CHAPTER 1

DRAINAGE REVIEW AND REQUIREMENTS

This chapter describes the drainage review procedures and types, the drainage requirements, and the adjustment procedures necessary to implement surface water runoff policies codified in Chapters 7.05, 7.06, and 7.07 of the Kent City Code. It also provides direction for implementing more detailed procedures and design criteria found in subsequent chapters of this manual.

Chapter Organization

The information presented in Chapter 1 is organized into four main sections as follows:

- Section 1.1, "Drainage Review"
- Section 1.2, "Core Requirements"
- Section 1.3, "Special Requirements"
- Section 1.4, "Adjustment Process"

Each section begins on an odd page so that tabs can be inserted by the user if desired for quicker reference.

Key Words and Phrases

Several key words and phrases have specific definitions as they are used in this manual; those of particular importance in determining drainage requirements are listed below. These and other terms are defined in the "Definitions" section in the back of the King County Manual. Many of these terms are also defined in Section 1.1 below and when first used in this chapter.

- Acceptable discharge point
- Closed depression
- Construct or modify
- Direct discharge
- Drainage area
- Equivalent area
- Existing site conditions
- Flow durations
- Flow path
- High-use site
- Hydraulically connected
- Natural discharge area
- New impervious surface
- Pollution-generating impervious surface
- Pollution-generating pervious surface
- Project site
- Redevelopment project
- Replaced impervious surface
- Single-family residential project
- Site (*see also onsite and offsite*)
- Surface flow
- Threshold discharge area

1.1 DRAINAGE REVIEW

Drainage review is the evaluation by the Public Works permit review staff of a proposed project's compliance with the drainage requirements of this manual. During drainage review, Public Works permit review staff may also consider the proposed project's compliance with other Kent requirements (which are not covered in this manual), such as those specified in the Kent Wetland Management Code, Kent Geologic Hazard Areas Code, and other environmental plans and policies. If required, drainage review becomes an integral part of the overall permit review process. **This section describes when and what type of drainage review is required for a proposed project and how to determine the drainage requirements that apply.**

Guide to Using Section 1.1

The following steps are recommended for efficient use of Section 1.1:

1. Determine whether your proposed project is subject to the requirements of this manual by seeing if it meets any of the thresholds for drainage review specified in Section 1.1.1. Making this determination requires an understanding of the key definitions listed below.
2. If drainage review is required per Section 1.1.1, use the flow chart in Figure 1.1.2.A to determine what type of drainage review will be conducted by Public Works. The type of drainage review defines the scope of drainage requirements that will apply to your project as summarized in Table 1.1.2.A.
3. Check the more detailed threshold information in Section 1.1.2 to verify that you have determined the correct type of drainage review.
4. After verifying drainage review type, use the information in Section 1.1.2 to determine the core requirements (found in Section 1.2) and the special requirements (found in Section 1.3) that must be evaluated for compliance by your project. To determine what actions are necessary to comply with each applicable core and special requirement, see the more detailed information on these requirements contained in Sections 1.2 and 1.3 of this chapter.

Note: For Steps 2 through 4, it is recommended that you arrange a preapplication meeting with Public Works permit review staff to confirm the type of drainage review and scope of drainage requirements that apply to your proposed project.

❑ KEY DEFINITIONS

Proper application of the drainage review thresholds in this section requires an understanding of the key definitions listed below. Other definitions can be found in the "Definitions" section of the King County Manual.

Acceptable discharge point: An enclosed drainage system (i.e., pipe system, culvert, or tightline) or open drainage feature (e.g., ditch, channel, swale, stream, river, pond, lake, or wetland) where concentrated runoff can be discharged without creating a significant adverse impact.

Base flood: The flood having a one percent chance of being equaled or exceeded in any given year. Also referred to as the "100-year flood." The base flood is determined for future flow conditions, except in

areas where the FEMA Flood Insurance Study includes detailed base flood calculations. In that case, the the FEMA data shall apply.

Construct or modify: To install a new drainage pipe/ditch or make improvements to an existing drainage pipe/ditch (for purposes other than routine maintenance, repair, or emergency modifications, and excluding driveway culverts installed as part of single-family residential building permits) that either serves to concentrate previously unconcentrated surface and stormwater runoff or serves to increase, decrease, and/or redirect the conveyance of surface and stormwater runoff.

Contiguous Pollution-Generating Impervious Surface (CPGIS): a discrete patch of PGIS that is all together as opposed to being separated in different locations on the project site. The intent is to identify those redevelopment projects that are replacing and/or adding enough impervious surface in one location to allow for opportune installation of a water quality treatment facility. The threshold of 5,000 square feet or more of contiguous PGIS shall be applied to by **Threshold Discharge Area.**

Erodible or leachable materials, wastes, or chemicals: Substances that, when exposed to rainfall, measurably alter the physical or chemical characteristics of the rainfall runoff (examples include erodible soil, uncovered process wastes, manure, fertilizers, oily substances, ashes, kiln dust, garbage dumpster leakage, etc.).

Erosion hazard area: Areas within the City of Kent underlain by soils which are subject to severe erosion when disturbed. Such soils include, but are not limited to those delineated in the *Soil Survey, King County Area, Washington* as having a moderate to severe, severe to very severe erosion hazard potential.

Existing flooding: Flooding over all lanes of the roadway or driveway has occurred in the past and can be verified by City records, City personnel, photographs, or other physical evidence.

Existing site conditions: depend on what, if any, land conversion occurred on the site since December 1978, when Kent first required flow control for new development (Ordinance 2130). IF a drainage plan has been approved by the City since December 1978 for any land conversion activity which includes the addition of more than 5,000 square feet of new impervious surface, AND the plans indicate a stormwater management system was designed according to standards in place at the time, AND the same system shown on the approved plan was constructed and is still operating according to the design, THEN existing site conditions are those created by the site improvement. (In this case, including any drainage facilities constructed per the approved engineering plans. It is the responsibility of the project proponent to submit such documentation to the Public Works Department.) OTHERWISE, existing site conditions are those that were present on December 1978 as determined from aerial photographs, and if necessary, on knowledge of individuals familiar with the area. The intent is to mitigate unadressed impacts created by site alterations or improvements, such as clearing, which have occurred since December 1978.

Finished area: Any enclosed area of a building that is designed to be served by the building's permanent heating or cooling system.

Floodway: The channel of the river or stream and those portions of the adjoining floodplains which are reasonably required to carry and discharge the base flood flow. The portions of the adjoining floodplains that are considered to be "reasonable required" are defined by the **City** flood hazard regulations as stated in Chapter 14 of the Kent City Code.

Flow duration: The aggregate time that peak flows are at or above a particular flow rate of interest (e.g., the amount of time over the last 40 years that peak flows were at or above the 2-year flow rate).

Full build-out conditions: The tributary area is developed to its full zoning potential except where there are existing **streams, lakes, wetlands, closed depressions, geologic hazard areas, or** open space tracts.

Geologic Hazard Areas: Include Seismic Hazard Areas, Erosion Hazard Areas, and Landslide Hazard Areas.

Habitable building: Any residential, commercial, or industrial building that is equipped with a permanent heating or cooling system and an electrical system.

High-use site: A commercial or industrial site that (1) has an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area; (2) is subject to petroleum storage or transfer in excess of 1,500 gallons per year, not including delivered heating oil; or (3) is subject to use, storage, or maintenance of a fleet of 25 or more diesel vehicles that are over 10 tons net weight (trucks, buses, trains, heavy equipment, etc.). Also included is any road intersection with a measured ADT count of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersecting roadway, excluding projects proposing primarily pedestrian or bicycle use improvements.

Impervious surface: A hard surface area which either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development; and/or a hard surface which causes water to run off the surface in greater quantities or at an increased rate of flow from the flow present under natural conditions prior to development. Common impervious areas include, but are not limited to, roof tops, walkways, patios, driveways, parking lots, or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam, or other surfaces which similarly impede the natural infiltration of surface and stormwater runoff. Open, uncovered flow control or water quality treatment facilities shall not be considered impervious surfaces (see also "new impervious surface").

Landscape management plan: An approved plan for defining the layout and long-term maintenance of landscaping features to minimize the use of pesticides and fertilizers, and to reduce the discharge of suspended solids and other pollutants. Guidelines for preparing landscape management plans can be found in Reference Section 4-A. Submittal requirements are detailed in Section 2.3.1.4.

Landslide hazard area: The following shall be classified as landslide hazard areas:

1. Any existing active or dormant landslide.
2. Areas delineated in the "Soil Survey, King County Area, Washington" as having a "severe" limitation for building site development. These soils consist of the following:
   - Alderwood gravelly sandy loam, 15 to 30 percent slopes (AgD)
   - Alderwood and Kitsap soils, very steep (AkF)
   - Beausite gravelly sandy loam, 15 to 30 percent slopes (BeD)
   - Beausite gravelly sandy loam, 40 to 75 percent slopes (BeF)
   - Everett gravelly sandy loam, 15 to 30 percent slopes (EvD)
   - Indianola loamy fine sand, 15 to 30 percent slopes (InD)
   - Kitsap silt loam, 8 to 15 percent slopes (KpC)
   - Kitsap silt loam, 15 to 30 percent slopes (KpD)
   - Ovall gravelly loam, 15 to 25 percent slopes (OvD)
   - Ovall gravelly loam, 40 to 75 percent slopes (OvF)
   - Ragnar fine sandy loam, 15 to 25 percent slopes (RaD)
   - Ragnar-Indianola association, moderately steep (RdE)
3. Areas designated as quaternary slumps, earth flows, mudflows, or landslides on maps published by the US Geological Survey, Washington Department of Natural Resources, or geologic consultant reports completed for the City of Kent.
4. Areas with all three of the following characteristics:
   - slopes steeper than 15 percent;
   - slopes intersecting granular material over silts or clays; and
   - springs or ground water seepage or evidence of seasonal springs or ground water seepage.
5. Slopes that are parallel or subparallel to planes of weakness (such as bedding planes, joint systems, and fault planes) in subsurface materials.

6. Slopes subject to failure during seismic shaking.
7. Areas potentially unstable as a result of rapid stream incision or stream bank erosion.
8. Areas located in a canyon or on an active alluvial fan, presently or potentially subject to inundation by debris flows or catastrophic flooding.
9. Any area with a slope of 40 percent or steeper and with a vertical relief of 10 or more feet. A slope is delineated by establishing its toe and top and measured by averaging the inclination over 10 feet of vertical relief.

Landslide hazard drainage area: Specially mapped areas where the City has determined that overland flows from new projects will pose a significant threat to health and safety because of their close proximity to **landslide hazard areas**. Such areas are delineated on the Landslide Hazard / Landslide Hazard Drainage Areas Map adopted with this manual (see map pocket inside cover).

Natural discharge location: The location where runoff leaves the project site under existing site conditions.

Natural onsite drainage feature: A natural swale, channel, stream, closed depression, wetland, or lake.

New impervious surface: The addition of a hard or compacted surface such as roofs, pavement, gravel, or dirt, or the addition of a more compacted surface such as the paving of pre-existing dirt or gravel.

NPDES: National Pollutant Discharge Elimination System.

Organic content: Measured on a dry weight basis using ASTM D2974.

Peak discharges: Computed using KCRTS as detailed in Chapter 3.

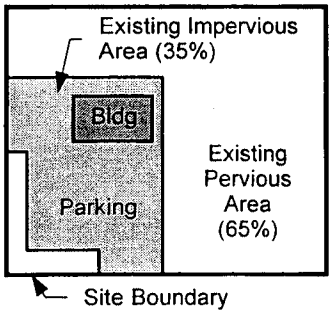
Pollution-generating impervious surface (PGIS): Those impervious surfaces considered to be a significant source of pollutants in stormwater runoff. Such surfaces include those subject to vehicular use or storage of erodible or leachable materials, wastes, or chemicals, and that receive direct rainfall or the run-on or blow-in of rainfall. Metal roofs are also considered to be PGIS unless they are treated to prevent leaching.

Pollution-generating pervious surface (PGPS): Any non-impervious surface with vegetative ground cover subject to use of pesticides and fertilizers. Such surfaces include, but are not limited to, the lawn and landscaped areas of residential or commercial sites, golf courses, parks, and sports fields.

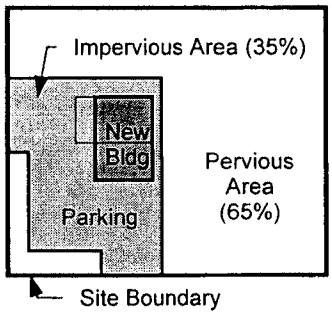
Project site: That portion of a property or properties subject to proposed project improvements including those required by this manual.

Redevelopment project: A project that proposes to *add*, *replace*, and/or *alter* impervious surface (for purposes other than routine maintenance, resurfacing, regrading, or repair) on a site that is already substantially developed (i.e., has *35% or more of existing impervious surface coverage*). The following examples illustrate the application of this definition.

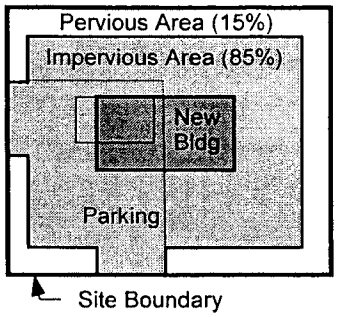
Example of an Existing Site Condition for a Redevelopment Project



Example of a Proposed Redevelopment Project that Alters Existing Impervious Surface



Example of a Proposed Redevelopment Project that Adds to Existing Impervious Surface



Replaced impervious surface: Any existing impervious surface on the project site that is proposed to be removed down to bare soil or base course and replaced with pollution-generating impervious surface, excluding impervious surface removed for the sole purpose of installing utilities.

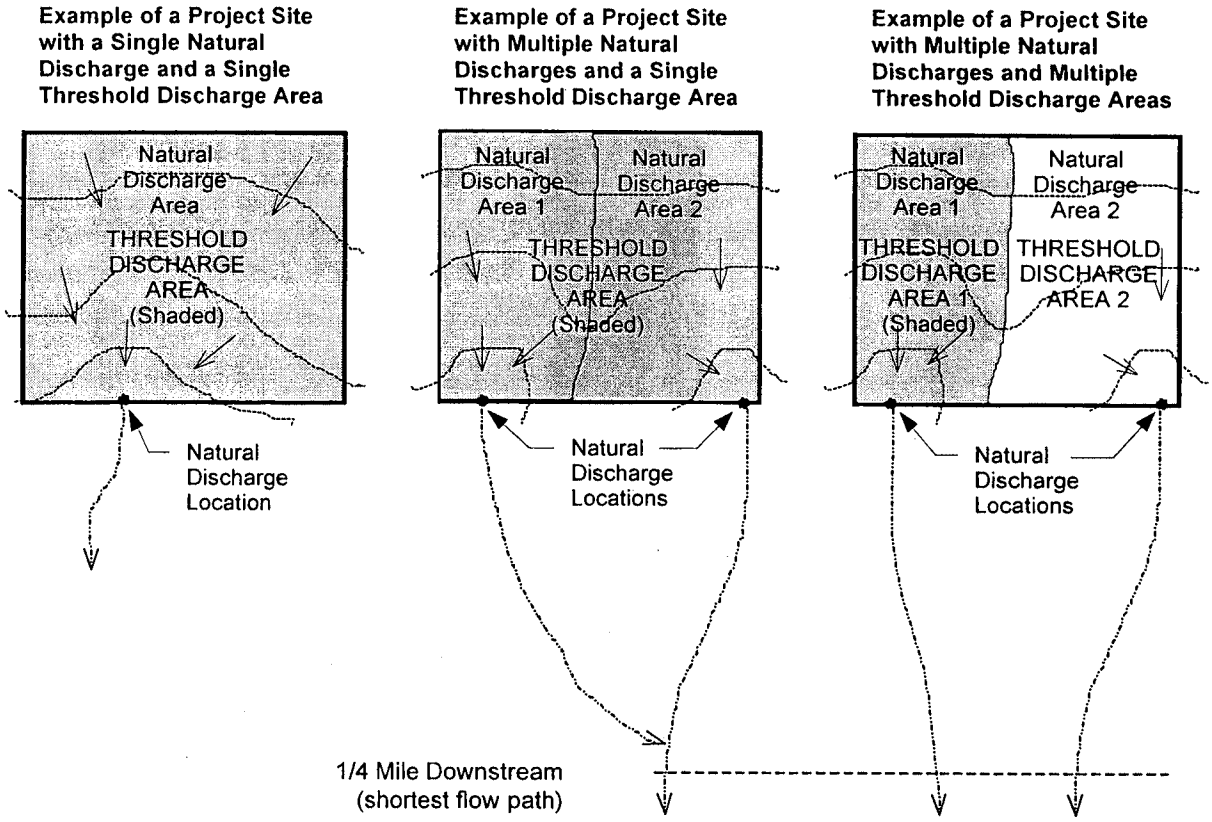
Roadway: The traveled portion of any public or private road or street.

