



## Top Environmental Strategies for Infrastructure Projects

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King County Green Team  
King County Roads Services Division  
King County Water & Land Division

## **ACKNOWLEDGEMENTS**

This guide was developed in conjunction with the King County Green Team, the Water and Land Resources Division and the Road Services Division.

Prepared by Paladino and Company, Inc. March 2006

## Top Environmental Strategies for Infrastructure Projects

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# Top Environmental Strategies for Infrastructure Projects

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## PROGRAM OVERVIEW

### Infrastructure and Environmental Design

One of the key services King County provides to its residents is maintaining and constructing roads, bridges and other infrastructure projects. The County also has a strong commitment to environmental stewardship. In support of the King County Green Building Ordinance, this guide provides King County project managers resources for complying with the Ordinance. The goal of this document is to provide an easily accessible compilation of the best and most relevant environmental strategies for infrastructure projects in the County's Water and Land Resources Division (WLRD) and Road Services Division (RSD). Each design decision made by the project team has a long-term impact on King County – its environment, its resources, its residents. By implementing environmentally preferable building practices, each project helps create a more sustainable future.

### King County Green Building Ordinance

In February of 2005, Ordinance #15118 was adopted by the King County Council. The ordinance directs all King County projects to incorporate green building practices, and achieve a LEED rating for applicable projects. LEED is the voluntary green building benchmarking system, Leadership in Energy and Environmental Design, created by the United States Green Building Council in 1995. Since LEED was designed primarily for buildings, obtaining an actual rating is not applicable to most infrastructure projects; however project managers can implement applicable green design, construction and maintenance strategies within the scope of infrastructure projects.

### Projects Applicable to Green Strategies

The Top Environmental Strategies are intended for use by the WLRD and RSD, but can be used as a guide for any project site design. WLRD and RSD projects fall under the umbrella of Transportation Infrastructure; these projects are related to transportation right-of-way, and any facilities that serve to support these areas. The largest portions of these projects, based on area, are the roads, bridges, sidewalks and adjacent properties that are maintained by the County. However, because these project areas are part of an extensive connectivity infrastructure, their impacts on adjacent non-County land must also be addressed.

Other considerations included in this guide are related to the operation and maintenance of the Roads Division projects. A significant amount of County utility costs are attributed to lighting, signals, switching, cameras and the intelligent traffic systems. Furthermore, the County retains a large fleet of vehicles and equipment that are used long-term for a variety of projects. Therefore, the strategies discussed in this document should be considered for all aspects of WLRD and RSD, from design and construction to maintenance and operations.

### Process of Prioritizing

Strategies in this guide were selected based on their environmental impact and alignment with the stated goals and objectives of the WLRD & RSD. The list is organized in order of environmental impact priority, based on project experience and research by Paladino and Company, and input from representatives from the King County WLRD and RSD. Project managers should consider implementing as many of the strategies as is applicable and feasible for their projects. Where limited by other constraints (budget, time, program), a project manager can also start at the top of the list and know that they are focusing attention on the strategies with the highest environmental impacts. While the list is intended to identify the strategies or impacts that are most significant for King County, interpretation and judgment from County staff should be exercised to identify the most appropriate applications for each project. This list is by no means a comprehensive list of all relevant environmental options, but represents a starting point for investigating and implementing environmentally preferable building and construction practices. Additional strategies can be considered where applicable, feasible and cost-effective.

## SUMMARY TABLE - TOP STRATEGIES LISTED BY ENVIRONMENTAL PRIORITY

Environmental Priority	Strategies	Applicability
1. Preserve Natural Site Amenities	<ul style="list-style-type: none"> <li>a. Minimize Development Footprint</li> <li>b. Preserve and link natural corridors</li> <li>c. Provide wildlife crossings</li> <li>d. Develop on brownfield sites</li> <li>e. Plan for efficient construction staging</li> <li>f. Preserve existing vegetation</li> <li>g. Eliminate use of pesticides &amp; herbicides</li> </ul>	Site preservation is applicable to all projects. This is especially important in decision-making about new right-of-ways and placement of facilities.
2. Maintain the Microclimate	<ul style="list-style-type: none"> <li>a. Specify light-colored surface treatments</li> <li>b. Integrate vegetated roofs and green cover</li> <li>c. Design lighting for reduced light pollution</li> <li>d. Design natural acoustic buffers</li> <li>e. Responsibly manage all spoils &amp; waste</li> <li>f. Maintain diversity in landscaped areas</li> </ul>	Decisions concerning the microclimate affect material specifications for sidewalks and road surfaces, in addition to exterior lighting plans. This also affects open space decisions and landscape integration into new or existing projects.
3. Manage Stormwater	<ul style="list-style-type: none"> <li>a. Use permeable pavement treatments</li> <li>b. Provide bioretention in localized systems</li> <li>c. Use open conveyance for drainage</li> <li>d. Schedule for summer construction</li> <li>e. Implement erosion and sedimentation control</li> <li>f. Implement an Integrated Pest Management plan</li> </ul>	Stormwater management is applicable to all projects, especially roads and facilities. This will affect decisions about surface treatment specifications, right of way sizing, landscaping and construction procedures.
4. Conserve Water	<ul style="list-style-type: none"> <li>a. Plant native species to eliminate irrigation</li> <li>b. Install high efficiency irrigation systems</li> <li>c. Install water saving fixtures</li> <li>d. Install rainwater harvesting systems</li> <li>e. Reduce water use for cleaning &amp; dust control</li> <li>f. Reduce water use for street maintenance</li> </ul>	Conserving water is primarily focused towards new and existing facilities. This will affect fixture selections and decisions about process water use and maintenance procedures.
5. Reduce Sources of Air Pollution	<ul style="list-style-type: none"> <li>a. Encourage alternative transportation</li> <li>b. Install Intelligent Traffic Management Systems</li> <li>c. Use alternative fuels for vehicle fleet</li> <li>d. Maintain &amp; retrofit existing vehicle fleet</li> </ul>	Air pollution reduction is a holistic approach that encompasses issues ranging from the entire regional transportation infrastructure and the individual vehicles in the County fleet. This directly impacts decisions about right-of-way sizing and vehicle fuel use.
6. Reduce Energy Use & Promote Renewables	<ul style="list-style-type: none"> <li>a. Provide daylight &amp; ventilation in facilities</li> <li>b. Use uniform &amp; low light levels</li> <li>c. Specify efficient lamps and fixtures</li> <li>d. Install daylight sensors to reduce lighting use</li> <li>e. Commission lighting controls</li> <li>f. Produce and/or purchase renewable energy</li> <li>g. Dispose of lamps properly</li> </ul>	Energy use is applicable to all County operations, but these strategies are primarily focused on exterior lighting and building efficiency.
7. Reduce Material Waste	<ul style="list-style-type: none"> <li>a. Design for maintenance &amp; accessibility</li> <li>b. Design and build with pre-fabricated elements</li> <li>c. Divert construction &amp; demolition waste</li> <li>d. Practice regular project maintenance</li> </ul>	Material waste reduction is critical during all construction procedures. This also affects construction techniques in selecting appropriate assembly systems.
8. Choose Sustainable Materials	<ul style="list-style-type: none"> <li>a. Use local materials</li> <li>b. Reuse salvaged materials</li> <li>c. Specify high recycled content materials</li> <li>d. Specify FSC certified sustainable wood</li> </ul>	Material selections are important issues for all projects. These apply to road beds, bridges, facilities and any other structures associated with infrastructure.



