21st Street Kids and Family Empowerment
Wichita, Sedgwick County, Kansas
08/24/05

21st Street Kids and Family Empowerment is a 32.05 acre development within the city limits of Wichita in Sedgwick County, Kansas. The 4 parcel development consists of streets and storm sewer. This site was originally platted as part of the Logopedics Addition. This report contains a drawing of the drainage plan, supporting calculations and data for the 21st Street Kids and Family Empowerment Drainage Plan.

Hydrology

The proposed plat lies in the SW 1/4, Section 3, T27S, R1E. The soil on-site is comprised of Urban land – Canadian complex, which is classified in hydrologic group B. The site is currently zoned for multi-family uses and has short grass and pavement throughout. The site is bordered to the north by 25th Street North, to the east by the Audry Matlock Heights Second Addition, to the south by 21st Street North, and to the west by the Wilbers Addition. The existing storm sewer and pavement adjacent to the Cessna Training and Assembly Complex will remain with these improvements. Basin 1 generally drains to the south to 21st Street North and Basin 2 drains to the south and west to 24th Street North. Note that no detention ponds are proposed for this site.

Parcel 4, which lies between 24th Street North and 25th Street North, was assumed to remain unchanged for this analysis since it is unknown what this site will be in the future. When this area is developed, detention will be necessary to offset the increase in runoff rates to 24th Street North.

Most of the site is in the ~~100~~ 500-year floodplain but is protected by a levee which is subject to possible failure or overtopping during larger floods. A copy of the FEMA Floodway Map for this area is included in the Design Aids section of this report.

The Rational Method was used to calculate runoff quantities. Runoff coefficients were estimated based on tables presented in the Design Aids section of this report using fully developed conditions. Time of concentration was based on slope, flow velocity and length of flow through each basin and was not allowed to be less than 15 minutes.

The analysis was made based on the available site data which includes the following: 1" = 100' topographic map with 1' contours of the site, a Sedgwick County Soil Survey Map and noted references.

Storm Sewer Design

In the hydraulic analysis, the storm sewers are typically designed for the minor storm, with major storm overflows to be routed through easements and rights-of-way to an appropriate outlet. The minor storm has a recurrence interval of two years. The major storm evaluated has a recurrence interval of one hundred years. To simplify this analysis, the time of concentration is identical for both the major and minor storms.

The existing storm sewer in the Jardine Drive right-of-way is a 15" RCP, which will not be replaced with this project. Since the existing storm sewer is the ultimate control, the proposed storm sewer is not sized for the two year storm and will surcharge into the street during the minor storm.

For each inlet, street flooding and inlet capacity were checked for the minor storm. Conveyance in the street is based on the Modified Manning's Equation, as expressed in the Design of Urban Highway Drainage – The State of the Art, Equation (5-1), pages 5-9. It has been assumed that Tc for street flow is equal to Tc for pipe flow. This is a simplifying, but conservative, assumption since pipe flow velocities generally exceed street flow velocities. For local streets, curb-deep flow is tolerable for the minor storm. For collector streets, a single eight-foot lane should remain unflooded for the minor storm. Since this site only has twenty-one foot back-to-back streets, the crown of the roadway will be under water with curb deep flow.

Inlet capacities were determined by the methods described in Drainage of Highway Pavements, Hydraulic Engineering Circular #12, using Chart #12 as found in the Design Aids section. City of Wichita Type 1A inlets and 3/8 inch per foot cross slopes have been assumed.

Design Aids

This section includes material used to assist in designing the drainage system. A 1" = 100' scale Drainage Plan map is enclosed in the pocket.

References

Design of Urban Highway Drainage – The State of the Art, by Reitz & Jens, Inc., April 1980.

Drainage of Highway Pavements, Hydraulic Engineering Circular #12, by Tye Engineering, Inc., March 1984.

Interim Drainage and Storm Sewer Policy for Design Criteria and Documentation, City of Wichita, Kansas, 1985.

Soil Survey of Sedgwick County, Kansas, US Department of Agriculture, Soil Conservation Service, 1979.