Single-family residential project: A project that constructs or modifies a single-family dwelling unit and/or makes related onsite improvements, such as driveways, roads, outbuildings, play courts, etc., or a project that creates single-family residential lots such as a plat or short plat.

Site: The legal boundaries of the parcel or parcels of land for which an applicant has or should have applied for authority from Kent to carry out a development activity, including any drainage improvements required by this manual.

Subject to vehicular use: As used in the definition of pollution-generating surrface, means a surface, whether paved or not, that is regularly used by motor vehicles. The following are considered *regularly-used surfaces*: roads, unvegetated road shoulders, bicycle lanes within the traveled lane of a roadway, driveways, parking lots, unfenced fire lanes, diesel equipment storage yards, and airport runways. The following are not considered regularly used surfaces: road shoulders primarily used for emergency parking, paved bicycle pathways, bicycle lanes adjacent to unpaved or paved road shoulders primarily used for emergency parking, fenced fire lanes, and infrequently used maintenance access roads.

Threshold discharge area: An onsite area draining to a single natural discharge location or multiple natural discharge locations that combine within one-quarter-mile downstream (as determined by the shortest flow path). The examples below illustrate this definition. The purpose of this definition is to clarify how the thresholds of this manual are applied to project sites with multiple discharge points.



Treatment train: A combination of two or more treatment Best Management Practices connected in series (i.e., the design water volume passes through each facility in turn).

Unsubmerged portion: Any portion outside the ordinary high water line of streams, lakes, and wetlands.

Wetlands: All areas in the city of Kent that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and similar areas. Wetlands do not include those articial wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities farm ponds, and landscape amentities. The burden of proving an area to be nonwetland rests with the applicant. Wetlands include artificial wetlands intentionally created from nonwetland areas for the purpose of mitigating conversion of wetlands. The City relies on the methodology contained in the *Wetlands Delineation Manaul*, U.S. Army Corps of Engineers Technical Report Y-87-1 for identifying and delineating wetlands within the city. Wetland classes are based on the classification system described in the U.S. Fish and Wildlife Service's *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979) (See Kent City Code Chapter 11.05).

Wetland Buffer or wetland buffer zone: An area that surrounds and protects a wetland from adverse impacts to the functions and values of a wetland (See Kent City Code Chapter 11.05).

1.1.1 PROJECTS REQUIRING DRAINAGE REVIEW

THRESHOLD

Drainage review is required for any proposed project (except those proposing only routine maintenance, repair, or emergency modifications) that is subject to a Kent development proposal, permit, or approval listed below, AND that meets any one of the following conditions:

1. Adds 5,000 square feet[1] or more of **new impervious surface**, OR
2. Proposes to **construct or modify** a drainage pipe/ditch that is 12 inches or more in size/depth, or receives surface and stormwater runoff from a drainage pipe/ditch that is 12 inches or more in size/depth, OR
3. Contains or is adjacent to a floodplain, stream, lake, wetland[2], closed depression, **erosion hazard area**[2] or **landslide hazard area**[2], OR
4. Is located within a **Landslide Hazard Drainage Area**[2] and adds 2,000 square feet or more of new impervious surface, OR
5. Is a **redevelopment project** proposing $100,000[3] or more of improvements to an existing **high-use site**, OR
6. Is a **redevelopment project** proposing $500,000 or more of site improvements and creates 5,000 square feet or more of *contiguous*[4] **pollution-generating impervious surface** through any combination of **new and/or replaced impervious surface.**

Kent Permits and Approvals
Construction Permits
Conditional Use Permits
Grade and Fill Permits
Flood Control Zone Permit
Planned Unit Developments
Rezones
Shoreline Management Substantial Development Permits
Short Subdivision Developments (Short Plat)
Subdivision Developments (Plat)

[1] The threshold of 5,000 square feet or more of new impervious surface shall be applied by threshold discharge area and shall include all impervious surface that will ultimately result from the proposed project (e.g., impervious surface that will result from future homes within a plat or short plat).

[2] Landslide Hazard Areas, Landslide Hazard Drainage Areas and Erosion Hazard Areas and Wetlands are defined in the section titled "Key Definitions" above. Maps have been included in the pocket of this manual showing locations of these areas.

[3] This is the "project valuation" as declared on the Public Works and Construction Permit applications submitted to the City.

[4] *Contiguous* pollution-generating impervious surface (PGIS) means a discrete patch of PGIS that is all together as opposed to being separated in different locations on the project site. The intent is to identify those redevelopment projects that are replacing and/or adding enough impervious surface in one location to allow for opportune installation of a water quality treatment facility. The threshold of 5,000 square feet or more of contiguous PGIS shall be applied by threshold discharge area.

If drainage review is required for the proposed project, the type of drainage review must be determined based on project and site characteristics as described in Section 1.1.2. The type of drainage review defines the scope of drainage requirements that must be evaluated for project compliance with this manual.

1.1.2 DRAINAGE REVIEW TYPES AND REQUIREMENTS

For most projects adding 5,000 square feet or more of impervious surface, the full range of core and special requirements contained in Sections 1.2 and 1.3 must be evaluated for compliance through the drainage review process. However, for some types of projects the scope of requirements applied is narrowed to allow more efficient, customized review. Each of the following three drainage review types tailors the review process and application of drainage requirements to a project's size, location, type of development, and anticipated impacts to the local and regional surface water system:

- Small Site Drainage Review, Section 1.1.2.1
- Targeted Drainage Review, Section 1.1.2.2
- Full Drainage Review, Section 1.1.2.3

Each project requires only one of the above drainage review types, with the single exception that a project that qualifies for Small Site Drainage Review may also require Targeted Drainage Review. Figure 1.1.2.A can be used to determine the drainage review type that would be required. This may entail consulting the more detailed thresholds for each review type specified in the above-referenced sections.

Table 1.1.2.A can be used to quickly identify the requirements that are applied under each type of drainage review. The applicant must evaluate those requirements that are checked off for a particular drainage review type to determine what is necessary to meet compliance.

FIGURE 1.1.2.A FLOW CHART FOR DETERMINING TYPE OF DRAINAGE REVIEW REQUIRED

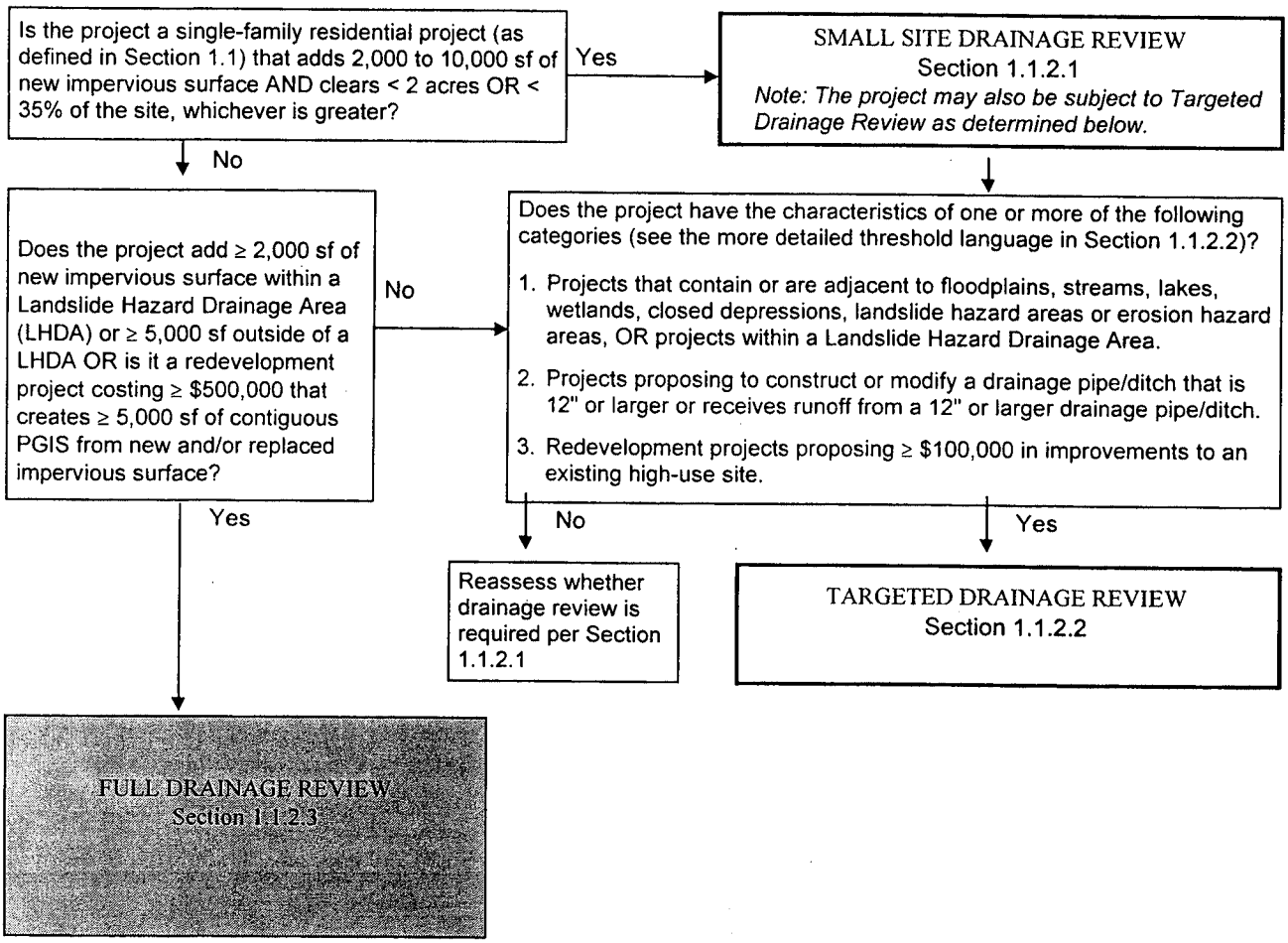


TABLE 1.1.2.A REQUIREMENTS APPLIED UNDER EACH DRAINAGE REVIEW TYPE

	Small Site Drainage Review	Targeted Drainage Review			Full Drainage Review
	Single-family residential projects that add 2,000 to 10,000 sf of new impervious surface AND clear < 2 acres or < 35% of the site, whichever is greater.	Small Site projects or other small projects that are not subject to Full Drainage Review as determined in Section 1.1.2.3, AND which have the characteristics of **one or more** of the following categories of projects: 1. Projects containing or adjacent to floodplains/ streams, lakes, wetlands, or closed depressions, landslide hazard areas or erosion hazard areas; or projects within a Landslide Hazard Drainage Area. 2. Projects proposing to construct or modify a drainage pipe/ditch that is 12" or larger or receives runoff from a 12" or larger drainage pipe/ditch. 3. Redevelopment projects proposing ≥ $100,000 in improvements to a high-use site.(1)			All projects, including redevelopment projects, that add ≥ 5,000 sf (2,000 sf within a Landslide Hazard Drainage Area) of new impervious surface but do not qualify for Small Site Drainage Review, OR redevelopment projects costing ≥ $500,000 that create ≥ 5,000 sf of contiguous PGIS from new and/or replaced impervious surface.
		Category 1	Category 2	Category 3	
SMALL SITE REQUIREMENTS	✓				
CORE REQUIREMENT #1 Discharge at Natural Location		*(2)	✓	✓	✓
CORE REQUIREMENT #2 Offsite Analysis		✓	✓	*(2)	✓(3)
CORE REQUIREMENT #3 Flow Control		*(2)	*(2)	*(2)	✓(3)
CORE REQUIREMENT #4 Conveyance System		*(2)	✓	*(2)	✓
CORE REQUIREMENT #5 Erosion & Sediment Control		✓	✓	✓	✓
CORE REQUIREMENT #6 Maintenance & Operations		*(2)	✓	✓	✓
CORE REQUIREMENT #7 Financial Guarantees & Liability		*(2)	✓(3)	✓(3)	✓(3)
CORE REQUIREMENT #8 Water Quality		*(2)	*(2)	✓(3)	✓(3)
SPECIAL REQUIREMENT #1 Other Adopted Requirements		✓(3)	*(2)		✓(3)
SPECIAL REQUIREMENT #2 Developments within Floodplain/Floodway		✓(3)			✓(3)
SPECIAL REQUIREMENT #3 Flood Protection Facilities		✓(3)	*(2)		✓(3)
SPECIAL REQUIREMENT #4 Source Control		✓(3)	✓(3)	✓(3)	✓(3)
SPECIAL REQUIREMENT #5 Oil Control				✓(3)	✓(3)

1. Category 3 projects that install oil controls that construct or modify a 12-inch pipe/ditch are also Category 2 projects.
2. May be applied by Public Works based on project or site-specific conditions.
3. These requirements have exemptions or thresholds that may preclude or limit their application to a specific project.

1.1.2.1 SMALL SITE DRAINAGE REVIEW

Small Site Drainage Review is a simplified alternative to Full Drainage Review for small residential projects adding less than 10,000 square feet of new impervious surface and restricting site clearing to less than 2 acres or less than 35% of the site, whichever is greater. The core and special requirements applied under Full Drainage Review are replaced with simplified small site requirements that can be applied by a non-engineer. These requirements include flow control Best Management Practices (BMPs) such as setting aside open space to limit future site clearing, and using simple measures such as splash blocks and gravel trenches to disperse or infiltrate runoff from impervious areas. Also included are simple BMPs for erosion and sediment control (ESC). Formal water quality treatment is not necessary. This alternative to Full Drainage Review acknowledges that drainage impacts for many small development proposals can be effectively mitigated without construction of costly flow control and water quality facilities.

The Small Site Drainage Review process minimizes the time and effort required to design, submit, review, and approve drainage facilities for these proposals. In most cases, the requirements can be met with submittals prepared by contractors, architects, or homeowners without the involvement of a licensed civil engineer.

