appendix 3: environmental resources

INTRODUCTION

The goal of the environmental recommendations for the Kensington Sector Plan is to begin the shift toward a sustainable community that "meets the needs of the present without compromising the ability of future generations to meet their own needs," a universally accepted definition of sustainability.

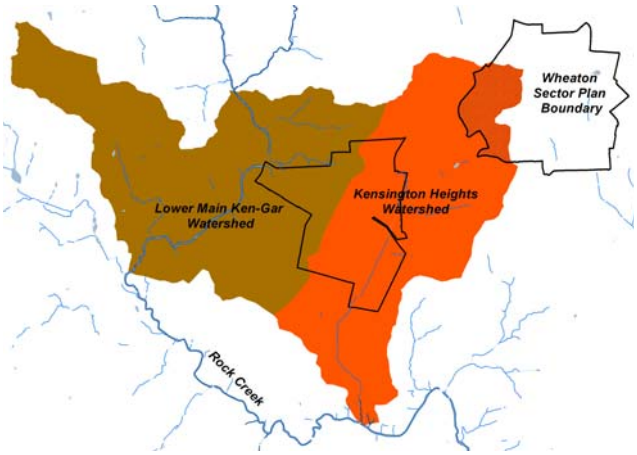
To achieve this, the Plan envisions:
mixed-use development that will allow residents and businesses to perform most daily activities by walking or biking
mitigation of stormwater impacts through the use of LID/ESD techniques such as infiltration and bioretention areas, green roofs, rain gardens, and urban tree plantings
increased tree cover to improve habitats, link green and municipal spaces, cool streets, and reduce greenhouse gas through carbon sequestration
increased bikeways and pedestrian access to business corridors, residential communities, entertainment and employment areas, and the local park system will improve quality of life and air
sustainable initiatives requiring LEED (Leadership in Energy and Environmental Design) construction; renewable energy such as geothermal, solar, and wind; and use deconstruction measures that salvage and reuse the buildings and/or building components.

These efforts will all contribute to making Kensington a desirable, prosperous, and sustainable community.

WATERSHEDS

The Kensington Sector Plan area falls within a portion of the Lower Rock Creek watershed and lies within parts of two subwatersheds: Lower Main Ken-Gar and Kensington Heights. Both subwatersheds drain into the main stem of Rock Creek.

Map 2: Kensington Area Watersheds



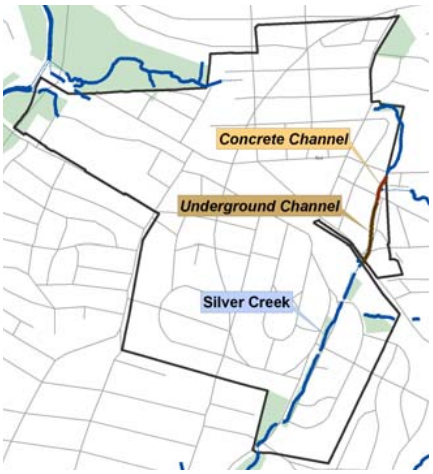
Runoff from the northeastern portion of the Kensington Heights watershed, including a portion of the 100-acre drainage area within the Wheaton Sector Plan area, flows into Kensington's Silver Creek. Consequently, activities beyond the Plan's boundaries affect water quality within the Plan area.

WATER RESOURCES

In the 1950s and1960s it was common practice to convert natural stream channels into concrete passages to transport water swiftly from one location to another to reduce overbank flooding. This practice has had severe consequences on the biological and physical function of the local stream and its associated habitat and floodplains.

Silver Creek, the only stream in the Plan area, is confined to a concrete channel, piped and placed underground, or retained in a natural streambed. Most of its natural floodplain and associated forested stream valley buffer was coverted to a park-like setting with nearby homes, leaving little

to no room for storm flows that rise above the stream banks. During severe storm events, the channel receives large quantities of untreated runoff from sections of Kensington and the adjacent portion of Wheaton. For most storms, the concrete channel transfers the stormwater through the landscape, however, during severe storm events the culvert at the base of Oberon Street exceeds its capacity causing periodic flooding for adjacent residents.