*Habitats are based on a sensitive and complex relationship of environmental conditions (top)*

# Protect Habitat

## 1. PRESERVE NATURAL SITE AMENITIES

### Impacts

Wildlife habitats are composed of a complex inter-connected network of species, food sources and micro-climate conditions. While these areas can often be identified, they are very difficult to be recreated or restored once disturbed. In 1999 the Chinook salmon and bull trout were listed as threatened under the Endangered Species Act (ESA), as a direct result of regional habitat degradation. Since then, it was stated by King County executives that “all King County activities, from stormwater management and wastewater disposal to road and development practices, will be newly scrutinized for their potential impact on listed salmon species and their habitat; activities that comprise an annual average budget of \$2.6 billion.” Habitat destruction can lead to the loss of animal and plant populations, which in turn affects citizen health and economic prosperity in the region.

### Strategies

Strategies for preserving habitat are focused on the assessment and limited disturbance of sensitive natural areas. Although the complete preservation of natural areas is often not possible, certain strategies can minimize the impact of construction activities. Planning is the most critical stage in driving habitat preservation, during which site analysis can reveal sensitive areas to avoid and geographical features that focus development. Once site amenities are known, construction boundaries should be established early and rigorously maintained throughout the project.

### Related Benefits

Because habitats are inherently fragile, reducing impacts to a site should be considered holistically. Activities that affect air or water quality will directly impact ecosystems, and therefore should be minimized or avoided. The legacy of projects, such as traffic, runoff, light pollution and maintenance should be evaluated for potential impact to site and managed accordingly. Material selections should be based on long-term evaluations of life-span, toxic release and maintenance requirements to understand long-term effects. And along with the responsibility to protect is the responsibility to educate future generations about the value and sensitivity of the regional environmental amenities.

### References

- King County, Endangered Species Act – Salmon Conservation & Recovery**  
<http://www.metrokc.gov/exec/esa/>
- King County DDES – Critical Area Reports**  
<http://www.metrokc.gov/ddes/sensarea/>
- Wildlife Protection: Keeping it Simple – Federal Highway Administration**  
<http://www.fhwa.dot.gov/environment/wildlifeprotection/>
- Wildlife Protection and Habitat Connectivity (Links)**  
<http://www.fhwa.dot.gov/environment/hconnect/>

### LEED Credit Parallels

**Sustainable Sites Credit 1**  
Site Selection

**Sustainable Sites Credit 3**  
Brownfield Development

**Sustainable Sites Credit 5.1**  
Reduced Site Disturbance, Protect or Restore Open Space

**Sustainable Sites Credit 5.2**  
Reduced Site Disturbance, Development Footprint

## 1. PRESERVE NATURAL SITE AMENITIES

### Planning & Design Strategies

### Additional Resources



#### a. Minimize development footprint

Reducing the footprint of any project is the most effective way to minimize habitat disturbance. Size right-of-way corridors appropriately based on traffic loads, with minimal disturbance of adjacent land. Design facilities with compact footprints, focusing on multi-story construction.



#### b. Preserve and link natural corridors

As development increases in the County, preserve connections between habitat zones – particularly river corridors and wetlands. Maintain a 100' no-build buffer zone around all sensitive areas, and do not build within the 100-year flood plane. In places where habitat was previously impacted, include remediation in project scope.

#### King County Wildlife Corridors:

<http://dnr.metrokc.gov/wlr/LANDS/natural/ecological.htm>



#### c. Provide wildlife crossings

Design opportunities for wildlife to cross major transportation corridors without interfering with traffic. Coordinate crossings with natural corridors and hydrological flows to preserve existing migration paths.

#### Examples of wildlife crossings:

<http://www.fhwa.dot.gov/environment/wildlifecrossings>

[http://international.fhwa.dot.gov/wildlife\\_web.htm](http://international.fhwa.dot.gov/wildlife_web.htm)

<http://www.wildlifecrossings.info>



#### d. Develop on brownfield sites

Using brownfield sites both restores a polluted or damaged site but also preserves existing open space for other uses. Cleaning up brownfield sites may improve run-off quality and reduce negative impacts on surrounding eco-systems and water bodies. The cost of mitigation varies, and should be based on a survey and sampling of potential pollutants.

#### King County brownfield assessments and technical assistance information:

<http://www.metrokc.gov/dnpr/swd/brownfields/>

### Construction Strategies

### Additional Resources



#### e. Plan for efficient construction staging

Efficient staging can significantly reduce the area of disturbance on a construction site. Maintain a minimal boundary around the area of work, not to exceed 40'. Coordinate material deliveries with the construction schedule to minimize on-site storage. Optimize paths for vehicles while minimizing site entry and exit points.



#### f. Preserve existing vegetation

Trees and other dominant plant species are important to local ecology, and are host to numerous species. Inventory existing vegetation and plan projects to remove as few as possible. If removal is necessary, relocate to a nearby location. During construction, maintain a barrier around the base of trees and other plants to protect root systems.

#### Tree Barrier information:

<http://www.city.vancouver.bc.ca/commsvcs/planning/treebylaw/treetbl.htm>

### Operation & Maintenance Strategies

### Additional Resources



#### g. Eliminate use of pesticides & herbicides

Pesticides and herbicides leave residuals that affect ecosystems. Use native vegetation with a natural resistance to pests and weeds. Use landscape materials that are durable and require minimal maintenance.