Threshold

THRESHOLD

Small Site Drainage Review is allowed for any project that is subject to drainage review as determined in Section 1.1.1 and that meets all of the following criteria:

- The project is a *single-family residential project*[5], AND
- The project adds 2,000 to 10,000 square feet[6] of new impervious surface, AND
- The project clears less than 2 acres or less than 35% of the site, whichever is greater.

Note: Some projects qualifying for Small Site Drainage Review may also require Targeted Drainage Review if they meet any of the threshold criteria in Section 1.1.2.2.

Any potential small site proposal may elect to go through Full Drainage Review described in Section 1.1.2.3.

Scope of Requirements

REQMTS

IF Small Site Drainage Review is allowed, THEN the applicant may apply the simplified small site submittal and drainage design requirements detailed in *Small Site Drainage Requirements* adopted as Appendix C to the King County Manual (detached) and available as a separate booklet from King County Department of Natural Resources or Department of Development and Environmental Services. These requirements include simplified BMPs for flow control and erosion and sediment control. *Note: An open space tract or covenant may be required to preserve uncleared areas.*

Exemption from Core and Special Requirements

The simplified drainage requirements applied under Small Site Drainage Review are considered sufficient to meet the overall intent of the core and special requirements in Sections 1.2 and 1.3, except under certain conditions when a proposed project has characteristics that trigger Targeted Drainage Review (see the threshold for Targeted Drainage Review in Section 1.1.2.2) and may require the involvement of a licensed civil engineer. Therefore, any proposed project that qualifies for Small Site Drainage Review as determined above and complies with the small site drainage requirements detailed in Appendix C is considered exempt

[5] *Single-family residential project* is defined on page 5.1-4.

[6] The threshold of 10,000 square feet of new impervious surface shall be applied by **threshold discharge area** and shall include all impervious surface that will ultimately result from the proposed project (e.g., impervious surface that will result from future homes within a plat or short plat).

from all core and special requirements in Sections 1.2 and 1.3 **except** those which would apply to the project if it is subject to Targeted Drainage Review as specified in Section 1.1.2.2.

1.1.2.2 TARGETED DRAINAGE REVIEW

Targeted Drainage Review (TDR) is an abbreviated evaluation by Public Works of a proposed project's compliance with selected core and special requirements. Projects subject to this type of drainage review are typically small-site proposals or other small projects that have site-specific or project-specific drainage concerns that must be addressed by a licensed civil engineer or by Public Works. Under Targeted Drainage Review, engineering costs associated with drainage design and review are kept to a minimum because the review includes only those requirements that would apply to the particular project.

Threshold

THRESHOLD

Targeted Drainage Review is required for those projects subject to drainage review as determined in Section 1.1.1, AND that are not subject to Full Drainage Review as determined in Section 1.1.2.3, AND that have the characteristics of one or more of the following project categories:

- **TDR Project Category #1:** Projects that contain or are adjacent to a floodplain, stream, lake, wetland, closed depression, erosion hazard area or landslide hazard area; OR projects located within a **Landslide Hazard Drainage Area.**
- **TDR Project Category #2:** Projects that propose to *construct or modify*[7] a drainage pipe/ditch that is 12 inches or more in size/depth or receives surface and stormwater runoff from a drainage pipe/ditch that is 12 inches or more in size/depth.
- **TDR Project Category #3:** Redevelopment projects that propose $100,000 or more of improvements to an existing *high-use site.*[8]

Scope of Requirements

REQMTS

IF Targeted Drainage Review is required, THEN the applicant must demonstrate that the proposed project complies with the selected core and special requirements corresponding to the project category or categories that best match the proposed project. The project categories and applicable requirements for each are described below and summarized in Table 1.1.2.A.

Note: If the proposed project has the characteristics of more than one project category, the requirements of each applicable category shall apply.

Compliance with these requirements requires submittal of engineering plans and/or calculations stamped by a licensed civil engineer registered in the state of Washington, unless deemed unnecessary by Public Works. The engineer need only demonstrate compliance with those core and special requirements that have been predetermined to be applicable based on specific project characteristics as detailed below and summarized in Table 1.1.2.A. The procedures and requirements for submittal of engineering plans and calculations can be found in Section 2.3.

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[7] *Construct and modify* is defined as to install a new drainage pipe/ditch or make improvements to an existing drainage pipe/ditch (for purposes other than routine maintenance, repair, or emergency modifications, and excluding driveway culverts installed as part of single-family residential building permits) that either serves to concentrate previously unconcentrated surface and stormwater runoff or serves to increase, decrease, and/or redirect the conveyance of surface and stormwater runoff.

[8] A *high-use site* is defined as a commercial or industrial site that (1) has an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area; (2) is subject to petroleum storage or transfer in excess of 1,500 gallons per year, not including delivered heating oil; or (3) is subject to use, storage, or maintenance of a fleet of 25 or more diesel vehicles that are over 10 tons net weight (trucks, buses, trains, heavy equipment, etc.). Also included is any road intersection with a measured ADT count of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersecting roadway, excluding projects proposing primarily pedestrian or bicycle use improvements.

In addition, **Public Works may require** the applicant to demonstrate compliance with any one or more of the **seven core requirements** in Section 1.2 based on project or site-specific conditions. For example, if a Category #1 TDR Project contains or is adjacent to a stream, lake, wetland, closed depression, or defined Hazard Area, Public Works may require compliance with "Core Requirement #1: Discharge at the Natural Location" (Section 1.2.1). This may in turn require compliance with "Core Requirement #2: Offsite Analysis" (Section 1.2.2) if a tightline is required by Core Requirement #1. If a tightline is found to be unfeasible, Public Works may instead require a flow control facility per "Core Requirement #3: Flow Control" (Section 1.2.3). If a tightline is feasible, "Core Requirement #4: Conveyance System" (Section 1.2.4) would be required to ensure proper size and design. Any required flow control facility or tightline system may also trigger compliance with "Core Requirement #6: Maintenance and Operations" (Section 1.2.6), "Core Requirement #7: Financial Guarantees and Liability" (Section 1.2.7), and possibly "Core Requirement #8, Water Quality" (Section 1.2.8) if runoff from pollution-generating impervious surfaces is collected.

The applicant may also have to address compliance with any applicable requirements in the Kent City Code for floodplains, streams, lakes, wetlands, closed depressions, or geologic hazard areas as determined by Public Works.

TDR Project Category #1

This category includes projects that are too small to trigger application of most core requirements, but may be subject to site-specific requirements pertaining to floodplains, streams, lakes, wetlands, closed depressions, Landslide Hazard Drainage Areas, Erosion Hazard Areas, or other area-specific drainage requirements adopted by the City. Such projects primarily include single-family residential projects in Small Site Drainage Review.

REQMTS

IF the proposed project meets the characteristics of TDR Project Category #1, THEN the applicant must demonstrate that the project complies with the following five requirements:

- Core Requirement #2: Offsite Analysis, Section 1.2.2
- Core Requirement #5: Erosion and Sediment Control, Section 1.2.5
- Special Requirement #1: Other Adopted Area-Specific Requirements, Section 1.3.1
- Special Requirement #2: Floodplain/Floodway Delineation, Section 1.3.2
- Special Requirement #3: Flood Protection Facilities, Section 1.3.3
- Special Requirement #4: Source Control, Section 1.3.4

TDR Project Category #2

This category is intended to apply selected core and special requirements to those projects that propose to construct or modify a drainage system of specified size, but are not adding sufficient impervious surface to trigger Full Drainage Review.

REQMTS

IF the proposed project meets the characteristics of TDR Project Category #2, THEN the applicant must demonstrate that the proposed project complies with the following requirements:

- Core Requirement #1: Discharge at the Natural Location, Section 1.2.1
- Core Requirement #2: Offsite Analysis, Section 1.2.2
- Core Requirement #4: Conveyance System, Section 1.2.4
- Core Requirement #5: Erosion and Sediment Control, Section 1.2.5
- Core Requirement #6: Maintenance and Operations, Section 1.2.6
- Core Requirement #7: Financial Guarantees and Liability, Section 1.2.7
- Special Requirement #4: Source Control, Section 1.3.4

TDR Project Category #3

This category is intended to improve water quality by applying water quality, source control, and oil control requirements to redevelopment projects located on the most intensively used sites developed prior to current water quality requirements. These are referred to as *high-use sites* and are defined below.

High-Use Site Definition: A *high-use site* is any one of the following:

- A commercial or industrial site with an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area, OR
- A commercial or industrial site subject to petroleum storage or transfer in excess of 1,500 gallons per year, not including delivered heating oil, OR
- A commercial or industrial site subject to use, storage, or maintenance of a fleet of 25 or more diesel vehicles that are over 10 tons net weight (e.g., trucks, buses, trains, heavy equipment, etc.), OR
- A road intersection with a measured ADT count of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersecting roadway, excluding projects proposing primarily pedestrian or bicycle use improvements.

REQMTS

IF the proposed project meets the characteristics of TDR Project Category #3, THEN the applicant must demonstrate that the proposed project complies with the following requirements:

- Core Requirement #1: Discharge at Natural Location, Section 1.2.1
- Core Requirement #5: Erosion and Sediment Control, Section 1.2.5
- Core Requirement #6: Maintenance and Operations, Section 1.2.6
- Core Requirement #7: Financial Guarantees and Liability, Section 1.2.7
- Core Requirement #8: Water Quality, Section 1.2.8
- Special Requirement #4: Source Control, Section 1.3.4
- Special Requirement #5: Oil Control, Section 1.3.5

Note: In some cases, Public Works may determine that application of these requirements does not require submittal of engineering plans and calculations stamped by a licensed civil engineer. For example, if catch basin inserts are proposed to meet oil control requirements, engineered plans and calculations may not be necessary. A plot plan showing catch basin locations may suffice.

1.1.2.3 FULL DRAINAGE REVIEW

Full Drainage Review is the evaluation by Public Works permit review staff of a proposed project's compliance with the full range of core and special requirements in this chapter. This review addresses the impacts associated with adding new impervious surface and changing land cover on typical sites.

Threshold

THRESHOLD

Full Drainage Review is required for any proposed new and redevelopment projects that are subject to drainage review as determined in Section 1.1.1, AND which meet one or more of the following criteria:

- Projects which add 5,000 square feet or more of new impervious surface but which do not qualify for Small Site Drainage Review as specified in Section 1.1.2.1 (p. 5.1-12), OR
- Projects located within a Landslide Hazard Drainage Area[9] which add 2,000 square feet or more of new impervious surface but which do not qualify for Small Site Drainage Review per Section 1.1.2.1, OR
- **Redevelopment projects** proposing $500,000 or more of site improvements which create 5,000 square feet or more of *contiguous pollution-generating impervious surface*[10] through any combination of new and/or *replaced impervious surface*.[11]

Scope of Requirements

REQMTS

IF Full Drainage Review is required, THEN the applicant must demonstrate that the proposed project complies with the following requirements:

- All eight core requirements in Section 1.2
- All five special requirements in Section 1.3

Engineering plans and calculations stamped by a licensed civil engineer registered in the state of Washington must be submitted to demonstrate compliance with these requirements. The procedures and requirements for submittal of engineering plans and calculations can be found in Section 2.3.

1.1.3 DRAINAGE REVIEW REQUIRED BY OTHER AGENCIES

Drainage review for a proposed project's impact on surface and stormwaters may be addressed by processes or requirements apart from Kent's. Agencies such as those listed below may require some form of drainage review and impose drainage requirements that are separate from and in addition to Kent's drainage requirements. The applicant is responsible for coordinating with these agencies and resolving any conflicts in drainage requirements.

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[9] Landslide Hazard Drainage Areas are delineated on a map adopted with this manual (see map pocket inside of back cover).

[10] *Pollution-generating impervious surface* (PGIS) is partially defined on page 5.1-4 and fully defined on page 5.1-49. *Contiguous* pollution-generating impervious surface (PGIS) means a discrete patch of PGIS that is all together as opposed to being separated in different locations on the project site. The intent is to identify those redevelopment projects that are replacing and/or adding enough impervious surface in one location to allow for opportune installation of a water quality treatment facility.

[11] *Replaced impervious surface* is defined on page 5.1-4.

Agency	Permit/Approval
Seattle/King County Department of Public Health	Onsite Sewage Disposal and Well permits
Washington State	
Department of Transportation	Developer/Local Agency Agreement
Department of Fish and Wildlife	Hydraulic Project Approval
Department of Ecology	Short Term Water Quality Modification Approval Dam Safety permit NPDES Stormwater permit
Department of Natural Resources	Forest Practices Class IV permit
United States Army Corps of Engineers	Sections 10, 401, and 404 permits

1.1.4 DRAINAGE DESIGN BEYOND MINIMUM COMPLIANCE

This manual presents Kent's minimum standards for engineering and design of drainage facilities. While the City believes these standards are appropriate for a wide range of development proposals, compliance solely with these requirements does not relieve the professional engineer submitting designs of his or her responsibility to ensure drainage facilities are engineered to provide adequate protection for natural resources and public and private property.

Compliance with the standards in this manual does not necessarily mitigate all probable and significant environmental impacts to aquatic biota. Fishery resources and other living components of aquatic systems are affected by a complex set of factors. While employing a specific flow control standard may prevent stream channel erosion or instability, other factors affecting fish and other biotic resources (such as increases in stream flow velocities) are not directly addressed by this manual. Likewise, some wetlands, including bogs, are adapted to a very constant hydrological regime. Even the most stringent flow control standard employed by this manual does not prevent increases in runoff volume that can adversely affect wetland plant communities by increasing the duration and magnitude of water level fluctuations. Thus, compliance with this manual should not be construed as mitigating all probable and significant stormwater impacts to aquatic biota in streams and wetlands, and additional mitigation may be required.

In addition, the requirements in this manual primarily target the types of impacts associated with the most typical land development projects occurring in the City. Applying these requirements to vastly different types of projects, such as rock quarries or dairy farms may result in poorer mitigation of impacts. Therefore, different mitigation may be required.

1.2 CORE REQUIREMENTS

This section details the following eight core requirements:

- Core Requirement #1: Discharge at the Natural Location, Section 1.2.1
- Core Requirement #2: Offsite Analysis, Section 1.2.2
- Core Requirement #3: Flow Control, Section 1.2.3
- Core Requirement #4: Conveyance System, Section 1.2.4
- Core Requirement #5: Erosion and Sediment Control, Section 1.2.5
- Core Requirement #6: Maintenance and Operations, Section 1.2.6
- Core Requirement #7: Financial Guarantees and Liability, Section 1.2.7
- Core Requirement #8: Water Quality, Section 1.2.8

1.2.1 CORE REQUIREMENT #1: DISCHARGE AT THE NATURAL LOCATION

REQMT

All surface and stormwater runoff from a project must be discharged at the natural location so as not to be diverted onto or away from downstream properties. The manner in which runoff is discharged from the project site must not create a significant adverse impact to downhill properties or drainage systems (see "Discharge Requirements" below).

Intent: To prevent adverse impacts to downstream properties caused by diversion of flow from one flow path to another, and to discharge in a manner that does not significantly impact downhill properties or drainage systems. Diversions can cause greater impacts (due to greater runoff volumes) than would otherwise occur from new development discharging runoff at the natural location. Diversions can also impact properties that rely on runoff water to replenish wells and ornamental or fish ponds. *Projects that do not discharge at the natural location will require an approved adjustment of this requirement (see Section 1.4).*

❑ DISCHARGE REQUIREMENTS

Proposed projects must comply with the following discharge requirements (1, 2, and 3) as applicable:

1. Where no conveyance system exists at the abutting downstream property line and the natural (existing) discharge is unconcentrated, any runoff concentrated by the proposed project must be discharged as follows:

   a) IF the 100-year peak discharge[12] is less than or equal to 0.2 cfs under existing conditions and will remain less than or equal to 0.2 cfs under developed conditions, THEN the concentrated runoff may be discharged onto a rock pad or to any other system that serves to disperse flows.

   b) IF the 100-year peak discharge is less than or equal to 0.5 cfs under existing conditions and will remain less than or equal to 0.5 cfs under developed conditions, THEN the concentrated runoff may be discharged through a dispersal trench or other dispersal system provided the applicant can demonstrate that there will be no significant adverse impact to downhill properties or drainage systems.