The water quality conditions for Kensington's two subwatersheds was evaluated by Montgomery County Department of Environmental Protection (DEP) and documented in the 1998 and 2003 Montgomery County Countywide Stream Protections Strategy (CSPS) reports. In the 1998 CSPS report, Lower Main-KenGar had fair water quality, while Kensington-Heights sub watershed was rated poor. In the 2003, Lower Main-KenGar was downgraded to poor water quality, while Kensington Heights remained unchanged in poor condition. In 2003, Silver Creek was rated as having poor water quality, poor stream conditions and fair habitat conditions.

Table 2: Watershed Water Quality

Watershed	1998 Water Quality (CSPS Report)	2003 Water Quality (CSPS Report)
Kensington Heights/Silver Creek	Poor	Poor
Lower Main KenGar: Rock Creek	Fair	Poor
Notes: Fair: intolerant and sensitive species are largely absent; intermediate species present Poor: tolerant species dominate; poor aquatic habitat		

STORMWATER MANAGEMENT

Kensington was developed over decades prior to strict stormwater management requirements. The lack of stormwater management causes stress in the conveyance areas, at discharge points, and in the aquatic systems. Impervious surfaces such as buildings, driveways, sidewalks, and roads contribute to stormwater problems by preventing runoff from soaking slowly into the substrate and recharging the groundwater table. Instead, stormwater sheets off these surfaces picking up particulates along the way in the form of debris, oils, pesticides, sand, salt, and other pollutants as it is conveyed into the storm drain systems and directly discharged into nearby streams. This direct discharge is the number one cause of impairment to urban streams causing erosion, altered hydrology and geomorphology (stream channeling), poor water quality, and loss of aquatic habitat. In addition to these ecological stresses, stormwater runoff affects neighborhoods and streets with flooding and swift water flow during intense storm events.

In the 1960s WSSC transferred the responsibility of all storm drain maintenance to the County. The town of Kensington chose to maintain their own storm systems but did not impose a separate tax as the County does to maintain its storm drain systems. As a result there are limited funds to repair the storm drain systems and outfalls, or for the design and installation of innovative stormwater best management practices throughout Kensington. As a solution to the lack of maintenance and funds, this Plan recommends Kensington either join the County's stormwater program or impose a tax on its citizens to pay for stormwater management, repairs, bioretention, rain gardens, and other environmental site designs (ESD).

Environmental Site Design (ESD) incorporates a variety of practices into new construction and redevelopment to minimize environmental impacts. The basic principle behind ESD is to control stormwater runoff as close to its point of generation as possible rather than collecting, transporting, and concentrating it in large stormwater management (SWM) facilities. It uses small-scale stormwater management practices, nonstructural techniques, and better site planning to mimic natural hydrologic runoff characteristics and minimize the impacts of land development on water resources[1]. The purpose of ESD is to make a development function hydrologically more like a wooded landscape by reducing the stormwater runoff generated, slowing the delivery of runoff to stream systems, encouraging groundwater recharge, and reducing pollution and thermal impacts to receiving water bodies. Use of ESD practices can ultimately reduce stormwater management costs by reducing the infrastructure necessary for collecting and transporting stormwater. Using ESD practices improves the water quality in receiving streams by pretreating and reducing runoff quantity.

Benefits include but are not limited to the following:
incorporating stormwater management at the earliest stages of site design
limiting land disturbance and grading
maximizing conservation of natural features
minimizing impervious surfaces (e.g. pavement, concrete channels, roofs)
slowing runoff to increase infiltration and evapotranspiration
using innovative and effective stormwater control, treatment, and non-structural best management practices (BMPs).

ESD BMPs include:
bioretention facilities
infiltration trenches
rain gardens
grass swales and channels
vegetated rooftops
rain barrels and cisterns
vegetated filter strips
permeable pavements.

[1] Title 4, Subtitle 201.1(B) of Stormwater Management Act of 2007

The Maryland Stormwater Management Act of 2007 requires local jurisdictions to implement ESD to the Maximum Extent Practicable (MEP) and to amend their codes, regulations, and ordinances to remove impediments to implementing ESD.

