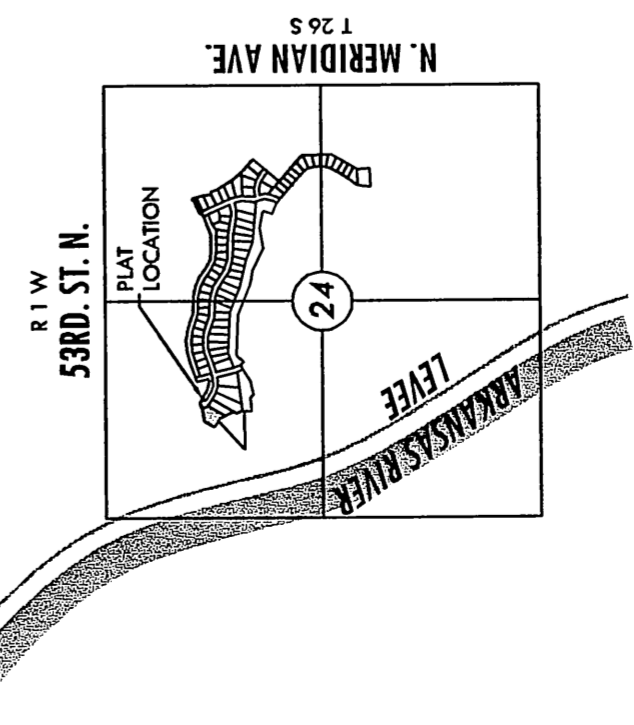
Plat

NOTES

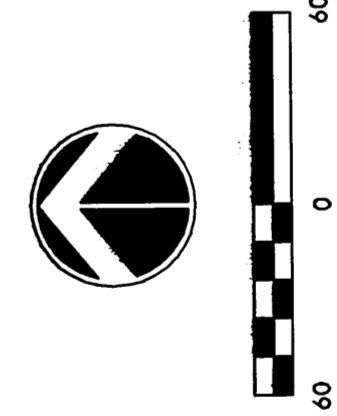
1. LOT TOTAL - 11
2. ANNEXATION: A northerly portion of the property is presently unincorporated; to be annexed with platting.
3. EXISTING PROPOSED USES: Vacant residential / Residential
4. ZONING: Existing - "SF-20" "SF-5"
5. PLAT AREA: C = 10.23 acres
6. SURVEY DATE: Sept., 2006 (by MKEC)
7. PUBLIC UTILITIES: Municipal sanitary sewer shall be extended to the property from the east. Water shall be extended from the south.
8. ACCESS CONTROLS: None
9. RESERVES: All reserves are planned for drainage, sidewalks, beams, landscaping, irrigation, utilities confined by easements, and open space. According to FEMA FIRM Community, Upl. Panel 20173C 0195AE, Effective Date February 7th, 2007; within flood zone "X"; LOWEST OPENING TO BE DETERMINED AT THE TIME OF FINAL PLATTING.
11. DRAINAGE: A drainage report shall accompany this plat.
12. LOWEST OPENINGS: As shown on the recorded final plat.

LEGEND

- SIGN - SIGN
- SM - GAS METER
- SSHH - SANITARY SEWER MANHOLE
- TREES - TREES
- FENCE - FENCE
- GATE - GATE
- POWER POLE/GUY ANCHOR - POWER POLE/GUY ANCHOR
- ELECTRIC BOX - ELECTRIC BOX
- POLE - POLE
- FIRE HYDRANT - FIRE HYDRANT
- WATER VALVE - WATER VALVE
- WATER METER - WATER METER
- TELEPHONE RISER - TELEPHONE RISER
- STORM SEWER PIPE - STORM SEWER PIPE
- WATER LINE - WATER LINE
- SANITARY SEWER LINE - SANITARY SEWER LINE
- GAS LINE - GAS LINE
- TELEPHONE LINE - TELEPHONE LINE
- OVERHEAD ELECTRIC - OVERHEAD ELECTRIC