[12] Peak discharges for applying this requirement are determined using KCRTS as detailed in Chapter 3.

c) IF the 100-year peak discharge is greater than 0.5 cfs for either existing or developed conditions, or if a significant adverse impact to downhill properties or drainage systems is likely, THEN a conveyance system must be provided to convey the concentrated runoff across the downstream properties to an acceptable discharge point.[13] Drainage easements for this conveyance system must be secured from downstream property owners and recorded prior to engineering plan approval.

2. IF a proposed project or any **natural discharge area** within a project is located within a *Landslide Hazard Drainage Area* and, in fact, ultimately drains over the erodible soils of a defined landslide hazard area with slopes steeper than 15%, THEN a **tightline system must be provided** through the landslide hazard area to an acceptable discharge point unless one of the following exceptions applies. The tightline system must comply with the design requirements in Core Requirement #4 and in Section 4.2.2 unless otherwise approved by Public Works. Drainage easements for this system must be secured from downstream property owners and recorded prior to engineering plan approval.

   Exceptions: A tightline is *not* required for any **natural discharge location** where one of the following conditions can be met:

   a) Less than 2,000 square feet of new impervious surface will be added within the **natural discharge area**, OR

   b) Public Works determines that a tightline system is not physically feasible or will create a significant adverse impact based on a soils report by a geotechnical engineer.

3. For projects adjacent to or containing **landslide hazard areas or erosion hazard areas**, the applicant must demonstrate that onsite drainage facilities and/or flow control BMPs will not create a significant adverse impact to downhill properties or drainage systems.

1.2.2 CORE REQUIREMENT #2: OFFSITE ANALYSIS

REQMT

Project proponents must submit an offsite analysis report that assesses potential offsite drainage impacts associated with development of the project site and that proposes appropriate mitigation measures for those impacts. The initial permit submittal shall include, at minimum, a **Level 1 downstream analysis** as described in Section 1.2.2.1 below.

Intent: To identify and evaluate offsite drainage problems that may be created or aggravated by the proposed project, and to determine appropriate measures for preventing aggravation of those problems in accordance with the requirements of this manual.

The primary component of an offsite analysis report is the **downstream analysis.** This examines the drainage system within one-quarter mile downstream of the project site or farther as described in Section 1.2.2.1 below. It is intended to identify existing or potential/predictable downstream problems so that appropriate mitigation, as specified in Section 1.2.2.2, can be provided to prevent aggravation of these problems. A secondary component of the offsite analysis report is an **evaluation of the upstream drainage system** to verify and document that impacts will not occur as a result of the proposed project. The evaluation must extend upstream to a point where any backwater effects created by the project cease.

[13] *Acceptable discharge point* means an enclosed drainage system (i.e., pipe system, culvert, or tightline) or open drainage feature (e.g., ditch, channel, swale, stream, river, pond, lake, or wetland) where concentrated runoff can be discharged without creating a significant adverse impact.

❑ EXEMPTION FROM CORE REQUIREMENT #2

A proposed project is exempt from Core Requirement #2 if any one of the following is true:

1. Public Works determines there is sufficient information for them to conclude that the project will not have a significant adverse impact on the downstream and/or upstream drainage system, OR
2. The project adds less than 5,000 square feet of new impervious surface, AND does not construct or modify a drainage pipe/ditch that is 12 inches or more in size/depth or that receives runoff from a drainage pipe/ditch that is 12 inches or more in size/depth, AND does not contain or lie adjacent to an defined hazard area, OR
3. The project does not change the rate, volume, duration, or location of discharges to and from the project site (e.g., where existing impervious surface is replaced with other impervious surface having similar runoff-generating characteristics, or where pipe/ditch modifications do not change existing discharge characteristics).

1.2.2.1 DOWNSTREAM ANALYSIS

The downstream analysis must consider the existing conveyance system(s) for a minimum flow path distance downstream of one-quarter mile and beyond as needed to reach a point where the project site area constitutes less than 15% of the tributary area. This minimum distance may be increased as follows:

- **Task 2** of a Level 1 downstream analysis (described in detail in Section 2.3.1.1) is a review of all available information on the downstream area and is intended to identify existing drainage problems. In all cases, **this information review shall extend one mile downstream** of the project site. The existence of flooding, erosion, or nuisance problems may extend the one-quarter-mile minimum distance for other tasks to allow evaluation of impacts from the proposed development to the identified problems.
- If a project's impacts to flooding, erosion, or conveyance system overflow problems are mitigated by improvements to the downstream conveyance system, the downstream analysis will extend a minimum of one-quarter mile beyond the improvement. This is necessary because many such improvements result in a reduction of stormwater storage or an increase in peak flows from the problem site.
- At their discretion, Public Works may extend the downstream analysis beyond the minimum distance specified above on the reasonable expectation of impacts.

The **Level 1 downstream analysis** is a qualitative survey of each downstream system and is the first step in identifying flooding, erosion, or nuisance problems as defined below under "Downstream Problems Requiring Special Attention." Each Level 1 analysis is composed of five tasks at a minimum:

- Task 1: Define and map the study area.
- Task 2: Review all available information on the study area.
- Task 3: Field inspect the study area.
- Task 4: Describe the drainage system, and its existing and predicted problems.
- Task 5: Propose mitigation measures.

Upon review of the Level 1 analysis, Public Works may require a Level 2 or 3 downstream analysis, depending on the presence of existing or predicted flooding, erosion, or nuisance problems identified in the Level 1 analysis.

Levels 2 and 3 downstream analyses quantify downstream problems by providing information on the severity and frequency of an existing problem or the likelihood of creating a new problem. A Level 2

analysis is a rough quantitative analysis (non-survey field data, uniform flow analysis). Level 3 is a more precise analysis (survey field data, backwater analysis) of significant problems. If conditions warrant, additional, more detailed analysis may be required beyond Level 3.

A detailed description of offsite analysis scope and submittal requirements is provided in Section 2.3.1.1. Hydrologic analysis methods and requirements for Levels 2 and 3 downstream analysis are contained in Chapter 3; hydraulic analysis methods are contained in Chapter 4.

❑ DOWNSTREAM PROBLEMS REQUIRING SPECIAL ATTENTION

While the flow control standards in Core Requirement #3 serve to minimize the creation and aggravation of many types of downstream drainage problems, there are some types that are more sensitive to aggravation than others depending on the nature or severity of the problem and which flow control standard is being applied. In particular, there are three types of downstream problems where the City has determined that the nature and/or severity of the problem warrants additional attention through the downstream analysis and possibly additional mitigation to ensure no aggravation:

1. Conveyance system overflow problems
2. Severe erosion problems
3. Severe flooding problems.

Conveyance system overflow problems may not cause extensive property or environmental damage. Chronic flooding or erosion problems can result from the overflow of a constructed conveyance system that is substandard or has become too small due to upstream development. Such problems warrant additional attention because of their chronic nature and because they result from the failure of a conveyance system to provide a minimum acceptable level of protection (see definition below). Severe flooding and erosion problems as defined below also warrant additional attention because they either pose a significant threat to health and safety or can cause significant damage to public or private property.

Conveyance System Overflow Problems (Type 1)

Conveyance system overflow problems in general are defined as any existing or predicted flooding or erosion which does not constitute a severe flooding or erosion problem as defined below. Conveyance system overflow problems are defined as any flooding or erosion that results from the overflow of a constructed conveyance system for runoff events less than or equal to a 25-year event. Examples include inundation of a shoulder or lane of a roadway, overflows collecting in yards or pastures, shallow flows across driveways, minor flooding of crawl spaces or unheated garages/outbuildings, and minor erosion.

If a conveyance system overflow problem is identified or predicted downstream, the need for additional mitigation must be evaluated as specified in Section 1.2.2.2 under "Problem-Specific Mitigation Requirements." This may entail additional onsite flow control or other measures as needed to prevent creation or significant aggravation of the problem.

For any other problems (exclusive of severe erosion or flooding problems) which may be identified downstream, this manual does not require mitigation beyond the flow control standard applied in Core Requirement #3. This is because to prevent aggravation of such problems (e.g., those caused by the elevated water surfaces of ponds, lakes, wetlands, and closed depressions or those involving downstream erosion) can require two to three times as much onsite detention volume, which is considered unwarranted for addressing nuisance problems. However, if under some unusual circumstance, the aggravation of such a problem is determined by Public Works to be a significant adverse impact, additional mitigation may be required.

Severe Erosion Problems (Type 2)

Severe erosion problems are defined as downstream channels, ravines, or slopes with evidence of or potential for erosion/incision sufficient to pose a sedimentation hazard to downstream conveyance systems or pose a landslide hazard by undercutting adjacent slopes. Severe erosion problems do not include roadway shoulder rilling or minor ditch erosion.

If a severe erosion problem is identified or predicted downstream, additional mitigation must be considered as specified in Section 1.2.2.2 under "Problem-Specific Mitigation Requirements." This may entail additional onsite flow control or other measures as needed to prevent creation or aggravation of the problem.

Severe Flooding Problems (Type 3)

Severe flooding problems can be caused by conveyance system overflows or the elevated water surfaces of ponds, lakes, wetlands, or closed depressions. Severe flooding problems are defined as follows:

- Flooding of the *finished area*[14] *of a habitable building*[15], or the electrical/heating system of a habitable building for runoff events less than or equal to a 100-year event. Examples include flooding of finished floors of homes and commercial or industrial buildings, or flooding of electrical/heating system components in the crawl space or garage of a home. Such problems are referred to in this manual as "**severe building flooding problems.**"
- Flooding over all lanes of a *roadway or severely impacting*[16] *a sole access driveway*[17] for runoff events less than or equal to the 100-year event. Such problems are referred to in this manual as "**severe roadway flooding problems.**"

If a severe flooding problem is identified or predicted downstream, the need for additional mitigation must be evaluated as specified in Section 1.2.2.2 under "Problem-Specific Mitigation Requirements." This may entail consideration of additional onsite flow control or other measures as needed to prevent creation or significant aggravation of the problem.

1.2.2.2 IMPACT MITIGATION

A proposed project must not significantly aggravate existing downstream problems or create new problems as a result of developing the site. This manual does not require development proposals to fix or otherwise reduce the severity of existing downstream drainage problems, although doing so may be an acceptable mitigation.

❑ PRINCIPLES OF IMPACT MITIGATION

Aggravation of an existing downstream problem means increasing the frequency of occurrence and/or severity of the problem. Increasing peak flows at the site of a problem caused by conveyance system overflows can increase the frequency of the problem's occurrence. Increasing durations of flows at or above the overflow return frequency can increase the severity of the problem by increasing the depth and duration of flooding. Controlling peaks and durations through onsite detention can prevent aggravation of such problems by releasing the increased volumes due to development only at return

[14] *Finished area*, for the purposes of this definition, means any enclosed area of a building that is designed to be served by the building's permanent heating or cooling system.

[15] *Habitable building* means any residential, commercial, or industrial building that is equipped with a permanent heating or cooling system and an electrical system.

[16] *Severely impacting* means the flooding overlaps a culverted section of the driveway, posing a threat of washout or unsafe access conditions due to indiscernible driveway edges, or the flooding is deeper than 6 inches on the driveway, posing a severe impediment to emergency access.

[17] *Sole access driveway* means there is no other unobstructed, flood-free route for emergency access to a habitable building.

frequencies below the conveyance overflow return frequency, with the net result of causing the conveyance system to flow full for a longer period of time.

When a problem is caused by high-water surface elevations of a volume-sensitive water body, such as a lake, wetland, or closed depression, aggravation means the same as for problems caused by conveyance overflows. Increasing the volume of flows to a volume-sensitive water body can increase the frequency of the problem's occurrence. Increasing the duration of flows for a range of return frequencies both above and below the problem return frequency can increase the severity of the problem; mitigating these impacts requires control of flow durations for a range of return frequencies both above and below the problem return frequency. The net effect of this duration control is to release the increased volumes due to development only at water surface elevations below that causing the problem, which in turn can cause an increase in these lower, but more frequently occurring, water surface elevations. This underscores an unavoidable impact of development upstream of volume-sensitive water bodies: the increased volumes generated by the development will cause some range of increase in water surface elevations, no matter what detention standard is applied.

Creating a new problem means increasing peak flows and/or volumes such that after development, the frequency of conveyance overflows or water surface elevations exceeds the thresholds for the various problem types discussed in Section 1.2.2.1. For example, application of the Level 1 flow control standard requires matching predeveloped and developed 2- and 10-year peak flows. The 100-year peak flow is only partially attenuated, and the flow increase may be enough to cause a "severe flooding problem" as described on page 23. The potential for causing a new problem is often identified during the Level 1 downstream analysis, where the observation of a reduction in downstream pipe sizes, for example, may be enough to predict creation of a new problem. A Level 2 or 3 analysis will typically be required to verify the capacity of the system and determine whether 100-year flows can be safely conveyed.

❑ SIGNIFICANCE OF IMPACTS TO EXISTING PROBLEMS

Whether additional onsite mitigation or other measures are needed to address an existing downstream problem depends on the significance of the proposed project's predicted impact on that problem. For some identified problems, Public Works will make the determination as to whether the project's impact is significant enough to require additional mitigation. For the downstream problems defined in Section 1.2.2.1, this threshold of significant impact or aggravation is defined below.

For **conveyance system overflow problems**, the problem is considered significantly aggravated if there is any increase in the project's contribution to the frequency of occurrence and/or severity of the problem for runoff events less than or equal to the 25-year event. *Note: Increases in the project's contribution to this type of problem are considered to be prevented if sufficient onsite flow control and/or offsite improvements are provided as specified in Table 1.2.3.A.*

For **severe erosion problems**, the problem is considered significantly aggravated if there is any increase in project's contribution to the *flow duration*[18] of peak flows ranging from 50% of the 2-year peak flow up to the full 50-year peak flow at the eroded area. *Note: Increases in the project's contribution to this type of problem are considered to be prevented if Level 2 flow control or offsite improvements are provided as specified in Table 1.2.3.A.*

For **severe building flooding problems**, the problem is considered significantly aggravated if there is any increase in the project's contribution[19] to the frequency, depth, and/or duration of the problem for runoff events less than or equal to the 100-year event.

[18] *Flow duration* means the aggregate time that peak flows are at or above a particular flow rate of interest (e.g., the amount of time over the last 40 years that peak flows were at or above the 2-year flow rate).

[19] Increases in the project's contribution are considered to be prevented if sufficient onsite flow control and/or offsite improvements are provided as specified for "severe flooding problems" in Table 1.2.3.A (p. 5.1-27).