STORMWATER HOTSPOTS

Two areas experiencing significant impact from uncontrolled stormwater are the outfalls at West Howard Avenue and points along Silver Creek. Other outfalls showing signs of erosion and undercutting to a lesser extent include Plyers Mill Road and Vaughn Street.

Photo 1: Looking north of Oberon St.

The Silver Creek stream channel was altered or confined in three locations within the Plan area:
From Plyers Mill Road to Oberon Street the natural streambed was replaced with a concrete trapezoid channel (photo 1).
From Oberon Street to Metropolitan Avenue the stream was enclosed in an underground culvert running parallel to Kensington Parkway.
From the railway to Fredrick Avenue the stream returns to a concrete trapezoid channel.
Altering the stream and headwaters has had severe consequences on the biological and physical function of the stream as well as its associated buffer and floodplain. Confining the stream in concrete or piping the channel has:
increased flow velocities
eliminated in-stream habitat for aquatic organisms
increased water temperatures
reduced aquatic oxygen levels
enabled heavy loads of sediment and pollutants to be transported downstream
disconnected the stream from the ground water table
severed, reduced, or eliminated the interconnection between floodplain functions such as pollutant and sediment filtration, velocity control, habitat, and flood control.

WEST HOWARD AVENUE

West Howard Avenue is primarily a commercial district with many thriving businesses. It is 76 percent impervious with a wide asphalt road that seamlessly merges into storefront parking and loading areas without sidewalks and stormwater management. Storm water cascades from roof tops, parking areas, and flows from Summit Avenue to the base of Howard Avenue where it discharges into M-NCPPC parkland. At the base of the street stormwater is undercutting the outfall and severely eroding the asphalt, forested slope, and soil substrate. Runoff transports and discharges sediment, oil, debris, and other pollutants into the mainstem of Rock Creek.

Implementing ESD practices throughout these drainage areas with an emphasis on volume reductions and quality/quantity control can improve water quality, reduce velocity at the discharge point, reduce impervious cover, and improve the visual and human experience of the area.

The discharge points at Plyers Mill Road and Vaughn Street are eroding from the fast-flowing runoff that transports sediment into Rock Creek. Using ESD measures throughout the drainage areas can reduce the quantity of runoff at the discharge points to greatly reduce scour and improve water quality.

IMPERVIOUS COVER

There is a high degree of imperviousness in Kensington. The commercial areas are approximately 80 percent impervious while the established residential neighborhoods are 30 percent impervious. One exception to this would be the residential area in North Kensington outside of the historic district. This area is primarily zoned R-60 and many of the properties have been extensively modified. The additions, teardowns, and added parking areas have increased the level of imperviousness to more than 42 percent.

Increasing levels of imperviousness have been linked to declines in water quality. Studies have shown that stream water quality indicators begin to decline when subwatershed imperviousness exceeds about 10 percent. Imperviousness levels above 25 percent are associated with severe levels of stream water quality degradation.

TREE CANOPY COVER

Tree canopy is defined as the layer of leaves, branches, and stems of trees that cover the ground when viewed from above. Within the Kensington Plan boundary, 93.76 acres (24 percent) of the area is in canopy cover. Nearly 21 percent of the cover is within the residential areas with only two percent canopy cover in the commercial areas.
There are two forest parcels at the end of Howard Avenue, one on M-NCPPC parkland (2.81 acres) and the other on private property owned by the Kaiser Foundation (1.4 acres).

Map 3: Tree Canopy Cover

Increasing tree canopy is an integral part of the Plan's recommendations and can provide links to green spaces and throughout the Plan area to include neighborhoods, public spaces, and commercial areas. Increased tree cover can be achieved by planting street trees, increasing the width of the Silver Creek stream valley buffer, and installing stormwater management with planting beds. Many low impact development (LID) measures including infiltration trenches, rain gardens, and biorentention areas, can be planted with shrubs and trees. Increasing tree canopy cover will have many measurable benefits including reduced heat island effect, improved water quality, energy savings, lower temperatures, improved wildlife habitat and connectivity, reduced air pollution, reduced thermal impacts on aquatic systems, enhanced property values, improved quality of life, and enhanced aesthetics.