VICINITY MAP

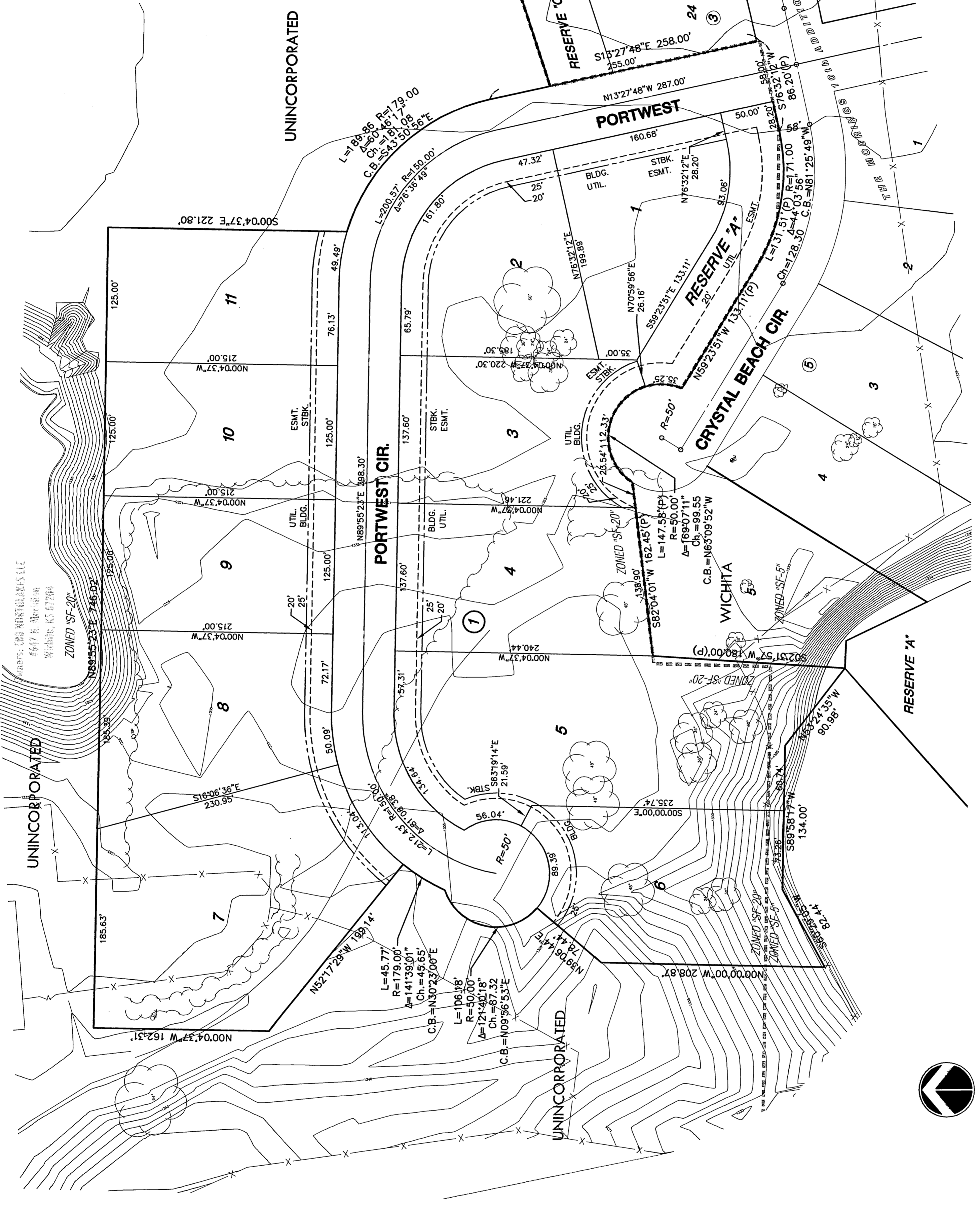


LEGAL DESCRIPTION

A tract of land lying within portions of the Northwest Quarter of Section 24, Township 26 South, Range 1 West, of the 6th Principal Meridian, Wichita, Sedgwick County, Kansas, said tract being more particularly described as follows:
BEGINNING at the Northwest corner of Lot 5, Block 5, The Moorings 10th Addition to the City of Wichita, Sedgwick County, Kansas; thence along the west line of said Lot 5, S02°31'57"W, 180.00 feet to the southwest corner of said Lot 5; thence N53°24'35"W, 90.98 feet; thence S89°58'17"W, 134.00 feet; thence S60°29'05"W, 82.44 feet; thence N00°00'00"W, 208.87 feet; thence N39°06'44"E, 78.44 feet to a point on a non-tangent curve to the right; thence along said curve, 106.18 feet; said curve having a central angle of 121°40'18", a radius of 50.00 feet and a long chord distance of 87.32 feet, bearing N09°56'53"E to a point on a non-tangent curve to the right; thence along said curve, 45.77 feet; said curve having a central angle of 141°39'01", a radius of 179.00 feet and a long chord distance of 45.65 feet, bearing N30°23'00"E; thence N52°17'29"W, 199.14 feet; thence N00°04'37"W, 162.31 feet; thence N89°55'23"E, 746.02 feet; thence S00°04'37"E, 221.80 feet to a point on a non-tangent curve to the right; thence along said curve, 189.86 feet; said curve having a central angle of 60°46'17", a radius of 179.00 feet and a long chord distance of 181.08 feet, bearing S43°50'56"E; thence S13°27'48"E, 298.00 feet; thence N76°32'12"E, 86.20 feet to a point on a curve to the right; thence along said curve 131.51 feet; said curve having a central angle of 44°03'56", a radius of 171.00 feet and a long chord distance of 128.30 feet, bearing N81°25'49"W; thence N59°23'51"W, 133.11 feet to a point on a non-tangent curve to the left; thence along said curve 147.58 feet; said curve having a central angle of 169°07'11", a radius of 50.00 feet and a long chord of 99.55 feet, bearing N63°09'52"W to the northeast corner of said Lot 5; thence along the north line of said Lot 5, S82°04'01"W, 162.45 feet to the POINT OF BEGINNING.

