

DRAINAGE PLAN  
I-135 POWER CENTER 2<sup>ND</sup>  
ADDITION  
TO  
WICHITA, SEDGWICK COUNTY, KANSAS

PREPARED BY



05 MARCH 2007



# DRAINAGE PLAN I-135 POWER CENTER 2<sup>nd</sup> ADDITION

## FINAL REPORT

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05 March 2007

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# REPORT CONTENTS

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- Project Narrative
  - Existing Conditions
  - Proposed Conditions
  - Offsite Conditions
- Exhibit 1: Site Location Map
- Exhibit 2: Plat – Half Scale
- Exhibit 3: Preliminary 4-Lot Corner Grading Plan –Half Scale

- Existing Conditions Runoff Calculations
  - Drainage Methods & Standards
  - Site Characteristics
- Existing Conditions Hydrologic Analysis
  - Downstream Drainage Capacity
- Exhibit 4: Aerial Photo Exhibit with Topography

- Post-Development Hydrologic Analysis
  - Drainage Methods & Standards
  - Detention Facilities
  - Detention Summary
  - Discharge Points Summary
- Potential Upstream/Downstream Impacts
- Exhibit 5: Drainage Plan –Half Scale

- Floodplain Submittal
  - Source of Floodplain Information
  - Exhibit 6: Floodplain Location
  - Exhibit 7: Floodway Data Table
  - Exhibit 8: Flood Profiles

- Federal, State, & Local Permitting
  - US Army Corps of Engineers
  - Kansas Dept of Agriculture –DWR Permitting
  - FEMA
  - Kansas Dept of Transportation
  - Sedgwick County ROW

- Appendices: Supporting Calculations
  - Appendix A: USGS Soils Survey
  - Appendix B: HydraFlow Hydrographs
  - Appendix C: HydraFlow Express

- Plan Sheets
  - Drainage Plan 1:100 Scale

# PROJECT NARRATIVE

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## EXISTING CONDITIONS

The site is located just northeast of the intersection of I-135 and Hydraulic Avenue. The existing site consists of approximately 28 acres and is currently open space. The space is currently being used as storage for the Cornejo & Sons concrete and asphalt plant. There is a FEMA SFHA to the south of the site due to the Arkansas River. The I-135 roadway separates this site from the FEMA SFHA.

The existing pond will be enlarged and will be included in a drainage easement. The existing pond has no outlet and is not located in an easement or a Reserve. There has been a ditch recently constructed along the south line to convey site runoff, as well as south offsite runoff, to the existing 48" RCP under I-135.

## PROPOSED CONDITIONS

The site is proposed to be developed into an asphalt/concrete plant. There will also be 3 commercial lots with frontage to Hydraulic Avenue. The pond will be enlarged to accommodate the site runoff as well as the ditch that will drain to the existing 48" RCP.

The proposed ponds will serve as sedimentation basins as well as storage for storm water runoff. The ponds will be used for drainage purposes only, no recreational purposes are expected. For a half-scale copy of the Plat, see Exhibit 2.

## OFFSITE CONDITIONS

The site generally drains to the south east and into an existing 48" RCP. There is also an existing 42" CMP in the I-135 ROW which conveys water to the south.

The 48" RCP headwall is located on the proposed property and drains to the south under I-135. A flapgate has been installed on the outlet of this pipe. The 42" CMP is located near the south corner of the property and is in I-135 ROW. This pipe drains the adjacent south properties as well the majority of the ROW. This pipe also has a flapgate installed on the outlet.

An existing 48" RCP storm sewer system drains properties from the north into the existing pond. This system appears to drain 10+ acres from the north, including street ROW from Industrial Road.

There is a pond adjacent to the site near the northeast corner. This pond appears to be detention for the adjacent properties to the east and west. This pond does not appear to have an outlet and has approximately 10 of freeboard.

There is approximately 4 acres to the north that drains onto this property. The majority of the north property drains to the existing offsite pond.

There is also a 24" HECMP that was installed from the south into the ditch section. The ditch is currently being constructed to help drain this south area which is standing water. This pipe accommodates approximately 3.2 acres of developed property.

There are two (3) locations in which offsite runoff encroaches the property. The following are the points of runoff entry onto the site.

- North – There are approximately 4 acres draining onto the north end of the proposed site from the adjacent north property. This runoff is mostly sheet flow.

- North 48" RCP –Based on field visits and aerial maps, a true basin delineation was not accomplished for the 48" RCP. Therefore, a maximum capacity was established using 2' of head and the length of the pipe. The 48" drains a large amount of runoff from the north and then discharges into the smaller existing pond.
- South West –There are 3.2 acres of offsite runoff that enters the property near the south west corner of the property via a 24" HECMP. This area is accommodated in a recently constructed ditch section and will flow to the existing 48" RCP.