LID/ESD ROAD PROJECTS

Of all the impervious surfaces, the largest amounts are road pavement. Roads also present one of the greatest opportunities for using LID/ESD stormwater practices within the rights-of-way, which can contribute to protecting and restoring a site's natural hydrology, its receiving streams, and the overall integrity of the watershed. Secondary benefits include improved community safety and aesthetics, and quality of life.

LID/ESD designs move away from a collect, convey, and discharge strategy to one that minimizes impervious areas and treats stormwater onsite. In roadways, LID/ESD directs stormwater to medians, planting beds, and other open areas designed to retain, treat, infiltrate and discharge stormwater slowly over time. LID/ESD reduces capital costs from more traditional ponds and increases benefits to the environment. It also means less cost to taxpayer for road repaving and other maintenance. LID/ESD practices increase visible green area for the community, including native trees and plants.

WATER AND SEWER

The Plan area is currently served with public water and sewer and no significant upgrades are needed to serve proposed growth. However, specific capacity evaluations will be performed by WSSC's Planning Group and Development Services Group when detailed information is provided as various parcels and properties are submitted for development review. The extent of any impact to water and/or sewer system capacity, whether localized or requiring a capital improvement programmed (CIP) project, will be determined by WSSC. Any new development generating 100,000 or more gallons of sewer per day (approximately 700 units or 3,500 employees) would be required to participate in system upgrades. Developments of this size are not expected in Kensington.

CARBON EMISSION ANALYSIS

Montgomery County Bill 32-07 establishes a goal to stop increasing greenhouse gas emissions by the year 2010, and to reduce emissions to 20 percent of 2005 levels by the year 2050. Another Montgomery County law (Bill 34-07) requires the Planning Board to estimate the carbon footprint of areas being master planned, and to make recommendations for carbon emissions reductions. Our current greenhouse gas modeling effort uses a version of the spreadsheet model developed by King County, Washington. While many of the inputs are derived from national averages, wherever possible we have substituted Montgomery County data derived by the Planning Department's Research and Technology Division. While the model considers all greenhouse gas emissions, results are reported in terms of the equivalent effect of a given volume of carbon dioxide ("carbon dioxide equivalents").

To project total emissions for an area, the model factors embodied energy emissions, building energy emissions, and transportation emissions. The model documentation defines embodied emissions as "emissions that are created through the extraction, processing, transportation, construction and disposal of building materials as well as emissions created through landscape disturbance (by both soil disturbance and changes in above ground biomass)." Building energy emissions are created in the normal operation of a building including lighting, heating cooling and ventilation, operation of computers and appliances, etc. Transportation emissions are released by the operation of cars, trucks, buses, motorcycles, etc.

Inputs for the planning area include the numbers and types of housing units and the square footage of different categories of retail, commercial, and public buildings. The model is run once using 2005 data to establish baseline results. The model is run again using projected housing units, and commercial and retail space to estimate future greenhouse gas emissions. The model estimates emissions over the life of the development, and results are given in metric tons of CO2 equivalents. This is different from the County Emissions Inventory prepared by the Montgomery County Department of Environmental Protection, which estimates annual emissions.

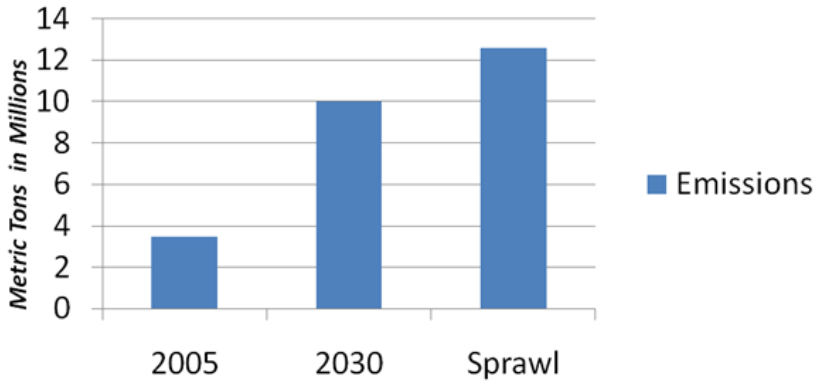
The model only deals with emissions; no calculations are included to estimate potential carbon offsets from best management practices. The estimates also assume business as usual when projecting emissions. As estimates of building energy consumption, vehicle fuel efficiency, vehicle miles travelled, and other input parameters change, it may be possible to re-run the model to measure the effects of improvements in technology and design. Many of these parameters are changing constantly and are a moving target.