For **severe roadway flooding problems**, the problem is considered significantly aggravated if any of the following thresholds are exceeded and there is any increase in the project's contribution to the frequency, depth, and/or duration of the problem for runoff events less than or equal to the 100-year event:

- The *existing flooding*[20] over all lanes of a roadway or overtopping the culverted section of a "sole access driveway" is predicted to increase in depth more than a quarter-inch or 10% (whichever is greater) for the 100-year runoff event.
- The "existing flooding" over all lanes of a roadway or "severely impacting a sole access driveway" is more than 6 inches deep or faster than 5 feet per second for runoff events less than or equal to the 100-year event.
- The "existing flooding" over all lanes of a *sole access roadway*[21] is more than 3 inches deep or faster than 5 feet per second for runoff events less than or equal to the 100-year event, or is at any depth for runoff events less than or equal to the 10-year event.

❑ PROBLEM-SPECIFIC MITIGATION REQUIREMENTS

1. IF a proposed project or threshold discharge area within a project drains to one or more of the three types of downstream drainage problems defined in Section 1.2.2.1 as identified through a downstream analysis, THEN the applicant must do one of the following:
   a) Submit a Level 2 or Level 3 downstream analysis per Section 2.3.1 demonstrating that the proposed project will not create or significantly aggravate the identified downstream problem(s), OR
   b) Show that the natural discharge area or threshold discharge area draining to the identified problem(s) qualifies for an exemption from Core Requirement #3: Flow Control, OR
   c) Document that the area-specific flow control standard required in Core Requirement #3 is adequate to prevent creation or significant aggravation of the identified downstream problem(s) as indicated in Table 1.2.3.A with the phrase, "No additional flow control needed," OR
   d) Provide additional onsite flow control necessary to prevent creation or significant aggravation of the downstream problem(s) as specified in Table 1.2.3.A and further detailed in Section 3.3.5, OR
   e) Provide offsite improvements necessary to prevent creation or significant aggravation of the identified downstream problem(s) as detailed in Chapter 3 unless identified as not necessary in Table 1.2.3.A, OR
   f) Provide a combination of additional onsite flow control and offsite improvements sufficient to prevent creation or significant aggravation of the downstream problem(s) as demonstrated by a Level 2 or Level 3 downstream analysis.
2. IF it is identified that the manner of discharge from a proposed project may create a significant adverse impact as described in Core Requirement #1, THEN Public Works may require the applicant to implement additional measures or demonstrate the impact will not occur.

Intent: To ensure provisions are made (if necessary) to prevent creation or significant aggravation of the three types of downstream problems requiring special attention by this manual, and to ensure compliance with the discharge requirements of Core Requirement #1.

In addressing downstream problems per Problem-Specific Mitigation Requirement 1 above, the easiest of the provisions to implement will often be that of additional onsite flow control. This involves designing the required onsite flow control facility to meet an additional set of performance criteria targeted to

[20] *Existing flooding*, for the purposes of this definition, means flooding over all lanes of the roadway or driveway has occurred in the past and can be verified by City records, City personnel, photographs, or other physical evidence.

[21] *Sole access roadway* means there is no other flood-free route for emergency access to one or more dwelling units.

prevent significant aggravation of specific downstream problems. To save time and analysis, a set of predetermined flow control performance criteria corresponding to each of the three types of downstream problems is provided in Table 1.2.3.A and described in more detail in Chapter 3.

Note that in some cases, the area-specific flow control standard applicable to the proposed project per Section 1.2.3.1 is already sufficient to prevent significant aggravation of many of the defined downstream problem types. Such situations are noted in Table 1.2.3.A as not needing additional onsite flow control or offsite improvements. For example, if the Level 3 flow control standard is required by Section 1.2.3.1, and a "conveyance system overflow problem" is identified through offsite analysis per Core Requirement #2, no additional onsite flow control is needed, and no offsite improvements are necessary.

1.2.3 CORE REQUIREMENT #3: FLOW CONTROL

REQMT

All proposed projects, including redevelopment projects, must provide onsite flow control facilities to mitigate the impacts of increased stormwater and surface water runoff generated by the addition of new impervious surface and any related land cover conversion. These facilities shall, at a minimum, meet the performance criteria for one of the area-specific flow control standards described in Section 1.2.3.1 and be implemented according to the applicable flow control implementation requirements in Section 1.2.3.2.

Intent: To ensure the minimum level of control needed to protect downstream properties and resources from increases in peak, duration, and volume of runoff generated by new development. The level of control varies depending on location and downstream conditions identified under Core Requirement #2.

Guide to Applying Core Requirement #3

Core Requirement #3 requires that onsite detention and/or infiltration facilities be constructed to control runoff discharges from the project site. These facilities must meet a minimum flow control performance standard as set forth in Section 1.2.3.1, "Area-Specific Flow Control Standards," and may need to be even larger to ensure that downstream problems are not created or significantly aggravated as set forth in Section 1.2.2.2, "Problem-Specific Mitigation Requirements." Table 1.2.3.A provides a quick guide for selecting the flow control performance criteria necessary to meet both of these requirements.

Area-specific flow control standards target the level of flow control performance to the protection needs of specific regions or areas of the city. These areas are called *flow control areas* and are depicted on the Flow Control Applications Map adopted with this Manual (see map pocket inside cover of Manual). Each flow control area has a basic flow control standard that is specific to that area. The performance criteria of that basic standard may need to be increased to address a specific downstream drainage problem as explained in Step 4 below.

Flow control implementation requirements are the minimum requirements for analyzing and designing flow control facilities to achieve required performance and other protection goals.

For efficient application of Core Requirement #3, the following steps are recommended:

1. Determine the flow control standard that applies to the drainage basin where your project is located. Generally, the City of Kent has adopted the Level 2 flow control standard as the minimum standard to be applied citywide, but there are areas within the City with different requirements. They are shown on the Flow Control Applications Map included with this manual and are described as follows:
   - Projects in the McSorley Creek Watershed shall apply Level 3 flow control.
   - Projects that provide for gravity stormwater discharges to the Green River shall follow the criteria specified by the Green River Management Agreement (see item 5 under the *Exemptions from Core Requirement #3* section.)
   - Projects that provide for stormwater discharges to the S 259th / 3rd Ave S Regional Detention Facility shall be required to provide ½ of the detention volume required by the Green River Management Agreement (see item 7 under the *Exemptions from Core Requirement #3* section.)
   - Projects in the Mill Creek Basin within the Kent Valley (generally below elevation 35' NGVD) and outside of the Green River Natural Resources Area Subbasin (see flow control applications map) shall apply Level 1 flow control with a "pasture" assumption for predevelopment pervious areas.
   - Projects in areas where a Master Drainage Plan has been approved shall follow the provisions of the respective plan (this includes "Kentview" and "The Lakes" areas).
2. Check the list of exemptions following Table 1.2.3.A to determine if and/or what portions of your project must provide flow control facilities per Core Requirement #3.
3. If flow control facilities are required, determine (for the flow control area identified above) the area-specific flow control standard that applies to your project by consulting the detailed threshold information in Section 1.2.3.1. The applicable flow control standard will determine the minimum flow control performance required for your proposed project.
4. If downstream problems were identified through offsite analysis per Core Requirement #2 and are proposed to be addressed through onsite flow control, use Table 1.2.3.A to determine if and what additional flow control performance is necessary to mitigate impacts (i.e., to prevent creation or aggravation of the identified problems).
5. The design of flow control facilities that are located on the Valley floor shall take into account the anticipated flood levels downstream of the facility. The project applicant shall demonstrate compliance with the minimum flow control requirements to Public Works where variable flooding occurs by analyzing the facility performance over the range of tailwater conditions anticipated, up to 100-year flood levels. See Section 1.2.3.2 for requirements regarding projects in the Valley floor.
6. Use Section 1.2.3.2 to determine the minimum requirements for implementing flow controls.

TABLE 1.2.3.A
SUMMARY OF FLOW CONTROL PERFORMANCE CRITERIA ACCEPTABLE FOR IMPACT MITIGATION[1]

AREA-SPECIFIC STANDARD			
Downstream Problems Identified through Offsite Analysis per Core Requirement #2	**Level 1 Flow Control**	**Level 2 Flow Control**	**Level 3 Flow Control**
No problem identified. Apply basic standard performance criteria.	Match 2-year and 10-year peaks (Only applicable in the Kent Valley / Mill Creek Basin – see flow control applications map)	Match durations for 50% of 2-yr through 50-yr peaks	Match durations for 50% of 2-yr though 50-yr peaks AND match 100-year peaks
Type 1 **Conveyance System Overflow Problem**	Additional Flow Control Hold 25-yr peak to overflow T_r peak[2][3]	Additional Flow Control Hold 25-yr peak to overflow T_r peak[2][3]	*No additional flow control or other mitigation is needed*
Type 2 **Severe Erosion Problem**	Additional Flow Control Apply level 2 flow control[3][4]	*No additional flow control is needed, but other mitigation may be required*[4]	*No additional flow control is needed, but other mitigation may be required*[4]
Type 3 **Severe Flooding Problem**	Additional Flow Control Apply level 3 flow control. If flooding is from conveyance system overflow, level 3 may be modified to match durations above the overflow T_r peak rather than 50% of the 2-year peak. If flooding is from a closed depression, make design adjustments as needed to meet the "special provision for closed depressions"[3][5]	Additional Flow Control Apply Level 3 flow control. If flooding is from a closed depression, make design adjustments as needed to meet the special provision for closed depressions[3][5]	Additional Flow Control If flooding is from a closed depression, make design adjustments as needed to meet the special provision for closed depressions [3][5]

Notes:

(1) More than one set of problem-specific performance criteria may apply if two or more downstream problems are identified through offsite analysis per Core Requirement #2. If this happens, the performance goals of each applicable problem-specific criteria must be met. This can require extensive, time-consuming analysis to implement multiple sets of outflow performance criteria if additional onsite flow control is the only viable option for mitigating impacts to these problems. In these cases, it may be easier and more prudent to implement the **Level 3 flow control standard** in place of the otherwise required area-specific standard. Use of the Level 3 flow control standard satisfies the specified performance criteria for all the area-specific and problem-specific requirements except if adjustments are required per the special provision for closed depressions described below in Note 5.

(2) Overflow T_r is the return period of conveyance system overflow. To determine T_r requires a minimum level 2 downstream analysis as detailed in Section 2.3.1.1. To avoid this analysis, a T_r of 2 years may be assumed.

(3) Offsite improvements may be implemented in lieu of or in combination with additional flow control as allowed in Section 1.2.2.2 and detailed in Section 3.3.5.

(4) A tightline system may be required regardless of the flow control standard being applied if needed to meet the discharge requirements of Core Requirement #1 or the outfall requirements of Core Requirement #4, or is deemed necessary by Public Works where the risk of severe damage is high.

(5) **Special Provision for Closed Depressions with a Severe Flooding Problem:**

IF the proposed project discharges by overland flow or conveyance system to a closed depression experiencing a severe flooding problem AND the amount of impervious surface area proposed by the project is greater than or equal to 10% of the 100-year water surface area of the closed depression, THEN use the point of compliance analysis technique described in Section 3.3.6 to verify that water surface levels are not increasing for the return frequencies at which flooding occurs, up to and including the 100-year frequency. If necessary, iteratively adjust onsite flow control performance to prevent increases. *Note: The point of compliance analysis relies on certain field measurements taken directly at the closed depression (e.g., soils tests, topography, etc.). If permission to enter private property for such measurements is denied, Public Works may waive this provision and apply the Level 3 flow control standard with a mandatory 20% safety factor on the storage volume.*

❑ EXEMPTIONS FROM CORE REQUIREMENT #3

There are seven possible exemptions or departures from the requirement to provide a formal flow control facility per Core Requirement #3. The intent of these exemptions is to provide for situations where a facility may not be practical or needed, where other alternatives to a facility can be just as effective, other arrangements govern, or where it makes sense to provide incentives for retaining native vegetation or for maximizing use of existing developed areas.

1. Impervious Surface Exemption

A proposed project or any **threshold discharge area** within a project is exempt if less than 5,000 square feet of new impervious surface will be added and the project or threshold discharge area is not within a Landslide Hazard Drainage Area.[22] If the project or threshold discharge area is located within a Landslide Hazard Drainage Area, this exemption only applies to new impervious surface less than 2,000 square feet.

2. Impervious Surface Exemption Using Flow Control BMPs

Any **threshold discharge area** within a proposed project is exempt if less than 10,000 square feet of new impervious surface will be added, AND all of the following criteria are met:

a) The area cleared to accommodate the proposed project must be less than 35% or less than 2 acres of the **threshold discharge area** (whichever is greater), AND

b) If the project is a **single-family residential project**, flow control BMPs must be applied within the threshold discharge area as specified in *Small Site Drainage Requirements* (detached Appendix C of the King County Manual), AND

c) For **projects other than single-family residential projects**, the new impervious surface within the threshold discharge area must be comprised of either non-pollution-generating roofs that comply with the roof downspout controls in Section 5.1, OR roads, trails, or driveways that comply with the rural roadway dispersion requirements in Section 5.2.1, AND

d) The **manner in which runoff is discharged** from the project site must not create a significant adverse impact per Core Requirement #1.

3. Peak Flow Exemption Using Flow Control BMPs

Any **threshold discharge area** within a proposed project is exempt if the project improvements within the threshold discharge area generate less than a 0.1 cfs increase in the *existing site conditions* 100-year peak flow rate, AND all of the following criteria are met:

a) If the project is a **redevelopment project**, flow control BMPs must be applied as specified in Section 5.2, and the project improvements must not significantly impact a "severe erosion problem" or "severe flooding problem" (see Section 1.2.2.1) and must not be located within a **Landslide Hazard Drainage Area**, AND

b) If the project is a **single-family residential project**, the runoff from impervious surfaces must be infiltrated or dispersed using flow control BMPs specified in Appendix C of the King County Manual, and any areas of native vegetation assumed not to be cleared for the purposes of computing the increase in 100-year peak flow must be preserved within a tract or by covenant as described in Appendix C of the King County Manual, AND

c) For **projects other than redevelopment projects and single-family residential projects**, the new impervious surface within the threshold discharge area must be comprised of either non-pollution-generating roofs that comply with the roof downspout controls in Section 5.1, OR roads,

[22] *Landslide Hazard Drainage Areas* are delineated on a map adopted with this manual (see map pocket inside cover).

trails, or driveways that comply with the rural roadway dispersion requirements in Section 5.2.1, AND

d) The **manner in which runoff is discharged** from the project site must not create a significant adverse impact per Core Requirement #1.

4. Peak Flow Exemption for Urban Redevelopment Projects

Any **natural discharge area** of a redevelopment project located within the City is exempt if the project improvements within the natural discharge area generate less than a 0.1 cfs increase in the existing site conditions 100-year peak flow, AND all of the following criteria are met:

a) The application of this exemption to natural discharge areas within a proposed project must not result in more than a 0.4 cfs increase in the existing site conditions 100-year peak flow rate for any **threshold discharge area** of the project, AND

b) **Flow control BMPs** must be applied to the runoff from new impervious surfaces as specified in Section 5.2.1, AND

c) The project improvements within the **natural discharge area** must not significantly impact a "**severe erosion problem**" or "**severe flooding problem**" (see Section 1.2.2.1), AND

d) The **manner in which runoff is discharged** from the project site must not create a significant adverse impact per Core Requirement #1.

5. Direct Discharge Exemption

In accordance with the **provisions of the Green River Management Agreement**, if the proposed development is located in an area that has a direct, gravity draining outlet to the Green River or is tributary to such a system (other than via the Black River Pumping Station) then stormwater runoff can be released undetained, provided all the following conditions are met:

1) Flood storage must be provided that is equivalent to the amount of rainfall falling on the entire site for a 100-year, 7-day design storm, corresponding to 9.8 to 10.0 inches depending on the site's location as shown on the 100-year, 7-day Isopluvial Maps, AND

2) It must be demonstrated that the downstream conveyance system has the capacity to carry the resultant flows without overflowing, AND

3) Appropriate water quality treatment is provided as required.