BENCH MARKS

- BM 1 City of Wichita disc northwest corner of Meridian and Keywest
Elev. = 1329.36 (NGVD 29)
- BM 2 City of Wichita "b" northwest corner water vault
Elev. = 1334.53 (NDVD29)
- BM 3 USGS gauging station top wall at southeast corner, bridge 53rd and Arkansas River.
Elev. = 1353.025 (NDVD 29)



PRELIMINARY PLAT
THE MOORINGS 11TH ADDITION

OWNERS / DEVELOPER: CBB NORTHLAKES LLC Attn: Kurt and Brad Bachman 4647 N. MERIDIAN Wichita, KS, 67204 (316) 838-6789

Date submitted: Sept. 29th
 Subdivision Hearing: Oct. 16th

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

Figure 1.3

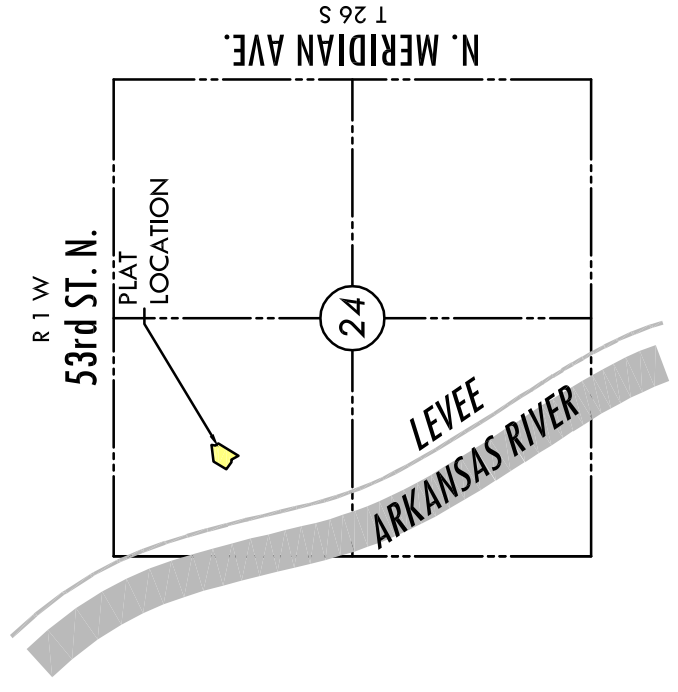
Preliminary Grading Plan

LEGEND

- ✕ CN - CONIFEROUS TREE
- DN - DECIDUOUS TREE
- SN - SIGN
- PF - POWER POLE
- ELEC - ELECTRIC BOX
- EL - LIGHT POLE
- FH - FIRE HYDRANT
- WV - WATER VALVE
- WM - WATER METER
- SC - SECTION CORNER
- BM - BENCHMARK
- EA - EASEMENT
- BS - BUILDING SETBACK
- FC - FENCE
- SS - STORM SEWER PIPE
- WL - WATER LINE
- SSL - SANITARY SEWER LINE
- GL - GAS LINE
- PL - GAS PIPELINE
- UT - TELEPHONE LINE
- UL - UNDERGROUND ELEC.
- OE - OVERHEAD ELECTRIC
- FO - FIBER OPTIC CABLE I
- DS - DRAINAGE SUB BASIN
- FA - FLOW ARROW

BENCH MARKS

- BM 1 City of Wichita disc northwest corner of Meridian and Keywest Elev. = 1329.36 (NGVD 29)
- BM 2 City of Wichita "a" northwest corner water vault Elev. = 1334.53 (NDVD29)
- BM 3 USGS gauging station top wall at southeast corner bridge 53rd and Arkansas River. Elev. = 1353.025 (NDVD 29)



VICINITY MAP



| | |
|--------------|--------------|
| DATE | OCTOBER 2008 |
| REVISED | |
| DESIGN BY | TMH |
| DRAWN BY | CMJ |
| CHECKED BY | GJA |
| SHEET NUMBER | 1 |

MOORINGS 11TH ADDITION
MOORINGS 11TH ADDITION
WICHITA, KANSAS
LOT GRADING PLAN

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

J:\CIVIL\06608\11th Add\dwg\DRNG\06608_1gp.dwg

Tab 2. Existing Conditions Runoff Calculations

A. Orthophotograph

The aerial photograph is included, Figure 2.1.

B. Runoff Method

The site was modeled using the SCS Hydrograph method in Hydraflow Hydrographs 2004 by Intelisolve; see *Drainage Report for Moorings 10th Addition, Wichita, Kansas June 2007*.

C. Existing Topography

The site is extremely flat with slopes less than 1%. Elevations on the site are around 1330 feet. The existing topography is shown in the *Drainage Report for Moorings 10th Addition, Wichita, Kansas June 2007*.

D. Site Areas

The Moorings Eleventh Addition is 10.2 acres. The site is currently undeveloped agricultural land.

