Section Five - Green Infrastructure

Green infrastructure is a concept that elevates importance of the natural environment to the level of the built infrastructure, requiring careful consideration and planning. Green infrastructure utilizes land and water that supports native species, maintains natural ecological processes, sustains air and water resources and contributes to the health and quality of life of our citizens. It also includes community initiatives integrating the natural ecosystem with the built environment using elements such as parks, tree lined streets, rain gardens, bio-retention systems and green roofs.

As described in the interim report, the study area is located within a Combined Sewer Overflow (CSO) area as defined by Sanitation District No. 1. A brief explanation of CSO's and associated challenges are explained in the Interim Report, which can be found at nkapc.org. In order to alleviate the problem, a focus on green development using various green infrastructure elements is needed.

As described in **Section 1** of this Chapter, the redevelopment within the study area is anticipated to occur in two phases. Following are the impervious area acreages under existing conditions and per the recommended redevelopment concept.

As tabulated in *Table 6.1*, the proposed redevelopment of the 110 acre *Park Hills Dixie Study* area has been projected to increase the impervious surface by approximately ten acres. A majority of the increase (6.67 acres) is associated with additional pavement (parking lot and roadway) with the remainder coming from increased building area. Storm water runoff from the study area flows into combined sewers and is eventually discharged into the Ohio River at the Willow Run combined sewer outfall, located in Covington near the Brent Spence Bridge.

With typical development practices, this ten acre increase in impervious surface has the potential to increase overflow volume at the Willow Run outfall by over five million gallons annually. Federal and state regulations require that the volume and frequency of CSOs be substantially reduced. Therefore, development projects that increase the amount of impervious surfaces in the combined sewer service area of Northern Kentucky can make it more difficult to comply with these regulations. Based on current estimates developed by SD1, the increased size and capacity of the controls needed to accommodate this ten acre increase could increase the capital cost of those controls by over $1 million.

In response to these facts as well as the overall trend towards more stringent storm water runoff management, SD1 is developing revised storm water regulations for Northern Kentucky that should be in place in 2010. In the combined sewer system area, these regulations would likely require the increased control of storm water runoff volume for storm events up to 0.75-inches. One approach for achieving this control is the use of green infrastructure. While green infrastructure is still relatively new in Northern Kentucky, other areas of the U.S. have been successfully incorporating these features into new development projects for years.

Given the characteristics of this development plan, green infrastructure features that could be applied in the proposed *Park Hills Dixie Study* include:

- Rain gardens / bioretention areas
- Storm water planter boxes
- Grassed swales
- Rain barrels and cisterns
- Green roofs
- Other Practices

	Existing (in acres)	Phase 1 (in acres)	Phase 2 (in acres)	Increase in impervious area between existing and phase 2 (in acres)
Roads	22.18	28.14	28.85	6.67
Building	9.94	11.77	13.49	3.55

TABLE 6.1
IMPERVIOUS SURFACE AREAS

Rain Gardens / Bioretention Areas

These features are based on the concept of directing storm water runoff into green space areas of the development that are designed to store, infiltrate, and slow the flow rate of runoff. See *Figure 6.19*. Effective rain garden / bioretention area designs require a consideration of existing soil conditions, the need for engineered soil, plant selection, and overflow structure design. Potential locations for rain gardens / bioretention areas in a mixed use development include landscaping areas around parking lots and buildings. A significant area for improved stormwater management and reduction of impervious surfaces is through the construction of a median along the stretch of the Dixie Highway corridor within the City of Park Hills. Such a median should be 12 feet wide depressed and designed to treat stormwater runoffs. Portions of the median could be used for the installation of rain gardens and bioretention areas which will readily store and infiltrate stormwater runoff from the roadway.

Figure 6.19
Rain Garden/Bioretention Area

Storm Water Planter Boxes

Storm water planter boxes (*Figure 6.20*) are a specific type of bioretention feature that are typically used in projects with space constraints. In this development, planter boxes could be used near buildings and along local roadways and access drives. Dixie Highway being a busy transportation corridor, the planter boxes can also act as a buffer between the sidewalk and the roadway making pedestrians feel safer.

Figure 6.20
Storm Water Planter Boxes

Grassed Swales

Grassed swales located in public roadway medians and along roadsides offer an alternative to traditional piped storm drainage systems. The proposed median in Dixie Highway has significant potential for providing stormwater management benefits. The use of swales in road rights-of-way can be very beneficial given the relatively large size of these areas combined with the fact that standard, raised medians provide minimal storm water management benefits.

Rain Barrels and Cisterns

Rain barrels and cisterns (*Figure 6.21*) are an effective way to reduce storm water runoff volume in developments with limited open space. Often, the most important factor to consider when using rain barrels / cisterns is the use of the captured water. This water can be used for typical landscaping purposes as well as certain domestic uses such as toilet flushing. Because the Dixie Study area includes a ball-field and substantial open space on the Covington Catholic campus, there could be significant potential for irrigation water usage.

FIGURE 6.21
RAIN BARRELS AND CISTERNS

Green Roofs

Green roofs are an example of green infrastructure that, in certain cases, can be a desirable addition to a building design that provides storm water management benefits. See *Figure 6.22*. Green roofs are mostly widely used for multi-story buildings in areas with limited open space. In addition to managing storm water runoff, green roofs can reduce cooling energy demand and can be designed to serve as a green space amenity for building users.

Other Practices

It should be noted that pervious/permeable pavement was discussed by the Task Force and at public meetings as one method to alleviate stormwater flows in the study area. Unfortunately, today's pavement technology combined with the area's poorly draining soils do not yield a substantial decrease in flow. The management practice should be considered as an option if new pavement technology produces better results with the area's soils.

FIGURE 6.22
GREEN ROOF