Additional detention and release rate requirements may be required by the Washington State Department of Fish and Wildlife when a Hydraulic Project Approval (HPA) is required by the agency, or by the City to mitigate for conveyance problems downstream of the development.

Release rates and/or detention requirements will be imposed by the City **only** when the Applicant's downstream system analysis indicates that the existing stormwater drainage system does not have the necessary capacity to carry the increased flows, **AND** appropriate off-site mitigation is not proposed by the developer.

The City of Kent does not recognize any other "major receiving waters" within the City that would be candidate for the Direct Discharge Exemption.

Standards are currently pending for the Washington Avenue Pump Station (refer to flow control map). Until standards are approved and adopted, the provisions of the Green River Management Agreement as described above shall apply.

6. Peak Flow Exemption for Horseshoe Acres and Union Pacific Pump Stations

Developments within the service areas draining to the Horseshoe Acres and Union Pacific Pump Stations along the Green River are not automatically required to provide on-site detention storage, but are required to provide on-site water quality treatment.

Release rates and/or detention requirements may be imposed by the City when the Applicant's downstream analysis indicates that the existing stormwater conveyance system from the development to the pump station does not have the necessary capacity to carry the increased flows, OR the pump station does not have the capacity to store and/or pump the additional runoff flows without local flooding.

Appropriate off-site mitigation measures to off-set identified conveyance or pumping constraints may be proposed by the Applicant and accepted at the discretion of the Director of Public Works.

7. Area-specific Exemptions for Regional Facilities

Stormwater detention and treatment are not required for any development that discharges to the **Valley Regional Detention/Enhanced Wetland Facility** also known as the **Green River Natural Resource Area (see the flow control applications map for the relevant subbasin boundary)**. The facility has been sized to provide detention and treatment for both existing and future developments.

Stormwater treatment and detention are required for any development that discharges to the **98th Avenue South Regional Treatment/Detention Pond** because this system is designed to handle existing erosion problems and is not designed to provide adequate detention and treatment according to current standards for existing or future developments.

Stormwater detention and treatment are also required for any development that discharges to the **Meridian Meadows (Springwood) Regional Detention Pond/Wetland Facility** or **the Upper or Lower Mill Creek Regional Detention Facilities**. These facilities were not designed to provide regional detention or treatment according to current standards for existing or future developments.

Master Drainage Plans have been approved for **Kentview** and **The Lakes** development areas (shown on the Flow Control Applications Map). Drainage standards applied within these areas shall be in accordance with the provisions of the respective Master Drainage Plans.

Standards are pending for the **S 259th/3rd Avenue Regional Detention facility** (refer to flow control map). Until standards are approved and adopted provisions of the Green River Management Agreement shall apply with the exception that only *one-half* of the Green River Management Agreement flood storage volume shall be required.

1.2.3.1 AREA-SPECIFIC FLOW CONTROL STANDARDS

REQMT

Projects subject to Core Requirement #3 must, **at a minimum, comply with one of the three** area-specific flow control standards: Level 1, Level 2, or Level 3, whichever applies per the threshold information detailed in this section. These standards are described below.

❑ LEVEL 1 FLOW CONTROL

Level 1 flow control is a **peak-matching performance standard** in the 1998 King County Surface Water Manual, primarily applied in areas where maintaining peak flows is sufficient to protect the natural and constructed conveyance systems that are not sensitive to development-induced increases in runoff volumes and flow durations.

The Level 1 Flow Control Standard is only applicable for the Kent Valley / Mill Creek Basin (see flow control applications map)

Performance Criteria

Level 1 Flow Control: Match the developed peak discharge rates to the *existing site conditions*[23] peak discharge rates for 2- and 10-year return periods.

Intent

The use of level 1 flow control for the Kent Valley / Mill Creek Basin is intended to protect flow-carrying capacity and limit increased erosion within the downstream conveyance system for runoff events less than or equal to the 10-year event. Matching the 2- and 10-year peak flows is intended to prevent increases in return-frequency peak flows less than or equal to the 10-year flow down to the 2-year flow. This level of control is also intended to prevent creation of new "conveyance system nuisance problems" as defined in Section 1.2.2. Volumes anticipated under the level 1 flow control standard assuming a "pasture" predevelopment condition are comparable to those previously required under the "Valley Criteria".

Effectiveness in Addressing Downstream Problems

While the level 1 flow control standard provides reasonable protection from many development-induced conveyance problems, (up to the 10-year event), it does not prevent increases in runoff volumes or flow durations that tend to aggravate the three types of downstream problems described in Section 1.2.2.1. Consequently, if one or more of these problems are identified through offsite analysis per Core Requirement #2, additional onsite flow control and/or offsite improvements will likely be required (see "Problem-Specific Mitigation Requirements" in Section 1.2.2.2.)

❑ LEVEL 2 FLOW CONTROL

Level 2 flow control is a **duration-matching and peak-matching performance standard**, which is effective in preventing increases in existing erosion rates. The City has determined that a duration-matching standard is needed to prevent severe erosion and sedimentation damage caused by development-induced increases in flow durations. The Level 2 Flow Control also provides greater flood protection than the Level 1 and is a regionally accepted standard for fisheries resource protection.

Performance Criteria

REQMT

Level 2 Flow Control: Match developed discharge durations to predeveloped durations for the range of predeveloped discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow, assuming existing site conditions as the predeveloped condition. In addition, match the developed peak discharge rates to the *existing site conditions* peak discharge rates for 2- and 10-year return periods. . (See previous section titled "Level 1 Flow Control" for a definition of "existing site conditions.")

Effectiveness in Addressing Downstream Problems

While the Level 2 flow control standard provides an excellent level of protection for preventing most development-induced problems, it does not necessarily prevent increases in 100-year peak flows that can aggravate "severe flooding problems" as defined in Core Requirement #2 (see Section 1.2.2.1), nor does it

[23] **Existing site conditions** depend on what, if any, land conversion activity has occurred at the site since December 1978, when Kent first required flow control for new development (Ordinance 2130). *If* a drainage plan has been approved by the City since December 1978 (or since 1979 by the County) for any land conversion activity *and* the plans indicate a stormwater management system was designed according to standards in place at the time, *and* the same system shown on the approved plan was constructed and is still operating according to the design, *Then* existing site conditions are those created by the site improvements (in this case, including any drainage facilities constructed per the approved engineering plans. The project proponent will be required to submit such documentation to the Public Works Department). Otherwise, existing site conditions are those that were present in December 1978 (or since 1979 by the County) as determined from aerial photographs and, if necessary, or knowledge of individuals familiar with the area. The intent is to mitigate unaddressed impacts created by site alterations or improvements, such as clearing, which has occurred since December 1978.

necessarily prevent aggravation of all "severe erosion problems." Consequently, if one or more of these problems are identified through offsite analysis per Core Requirement #2, additional onsite flow control and/or offsite improvements will likely be required (see "Problem-Specific Mitigation Requirements" in Section 1.2.2.2).

❑ LEVEL 3 FLOW CONTROL

Level 3 flow control is a **duration-matching and peak-matching performance standard** for up to the 100-year storm, which is effective in preventing significant increases in water surface levels of lakes, wetlands, and closed depressions. The standard is primarily applied in areas where the City has determined that a higher level of flow control is needed to prevent aggravation of existing documented flooding or erosion problems; the City has designated such areas as **Level 3 Flow Control Areas**. Level 3 flow control is required in the McSorley Creek Drainage Basin.

Performance Criteria

REQMT **Level 3 Flow Control:** Apply the Level 2 flow control standard AND match the developed 2-, 10- and 100-year peak discharge rate to the corresponding 2-, 10- and 100-year peak discharge rate for existing site conditions. (See previous section titled "Level 1 Flow Control" for a definition of "existing site conditions.")

Effectiveness in Addressing Downstream Problems

If the Level 3 flow control standard is implemented onsite, no additional measures are required to prevent aggravation of the three types of downstream problems defined in Core Requirement #2. The one exception is when the wetland or lake is a closed depression with a "severe flooding problem," and the proposed project is adding impervious surface area amounting to more than 10% of the 100-year water surface area of the closed depression. In this case, additional onsite flow control or offsite improvements may be necessary as determined by a "point of compliance analysis" (see "Special Provision for Closed Depressions" in Table 1.2.3.A, and see Section 3.3.6, "Point of Compliance Analysis").

1.2.3.2 FLOW CONTROL IMPLEMENTATION REQUIREMENTS

Onsite vs. Offsite Implementation

All required flow control must be implemented onsite except where the below requirements can be met for direct discharge to a regional or shared facility constructed to provide flow control for the proposed project. Regional facilities are typically constructed as part of a basin plan. Shared facilities may be constructed under a City-developed shared facility drainage plan or under an agreement between two or more private developers. These requirements apply to proposed *new* facilities. The relationship between onsite and offsite implementation for *existing* regional facilities is described under "Exemptions from Core Requirement 3" (item 6, page 5.1-31).

1. The regional or shared facility must be of adequate size and design to meet the **current** flow control requirements for the proposed project's increased surface and stormwater runoff. *Note: the current flow control requirements are those specified by Core Requirement #3 of this manual unless superceded by other adopted area-specific flow control requirements per Special Requirement #1 (see Section 1.3.1).*
2. The regional or shared facility must be fully operational at the time the proposed project is constructed. In the case of a shared facility, the proposed project must comply with the terms and conditions of all contracts, agreements, and permits associated with the shared facility.
3. The conveyance system between the project site and the regional facility must be approved by Public Works and meet all the following criteria:

a) The conveyance system between the project site and the ordinary high water line of the regional facility shall be comprised of manmade conveyance elements (pipes, ditches, outfall protection, etc.) and shall be within public right-of-way or a public or private drainage easement, AND

b) The conveyance system shall have **adequate capacity** per Core Requirement #4, Conveyance System, for the entire contributing drainage area, assuming **build-out conditions** to current zoning for the **"equivalent area"** portion (defined in Figure 1.2.3.A below) and existing conditions for the remaining area, AND

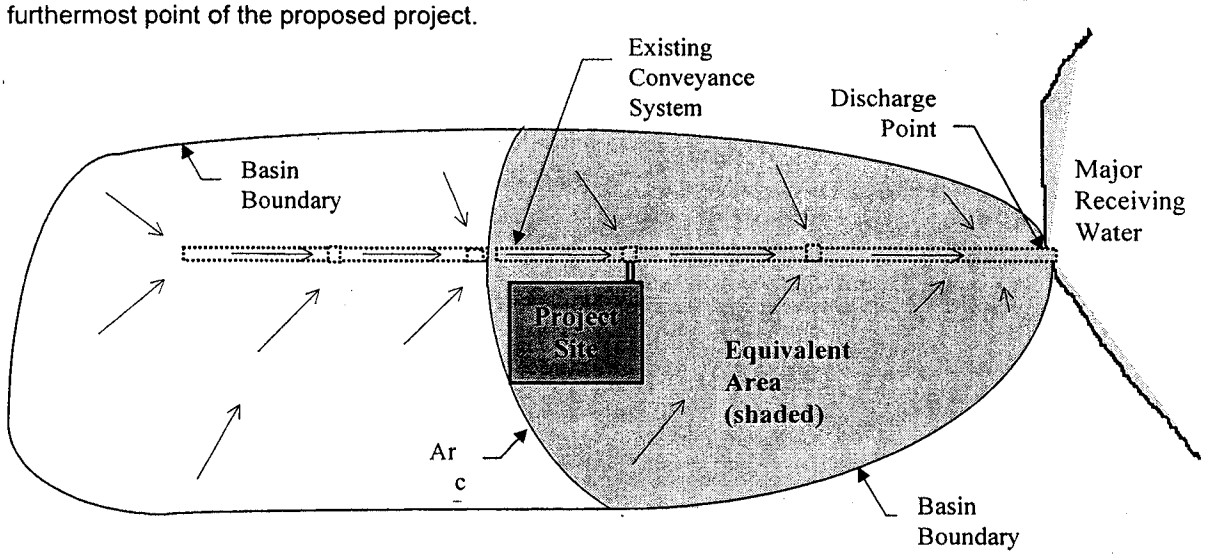
c) The conveyance system will be adequately stabilized to prevent erosion, assuming the same basin conditions as assumed in Criterion (b), AND

d) The conveyance system will not divert flows from or increase flows to an existing wetland or stream sufficient to cause a significant adverse impact.

In the case of a shared facility, the criteria are the same, except the conveyance system need only have adequate capacity and erosion protection for buildout of the participating portion of the contributing drainage area. The particpating portion includes those properties that have agreements for use of the shared facility.

FIGURE 1.2.3.A EQUIVALENT AREA DEFINITION AND ILLUSTRATION

Equivalent area: The area tributary to a direct discharge conveyance system that is contained within an arc formed by the shortest, straight line distance from the conveyance system discharge point to the furthermost point of the proposed project.



Methods of Analysis and Design

Flow control facilities must be analyzed and designed using a continuous flow simulation method such as HSPF (Hydrologic Simulation Program–FORTRAN) or the simplified HSPF-based runoff files method. Specifications for use of the runoff files method and associated computer program, KCRTS, are found in Chapter 3. Detailed design specifications for flow control facilities are found in Chapter 5.

Flow control facilities to be constructed on the **Valley floor** (below elevation 35 feet) shall take into account the anticipated Valley floor flood levels in the facility design. The facility is to be designed assuming a freely draining outlet, but potential onsite flooding and facility performance should be evaluated **considering tailwater conditions** that can exist due to Valley floor flooding for up to the 100-

year flood. This evaluation shall be completed by routing the 100-year flood through the site storm drain/detention pond system considering high tailwater conditions (100-year flood). Potential onsite flooding needs to be identified and an overflow is to be provided that is capable of conveying the 100-year peak flood flow from the site in accordance with these conditions:

1. The overflow shall be directed to and released at the natural location without causing risk or damage to downstream properties, AND
2. No flooding of traffic lanes will occur, AND
3. No structural flooding will occur.

Developments sited on the Valley floor within the FEMA mapped floodplain will also be required to include **compensatory flood storage** volumes. This volume shall be calculated as 50% of the flood storage volume lost from the 100-year floodplain when comparing pre- and post-development conditions. Compensatory flood volumes can be added to the on-site flow control facility after the flow control volume has been determined. Storage volumes required for flow control will not be credited toward compensatory flood volumes (see Special Requirement #2, Section 1.3.2).

Land Cover Assumptions

Land cover assumptions for designing flow control facilities are detailed in Chapter 3. For residential development (plats, short plats, and large single-family projects), flow control facilities must be sized for the ultimate potential development of the site; this assumes that all forest and shrub cover (outside of proposed impervious surface areas) will be converted to grass unless protected by an open space tract or covenant.

Predeveloped pervious areas should be assumed to be forest or pasture, whichever was predominant in 1978. The grass assumption for pervious areas should only be made when the predeveloped land cover (current or 1978 as applicable) is greater than 4 dwelling units per gross acre.

Roof Downspout Controls in Subdivisions

All proposed single-family residential subdivision projects must, on a lot-specific basis, provide for or implement one of three types of roof downspout controls in the order of preference specified in Section 5.1. These include downspout infiltration, dispersion, or a perforated stub-out connection.