E. Benchmarks

Benchmarks used for site control are included on the plat, Figure 1.2.

F. Streams, Creeks, and Waterways

The platted area is located in Zone X, areas protected by levees from the 1% annual chance storm, as shown on the Sedgwick County February 2, 2007, Kansas FIRM Panels 195 & 213 of 700, Figure 2.2. The Arkansas River is adjacent to the west property line. The Arkansas River is in Zone A floodplain. A levee runs parallel to the river, west of the property. Another channel east of Moorings 10th Addition drains from northwest to southeast. Improvements for this channel are proposed by others.

G. Soils

According to the NRCS (SCS) Sedgwick County Soil Survey, Figure 2.3, soils on the site are:

- Tabler silty clay loam, 0 to 1 percent slopes, HSG "D"
- Canadian fine sandy loam, rarely flooded, HSG "B"
- Sand Pits

Hydraulic Soil Group "D" was used for calculations for the basin which includes the site. Upstream of the site, the drainage area is primarily made up of Elandco silt loam, rarely flooded, HSG "B". Hydraulic Soil Group "B" was used for this basin.

H. Natural Features

The property is currently undeveloped agricultural land.

I. Location of Existing Impervious Areas

Currently the site is undeveloped agricultural land with no impervious area.

J. Location of Existing Utilities

No existing utilities are onsite.

K. Location of Existing Conveyance Systems

There are no existing conveyance systems onsite or adjacent to the site.

L. Flow Paths

Flow paths are shown on the *Drainage Report for Moorings 10th Addition, Wichita, Kansas June 2007*.

M. Location and Sizes of Existing Structures

There are no existing structures in the area identified on the plat as Moorings Eleventh Addition.

N. Existing Conditions Hydrologic Analysis

The site was divided into drainage areas as shown in the *Drainage Report for Moorings 10th Addition, Wichita, Kansas June 2007*. These drainage areas include the basin upstream and also area east and south of the site. All of these basins drain into the channel that runs east of Moorings 10th Addition.

The resulting pre-project flows are reported in the table below. Runoff calculations are in *Drainage Report for Moorings 10th Addition, Wichita, Kansas June 2007*.

Pre-Development Flow Rates

| Description | Design Storm Flows (cfs) | | | | |
|-----------------|--------------------------|------|-------|-------|--------|
| | 2-Yr | 5-Yr | 10-Yr | 25-Yr | 100-Yr |
| Flow to Channel | 111 | 191 | 249 | 342 | 483 |

O. Pre-Developed Runoff Curve Numbers

The curve number used for pre-developed conditions is 81 for onsite and a weighted curve number of 71.4 for the offsite watershed.

P. Existing Time of Concentration

The times of concentration for pre-development conditions are shown in the following table. Time of concentration calculations are in *Drainage Report for Moorings 10th Addition, Wichita, Kansas June 2007*.

Existing Times of Concentration

| Area | T _c | Curve Number |
|------------------------|----------------|--------------|
| | minutes | |
| Offsite | 380.8 | 71.4 |
| To Outlet | 56.7 | 81.0 |
| To Pond | 48.0 | 81.0 |
| WS1 | 27.9 | 81.0 |
| WS2 | 40.4 | 81.0 |
| WS3 | 24.2 | 81.0 |
| To Moorings North Pond | 15.0 | 81.0 |

Q. Downstream Drainage Capacity

The channel east of Moorings 10th Addition is being modified by others and will be designed to accommodate post-project flows from Moorings Eleventh Addition.

R. Existing Structural Elevations

There are no existing structures on site.

S. Open Channels

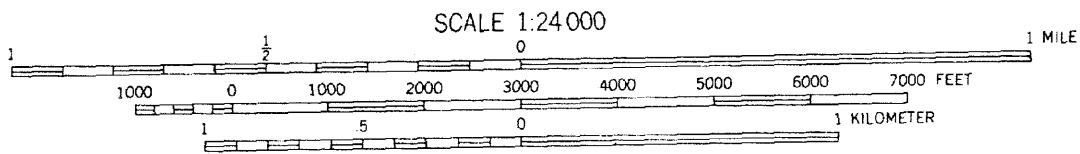
The channel east of Moorings 10th has a drainage area of 1,350 acres according to plans from Baughman. An additional area drains south to the levee and would be blocked from entering the river by the levee and blocked from entering the channel by 53rd Street. Existing 42" pipes with flap gates carry flow from this area into the Arkansas River.

T. Groundwater Elevations

Groundwater in the area is at an elevation ranging from 1321.0 west of the site to 1316.0 near the site. The groundwater elevation of Crystal Lake is 1324.9.

Figure 2.1

Orthophotograph



CONTOUR INTERVAL 10 FEET
 NATIONAL GEODETIC VERTICAL DATUM OF 1929

MKEC
 ENGINEERING
 CONSULTANTS, INC.