# EXISTING CONDITIONS RUNOFF CALCULATIONS

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## DRAINAGE METHODS & STANDARDS

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

### Ø STORM SERIES

- 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 50-yr, 100-yr Storm Events Modeled
- 2-yr Rainfall Depth = 3.5 in
- 5-yr Rainfall Depth = 4.5 in
- 10-yr Rainfall Depth = 5.3 in
- 25-yr Rainfall Depth = 6.1 in
- 50-yr Rainfall Depth = 7.0 in
- 100-yr Rainfall Depth = 7.8 in

### Ø OFFSITE FLOW

- Areas per existing topography and site visits
- HydraFlow Hydrographs software for existing flows (SCS Unit Hydrograph Method)
- Time of Concentration using City of Wichita minimum 15 min

## SITE CHARACTERISTICS

The proposed site is currently open space with pasture characteristics. There is an existing pond in the northeast portion of the site which stores offsite runoff from the north. A ditch is being constructed, at the time of this report, to accommodate runoff from the south.

The Arkansas River is to the south of the property, separated by I-135. The relatively high tailwater of the river required the sites 2 outlet pipes to have flapgates.

The predominant soils on the site consist of Type B soils. The site generally drains to the south.

## EXISTING CONDITIONS HYDROLOGIC ANALYSIS

There are three (3) locations in which offsite runoff encroaches the property. The following are the points of runoff entry and the flow onto the site. All offsite Tc's were assumed to be the 15 minute minimum. A Curve Number of 88 was used for offsite flows for developed conditions. A curve number of 79 was used for undeveloped conditions.

- North - There are approximately 4 acres draining onto the north end of the proposed site from the adjacent north property. Since this runoff was sheet flow, its area was calculated into Basin 2. This basin includes some of the existing site and has a time of concentration of 24 minutes.
- North 48" RCP –The basin for the 48" SWS system was not delineated due to north offsite access. Therefore, the capacity of the system was calculated using HydraFlow with a 2' headwater over the inlet. There did not appear to be any overland relief due to overtopping of the pipe. This pipe, with the 2' headwater, will produce approximately 100 cfs in the 100-yr storm event. The time of

The time of concentration was calculated using the adjacent street draining to the inlets. This street, assuming a minimum grade of 0.5% and a run length of 1300 feet, produces a Tc of 42 minutes. This gives the peak runoff a value of 65 cfs. The pipe discharges into the onsite existing pond.

- South West—There is approximately 3.2 acres of runoff that is conveyed onto the site via a 24" HECMP. This area produces approximately 24 cfs of runoff. The pipe appears to handle this runoff. Once on the property, the runoff flows in a newly constructed ditch to the existing 48" RCP.

#### DOWNSTREAM DRAINAGE CAPACITY

The two structures which drain the property are a 48" RCP and a 42" HECMP. These structures will convey approximately 100 cfs and 75 cfs normally. However, the two pipes have flapgates on them due to the tailwater of the Arkansas River. The 100-yr tailwater elevation of 1274.0 NAVD (1273.5 NGVD) will not allow either of these pipes to discharge at their full capacities. The flowlines of the pipes are approximately 1270 to 1271.0. The 48" RCP outfall for the ditch section was modeled with a tailwater of 1273.5.

# POST-DEVELOPMENT HYDROLOGIC ANALYSIS

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## DRAINAGE METHODS & STANDARDS

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

- Ø STORM SERIES
  - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 50-yr, 100-yr Storm Events Modeled
  - 2-yr Rainfall Depth = 3.5 in
  - 5-yr Rainfall Depth = 4.5 in
  - 10-yr Rainfall Depth = 5.3 in
  - 25-yr Rainfall Depth = 6.1 in
  - 50-yr Rainfall Depth = 7.0 in
  - 100-yr Rainfall Depth = 7.8 in
  
- Ø STORM WATER SEWER PIPES
  - Calculated in HydraFlow Hydrographs
  - Soil Type = B & D
  - Developed CN = 88 (Industrial)
  - Minimum Tc = 15 min
  
- Ø GRADING CONSTRAINTS
  - Minimum 1% Cross-lot Rear Yard Grades
  - Minimum 4:1 Ditch Side Slopes
  - Minimum 0.5% Ditch Longitudinal Slope
  
- Ø POND ROUTING / GRADING
  - HydraFlow software utilized for modeling (Hydrograph Method)
  - Minimum 1' Freeboard from 100-yr Water Surface Elevations to adjacent lot corners (except where noted below)
  - Minimum 2' between BFE and lowest opening elevation
  - Minimum 3:1 Side Slopes above water surface for Pond Banks
  - Minimum 4:1 Side Slopes on ditch sections

## DETENTION FACILITIES

There are two (2) ponds proposed on this site, including the storage capacity of the dry ditch section. These ponds and ditch will detain offsite runoff as well as developed runoff. These ponds can be seen on the half-scale drainage plan in Exhibit 5. The pond systems are described below in further detail.