#### Saving Water Partnership, Less Toxic Pest & Weed Control

[http://www.savingwater.org/outside\\_pesticide.htm](http://www.savingwater.org/outside_pesticide.htm)



*Light pollution and glare as a result of poorly shielded fixtures (top).*

*Heavily paved areas create increased temperatures in urban zones, known as the "heat island" effect (bottom).*

## Protect Habitat

### 2. MAINTAIN THE MICROCLIMATE

#### Impacts

Microclimate is a term for the local environmental conditions of a place, which are specific and sensitive factors in a habitat. Infrastructure projects have the potential to affect many aspects of a microclimate, which in turn affects both animals and humans. Paved surfaces are darker and less absorptive than natural growth, and therefore raise the ambient air temperatures and affect natural evaporation-transpiration rates. Heat that re-radiates from these surfaces can raise local temperatures up to 10 degrees above ambient, causing what is known as the urban "heat island" effect. This degrades air quality and can lead to heat exhaustion and other human health problems.

Local conditions are also impacted by the noise and light that is generated from infrastructure project sites. Noise pollution affects humans most prevalently in sleep patterns, stress levels and productivity. High noise levels also interfere with the natural cycles of animals, such as feeding behavior, breeding rituals and migration paths. Without sufficient separation, this reduces the usability of adjacent land for both human and animal habitat. This problem is compounded with additional impacts from light pollution. One-third of exterior lighting is wasted because it shines upward or sideways—illuminating nothing, disturbing neighbors, obscuring views of the sky, and providing unnaturally high light levels for nocturnal wildlife. This night sky pollution is especially problematic for animals, such as migratory birds that rely on constellations to navigate at night or other animals that depend on the natural fluctuation of day/night for foraging and reproduction.

#### Strategies

Strategies to maintain a microclimate involve restoring or simulating the natural conditions that existed pre-development. For infrastructure projects this involves the attenuation of impacts related to noise, light and heat. LEED addresses many of these issues individually, through specific product specifications and site planning. However, project teams must take a holistic approach that considers the impact to both the site and the surrounding area.

#### Related Benefits

Maintaining microclimates are very much linked to preservation of habitat. Using native and pre-existing vegetation will retain the visual and natural benefits of the pre-development conditions, in addition to attenuating noise and providing stormwater filtration. Permeable pavement or green surfaces both reduce heat re-radiation and reduce stormwater runoff. Materials used for surfaces can be specified with recycled content and be locally sourced. Waste hauled from the site can be recycled or reused by other county projects.

#### References

- ❑ **Dark Skies Northwest Group – Light Pollution Slideshow**  
<http://www.scn.org/darksky/slideshow/sld001.htm>
- ❑ **International Dark-Sky Organization – Good Lighting Fixtures**  
<http://www.darksky.org/fixtures/>

#### LEED Credit Parallels

**Sustainable Sites Credit 5.1**  
Protect or Restore Open Space

**Sustainable Sites Credit 7.1**  
Landscape & Exterior Design to Reduce Heat Islands

**Sustainable Sites Credit 8**  
Light Pollution Reduction

## 2. MAINTAIN THE MICROCLIMATE

### Planning & Design Strategies

### Additional Resources



#### a. Specify light-colored surface treatments

Reduce the "heat island" effect by specifying light-colored surfaces such as concrete, gravel or stone. These materials absorb less heat from the sun than darker surfaces such as asphalt. This reduces the "heat island" effect, where heavily paved areas re-radiate heat and can raise local temperatures up to 10 degrees above ambient.

For general info on heat islands:

<http://www.epa.gov/heatisland/>

For information on cool pavements:

[http://www.epa.gov/heatisland/resources/pdf/CoolPavementReport\\_FormerGuide\\_complete.pdf](http://www.epa.gov/heatisland/resources/pdf/CoolPavementReport_FormerGuide_complete.pdf)



#### b. Integrate vegetated roofs and green cover

Natural cover on horizontal surfaces helps to reduce temperatures, maintain air moisture levels, and provide natural air and stormwater filtration. Integrate vegetation into overpasses or medians, using plants that have tolerance to exhaust. Install greenroofs on facilities to improve energy performance and mitigate stormwater.



#### c. Design lighting for reduced light pollution

Light pollution can be reduced by eliminating light that is cast above the horizontal plane. Install full cut-off fixtures and use low-wattage lamps where possible. Use timers and daylight sensors to minimize light use. Design exterior lighting plans to not cast light outside of the project boundary.

For a slideshow on reducing light pollution:

<http://www.darksky.org/fixtures/>

For full cut-off fixture recommendations:

<http://www.darksky.org/fixtures/>



#### d. Design natural acoustic buffers

Natural acoustic barriers limit disruption of both human and animal habitats. Rather than walls, use earth berms or dense vegetation between roads and sensitive areas. Size to provide appropriate acoustic "shadow". Where feasible, entrench roads to reduce noise. Target a 200' buffer zone between major roads and residential areas.

For information on acoustic barrier design:

<http://www.fhwa.dot.gov/environment/htnoise.htm>

### Construction Strategies

### Additional Resources

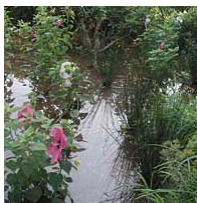


#### e. Responsibly manage all spoils and wastes

Contaminated or toxic substances should be contained and disposed of by an approved receiving facility. Waste from construction practices should be either crushed and reused on-site or sent to an appropriate off-site recycler. Any onsite use of waste should be approved in advance, and should not compromise existing site amenities.

### Operation & Maintenance Strategies

### Additional Resources



#### f. Maintain diversity in landscaped areas

Homogeneous plant material, such as turf grass, creates a monoculture that requires treatment and maintenance, or is vulnerable to insects, weeds and disease. Using a diversity of plants emulates natural conditions, creates a natural defense against many pests, limits excessive growth and reduces the need for weeding or maintenance.



*Unmanaged stormwater can lead to severe erosion (top).*

*Open conveyance (middle) and porous pavement (bottom) can help mitigate stormwater volumes.*

## Protect Water Resources

### 3. MANAGE STORMWATER

#### Impacts

Land development disrupts the natural cycle of water or hydrology that previously existed on the site. Urbanization affects not only the quantity of stormwater runoff but also the quality. Site-runoff as it moves across paving, parking lots and roadways picks up pollutants like oil spills, metals, sediments, oxygen-demanding substances, nutrients, toxic organic substances and fecal coli-form bacteria. Depleting aquifers, downstream erosion, water quality degradation, habitat destruction, danger to human health and flooding are some of the adverse effects that can be mitigated by storm water management.