411 N. WEBB ROAD
 WICHITA, K.S. 67206
 316 - 684 - 9600

MOORINGS 11TH ADDITION
 PROJECT NAME

AERIAL MAP
 SHEET TITLE

TMH
 DESIGN BY:

CMJ
 DRAWN BY:

TMH
 CHECKED BY:

SEPTEMBER 2008
 DATE

08521
 JOB NO.

1 / 1
 SHEET/OF

Figure 2.2

FIRM

53RD ST NORTH W 53RD ST N

MOORINGS 11TH ADDITION

ZONE X

SEDGWICK COUNTY
CITY OF WICHITA

W BAYVIEW ST

W KEYWEST ST

N PORTWEST ST

24

+

+

W BACHMAN DR

W 42ND ST N

25


N COBBLESTONE ST

W 41ST ST N

N MERIDIAN AVE

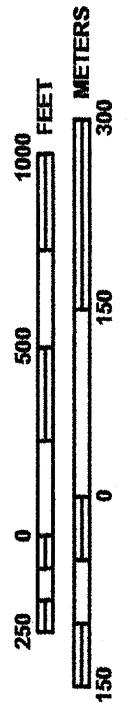
HF0557 X
HF0558 X

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

| | |
|---|---|
| PANEL 0213E | |
| FIRM | |
| FLOOD INSURANCE RATE MAP | |
| SEDGWICK COUNTY, KANSAS AND INCORPORATED AREAS | |
| PANEL 213 OF 700 | |
| (SEE MAP INDEX FOR FIRM PANEL LAYOUT) | |
| CONTAINS: | |
| COMMUNITY: | PANEL SUBJECT |
| PARK CITY CITY OF SEDGWICK COUNTY WICHITA, CITY OF | NUMBER 0213 E 200083 0213 E 200028 0213 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. | |
|  | |
| Federal Emergency Management Agency | |
| MAP NUMBER 20173C0213E | |
| EFFECTIVE DATE FEBRUARY 2, 2007 | |



MAP SCALE 1" = 500'



MOORINGS 11TH ADDITION

PROJECT NAME

FIRM PANEL 195 & 213 OF 700

SEDGWICK COUNTY, KANSAS

SHEET TITLE

MKEC
ENGINEERING
CONSULTANTS, INC.

411 N. WEBB ROAD
WICHITA, KS. 67206
316-684-9600

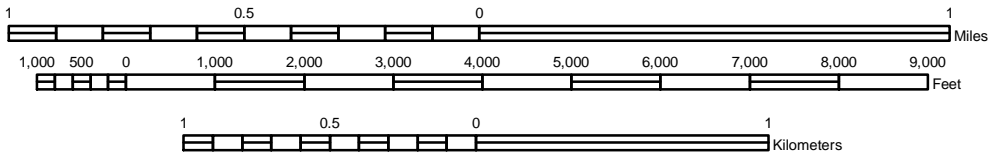
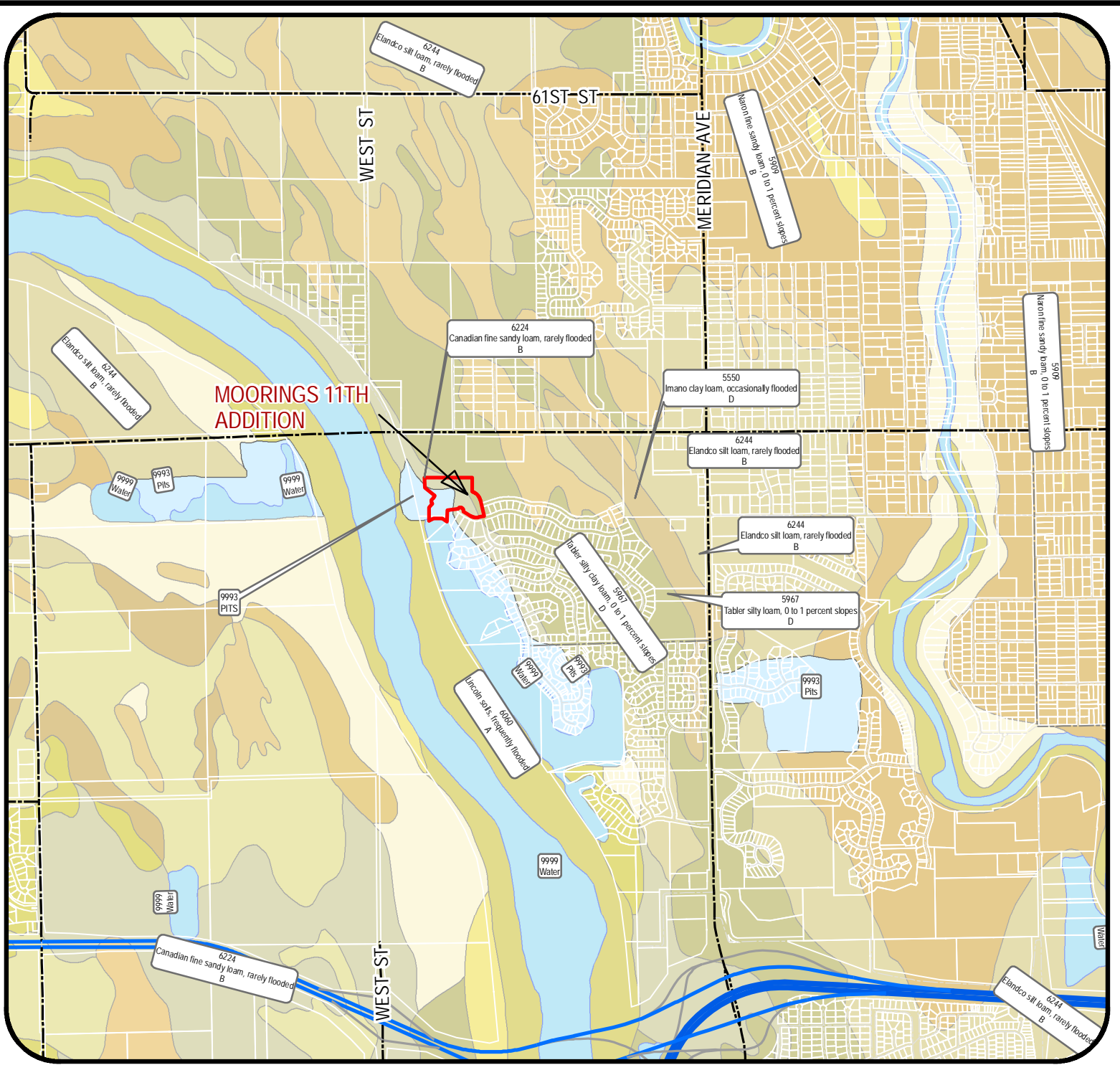
DESIGN BY: TMH
DRAWN BY: CMJ
CHECKED BY: TMH

