

DRAINAGE PLAN  
**FRONTGATE ADDITION**  
TO  
WICHITA, SEDGWICK COUNTY, KANSAS

PREPARED BY



12 FEBRUARY 2013



# DRAINAGE PLAN FRONTGATE ADDITION

## FINAL REPORT

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# PROJECT NARRATIVE

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## EXISTING CONDITIONS

The site is located along the south side of Central Avenue and to the west adjacent to Jackson Heights. This site is approximately 8.7 acres and was previously platted as Plaza Central Office Park 2<sup>nd</sup> Addition in 2000. A Drainage Plan currently is on file which shows no detention onsite and also portrays the onsite runoff to be conveyed to the east via SWS to the channel alongside Jackson Heights. The site slopes to the north and northeast and is currently vacant and tree covered. There is a 24" RCP stub and inlet which drains a large majority of this site at the north east corner.

There is no FEMA SFHA located on this property as of this report. The drainage patterns as defined above can be seen on the Aerial (Exhibit 2).

## PROPOSED CONDITIONS

The property is being re-platted for single family homes in a residential subdivision which will feature narrow street ROWs and homes covering the majority of the platted lots (while meeting all local applicable building code requirements). There is a detention facility proposed on this site located at the northeast corner and will discharge via a new storm sewer which will be located under Jackson Heights. On-site storm sewer will be utilized to convey south offsite runoff as well as developed onsite runoff to the detention facility. The detention facility has been sized for standard detention requirements as well as water quality and downstream channel protection responsibilities. The majority of the site will flow directly to the detention area; although some areas will sheet flow offsite as they do currently, the pond has been over-sized to account for these losses.

For a half-scale copy of the Plat, see Exhibit 3.

## OFFSITE CONDITIONS

The site currently drains to the north and east into a SWS which is conveyed to the existing channel section located in Reserve A, Plaza Central Office Addition along the east edge of Jackson Heights. There is offsite runoff from the south entering at two separate locations. They are both within 150' of each other and appear to be sheet flow of shallow concentrated flow. The offsite runoff appears to be minimal and is approximately 3.2 acres in total area. There is an offsite pond to the west / northwest which also drains to the city SWS system. The majority of the site flows to the north east corner and into the same SWS system, as mentioned above.

However, some of the site sheet flows directly to the east and over Jackson Heights asphalt roadway and directly into the channel section. The channel section is not located in a FEMA SFHA at this time, however, based on the Plaza Central Office Addition Drainage Plan a flooding peak elevation is expected at a 1344.86 (assuming NGVD29 datum). The nearest Zone AE BFE is approximately 1000' downstream and is shown as a 1344.0 elevation (NAVD88 datum).

The overall site location and hydrogeodatabase can be seen with the site location plotted as Exhibit 1.

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# EXISTING CONDITIONS RUNOFF CALCULATIONS

## DRAINAGE METHODS & STANDARDS

The following methods and standards, although not a complete list, were used in calculating the existing conditions runoff values.

- STORM SERIES
  - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 100-yr Storm Events Modeled
  - 2-yr Rainfall Depth = 3.5 in
  - 10-yr Rainfall Depth = 5.3 in
  - 100-yr Rainfall Depth = 7.9 in
  
- FLOW DATA
  - Areas per LIDAR data, USGS Quadrangle Sheet, Aerial Photos, and Site Visits
  - SCS Curve Number used for Existing Flows (CN = 84)
  - Time of Concentration: Lag Method (minimum 15 min)

## SITE CHARACTERISTICS

The site is currently platted as general office as Plaza Central Office Park Addition. The site mainly sheet flows to the north and north east and drains ultimately to the channel along Jackson Heights. There is currently a Drainage Plan on file with the City of Wichita which shows no detention on site and all developed runoff flowing via SWS to the channel section. This site is not developed per this plan, and is currently vacant.

The existing site characteristics can be seen from the aerial exhibit (Exhibit 2).

## EXISTING CONDITIONS HYDROLOGIC ANALYSIS

The site was analyzed for pre-development conditions using the SCS Curve Number method for the entire storm event series. A Curve Number of 84 was used based on undeveloped existing area in Soil Type D. A minimum Time of Concentration of 15 minutes was used.

## DOWNSTREAM DRAINAGE CAPACITY

The existing site drains primarily to the north and northeast portions of the site. Currently there is a 24" stub with a drop inlet located at the NE corner which drains into the City SWS system in Central Avenue. The east portions of the site sheet flow across Jackson Heights, which is currently asphalt mat, and into the adjacent channel. A small portion at the northwest corner drains to the adjacent corner and into the SWS central in Central Avenue. There is also currently general sheet flow from the site which drains to the ROW and into the Central Avenue ROW.

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# POST-DEVELOPMENT HYDROLOGIC ANALYSIS

## DRAINAGE METHODS & STANDARDS

The following methods and standards, although not a complete list, were used in developing the drainage and grading plans.