#### Strategies

Low Impact Development (LID) is a land development approach that is being promoted by King County as of the 2003 Smart Growth legislation. LID is an eco-system-based approach to land development and stormwater management; the approach focuses on directing, filtering and infiltrating water entering a site, in order to minimize and clean any water that leaves a site. Projects that incorporate LID practices minimize impervious surface area, protect and enhance native vegetation and soils, and manage stormwater at its source rather than diverting it through hard piping.

#### Related Benefits

Bioretention swales and ponds, and permeable surface treatments allow infiltration, mitigate the urban heat-island effect and introduce variety into the hard landscape. Increased evaporation rates from open swales, ponds and streams improve the micro-climate. In the case of building projects, collected rain water from the roof can be used for non-potable uses such as irrigation and toilet flushing. Green roofs can provide additional stormwater mitigation and can reduce impacts to the microclimate.

#### References

- King County Surface Water Design Manual**  
<http://dnr.metrokc.gov/wlr/dss/manual.htm>
- Puget Sound Action Team – Low Impact Development**  
<http://www.psat.wa.gov/Programs/LID.htm>
- Green Building and Low Impact Development – Frequently Asked Questions**  
<http://www.metrokc.gov/ddes/acrobat/cib/55.pdf>
- Soils for Salmon – Low Impact Development**  
[http://www.soilsforsalmonoregon.org/Low\\_Impact\\_Development.htm](http://www.soilsforsalmonoregon.org/Low_Impact_Development.htm)
- EPA – Low Impact Development**  
<http://www.epa.gov/owow/nps/lid/>

#### LEED Credit Parallels

**Sustainable Sites Credit 6.1**  
Stormwater Management,  
Rate and Quantity

**Sustainable Sites Credit 6.2**  
Stormwater Management,  
Stormwater Treatment

**Sustainable Sites Credit 7.1**  
Landscape & Exterior Design to  
Reduce Heat Islands

**Water Efficiency Credit 1.1**  
Water Efficient Landscaping

### 3. MANAGE STORMWATER

#### Planning & Design Strategies

#### Additional Resources



**a. Use permeable pavement treatments**

Permeable pavement allows direct infiltration into the ground. While most often applicable for parking surfaces, permeable pavement is suitable for roads, sidewalks and paths. Examples include grassed modular pavement (shown), porous concrete, and concrete pavers with grass infill.

**K.C. Environmental Purchasing – Pervious Pavement**  
<http://www.metrokc.gov/procure/green/bul71.htm>

**K.C. Surface Water Design Manual – Appendix C**  
[http://dnr.metrokc.gov/wlr/dss/DMUpdates/appendix\\_c\\_-\\_final.pdf](http://dnr.metrokc.gov/wlr/dss/DMUpdates/appendix_c_-_final.pdf)



**b. Provide bioretention in localized systems**

Bioretention swales or ponds (also called rain gardens) can provide a significant amount of contaminant uptake and runoff reduction. Design roads and parking lots to drain to localized systems rather than storm drains, to increase ground infiltration and evaporation. Specify drought-tolerant plants with specific ability to absorb heavy metals.

**K.C. Surface Water Design Manual – Appendix C**  
[http://dnr.metrokc.gov/wlr/dss/DMUpdates/appendix\\_c\\_-\\_final.pdf](http://dnr.metrokc.gov/wlr/dss/DMUpdates/appendix_c_-_final.pdf)



**c. Use open conveyance for drainage**

Open conveyance reduces stormwater volumes by allowing evaporation and ground infiltration. This can be integrated alongside road shoulders as grassy swales or integrated into sidewalks.

**K.C. Surface Water Design Manual – Appendix C**  
[http://dnr.metrokc.gov/wlr/dss/DMUpdates/appendix\\_c\\_-\\_final.pdf](http://dnr.metrokc.gov/wlr/dss/DMUpdates/appendix_c_-_final.pdf)

#### Construction Strategies

#### Additional Resources



**d. Schedule for summer construction**

King County summers are typically dry and warm. Scheduling construction during this period will avoid excessive runoff from the construction site. This also saves time and money spent to repair in-progress site damage caused by heavy rains.

**K.C. Surface Water Design Manual – Appendix D: Erosion & Sedimentation Control Standards**  
[http://dnr.metrokc.gov/wlr/dss/DMUpdates/Appndx\\_D.pdf](http://dnr.metrokc.gov/wlr/dss/DMUpdates/Appndx_D.pdf)

**King County - Erosion Control for Construction Sites**  
<http://www.metrokc.gov/DDES/lusd/erosion.htm>



**e. Implement erosion and sedimentation control**

Erosion and Sedimentation Control prevents runoff from disturbed areas during construction. It is important to develop a plan for the site, and implement it throughout construction. Techniques include seeding, silt fencing, mulching, sedimentation basins, earth dikes, and sedimentation traps.

#### Operation & Maintenance Strategies

#### Additional Resources



**f. Implement an Integrated Pest Management Plan**

The overuse of pesticides and herbicides can negatively impact ecosystems when transported by stormwater. Thus, low-impact Integrated Pest Management (IPM) practices should be used to control insects, weeds and other pests. Focus on strategies such as natural predators, pest-resistant plant material, physical traps and biological controls.

**King County Noxious Weed Control Program**  
[http://dnr.metrokc.gov/Weeds/control\\_info.htm](http://dnr.metrokc.gov/Weeds/control_info.htm)

**Fundamentals of a Low Maintenance, Integrated Pest Management Approach to Landscape Design**  
<http://www.efn.org/~ipmpa/des-cnsd.html>



## Protect Water Resources

### 4. CONSERVE WATER

#### Impacts

Although the Puget Sound area is synonymous with water, the region is highly dependant on the seasonal precipitation with watersheds to provide water resources year-round. Water from streams and rivers provides critical resources for drinking water, industry, food production and animal habitat. Therefore, in years with low precipitation in the months of fall, winter and spring, conservation becomes a critical measure to protect the water supply. Wasting water can strain the capacity of treatment facilities and diminish resources for local animal populations such as salmon. In the end this affects economy, human health and most significantly the natural hydrology that makes King County unique.

#### Strategies

Due to a sensitive water resources and limited capacity, King County has aggressively pursued water-saving measures in recent years. In 2002, King County partnered with Seattle Public Utilities and conducted water audits of major county facilities. Cooling systems in the County Courthouse and County Administration Building were replaced with more efficient systems, saving about 12 million gallons of water a year and \$120,000 in water and sewer costs. By replacing toilets, urinals and faucet aerators in the Courthouse, Administration and Yesler buildings, about 5 million gallons of water a year were saved and \$50,000 a year in water and sewer costs.