DATE: OCTOBER 2008
JOB NO.: 08521
SHEET OF: 1 / 1

J:\CIVIL\06508\11th Add\dwg\DRNG\06508FIRM.dwg

Figure 2.3

Soil Survey



J:\Civil\06608111TH-ADD\dwg\DRNG\hrccs-soil.mxd

MOORINGS 11TH ADDITION

Project Name:
Soil Survey - Sedgwick County, KS

Sheet Title:

| | | |
|--|-------------------|-------------|
| | CMJ | Oct. 2008 |
| | Drawn By: TMH/KLA | Date: 08521 |
| | Design / Review: | Job No.: |

Tab 3. Post-Development Hydrologic Analysis

A. Proposed Conditions Hydrologic and Hydraulic Analysis

The post-project drainage boundaries are shown in the *Drainage Report for Moorings 10th Addition, Wichita, Kansas June 2007*. Hydraflow Hydrographs, 2004 by Intelisolve was used to complete the hydrologic analysis for Moorings Eleventh Addition. The runoff calculations are in *Drainage Report for Moorings 10th Addition, Wichita, Kansas June 2007* and the resulting flows are in the table below.

Post-Development Flowrates

| Description | Design Storm Flows (cfs) | | | | |
|-----------------|--------------------------|------|-------|-------|--------|
| | 2-Yr | 5-Yr | 10-Yr | 25-Yr | 100-Yr |
| Flow to Channel | 106 | 183 | 238 | 327 | 462 |

For the 100-year storm, under developed conditions, Baughman reported a flow of 370 cfs reaching 53rd St. N. from the north watershed. The decrease in flow from pre to post development is from the detention that is provided upstream. Due to different modeling software and details of the detention, we were unable to reproduce the detention in our modeling, thus the pre-project flow rate was used.

B. Proposed Time of Concentration

The time of concentration was calculated using the FAA method. The following table shows the post-development time of concentrations. Time of concentration calculations are in *Drainage Report for Moorings 10th Addition, Wichita, Kansas June 2007*.

Proposed Time of Concentrations

| Area | T _c | Curve Number |
|------------------------|----------------|--------------|
| | minutes | |
| Offsite | 380.8 | 71.4 |
| To Outlet | 43.2 | 89.7 |
| To Pond | 25.0 | 93.5 |
| WS1 | 15.0 | 95.0 |
| WS2 | 21.1 | 95.0 |
| WS3 | 15.0 | 90.5 |
| To Moorings North Pond | 15.0 | 92.0 |

C. Assumed Post-Developed Curve Numbers

A weighted curve number was used for each watershed. Curve number calculations are in *Drainage Report for Moorings 10th Addition, Wichita, Kansas June 2007*.

D. Proposed Contours for Detention

A dry detention basin was proposed for the Moorings 10th Addition, this detention adequately serves this development. Contours for this proposed detention are in *Drainage Report for Moorings 10th Addition, Wichita, Kansas June 2007*.

E. Preliminary SWS Sizing Calculations

Using 2-year design flows calculated using the rational method; Manning's equation was used to size storm sewer pipes for Moorings Eleventh Addition. Calculations are in Figure 3.1.