- Ø NORTH POND

This pond is located near the north east corner of the property and accepts offsite runoff from the north and onsite runoff. This pond will be expanded from its current state and include an outlet (24" RCP) to the south into the ditch section. This pond is expected to be dry and have a bottom of 1267.0. No tailwater was applied to this pond in the modeling.

Ø DITCH SECTION

The current ditch section was modeled for its storage and water surface due to its size as well as its outlet. The ditch directly discharges into the Arkansas River via a 48" RCP. This pipe contains a flapgate, and due to the 100-yr BFE, will limit its discharge. The ditch will have a bottom of 1267.0 and run along the south line of the property.

A 24" HECMP will convey runoff from the south properties into this ditch.

*NOTE: The BFE of the Arkansas River is the same during the 10, 25, 50, and 100-yr storm events.*

DETENTION SUMMARY

Detention will be provided on the proposed site to limit the developed runoff to less than or equal to the existing conditions. The pond and ditch was modeled in an interconnected system due to utilizing the same outlet. The following tables represent the pond systems inflow and outflow for the 24-hour, 100-yr storm event.

*POND & DITCH SYSTEM*

POND	INFLOW	OUTFLOW	100-yr WSE	OUTLET
Pond	155 cfs	27 cfs	1274.8	24" RCP
Ditch	47 cfs	37 cfs	1274.0	48" RCP

DISCHARGE POINTS SUMMARY

There is 1 main discharge points that this site utilizes. This point is summarized below. All flows are the 24-hour, 100-yr storm events with no tailwater applied. The capacity of the structures was calculated using HydraFlowExpress (Appendix D) using existing flowlines and overtopping elevations of the roadways.

LOCATION	STRUCTURE	CAPACITY
Under I-135	48" RCP	95 cfs

POTENTIAL UPSTREAM/DOWNSTREAM IMPACTS

No potential upstream impacts are expected with this development. The site will accept all offsite runoff in ditch sections and the pond. Where needed, drop structures and ditch checks will be constructed.

Due to detention on the proposed site, there are no downstream impacts expected.

## FLOODPLAIN SUBMITTAL

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### SOURCE OF FLOODPLAIN INFORMATION

No FEMA SFHA exists on this property. However, due to the Arkansas River directly south and downstream of this project, the flood map and profiles are attached. The BFE of the river directly impacts the sites discharge.

The actual FEMA FIRM Panel can be viewed as Exhibit 6.

The Floodway data table, as provided by the National Flood Insurance Program, can be seen in Exhibit 7. The corresponding Flood Profiles are attached as Exhibit 8.

*Note: The elevations shown on the plan sheets are in NGVD. The elevations on the FEMA FIRM Panels are in NAVD. To convert NAVD to NGVD, subtract 0.4.*

## FEDERAL, STATE, & LOCAL PERMITTING

### US ARMY CORPS OF ENGINEERS

There does not appear to be any US Army Corps of Engineers jurisdiction on this property.

### KANSAS DEPT OF AGRICULTURE – DWR PERMITTING

There is not 240+ acres draining onto this site, therefore no DWR permit is expected.

### FEMA

No FEMA SFHA exists on this property.

### KANSAS DEPT OF TRANSPORTATION

There does not appear to be any KDOT permitting needed on the proposed project. The 48" RCP, which this site utilizes, is on the proposed property, not in the ROW.

### SEDGWICK COUNTY ROW

There does not appear to be any water discharging to the Sedgwick County ROW.

DRAINAGE PLAN

Scale 1:100

## SUPPORTING CALCULATIONS

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- APPENDIX A: USGS Soils Survey
- APPENDIX B: HydraFlow Hydrographs  
- Existing Conditions  
- Pond System
- APPENDIX C: HydraFlow Express  
- 48" Storm System  
- 24" HECMP  
- 48" RCP Outlet  
- Channel Section

# USGS Soils Survey

# HydraFlow Hydrographs

Existing Conditions  
Pond System

# HydraFlow

48" Storm System  
24" HECMP  
48" RCP Outlet  
Channel Section