In 2005, record low snowpack and diminished stream flow required King County to implement a Drought Response Plan to reduce County water use. County executives outlined specific water conservation strategies for facilities and fleet managers such as reduced sidewalk cleaning and landscape irrigation, minimal washing of bus and vehicle fleets and retrofitting of county facilities with water-saving devices such as low-flow toilets. The County continues to identify opportunities to conserve water by performing audits of existing facilities, beginning restrictive irrigation programs, and eliminating nonessential use of water unless supplied with reclaimed water.

#### Related Benefits

Bio-swales and pervious surface treatments allow infiltration, mitigate the urban heat-island effect and introduce variety into the hard landscape. Increased evaporation rates from open swales and streams improve the micro-climate. In the case of building projects, collected rain water from the roof can be used for non-potable uses such as irrigation and toilet flushing.

#### References

- King County Water Conservation Program**  
<http://dnr.metrokc.gov/wtd/waterconservation>
- King Street Center Virtual Tour (see Water Reclamation)**  
[http://dnr.metrokc.gov/dnrp/ksc\\_tour](http://dnr.metrokc.gov/dnrp/ksc_tour)
- Saving Water Partnership – Water Smart Technology Program**  
<http://www.savingwater.org>
- Water Conservation Coalition**  
<http://www.bewatersmart.net/work.htm>

#### LEED Credit Parallels

**Water Efficiency Credit 1**  
Water Efficient Landscaping

**Water Efficiency Credit 2**  
Water Use Reduction

## 4. CONSERVE WATER

### Planning & Design Strategies

### Additional Resources



**a. Plant native species to eliminate irrigation**  
Vegetation used alongside roads and near facilities should be selected from a native plant palette, to take advantage of their adaptation to local climate conditions. Once established, landscaped areas should be irrigation free.

**King County Sustainable Landscaping**  
<http://www.metrokc.gov/dnrp/swd/sustainable-landscaping/>



**b. Install high efficiency irrigation systems**  
Typical sprinkler systems waste water by releasing excess moisture into the air, or over-spraying plant beds. So in situations where irrigation is necessary, such as for temporary establishment, install water efficient systems such as drip irrigation. Mulch to retain soil moisture and reduce evaporation. Install rain sensors to regulate flow and set timers to water early in the day or late at night.

**Saving Water Partnership – Smart Watering Strategies**  
[http://www.savingwater.org/outside\\_watering.htm](http://www.savingwater.org/outside_watering.htm)



**c. Install water-saving fixtures**  
The use of low-flow fixtures is the most effective way to reduce potable water use in facilities. Install dual-flush or composting options for toilets, and waterless or low-flow urinals. Upgrade lavatories to touchless systems with faucet aerators. Take advantage of rebates available from local initiatives for fixture upgrades.

**Toilet Rebate Program**  
[http://www.savingwater.org/business\\_toilet.htm](http://www.savingwater.org/business_toilet.htm)

**King County Parks & Recreation – Water Saving Fixtures**  
<http://dnr.metrokc.gov/parks/kcac/fixtures.htm>



**d. Install rainwater harvesting systems**  
Rain collected from the roofs of facilities can be used to offset the water used for sewage conveyance, irrigation and process water use such as facility washdown or vehicle cleaning. Tanks should be sized to provide year-round water availability, targeting the maximum percentage of water savings with the least amount of capacity.

**King County Rainwater Collection Tech Brief**  
<http://www.metrokc.gov/dnrp/swd/about/green-building-team/documents.asp>

### Construction Strategies

### Additional Resources



**e. Reduce water use for cleaning & dust control**  
Cover construction entrances or heavy traffic areas with rocks, crushed debris or blankets. This will minimize dust and dirt transfer, thus reducing the need for vehicle cleaning. When vehicle washing is necessary, it should be done in a station that uses a water reclamation system, such as those found in commercial car washes.

### Operation & Maintenance Strategies

### Additional Resources



**f. Use reclaimed water for non-essential uses**  
Substitute reclaimed water for any uses that do not require potable water, such as drinking or hand washing. Some opportunities to use reclaimed water include facility & road maintenance, vehicle & equipment cleaning and irrigation.

**King County Reclaimed Water Program**  
<http://dnr.metrokc.gov/wtd/reuse/>



**g. Reduce water use for street maintenance**  
Perform maintenance of streets or sidewalks using brush or air-based equipment, rather than being sprayed clean. If water is to be used, it should be drawn from reclaimed water, or rainwater harvesting systems (See d. & f. above).



*Infrastructure projects can be designed to reduce vehicle miles traveled and idling – reducing emissions and providing cleaner air for King County residents.*

## Protect Air Quality

### 5. PREVENT AND REDUCE AIR POLLUTION

#### Impacts

Dirty air reduces the amount of oxygen human lungs can absorb. Breathing dirty air has the same kind of effect on our lungs as smoking cigarettes. Air pollution has a greater effect on children, the elderly, and people with lung problems such as asthma, allergies, and emphysema. In 2001, the American Lung Association reported a 15% increase in the counties nation-wide that received poor air quality reports for the year. King County was up to a “D” grade for ozone air pollution, or “smog”, up from an “F” in 2000. Based on the 2000 Emissions Inventory for King County, mobile services, including the County’s fleet, are the largest source of the County’s traditional pollutants.

Residents’ activities such as driving also contribute to poor air quality, but County infrastructure development and refinements can also significantly reduce the emissions of its population. Local governments such as King County build roads, manage transportation, handle solid waste and treat waste water, all of which contribute to air pollution.

In 2000, King County decided to participate in the Cities for Climate Protection Campaign, along with other northwest neighbors, Seattle, Portland, Multnomah County, Tacoma, Spokane, Olympia and Burien. The first step was an inventory of emissions, which identified landfills, metro transportation and waste water treatment as the largest contributors to King County’s emissions. With respect to roads and other transportation capital projects, fuel consumption, traffic paint, and electricity consumption also contribute to greenhouse gas and traditional pollutant emissions (NOx, VOC, PM, SOx).

#### Strategies

Reducing vehicle emissions is the largest contribution infrastructure projects can make to reduce air pollution. Optimizing routes, installing intelligent traffic management systems, and encouraging alternatives to single occupancy vehicles will reduce emissions; these are largely master planning activities. Since diesel engines account for 66% of particulate pollution from transportation, overall departmental operations and construction policies are the key. Specific strategies include diesel emissions reduction through construction and maintenance fleet improvements, and bio-diesel fuels. At the project design level, easy and low-cost specifications changes include specifying fly-ash as partial cement replacement, low-VOC exterior paints, and dust mitigation measures such as gravel construction entrances.