F. Stage-Storage-Discharge

The stage-storage-discharge for the Moorings 10th dry detention pond is in *Drainage Report for Moorings 10th Addition, Wichita, Kansas June 2007*.

G. Analysis of upstream/downstream impact

Runoff flows for all design storms remain the same or decrease from pre to post-development; therefore, upstream/downstream impacts are unchanged from current conditions.

H. Existing and Proposed Structural Elevations

There are no existing structures on site. Where applicable, minimum pad elevations will be set 3 feet above the 100-year water surface elevation. When feasible, current grade will dictate structural elevations.

I. Pond Design Elevations

Pond design elevations for the Moorings 10th pond are in *Drainage Report for Moorings 10th Addition, Wichita, Kansas June 2007*.

J. Structure Details

Storm sewer is proposed for the site.

K. Limits of Clearing and Grading

The entire site will be cleared and graded.

L. Location of Impervious Areas

The streets, houses, and driveways will be impervious.

M. Location of Utilities

Proposed utilities are shown on the drainage and utility plan, Figure 3.2.

N. Location of Conveyance Systems

Storm sewer will carry flow from the paving into the dry detention basin. Proposed storm sewer lines are shown on the drainage and utility plan, Figure 3.2.

O. Location of Channel Modifications

The channel east of Moorings 10th Addition is being modified by others.

P. Selection and Location of Stormwater Controls

Stormwater controls consist of curb inlets, storm sewer sized to handle 2-year flows in the residential areas. The detention pond in Moorings 10th adequately controls flows from this site.

Q. Emergency Overflow

The Moorings 10th drainage swale will emergency overflow to the channel east of the site.

R. Freeboard

The Moorings 10th drainage swale design will include a 1-foot freeboard for added safety.

S. 100-Year High Water Line

The 100-year water surface elevation of Crystal Lake is 1321.4.

T. Lowest Openings

The lowest opening for lots adjacent to the detention area will be 1324.4. All other lots will be graded to maintain at least 0.5% slope in the streets and 2% in the backyards.

U. Stormwater Management Facilities

The detention corridor onsite is located within a reserve.

V. Maintenance Responsibility

The maintenance of any reserves will be the responsibility of the owner until it is turned over to the homeowners association.

W. Offsite-Drainage Easements

Not applicable to Moorings Eleventh Addition.

Figure 3.1

Pipe Sizing Calculations

Hydraflow Storm Sewers Plan



Project File: sws.stm

Number of lines: 2

Date: 10-10-2008

Storm Sewer Tabulation

| Station Line | To Line | Len (ft) | Drng Area (ac) | | Rhoff coeff (C) | Area x C | | Tc | | Rain (l) (in/hr) | Total flow (cfs) | Cap full (cfs) | Vel (ft/s) | Pipe | | Invert Elev | | HGL Elev | | Grnd / Rim Elev | | Line ID |
|-----------------|------------|-------------|-------------------|-------|-----------------------|----------------|---------------|------|-------|------------------------|------------------------|----------------------|---------------|----------------|---------------|--------------|--------------|------------|------------|-----------------|------------|---------|
| | | | Incr | Total | | Inlet (min) | Syst (min) | Incr | Total | | | | | Inlet (min) | Syst (min) | Size (in) | Slope (%) | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | |
| 1 | End | 20 | 2.90 | 5.80 | 0.53 | 1.54 | 3.07 | 15.0 | 15.0 | 3.8 | 11.81 | 2.69 | 9.63 | 15 | 0.17 | -1.25 | -1.22 | 0.00 | 0.67 | 0.00 | 0.00 | |
| 2 | 1 | 20 | 2.90 | 2.90 | 0.53 | 1.54 | 1.54 | 15.0 | 15.0 | 3.8 | 5.92 | 1.80 | 7.53 | 12 | 0.25 | -0.97 | -0.91 | 1.95 | 2.50 | 0.00 | 0.00 | (2) |

Project File: sws.stm

Number of lines: 2

Run Date: 10-10-2008

NOTES: Intensity = 76.31 / (Inlet time + 14.30) ^ 0.88; Return period = 2 Yrs. ; c = cir e = ellip b = box

