CITY OF KIRKLAND
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DEPARTMENT OF PUBLIC WORKS
PRE-APPROVED PLANS POLICY

Policy L-1: FEASIBILITY OF STORMWATER LOW IMPACT DEVELOPMENT (LID) FOR SMALL PROJECT TYPE I[1], TYPE II[2] & TARGETED[3] PROJECTS

The City of Kirkland encourages (and sometimes requires) the use of stormwater low impact development (LID) on all projects, whenever feasible. The intent of stormwater LID techniques is to mimic natural hydrologic processes (allow runoff to infiltrate into the ground), and to mitigate for impervious surfaces added through development.

Stormwater LID is **encouraged for TYPE I** projects, but is not required.

Applicants for projects meeting the threshold for Small Project **Type II** and **Targeted** Drainage Review must evaluate the feasibility of dispersion, infiltration, and/or other Stormwater LID options.

EVALUATION

Evaluate the feasibility of Dispersion BMPs:

- **Full Dispersion** is feasible if the proposed project has 50-100 feet of native vegetated flowpath (depending on the dispersion method) to disperse the runoff from the new and/or replaced impervious surface area. A SW Adjustment form (Policy D-11) may be necessary if less than 100ft flowpath, with approval on a case-by-case basis.
- **Basic Dispersion** is feasible if the project has 25-50 feet of vegetated flowpath (does not have to be native vegetation) to disperse the runoff. Other constraints affecting feasibility are steep slopes (greater than 15%), sensitive areas, and the potential to cause or aggravate flooding and erosion problems to adjacent properties. If dispersion is feasible, use the design criteria for dispersion BMPs in Appendix C of the 2009 King County Surface Water Design Manual (KCSWDM).

If Dispersion BMPs are not feasible, **evaluate the feasibility of Infiltration BMPs**. Potential constraints to consider are soil type, ground water level, and steep slopes (15% or greater). If possible, design infiltration facilities with an overflow connection to the public storm drainage system.

If the BMPs involving dispersion or infiltration are not feasible, then **consider the other LID BMPs** (rainwater harvesting, vegetated roof, reduced impervious surface credit, and native growth retention credit) for the project.

BMP AREA REQUIREMENTS

The amount of impervious area routed to storm LID BMPs varies based on the size of the lot:

1. For a lot up to 11,000sf, route runoff from an impervious surface area equal to at least **10% of the lot** to one or more storm LID BMPs.
2. For a lot between 11,000 and 22,000sf, route runoff from an impervious surface area equal to at least **20% of the lot** to one or more storm LID BMPs. If total impervious area is less than 20% of the site, route all impervious area to one or more LID BMPs.
3. For a lot greater than 22,000sf, **all new and replaced impervious area** must be routed to one or more storm LID BMPs.

[1]Type I project refers to small projects creating between 500 and 1,999ft^2 new impervious (see Policy D-2 for full definition).

[2]Type II project refers to small projects creating between 2,000 and 5,000ft^2 new impervious (see Policy D-2 for full definition).

[3]Targeted project refers to small projects creating between 2,000 and 5,000ft^2 new impervious, but also contains sensitive areas or other issues triggering more review than Type II (see Policy D-3 for full definition).

SOIL REPORT

A small site **Soil Report is required** for infiltration trenches, drywells, rain gardens, and pervious pavement **without an overflow connection** to the public storm drainage system.
A small site Soil Report includes the following (2009 KCSWDM, page C-41):

1. At least one soil log for each proposed infiltration location, including:
   a. a minimum of 4 feet deep (6 feet if drywell is proposed), and
   b. a soil description from each horizon through the depth of the log, and
   c. notes of any evidence of a high groundwater table, such as mottling.
2. Level of maximum wet-season water table (minimum of 1 foot between bottom of gravel filled facility and maximum wet season water table).
3. Soil report must be prepared by or under the direction of a licensed civil engineer, engineering geologist, geotechnical engineer, or onsite sewage system designer.
4. If soils are coarse sands or cobbles or medium sands, then an infiltration rate is not required and facility can be sized based on small site requirements in Appendix C (2009 KCSWDM). If soils are other type then an infiltration rate is required and the facility must be designed to fully infiltrate.