#### Related Benefits

Reducing vehicle miles traveled and idling time also reduces energy consumption, another significant contributor to County emissions. Reducing impacts to air also protects sensitive habitat and preserves microclimate conditions.

#### References

- King County Government Greenhouse Gas & Traditional Pollutants Emissions Inventory**  
<http://dnr.metrokc.gov/dnrcp/air-quality/inventory.htm>
- West Coast Diesel Collaborative Regional Greenhouse Gas Reduction Initiative**  
<http://www.westcoastdiesel.org/>

#### LEED Credit Parallels

##### Sustainable Sites Credit 4.1

Alternative Transportation,  
Public Transportation Access

Design features such as bus lanes allow commuters to get to work faster, an incentive for riders.

##### Sustainable Sites Credit 4.3

Alternative Transportation,  
Alternative Fuels

Applicable to vehicle fleet

##### Sustainable Sites Credit 4.4

Alternative Transportation,  
Parking Capacity

Carpool lanes complement building projects that provide carpool parking.

##### Energy & Atmosphere Credit 1

Optimize Energy

Reduce emissions due to County electricity use.

## 5. PREVENT AND REDUCE AIR POLLUTION

### Planning & Design Strategies



#### a. Encourage alternative transportation

Providing separate lanes for bicycles provides a safe, zero-emission alternative to driving. Safety enhancements such as plantings, railings and low fences, provide visual and physical separation and encourage walking and biking. At department facilities, consider adding changing rooms and bike lockers or racks. For projects near schools, coordinate to provide safe pedestrian and cyclist routes.

### Additional Resources

**Designing for Bicycles: Information and Resources**  
[http://www.wsdot.wa.gov/bike/Design\\_Info.htm](http://www.wsdot.wa.gov/bike/Design_Info.htm)

**Bicycle and Pedestrian Design Guidance**  
<http://www.fhwa.dot.gov/environment/bikeped/design.htm>

**Bike Lane Design Guide**  
<http://www.bicyclinginfo.org/de/bikelaneguide.htm>



#### b. Install Intelligent Traffic Management Systems

As the population of King County grows, roads reach capacity. ITMS can both decrease congestion and delays and associated emissions due to idling. In addition to signal timing,

**King County's ITMS Program**  
<http://www.metrokc.gov/kcdot/roads/cip/ProjectCountyWide.aspx?CIPID=RDCW07>

**Seattle DOT – Traffic Signal Optimization Program**  
<http://www.cityofseattle.net/transportation/signaloptimization.htm>

### Construction Strategies



#### c. Use alternative fuels for vehicle fleet

Retrofit existing vehicles, or purchase new vehicles that accept bio-diesel, low-sulfur diesel or natural gas. Most current diesel vehicles are compatible with bio-diesel--some may need fuel filter or hose replacements. Bio-diesel may be purchased in different formulations, ranging from B-20 (20% bio-diesel + 80% diesel) to B-100 (100% bio-diesel).

### Additional Resources

**Voluntary Diesel Retrofit Program**  
<http://www.epa.gov/otaq/retrofit/>

**Alternative Fuel for Heavy Duty Vehicles & Engines**  
[http://www.pugetsoundcleancities.org/vehicles\\_heavyduty.htm](http://www.pugetsoundcleancities.org/vehicles_heavyduty.htm)

### Operation & Maintenance Strategies



#### d. Maintain & retrofit existing vehicle fleet

Regular maintenance, including tasks as simple as tire inflation, keeps vehicles operating efficiently thus reduces fuel consumption. Consider retrofitting existing vehicles with new filter systems, or converting fuel system to accept biodiesel.

### Additional Resources

**EPA Tips for Efficient Vehicle Maintenance and Driving**  
<http://www.epa.gov/otaq/consumer/18-youdo.pdf>



## Save Energy

### 6. REDUCE ENERGY USE AND PROMOTE RENEWABLES

#### Impacts

Energy use for lighting and operating King County's infrastructure projects depletes natural resources, pollutes the environment, destroys habitat, and burdens County budgets with ongoing operating costs. Reducing energy use is the first step in a sustainable energy approach. The second is to evaluate opportunities for project-related renewable energy generation. All projects should encourage increased levels of site-based renewable energy technologies. Purchased energy should also be from renewable sources.

#### Strategies

Electric lighting is one of the major site-based energy uses in King County's parks and infrastructure systems. It constitutes up to 50% of visitor center and storage building energy use and may represent 100% of exterior energy use (not counting transportation). Daylighting is the most fundamental solution to reducing lighting energy during the day. Additionally, good lighting design saves energy, which includes energy efficient lamps and fixtures with controls that turn lights off when they are not needed.

Evaluate opportunities for site generated renewable energy, either equipment mounted, serving one purpose like a PV parking lot light, or building mounted, providing power for multiple purposes and potentially fed back to the utility grid for net metering. Site generated renewable energy opportunities include wind, solar, geothermal, biomass, bio-gas, bio-diesel, and low impact micro-hydro. A pilot project at King County's South Treatment Plant is using gas produced by the sewage treatment process to generate enough energy to power the plant, saving King County about \$450,000 in electricity costs annually. The Carkeek Environmental Learning Center uses building and pole mounted PV cells to generate electricity for the facility.

Purchase renewable energy for additional power needs. Puget Sound Energy and Seattle City Light have renewable energy purchase options. Tradable renewable certificates, or "green tags", are also available nationally to support the production of renewable energy. Although many sources are available, LEED specifically acknowledges Green-e certified power providers for achievement of Energy & Atmosphere Credit #6.

#### Related Benefits

Energy conservation and use of site-based renewable energy systems reduce the pollution and habitat destruction associated with non-renewable generation and transmission systems, helping to reduce air pollution and habitat destruction. Specifying long-life, mercury-free lamps can reduce solid waste and minimize toxic contamination of habitats.

#### References

- Consortium for Energy Efficiency – Energy-Efficient Traffic Signals  
<http://www.cee1.org/gov/led/led-main.php3>
- Green-e Renewable Energy  
<http://www.green-e.org>

#### LEED Credit Parallels

##### Sustainable Sites Credit 8

Light Pollution Reduction

Specify low wattage exterior lights to save energy and reduce light trespass.

##### Energy & Atmosphere Prereq 1 and Credit 3

Building Systems Commissioning

Commissioning energy systems saves energy and O&M costs.