Sizing Credits for Roof Downspout Controls

When sizing flow control facilities serving single-family residential subdivisions, the following credits may be applied:

- Where roof runoff is infiltrated according to the requirements of Section 5.1.1, the roof area may be discounted from the net impervious area used for sizing flow control facilities.
- Where roof runoff is dispersed according to the requirements of Section 5.1.2 on lots 22,000 square feet or larger, and the vegetated flow path of the roof runoff is 50 feet or longer, the roof area may be modeled as grass surface rather than impervious surface when sizing flow control facilities.

Note: These credits do not apply when determining eligibility for exemptions from Core Requirement #3.

Onsite Runoff Bypass

Proposed project runoff may bypass proposed onsite flow control facilities provided that all of the following are true:

1. Runoff from both the bypass area and the flow control facility converges within a quarter-mile downstream of the project site discharge point, AND

2. The flow control facility is designed to compensate for the uncontrolled bypass area such that the net effect at the point of convergence downstream is the same with or without bypass, AND
3. The 100-year peak discharge from the bypass area will not exceed 0.4 cfs, AND
4. Runoff from the bypass area will not create a significant adverse impact to downstream drainage systems or properties, AND
5. Water quality requirements applicable to the bypass area are met.

Offsite Bypass Requirement

IF the existing 100-year peak flow rate from any upstream offsite area is greater than 50% of the 100-year developed peak flow rate (undetained) for the project site, THEN the runoff from the offsite area must bypass onsite flow control facilities. The bypass of offsite runoff must be designed so as to achieve all of the following:

1. Any existing contribution of flows to an onsite wetland must be maintained, AND
2. Offsite flows that are naturally attenuated by the project site under predeveloped conditions must remain attenuated, either by natural means or by providing additional onsite detention so that peak flows do not increase, AND
3. Offsite flows that are dispersed or unconcentrated on the project site under predeveloped conditions must be discharged in a safe manner as described in Core Requirement #1 under "Discharge Requirements."

Manifold Detention Facilities

A *manifold detention facility* is a single detention facility designed to take the place of two or more otherwise required detention facilities. It combines the runoff from two or more onsite drainage areas having separate natural discharge points, and redistributes the runoff back to the natural discharge points following detention. Because manifold detention facilities divert flows from one natural discharge point to another and then back, they are not allowed except by an approved adjustment (see Section 1.4, "Adjustment Process").

Use of Underground Detention Facilities

Open detention ponds are preferred over underground detention facilities (vaults or tanks) because open vegetated ponds provide additional stormwater treatment in addition to quantity controls. Storage vaults/tanks also require excessive maintenance costs compared to ponds and are therefore not acceptable for City-maintained retention/detention facilities.

Underground vaults or tanks shall not be permitted to meet detention requirements for 1) new developments on commercial or industrial parcels over 1-acre in size and 2) all residential developments. In addition, underground vaults or tanks shall not be permitted for redevelopments where there is an existing pond or where there is area available for an open pond, regardless of the size of the parcel area for the proposed redevelopment.

No credit will permitted toward required detention volumes for any element of the conveyance system.

Aquifer Recharge Areas

The City of Kent implements a wellhead protection program to protect and preserve regional groundwater resources. This program is critical to the City to ensure that the water supplies obtained from groundwater is maintained at the highest quantity and quality levels possible. Protection of quantity and quality of groundwater is also important to the City and regional interests due to the linkage between groundwater and surface water. Baseflow represents a high percentage of streamflow in the dry summer months in the Puget Sound Region.

To work towards protection of the groundwater resource, the City of Kent, Covington Water District, and Water District 111 have designated and mapped "Wellhead Protection Areas". These areas are shown on the Soils/Wellhead Area Map included with this manual in the cover pocket. **The City of Kent requires that any project located within Wellhead Protection Areas and subject to the requirements of this manual enhance or maintain groundwater recharge quantity and quality to the maximum extent possible.** This shall predominantly be achieved through the construction of infiltration facilities as described in Chapter 5 – Flow Control Design.

1.2.4 CORE REQUIREMENT #4: CONVEYANCE SYSTEM

REQMT

All engineered conveyance system elements for proposed projects must be analyzed, designed, and constructed to provide a minimum level of protection against overtopping, flooding, erosion, and structural failure as specified in the following groups of requirements:

- "Conveyance Requirements for New Systems," Section 1.2.4.1
- "Conveyance Requirements for Existing Systems," Section 1.2.4.2
- "Conveyance System Implementation Requirements," Section 1.2.4.3

Intent: To ensure proper design and construction of engineered conveyance system elements. *Conveyance systems* are natural and engineered drainage facilities that collect, contain, and provide for the flow of surface water and stormwater. This core requirement applies to the engineered elements of conveyance systems—primarily pipes, culverts, and ditches/channels.

1.2.4.1 CONVEYANCE REQUIREMENTS FOR NEW SYSTEMS

All *new conveyance system elements*,[24] both onsite and offsite, shall be analyzed, designed, and constructed according to the following requirements. All analyses shall examine the full range of anticipated tailwater conditions.

Pipe Systems

1. New pipe systems shall be designed with sufficient capacity to convey and contain (at minimum) the 25-year peak flow, assuming developed conditions for onsite tributary areas and existing conditions for any offsite tributary areas.
2. Pipe system structures may overtop for runoff events that exceed the 25-year design capacity, provided the overflow from a 100-year runoff event does not create or aggravate a "severe flooding problem" or "severe erosion problem" as defined in Core Requirement #2, Section 1.2.2. Any overflow occurring onsite for runoff events up to and including the 100-year event must discharge at the natural location for the project site. In residential subdivisions, such overflow must be contained within an onsite drainage easement, tract, covenant, or public right-of-way.
3. The upstream end of a pipe system that receives runoff from an open drainage feature (pond, ditch, etc.) shall be analyzed and sized as a culvert as described below.

Culverts

1. New culverts shall be designed with sufficient capacity to meet the headwater requirements in Section 4.3.1 and convey (at minimum) the 25-year peak flow, assuming developed conditions for onsite tributary areas and existing conditions for any offsite tributary areas.
2. New culverts must also convey as much of the 100-year peak flow as is necessary to preclude creating or aggravating a "severe flooding problem" or "severe erosion problem" as defined in Core Requirement #2, Section 1.2.2. Any overflow occurring onsite for runoff events up to and including the 100-year event must discharge at the natural location for the project site. In residential subdivisions, such overflow must be contained within an onsite drainage easement, tract, covenant, or public right-of-way.
3. New culverts proposed in streams with salmonids shall be designed to provide for fish passage based on requirements published in the document "Fish Passage Design at Road Culverts – A design manual

[24] *New conveyance system elements* are those that are proposed to be constructed where there are no existing constructed conveyance elements.

for fish passage at road crossings" by the Washington State Department of Fish and Wildlife Habitat and Lands Program - Environmental Engineering Division.

Ditches/Channels

1. New ditches/channels shall be designed with sufficient capacity to convey and contain, at minimum, the 25-year peak flow, assuming developed conditions for onsite tributary areas and existing conditions for any offsite tributary areas.
2. New ditches/channels must also convey as much of the 100-year peak flow as is necessary to preclude creating or aggravating a "severe flooding problem" or "severe erosion problem" as defined in Core Requirement 2, Section 1.2.2. Any overflow occurring onsite for runoff events up to and including the 100-year event must discharge at the natural location for the project site. In residential subdivisions, such overflow must be contained within an onsite drainage easement, tract, covenant, or public right-of-way.

Tightline Systems Traversing Steep Slopes

New tightline conveyance systems traversing slopes that are steeper than 15% and/or located in designated Landslide Hazard Areas shall be designed with sufficient capacity to convey and contain (at minimum) the 100-year peak flow, assuming *full build-out conditions*[25] for all tributary areas, both onsite and offsite. Tightline systems shall be designed as detailed in Section 4.2.2.

Bridges

New bridges shall be designed to pass the 100-year peak flow with clearance as specified in Section 4.3.3.

1.2.4.2 CONVEYANCE REQUIREMENTS FOR EXISTING SYSTEMS

The following conveyance requirements for existing systems are less rigorous than those for new systems to allow some salvaging of existing systems that are in useable condition. Existing systems may be utilized if they are capable of providing a minimum level of protection as-is or with minor modifications.

Existing Onsite Conveyance Systems

No Change in Flow Characteristics: Existing onsite conveyance systems that will not experience a change in flow characteristics (e.g., peak flows or volume of flows) as a result of the proposed project need not be analyzed for conveyance capacity.

Change in Flow Characteristics: Existing onsite conveyance systems that will experience a change in flow characteristics as a result of the proposed project must comply with the following conveyance requirements:

1. The existing system must be analyzed and shown to have sufficient capacity to convey and contain (at minimum) the 10-year peak flow assuming developed conditions for onsite tributary areas and existing conditions for any offsite tributary areas.
2. The applicant must demonstrate that the 100-year peak flow to the existing system will not create or aggravate a "severe flooding problem" or "severe erosion problem" as defined in Core Requirement #2, Section 1.2.2.
3. Minor modifications may be made to the conveyance system to achieve the required capacity stated above. Examples of minor modifications include raising a catch basin rim, replacing or relaying a

[25] *Full build-out conditions* means the tributary area is developed to its full zoning potential except where there are existing environmentally sensitive areas, open space tracts, and/or native growth protection easements/covenants.

section of pipe to match the capacity of other pipes in the system, improving a pipe inlet, or enlarging a short, constricted reach of ditch or channel.

4. Modifications to an existing conveyance system or element that act to attenuate peak flows due to the presence of upstream detention storage shall be made in a manner that does not significantly increase peak flows downstream. For example, if water is detained in a pond upstream of a restrictive road culvert, then installing an overflow system for the culvert should prevent overtopping of the road without significantly reducing existing detention storage.

Existing Offsite Conveyance Systems

1. Existing offsite conveyance systems need not be analyzed for conveyance capacity except as required by Core Requirement #2, or if offsite improvements or direct discharge are proposed per Core Requirement #3.
2. Improvements made to existing offsite conveyance systems to address the problem-specific mitigation requirements in Section 1.2.2.2 need only change existing conveyance capacity sufficiently to prevent aggravation of the drainage problem(s) being addressed.

1.2.4.3 CONVEYANCE SYSTEM IMPLEMENTATION REQUIREMENTS

Methods of Analysis and Design

Properly-sized conveyance elements provide sufficient hydraulic capacity to convey peak flows of the return frequencies indicated in Sections 1.2.4.1 and 1.2.4.2. Conveyance capacity shall be demonstrated using the methods of analysis detailed in Chapter 4. Design flows for sizing conveyance systems shall be determined using the appropriate runoff computation method specified in Section 3.2.

Spill Control Provisions

Projects proposing to construct or replace onsite conveyance system elements that receive runoff from non-roof-top *pollution-generating impervious surface* must provide a spill control device as detailed in Section 4.2.1 prior to discharge from the project site or into a *natural onsite drainage feature.*[26] More specifically, this requirement applies whenever a proposed project does either of the following:

- Constructs a new onsite conveyance system that receives runoff from non-roof-top pollution-generating impervious surface, OR
- Removes and replaces an existing onsite conveyance system element that receives runoff from 5,000 square feet or more of non-roof-top pollution-generating impervious surface onsite.

The intent of this device is to temporarily detain oil or other floatable pollutants before they enter the downstream drainage system in the event of an accidental spill or illegal dumping. It may consist of a tee section in a manhole or catch basin, or another alternative as specified in Section 4.2.1. The spill control device should be installed upstream of any onsite water quality or flow control facility. If no facilities are present, then the spill control device must be installed upstream from the final discharge point to the downstream drainage system.

Composition

Where feasible, conveyance systems shall be constructed of vegetation-lined channels, as opposed to pipe systems. Vegetative channels shall generally be considered feasible if all of these conditions are present:

1. The channel gradient generally does not exceed five percent, AND

[26] *Natural onsite drainage feature* means a natural swale, channel, stream, closed depression, wetland, or lake.

2. No modifications to currently adopted standard roadway cross-sections in the *King County Road Standards* are necessitated by the channel, AND
3. The channel will be accessible for maintenance (see Section 1.2.6), AND
4. The channel will not be subject to erosion.

Exceptions: The following are exceptions to the requirement for vegetative channels:

- Conveyance systems proposed under roadways, driveways, or parking areas
- Conveyance systems proposed between houses in urban-zoned plats and short plats
- Conveyance systems conveying roof runoff only.

Outfalls

An outfall is defined as a point where collected and concentrated surface and stormwater runoff is discharged from a pipe system or culvert.

Energy Dissipation: At a minimum, rock erosion protection is required at outfalls from all drainage systems and elements except where Public Works determines that erosion protection is being provided by other means or is not needed. Details on outfall structures are included in Section 4.2.2.

New Point Discharges Over Steep Slopes / Landslide Hazard Areas: Proposed outfalls that will: 1) discharge runoff in a location where the natural (existing) discharge is unconcentrated over a slope steeper than 15%, and/or 2) discharge runoff through a designated landslide hazard area must meet the following criteria:

1. IF the 100-year peak discharge is less than or equal to 0.2 cfs[27] under existing conditions and will remain less than or equal to 0.2 cfs under developed conditions, THEN outfall runoff may be discharged onto a rock pad shaped in a manner so as to disperse flow. The outfall and rock pad must be located upstream from any Landslide Hazard Area buffer and no less than 50 feet from a defined Landslide or Erosion Hazard Area unless otherwise approved by Public Works based on an evaluation/report by a geotechnical engineer.
2. IF the 100-year peak discharge is greater than 0.2 cfs but less than or equal to 0.5 cfs under existing conditions and will remain less than or equal to 0.5 cfs under developed conditions, THEN runoff must be conveyed to a dispersal trench or other dispersal system. The dispersal trench or system must be located upstream from any landslide hazard area buffer and no less than 50 feet from a defined Landslide or Erosion Hazard Area unless otherwise approved by Public Works based on an evaluation/report by a geotechnical engineer.
3. IF the 100-year peak discharge is greater than 0.5 cfs for either existing or developed conditions, THEN a tightline conveyance system must be constructed to convey the runoff to the bottom of the slope unless other measures are approved by Public Works based on an evaluation/report by a geotechnical engineer. Tightline systems must be designed such that existing base flow conditions are not significantly changed and adequate energy dissipation is provided at the bottom of the slope.

Outfalls to the Green River

New stormwater outfalls or modifications to existing stormwater outfalls discharging to the Green River between River Mile 6 (South Boeing Access Road) and SR 18 are allowed only through the adjustment process. These outfalls must comply with requirements of the Green River Pump Operations Procedure Plan, which establishes storage volumes and release rate criteria for developments proposing to construct or modify outfalls. Copies of the plan are available from King County DNR.

[27] Peak discharges shall be as computed using KCRTS as detailed in Chapter 3.

Interflow and Interception

Interflow is near-surface groundwater that moves laterally through the soil horizon following the hydraulic gradient of underlying relatively impermeable soils. When interflow is expressed on the surface, it is termed a *spring or seepage*. Any significant springs or seepage areas that impact a roadway or structure proposed by the project must be intercepted and directed into a conveyance system. Where roadways may impede the passage of interflow to downstream wetlands or streams, provision for passage of unconcentrated flows must be made.

Pump Systems

Pump systems may be used to convey water from one location or elevation to another within the project site provided they meet the design criteria specified for such systems in Section 4.2.3 and will be privately owned and maintained.