If an **overflow connection can be installed**, then **a soil report is not required** for basic infiltration with the following BMPs:

1. 30 foot long infiltration trench for 1,000sf of area,
2. 90 cubic feet of drywell for 1,000sf of area,
3. Rain garden per design criteria in Appendix C of 2009 KCSWDM, and
4. Permeable pavement per design criteria in Appendix C of the 2009 KCSWDM.

LID BMP OPTIONS

All stormwater LID BMPs must be designed and installed according to the 2009 KCSWDM, COK Addendum, and the Public Works Pre-Approved Plans. Listed below are the Stormwater LID options from the 2009 KCSWDM:

1. Dispersion (Appendix C, section C.2.4)
2. Infiltration (Appendix C, section C.2.3)
3. Rain Garden (Appendix C, section C.2.5)
4. Permeable Pavement (Appendix C, section C.2.6)
5. Rainwater Harvesting (Appendix C, section C.2.7)
6. Vegetated Roof (Appendix C, section C.2.8)
7. Reduced Impervious Surface Credit (Appendix C, section C.2.9)
8. Native Growth Retention Credit (Appendix C, section C.2.10)

ADDITIONAL INFORMATION

Applicant must submit a Feasibility Summary of their analysis used to determine the BMPs proposed to meet the requirements stated above. Include a soil report if required.

As the design professional of record for this project (Civil, Geotechnical Engineer, or Architect), the following choice of LID application and storm conveyance is noted on the attached summary sheet.

By: _____ Title: _____ Date: _____

City policy is to require the installation of stormwater LID to the maximum extent feasible. The City acknowledges stormwater LID may not work on some sites, due to topography, soil, or other site specific conditions. Policy D-11 contains a Stormwater Adjustment Form that must be completed if standard storm LID BMPs are not feasible at a site. If standard LID options are not feasible, at a minimum amended soil will be required in all landscaped areas and/or additional landscape/trees as appropriate.

How to Size a Small Site Rain Garden:

1) Determine the amount of LID needed for the site, see Policy L-1 for more information:

	Actual:		*Example:*	
Lot Size =		square feet	*13,500*	*sf*

LID Required = Lot Size x Required % of LID

LID Required =		square feet	*2,700*	*sf*

2) Size Rain Garden Storage Volume

Per King County Surface Water Design Manual, App C, the minimum water storage volume is 3 in (0.25 ft).

LID Required =		square feet	*2,700*	*sf*
Min Rain Garden Storage Required =	0.25	feet	*0.25*	*ft*

Rain Garden Volume Needed = LID Required x Minimum Storage Requirement

Rain Garden Volume =		cubic feet	*675*	*cf*

3) Determining the Bottom Area of Rain Garden

Rain Garden (RG) Vol = 1/2 x (width of RG bottom + width of RG top) x depth of RG x length of RG

To solve for bottom area, must assume the depth and bottom width of the rain garden.

Depth of Rain Garden =		feet	*1*	*ft (max depth)*
Bottom Width of Rain Garden =		feet	*2*	*ft (min width)*

Top Width of Rain Garden = Bottom Width + (2 x Height x Horizontal Side Slope)

Top Width of Rain Garden =		feet	*8*	*ft*

Length of Rain Garden = Rain Garden Volume / [2 x Height x (Bottom Width + Top Width)]

Bottom Length of Rain Garden =		feet	*135*	*ft*
Bottom Area of Rain Garden =			*270*	*sf*

The bottom area can change, as long as the total bottom area equates to 270 square feet. If the height changes, redo the calculations to determine the new bottom area.

Use the RG Vol equation above to verify that the sizing volume of the RG meets the required volume.

Verified Rain Garden Volume =		cubic feet	*675*	*cf*

For additional design criteria, refer to CK-L.05