##### Energy & Atmosphere Prereq 2 Energy & Atmosphere Credit 1

Optimize Energy

Reduce operating costs and emissions due to County electricity use.

##### Energy & Atmosphere Credit 2

Renewable Energy

Reduce dependence on nonrenewable energy sources, control future energy availability, & save on energy bills.

##### Energy & Atmosphere Credit 6

Green Power

Support renewable energy sources.

##### Indoor Environmental Quality Credit 8

Daylight & Views

Increase visual comfort and productivity and save energy.

## 6. REDUCE ENERGY USE & PROMOTE RENEWABLES

### Planning & Design Strategies

### Additional Resources



#### a. Provide daylight & ventilation in facilities

Take advantage of daylighting in facilities to reduce or eliminates the need for electric lights during the day. For open facilities, design for natural cross-ventilation and stack ventilation for fresh air delivery and passive cooling.

#### BetterBricks – Daylighting

<http://www.betterbricks.com/daylighting>

#### Whole Building Design Guide – Natural Ventilation

<http://www.wbdg.org/design/naturalventilation.php>



#### b. Use uniform & low light levels

Lighting uniformity is more important than high light levels to ensure safety and comfort. Use fixtures that provide even lighting over a wider area rather than high brightness in a small spot. Specify low ambient light levels, especially in rural areas that are intrinsically dark. Limit light trespass from site to 0.1 fc, or 0.2 fc in urban areas.

#### IES – Lighting for Exterior Environments (RP-33-99)

Available for purchase at: <http://www.iesna.org/shop/>



#### c. Specify efficient lamps and fixtures

Use energy-efficient, long-life fixture, such as LEDs for traffic signage and metal-halide or compact fluorescent lamps for road illumination. Avoid incandescent (inefficient) and mercury and sodium lamps (poor color rendering and visibility). Specify full cutoff fixtures to focus all light downwards, which takes full advantage of light provided and eliminates light trespass to the night sky.

#### EnergyStar – Traffic Signals

[http://www.energystar.gov/index.cfm?c=traffic.pr\\_traffic\\_signals](http://www.energystar.gov/index.cfm?c=traffic.pr_traffic_signals)



#### d. Install daylight sensors to reduce lighting use

Use photocells to turn lights on and off depending on daylight availability and seasonal variance. At facilities, turn primary exterior lights off at curfew hours, providing only for safety lighting.

### Construction Strategies

### Additional Resources



#### e. Commission lighting controls

Commissioning lighting controls & renewable energy systems during design and after construction ensures they will work as designed. Re-commissioning controls annually and cleaning and maintenance of photocells and lamps guaranties continued energy savings.

#### Seattle City Light Building Commissioning Assistance

[http://www.ci.seattle.wa.us/light/conserves/business/bdgcomal/cv5\\_bca.htm](http://www.ci.seattle.wa.us/light/conserves/business/bdgcomal/cv5_bca.htm)

### Operation & Maintenance Strategies

### Additional Resources



#### f. Produce and/or purchase renewable energy

Site generated renewable energy can be equipment mounted, serving one purpose, or building mounted, providing power for multiple purposes. Excess energy can be fed back to the utility grid (net metering). Purchase renewable energy (green power) for utility power needs.

#### Puget Sound Energy Green Power:

<http://www.pse.com/solutions/businessGreenPower.aspx>

#### Seattle City Light Green Power:

<http://www.ci.seattle.wa.us/light/green/greenpower/>



#### g. Dispose of lamps properly

Although safe to operate, fluorescent lamps contain mercury that contaminates the environment if disposed of improperly. As of Oct 1, 2005, mercury containing lamps must be recycled and cannot be disposed of at transfer stations or landfills. Many recycling vendors in King County accept these lamps for a small fee.

#### King County lamp recycling vendors:

<http://www.govlink.org/hazwaste/business/fluor/vendors.htm>



## Conserve Resources

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### 7. REDUCE MATERIAL WASTE

#### Impacts

According to the EPA, in 1998 the U.S. generated 136 million tons of waste from construction and demolition. Only 20 percent to 30 percent (mostly concrete, asphalt, metals and some wood) was recycled or reused. In an urban and semi-urban area like King County, waste handling consumes land, resources and budget. In unincorporated King County over 2,500 tons of garbage is added to the Cedar Hills Regional Landfill each day. Additionally, each year tons of construction and demolition debris are illegally dumped in forests, streams, ravines and empty lots. Waste consumes land, spoils groundwater, contaminates soil and leaves a negative legacy for decades to come.

#### Strategies

Reducing material waste is a holistic process that begins at the project planning phase and continues throughout the life of a project. Designing projects to use materials efficiently, and thereby reduce waste, is dependent on material selections, construction processes and job-site management techniques. Goals should be set early on in the projects that identify clear targets for waste diversion percentages and specific materials that contribute to high waste volumes. Specifications for waste management should be integrated into the construction documents and be thoroughly implemented throughout the project. Vendors and suppliers should be selected based on low-waste delivery methods, or an arrangement should be made for the collection and reuse of packaging materials. Materials should be selected and installed based on long-life durability, or the ability to easily maintain over years of use.

#### LEED Credit Parallels

##### Materials & Resources Credit 2 Construction Waste Management

Recycling job-site waste saves money and reduces demand on limited landfill resources in King County

#### Related Benefits

Designs that use less material can also reduce costs. For example, low-impact development may use more landscaping, but uses less concrete piping which can make LID projects less expensive to install than conventional civil systems. Greater waste also impacts the capacity of King County landfills – the County will save infrastructure costs over time by reducing waste.

#### References

- ❑ **King County Solid Waste Division – Construction Recycling**  
<http://www.metrokc.gov/dnrp/swd/construction-recycling/>
- ❑ **King County Solid Waste Division Online Materials Exchange**  
<http://www.metrokc.gov/dnrp/swd/exchange/index.asp>
- ❑ **King County Atlantic Central Base Construction Recycling Case Study**  
<http://www.metrokc.gov/ddes/sensarea/>

## 7. REDUCE MATERIAL WASTE

### Planning & Design Strategies

### Additional Resources



#### a. Design for maintenance & accessibility

During the design phase, discuss maintenance needs with representatives from the operations staff. Confirm that the design provides access for personnel, and that previously installed materials will not be damaged or removed during maintenance procedures. Coordinate future work on the site to avoid compromising accessibility.