The results are also restricted to estimates for a specific plan area. Overall greenhouse gas emissions are projected to increase due to increased population and commercial development within a given plan area. As model results are evaluated, we must bear in mind that Montgomery County's greenhouse gas reduction targets are considered at a County wide scale.

Modeling results using these assumptions, along with sprawl scenario estimates are shown in the table below.

Table 3: Projected Carbon Emsissions

This Plan makes several recommendations to promote reductions in greenhouse gas (carbon, methane, and others) including changes in building and site design, vehicle technology improvements, constructing energy efficient buildings, as well as the behavioral changes enabled by a compact, live/work community.



ALTERNATIVE ENERGY

Concern over global climate change has led to the adoption of several County laws requiring Montgomery County to stop increasing and to reduce greenhouse gas emissions. Accomplishing this will require new development and redevelopment to incorporate energy reduction measures, energy efficiency measures, and on-site renewable energy production into building and site designs.

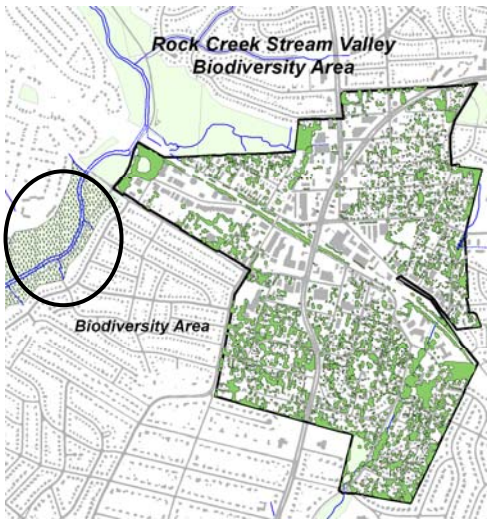
MEASURES THAT MAY BE REQUIRED INCLUDE:
geothermal heating and cooling systems
solar collectors to power County infrastructure such as signage
forest preservation and street tree planting
insulation and window treatments
reduced imperviousness, improved stormwater management, and other LID/ESD and green building techniques
green roofs and low-reflectance roof surfaces
urban stormwater practices that reuse stormwater for non-potable water uses
native species requiring low maintenance and watering
wild grasses (rather than non-native grass requiring constant cutting and watering)
buildings oriented for passive solar energy and for photovoltaic cells
coordination with other environmental plans and policies.

ADJACENT RESOURCES

Rock Creek Stream Valley abuts the Plan boundaries and is a much treasured recreational resource used by thousands each year. Although DEP has designated the stream as a restoration area, there are very unique habitat pockets throughout the corridor. Adjacent to the Kensington Plan area, the forested stream valley M-NCPPC determined it is abiodiversity area with rare, threatened, and endangered species, and shallow pools of water with their associated species.

Runoff from Kensington can affect the health of this sensitive biodiversity area. Through LDI/ESD stormwater treatments Kensington can help protect this sensitive area by reducing and treating its stormwater runoff.

Map 4: Rock Creek Stream Valley



OTHER PLANS AND INITIATIVES

A number of environmental plans and initiatives are underway in Montgomery County and their recommendations will supplement and may supersede this Plan's recommendations.

These plans and initiatives include:
The Water Quality Functional Master Plan for Montgomery County
The Montgomery County Green Infrastructure Functional Master Plan
Revisions to the County's stormwater management regulations
Revisions to the County's forest conservation regulations.

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