Figure 3.2

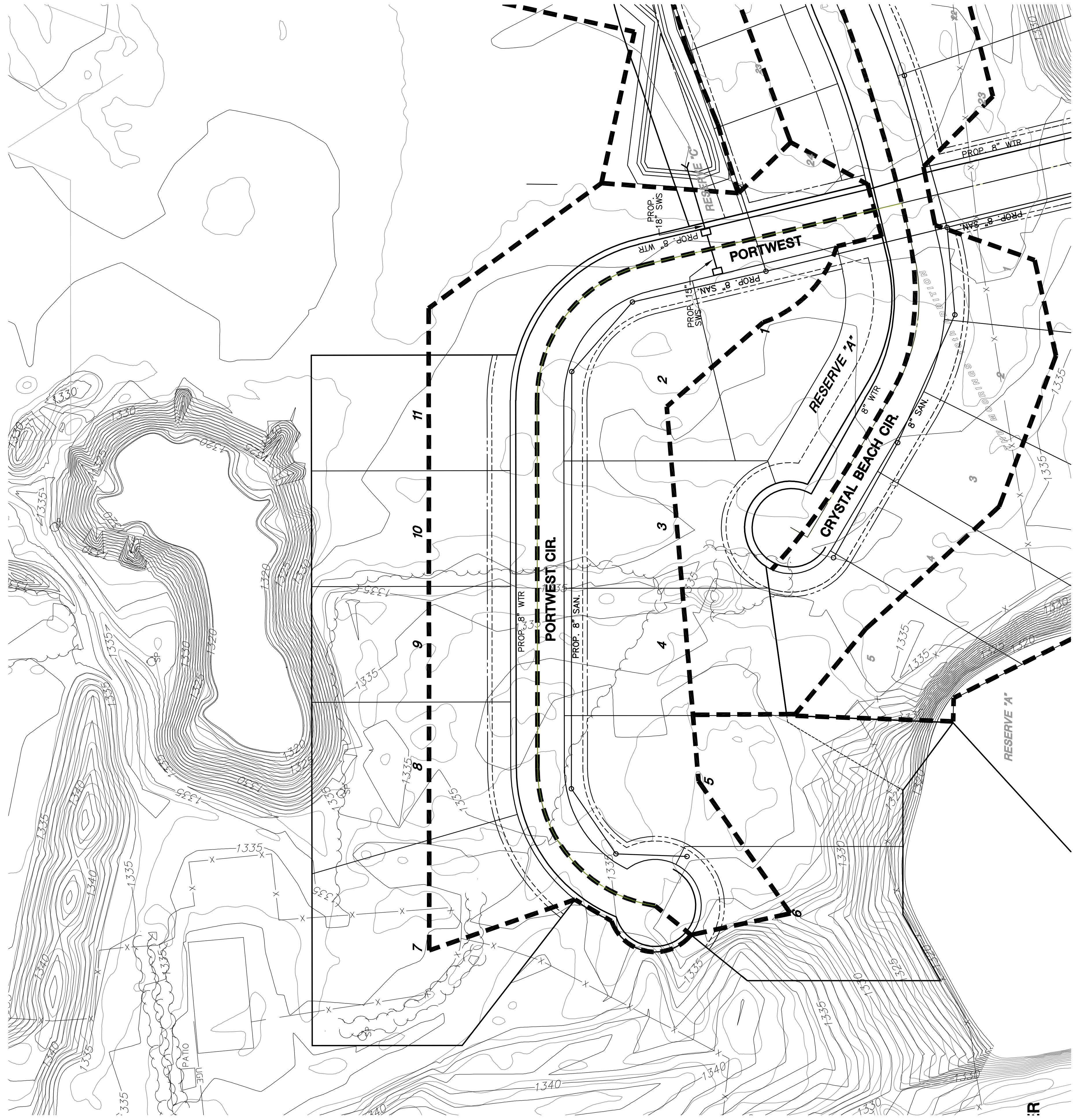
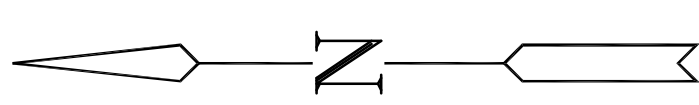
Drainage and Utility Plan

LEGEND

- CONIFEROUS TREE
- DECIDUOUS TREE
- POWER POLE
- ELECTRIC BOX
- LIGHT POLE
- FIRE HYDRANT
- WATER VALVE
- WATER METER
- SECTION CORNER
- BENCHMARK
- EASEMENT
- BUILDING SETBACK
- FENCE
- STORM SEWER PIPE
- WATER LINE
- SANITARY SEWER LINE
- GAS LINE
- GAS PIPELINE
- TELEPHONE LINE
- UNDERGROUND ELEC
- OVERHEAD ELECTRIC
- FIBER OPTIC CABLE
- DRAINAGE SUB BASIN
- FLOW ARROW
- A17** - AREA FOR SWS SIZING

BENCH MARKS

- BM 1 City of Wichita disc northwest corner of Meridian and Keywest
Elev. = 1329.36 (NGVD 29)
- BM 2 City of Wichita "T" northwest corner water vault
Elev. = 1334.53 (NDVD29)
- BM 3 USGS gauging station top wall at southeast corner bridge 53rd and Arkansas River.
Elev. = 1333.025 (NDVD 29)



Tab 4. Floodplain Submittal

Not applicable to Moorings Eleventh Addition.

Tab 5. Permits

A. *US Army Corps of Engineers*

Not applicable to Moorings Eleventh Addition.

B. *Kansas Department of Agriculture*

Not applicable to Moorings Eleventh Addition.

C. *Federal Emergency Agency (FEMA)*

Not applicable to Moorings Eleventh Addition.

D. *Kansas Department of Transportation*

Not applicable to Moorings Eleventh Addition.

E. *Sedgwick County Right-of-way Permit*

Not applicable to Moorings Eleventh Addition.