#### b. Design and build with pre-fabricated elements

Pre-fabricated elements are made off-site in a controlled environment, where raw materials can be used more efficiently and waste can be easily recovered. This saves time and waste by minimizing the inefficiencies of on-site fabrication. Specify elements that are easy to handle and assemble, and are delivered with minimal or no packaging.

#### FHWA - Prefabricated Bridge Elements and Systems

<http://www.fhwa.dot.gov/BRIDGE/prefab/>

### Construction Strategies

### Additional Resources



#### c. Divert construction & demolition waste

Develop a construction waste management plan for all new projects. Specific diversion targets in the project specifications, such as 50%, 75% or 95%. In King County, there should be no construction cost increase for recycling at least 75% of all construction, demolition and land-clearing (CDL) debris. Identify opportunities to reuse demolition and excavation materials from the site in new projects. Seek qualified contractors that are experienced in construction waste management techniques.

#### K.C. Construction Recycling Information

<http://www.metrokc.gov/dnrp/swd/construction-recycling>

#### K.C. Design Specifications & Waste Management Plans

<http://www.metrokc.gov/dnrp/swd/construction-recycling/specs-plans.asp>

### Operation & Maintenance Strategies

### Additional Resources



#### d. Practice regular project maintenance

Proper maintenance can increase the longevity of materials and components, which will ultimately save waste by minimizing replacement. Coordinate regular audits of existing projects and identify maintenance concerns early, before replacement of components is required. Conduct practices that do not pose an impact to local habitat or adjacent land.

#### Regional Road Maintenance Endangered Species Act (ESA) Program Guidelines

<http://www.metrokc.gov/kcddot/roads/esa/>



*Green materials can reduce the environmental impact of building new infrastructure in King County.*

## Conserve Resources

### 8. CHOOSE SUSTAINABLE MATERIALS

#### Impacts

Building and construction activities worldwide consume 3 billion tons of raw materials each year or 40 percent of total global use. As the population within King County grows, almost 9% in the last eight years, expanding development consumes more and more resources. Increasing consumption of virgin materials puts pressure on our local and global environment, increasing our region's "environmental footprint". King County maintains an extensive network of roads and over 200 bridges. New construction, seismic upgrade, bridge re-decking, road resurfacing and regular maintenance all require material resources. Sustainable, or "green", materials offer alternatives that lessen the impact on the environment, and support a local economy for green products.

#### Strategies

Infrastructure projects have many opportunities for material cycling due to a high volume of materials that are able to be recovered. Concrete, asphalt and similar materials can be crushed and reused in other projects as subbase or used as aggregate in new concrete. Additionally, materials used for road structures, such as wood beams or steel, may be recovered and reconditioned for resale or future use. For example, the Atlantic Central Base Expansion was a project in 2003 that required the removal of two city blocks of warehouses to construct a new bus storage facility. King County conducted a coordinated demolition that afforded the salvaging of over 15,000 tons of concrete that was reused as backfill sub-base in the new Employee Parking Garage and Bus Parking Area Expansion Project. An additional 200,000 board feet of old growth Douglas Fir timber was recovered, valued at an estimated \$1.1 million.

Additional material opportunities exist with the use of recycled products. This reduces the energy and pollution associated with the harvesting, manufacturing, transport and disposal of virgin materials and products. Contractors should be encouraged or required to source materials from local distributors, which will save the associated impacts and costs of transportation. Specifying sustainably harvested materials, such as FSC wood, will ensure that regional and national forest resources are protected. Specific product recommendations can be found through King County's Environmental Purchasing Policy.

#### Related Benefits

Some sustainable materials may offer durability and maintenance advantages. For example, recycled content composite lumber is a low-maintenance and economic alternative to virgin lumber. It can be used at raised pedestrian walkways and at pedestrian bridge components. Green options may also be less energy intensive to manufacture, which means their manufacture creates fewer emissions. Fly-ash can be used in concrete mixes, resulting in a higher quality and stronger concrete with no extra cost. Since fly-ash is a waste product that replaces energy-intensive cement, it is a lower "embodied energy" material.

#### References

- King County Environmental Purchasing Policy**  
<http://www.metrokc.gov/procure/green/policy.htm>
- King County Solid Waste Division Online Materials Exchange**  
<http://www.metrokc.gov/dnrp/swd/exchange/index.asp>
- Environmental Building News Green Materials Database (Membership Required)**  
<http://www.buildinggreen.com>

#### LEED Credit Parallels

##### Materials & Resources Credit 3

###### Resource Reuse

Excavation and demo materials from County projects can be used for new road sub-base

##### Materials & Resources Credit 4

###### Recycled Content

Recycled content asphalt and concrete can be relatively easy strategies

##### Materials & Resources Credit 5

###### Local/Regional Materials

Most heavy materials are more cost-effective if purchased locally due to high transportation costs

##### Materials & Resources Credit 7

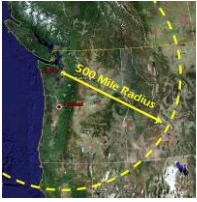
###### Certified Wood

Minimize wood use where possible, and specify FSC certified wood for major components

## 8. CHOOSE SUSTAINABLE MATERIALS

### Planning & Design Strategies

### Additional Resources



#### a. Use local materials

Local materials for infrastructure projects are relatively easy to find and are often common practice. Source heavy materials—such as concrete, steel, fill, sub-base and asphalt—from local manufacturers or extraction sites. If possible, use materials that are native to the region, such as specific rock types or wood species.



#### b. Reuse salvaged materials

Inventory any existing on-site materials, and coordinate the salvage and reuse in new work. Specifically target higher value items. Establish channels to coordinate unused material exchanges with other projects that may be in planning, design or construction stages.

#### Atlantic Central Base Demo Waste Recycling Case Study

<http://www.metrokc.gov/dnrp/swd/greenbuilding/documents.asp>



#### c. Specify high recycled content materials

There are many options for recycled content materials in infrastructure projects. Specify crushed concrete or asphalt aggregate, and/or fly ash and slag replacement for cement. Purchase steel with a high post-consumer recycled content. Specify composite wood products with recycled content rather than virgin lumber.

#### K.C. Environmental Purchasing – Recycled Concrete

<http://www.metrokc.gov/procure/green/concrete.htm>



#### d. Specify FSC certified sustainable wood

When wood is required, consider specification of sustainably harvested wood that is certified by the Forest Stewardship Council. FSC wood typically has a 3% to 20% premium, depending on the nature of the material and availability. However, supporting local FSC forests supports the Water & Land Resources Division's mission to protect and restore habitats and conserve our natural resources.