- STORM SERIES
  - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 50-yr, 100-yr Storm Events Modeled
  - 1.2" Water Quality Flow modeled as '3-yr event' in HydraFlow
  - Hydrograph Method utilized for Developed Flows
  - CN = 92 (Soil Type D – composite of impervious area and disturbed area)
  - Time of Concentration; Lag Method, minimum Tc = 15min
  
- GRADING CONSTRAINTS TO BE OBSERVED AT SITE PLAN
  - One foot freeboard between 100-yr WSE and adjacent lot corner
  - Match all existing perimeter grades

## DEVELOPED CONDITIONS HYDROLOGIC ANALYSIS

The site is proposed to be re-platted into a residential subdivision with corresponding streets, utilities, drainage paths and structures, and amenities. There is currently one detention facility located on the proposed layout which consists of a wet pond surface at the northeast corner. The sites developed runoff will be conveyed to the pond primarily by onsite storm water sewer and conveyance in the street ROWs and rear yard easements. A CN of 92 was used based on a composite of disturbed areas and impervious areas in Soil Type D cover.

Please be aware, that the storm listed as the '3-yr event' in the Hydraflow model is actually the 1.2" rainfall water quality event. This is due to the constraints of the programs naming conventions. All the other storm events correspond to their respective years. The Channel Protection volume is generated using the 1-year event.

## DETENTION FACILITIES

There is one detention pond proposed for this site. The pond will be located in the extreme north east corner of the site – near its natural low area – and will discharge via a proposed 30" RCP extended to the channel on the east side of Jackson Heights. The pond has been sized for water quality as well as quantity control purposes. The facility is detailed in depth below.

- Proposed Pond
  - The pond is located at the NE corner of the site. Runoff from the site will be primarily conveyed to the area via SWS. The pond will have a static WSE at a 1346.0. The pond will drain via a 2" orifice located at static, a riser/drop structure at elevation 1348.3, and a primary 30" RCP with an approximate flowline elevation at 1342.0. The orifice will slowly drain the 1-year storm event over 22 hours. We are aware that this is just short of the 24 hour City requirement. However, the adjacent channel is sized for a much larger storm event and

downstream is a series of ponds that were originally intended for this sites detention. We also caution the use of an orifice smaller than 2" due to clogging and maintenance and feel that the 22 hours is a suitable compromise from the original intent of no detention or channel protection. The corresponding 100-year WSE is expected to be 1349.4.

#### DISCHARGE POINTS SUMMARY

The site will incorporate a new SWS under Jackson Heights and will not utilize the 24" stub that is currently serving the property. The property will primarily discharge through this new conduit, and it will continue to discharge into the existing offsite channel. Some of the site will continue to sheet flow offsite as it does today.

However, the pond system has been sized to handle the total site area detention requirement to compensate for offsite flow.

The proposed orifice on the pond outfall will limit the flow volume as compared to the existing conditions. In short, the flow rates from 1 and 2 year storm events, which are the 'erosion causing storms' will be greatly reduced by the pond outfall and storage.

#### WATER QUALITY

Water quality will be obtained within the wet ponds static pool. The pond is oversized and will provide more than adequate volume to account for the water quality volume. The total water quality volume generated on the site in the 1.2 in storm event is approximately 26,625 cubic foot of storage needed. The proposed pond will contain approximately 47,916 cubic feet of volume under their static water surface. The WQ calculations can be found in the Appendix.

#### DOWNSTREAM CHANNEL PROTECTION

Downstream channel protection will be provided on the site in the proposed detention pond. The pond will provide approximately 22 hours of extended detention during the 1-year storm even. This is achieved via the 2" orifice and overflow structure. This will be done for not only the proposed site, but also the south offsite which drains through this basin.

#### POTENTIAL UPSTREAM/DOWNSTREAM IMPACTS

The site will provide detention for the entire range of storm events as well as provide downstream channel protection and meet water quality requirements. Although this site is draining some areas undetained into the Central and Jackson Heights streets ROWs, it is accepting the entire south offsite runoff into the detention pond. Since these areas ultimately discharge to the offsite channel, the net detention, channel protection, and water quality effects are the same.

Due to these issues being addressed, we do not anticipate any downstream impacts with this subdivision.

# FLOODPLAIN SUBMITTAL

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## SOURCE OF FLOODPLAIN INFORMATION

The site lies within a FEMA Zone X - Unshaded. The location of the property, on FEMA FIRM Panel 379 of 700 for Sedgwick County, Kansas, effective February 2, 2007, is attached as Exhibit 6.

## FEDERAL, STATE, & LOCAL PERMITTING

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### US ARMY CORPS OF ENGINEERS

There does not appear to be any jurisdictional waters of the US on this site.

### KANSAS DEPT OF AGRICULTURE – DWR PERMITTING

There does not appear to be any DWR permitting needed on the proposed site at this time. The areas of discharge do not account for more than 240 acres.

### FEMA

There is no mapped floodplain located upon the proposed site. Therefore, no FEMA permitting is expected at this time.

### KANSAS DEPT OF TRANSPORTATION

There is no KDOT ROW adjacent or near this property which would require a permit at this time.

### SEDGWICK COUNTY PERMITTING

There does not appear to be any Sedgwick County permitting needed at this time.

EXHIBIT 1: Site Location Map

EXHIBIT 2: Aerial Photo Exhibit with Lidar Topography

EXHIBIT 3: Plat – Half Scale

EXHIBIT 4: Drainage Plan – Half Scale

EXHIBIT 5: Floodplain Location (FIRM)

## SUPPORTING CALCULATIONS

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APPENDIX A: USGS Soils Survey

APPENDIX B : HydraFlow Hydrographs  
Site Flow and Pond Routing

# USGS Soils Survey

# HydraFlow Hydrographs

## Site Flow & Pond Routing

Drainage Plan  
1:50 Scale