Pump systems that discharge flows from the project site that would not have discharged by gravity flow under existing site conditions will require an approved adjustment to Core Requirement #1 (see Section 1.4, "Adjustment Process"). These pump systems will be considered only when they are the sole alternative to solving a flooding or erosion problem as defined in Section 1.2.2. Typical conditions of approval for these systems are available in Reference Section 8-I under "Adjustment Application Form and Process Guidelines".

1.2.5 CORE REQUIREMENT #5: EROSION AND SEDIMENT CONTROL

REQMT

All proposed projects that will clear, grade, or otherwise disturb the site must provide erosion and sediment controls to prevent, to the maximum extent possible, the transport of sediment from the project site to downstream drainage facilities, water resources, and adjacent properties. To prevent sediment transport, **Erosion and Sediment Control (ESC)** measures are required and shall perform as described in Section 1.2.5.2. Both temporary and permanent erosion and sediment controls shall be implemented as described in Section 1.2.5.3.

Intent: To prevent the transport of sediment to streams, wetlands, lakes, drainage systems, and adjacent properties. Erosion on construction sites can result in excessive sediment transport to adjacent properties and to surface waters. Sediment transport can result in major adverse impacts, such as flooding due to obstructed drainageways, smothering of salmonid spawning beds, and creation of algal blooms in lakes.

1.2.5.1 ESC MEASURES

The following ESC measures shall be provided as specified below and as further detailed in the King County *Erosion and Sediment Control (ESC) Standards,* adopted as Appendix D (detached) of the King County Manual:

- **Clearing Limits:** Prior to any site clearing or grading, areas to remain undisturbed during project construction shall be delineated. At a minimum, clearing limit delineation flagging shall be provided at the edges of all stream, lake, or wetland buffers.
- **Cover Measures:** Temporary and permanent cover measures shall be provided when necessary to protect disturbed areas. Temporary cover shall be installed if an area is to remain unworked for more than seven days during the dry season (May 1 to September 30) or for more than two days during the wet season (October 1 to April 30), unless otherwise determined by the City. Any area to remain unworked for more than 30 days shall be seeded or sodded, unless the City determines that winter weather makes vegetation establishment unfeasible. **During the wet season, slopes and stockpiles 3H:1V or steeper with more than 10 feet of vertical relief shall be covered if they are to remain**

unworked for more than 12 hours. The intent of these measures is to prevent erosion by having as much area as possible covered during any period of precipitation.

- **Perimeter Protection:** When necessary, perimeter protection to filter sediment from sheet flow shall be provided downstream of all disturbed areas. Perimeter protection includes the use of vegetated strips, as well as more conventional constructed measures such as silt fences. Such protection shall be installed prior to upstream grading.
- **Traffic Area Stabilization:** Unsurfaced entrances, roads, and parking areas used by construction traffic shall be stabilized to minimize erosion and tracking of sediment offsite.
- **Sediment Retention:** Surface water collected from disturbed areas of the site shall be routed through a sediment pond or trap prior to release from the site. This does not apply to areas at the perimeter of the site small enough to be treated solely with perimeter protection. Sediment retention facilities shall be installed prior to grading any contributing area.
- **Surface Water Controls:** Surface water controls shall be installed to intercept all surface water from disturbed areas, convey it to a sediment pond or trap, and discharge it downstream of any disturbed areas. However, areas at the perimeter of the site small enough to be treated solely with perimeter protection do not require surface water controls. Significant sources of upstream surface water that drain onto disturbed areas shall be intercepted and conveyed to a stabilized discharge point downstream of the disturbed areas. Surface water controls shall be installed concurrently with or immediately following rough grading.
- **Dust Control:** Preventative measures to minimize wind transport of soil shall be implemented when a traffic hazard may be created or when sediment transported by wind is likely to be deposited in water resources.

1.2.5.2 ESC PERFORMANCE

The above ESC measures shall be applied and maintained so as to prevent, to the maximum extent possible, the transport of sediment from the project site or into onsite wetlands, streams, or lakes. This performance is intended to be achieved through proper selection, installation, and operation of the above ESC measures as detailed in the *ESC Standards* (detached Appendix D of the King County Manual) and approved by the City. However, the City may determine at any time during construction that such approved measures are not sufficient and additional action is required based on one of the following criteria:

1. IF a sieve test of storm and surface water discharges indicates that sand-sized sediment (soil particles coarser than the #200 sieve, 0.075 mm) is leaving the project site or entering onsite wetlands, streams, or lakes, THEN corrective actions and/or additional measures beyond those specified in Section 1.2.5.1 shall be implemented as deemed necessary by the City. *Note: The City can require that the ESC supervisor have a #200 sieve on site. Also, "leaving the project site" will be interpreted liberally. For example, if this criterion is applied to individual lots within a subdivision, it may, depending on the site, be appropriate to conduct the sieve test at the outlet of the drainage system rather than at the edge of the lot.*
2. IF the City determines that the condition of the construction site poses a **hazard to adjacent property** or may **adversely impact drainage facilities or water resources**, THEN additional measures beyond those specified in Section 1.2.5.1 can be required by the City.

1.2.5.3 IMPLEMENTATION REQUIREMENTS

ESC Plan

As specified in Chapter 2, all proposed projects must submit a plan for providing ESC measures. The ESC plan shall include a detailed construction sequence as proposed by the design engineer and shall identify required ESC measures. All ESC measures shall conform to the details and specifications in the *ESC Standards* unless an alternative is approved by Public Works (see "Alternative and Experimental Measures" in the *ESC Standards*, detached Appendix D). The ESC plan shall be accompanied by any calculations or information necessary to size ESC measures and demonstrate compliance with Core Requirement #5. The City may require large, complex projects to phase construction and to submit multiple ESC plans for the different stages of construction. Development of new ESC plans is not required for changes that are necessary during construction.

Wet Season Construction

During the wet season (October 1 to April 30), any site with exposed soils shall be subject to the "Wet Season Requirements" contained in the *ESC Standards*. In addition to the ESC cover measures, these provisions include covering any newly seeded areas with mulch and seeding as much disturbed area as possible during the first week of October to provide grass cover for the wet season.

Construction within Streams, Lakes, or Wetlands and Buffers

Any construction that will result in disturbed areas: 1) on or within a stream or associated buffer, or 2) within a wetland or associated buffer, or 3) within 50 feet of a lake shall be subject to the "Sensitive Area Restrictions" contained in the *ESC Standards*. These provisions include phasing the project whenever possible so that construction in these areas is limited to the dry season.

Maintenance

All ESC measures shall be maintained and reviewed on a regular basis as prescribed in the *ESC Standards*. The applicant shall designate an ESC supervisor who shall be responsible for maintenance and review of ESC measures and for compliance with all permit conditions relating to ESC as described in the *ESC Standards*.

Final Stabilization

Prior to obtaining final construction approval, the site shall be stabilized, structural ESC measures (such as silt fences and sediment traps) shall be removed, and drainage facilities shall be cleaned as specified in the *ESC Standards*.

Flexible Compliance

Some projects may meet the intent of Core Requirement #5 while varying from specific ESC requirements contained here and in the *ESC Standards*. If a project is designed and constructed such that it meets the intent of this core requirement, the City may determine that strict adherence to a specific ESC requirement is unnecessary; an approved adjustment (see Section 1.4) is not required in these circumstances. Certain types of projects are particularly likely to warrant this greater level of flexibility; for instance, projects on relatively flat, well drained soils, projects that are constructed in closed depressions, or projects that only disturb a small percentage of a forested site may meet the intent of this requirement with very few ESC measures. More information on intent and general ESC principles is contained in the *ESC Standards*.

Roads and Utilities

Road and utility projects often pose difficult erosion control challenges because they frequently cross surface waters and are long and narrow with limited area available to treat and store sediment-laden water.

Because of these factors, road and utility projects are allowed greater flexibility in meeting the intent of Core Requirement #5 as described in the *ESC Standards*. Projects that pose a very low risk of erosion or sediment transport due to site conditions or project scope may also warrant greater flexibility.

Consideration of Other Required Permits

Consideration should be given to the requirements and conditions that may be applied by other agencies as part of other permits required for land-disturbing activities. In particular, the following permits may be required and should be considered when implementing ESC measures:

- A **Class IV Special Forest Practices Permit** is required by the Washington State Department of Natural Resources for projects that will clear more than two acres of forest or 5,000 board feet of timber. All such clearing is also subject to the State Environmental Policy Act (RCW 43.21C) and will require SEPA review.
- A **NPDES General Permit for Construction** (pursuant to the Washington State Department of Ecology's Baseline General Permit for Stormwater) is required for projects that will disturb more than five acres. The five-acre threshold applies even where the five acres are to be disturbed in phases, as long as the construction is "part of a larger common plan of development or sale."

1.2.6 CORE REQUIREMENT #6: MAINTENANCE AND OPERATIONS

REQMT

Maintenance and operation of all drainage facilities is the responsibility of the applicant or property owner, except those facilities for which Kent is granted an easement, tract, or right-of-way and officially assumes maintenance and operation as described below.

Intent: To ensure that the maintenance responsibility for drainage facilities is clearly assigned and that these facilities will be properly maintained and operated in perpetuity.

Drainage Facilities to be Maintained by the City of Kent

Kent will assume maintenance and operation[28] of 1) conveyance systems within improved public road rights-of-way and 2) flow control and water quality facilities if these systems/facilities are associated with a residential subdivision with five or more lots served by a public street, or a non-residential short plat or long plat subdivision (i.e. commercial, industrial, etc.). Kent will not assume maintenance and operation of 1) stormwater facilities associated with residential subdivisions with 9 or less lots served by a private street, or 2) stormwater facilities associated with commercial or industrial developments located on single parcels.

Kent **will assume maintenance** and operation of these facilities **one year after final construction approval** by Public Works and an inspection by the City to ensure the facilities have been properly maintained and are operating as designed.

Flow control and water quality facilities to be maintained and operated by Kent must be located in a tract or right-of-way dedicated to Kent. Access roads serving these facilities must also be located in the tract or right-of-way and must be connected to an improved public road right-of-way. When allowed (see section 1.2.3.2) they may be sited in private rights-of-way or roads if the easement includes provisions for facility access and maintenance.

Conveyance systems to be maintained and operated by Kent must be located in a drainage easement, tract, or right-of-way granted to Kent. *Note: Kent does not normally assume maintenance responsibility for conveyance systems which are outside of improved public road right-of-way.*

[28] Kent does not assume maintenance of lot drainage systems or drainage stub-outs serving single-family residential lot downspout, footing, or yard drains, nor does Kent assume maintenance of those water quality facilities installed and integrated into site landscaping.

Exceptions to the above will be made on a case-by-case basis as determined by the Director.

Drainage Facilities to be Maintained by Private Parties

All privately maintained drainage facilities must be maintained as specified in Appendix A, "Maintenance Requirements for Privately Maintained Drainage Facilities," and as further prescribed in **Chapter 6** for water quality facilities. A copy of the **Operation and Maintenance Manual** submitted as part of the permit application (see Section 2.3.1) shall be retained on site and shall be transferred with the property to the new owner. A log of maintenance activity indicating when cleaning occurred and where waste was disposed of shall also be kept by the owner and be available for inspection by the City.

A "Declaration of Stormwater Facility Maintenance Covenant" must be completed for all private developments. This document is included with the manual as Reference 8-F. The timing of completion of this agreement varies depending on the type of development. For stormwater facilities serving more than one single family residential unit in a short plat serving less than four lots, the agreement shall be completed prior to plat recording. For all other developments or redevelopments (including commercial, industrial, multifamily development or redevelopment or single family residential building), the agreement shall be completed prior to engineering plan approval. The responsibilities detailed in the document may be assumed by a homeowners association or other legal organization as approved by the City of Kent.

Kent may inspect all privately maintained drainage facilities for compliance with these requirements. If property owner(s) fail to maintain their facilities to acceptable standards, the City may issue a written notice specifying the required actions. If these actions are not performed in a timely manner, the City may enter the property to perform the actions needed and bill the property owner(s) for the cost of the actions. In the event a hazard to public safety exists, written notice may not be required.

If the proposed project is a **residential subdivision development**, all privately maintained conveyance systems or other drainage facilities, which convey flows through private property, must be located in a **drainage easement dedicated to convey surface and stormwater**. Individual owners of the properties containing such easements must maintain the drainage facilities through their property. The legal instrument creating drainage easements on private property must contain language that requires a private property owner to obtain written approval from Kent prior to removing vegetation (except by routine mowing) from any drainage easement containing open, vegetated drainage facilities (such as swales, channels, ditches, ponds, etc.). A sample copy of the City of Kent's Drainage Easement is included with the Manual as Reference 8-G.

1.2.7 CORE REQUIREMENT #7: FINANCIAL GUARANTEES AND LIABILITY

REQMT

All drainage facilities constructed or modified for projects (except downspout infiltration and dispersion systems), and any work performed in the right-of-way, must comply with City of Kent's financial guarantee requirements.

Intent: To ensure financial guarantees are posted to sufficiently cover the cost of correcting, if necessary, incomplete or substandard drainage facility construction work, and to warrant for one year the satisfactory performance and maintenance of those newly-constructed drainage facilities to be assumed by Kent for maintenance and operation. Core Requirement #7 is also intended to ensure that a liability policy is provided that protects the proponent and the City from any damages relating to the construction or maintenance of required drainage facilities by private parties.

Surface Water and Drainage Facilities Construction Bond

Prior to commencing construction, applicants that are required to construct drainage facilities pursuant to this manual and/or any other requirements of the Kent City Code must post a Surface Water and Drainage Facilities Construction Bond (see Reference 8-E). This guarantee must be an amount sufficient to cover the cost of project-related work performed on- or off-site. The exact amount of the bond shall be documented in the approved engineers estimate. *Note: Public Works may waive the requirement of this guarantee on projects proposing only minor modifications or improvements to the drainage system (e.g., catch basin inserts, spill control devices, pipe replacements, etc.). In addition, this guarantee may be combined with other required guarantees.*

The bond shall be released in two stages as follows. Generally, 90% of the bond is released upon completion of the following:

1. Payment of all required fees.
2. Construction of the drainage facilities.
3. Receipt of final construction approval from Public Works.
4. Provide the City with As-builts meeting the requirements of the City of Kent Construction Standards (including this manual).

The drainage facilities shall be maintained during a period of one year according to the City of Kent's "Maintenance Requirements for Privately Maintained Drainage Facilities". At the end of the year, the remaining 10% of the bond is released subject to the following requirements:

1. For plats, record the final plat.
2. For tracts containing drainage facilities to be maintained by Kent and not located within the final plat, deed the tract to Kent and set property corners in conformance with state surveying standards.
3. For easements containing drainage facilities to be maintained by Kent and not located within the final plat, provide easement documents and set temporary survey markers to delineate the easement location.
4. Receive a final City inspection to ensure the drainage facilities have been properly maintained and are operating as designed.
5. Correct any defects noted in the final inspection.
6. Submit a letter to the City formally requesting a release of the bond.

Following completion of these steps, the City will assume maintenance and operation of the drainage facilities.

1.2.8 CORE REQUIREMENT #8: WATER QUALITY

REQMT

All proposed projects, including redevelopment projects, must provide water quality (WQ) facilities to treat the runoff from new and/or replaced pollution-generating impervious surfaces and pollution-generating pervious surfaces. These facilities shall be selected from one of the area-specific WQ menus described in Section 1.2.8.1 and implemented according to the applicable WQ implementation requirements in Section 1.2.8.2.

Intent: To require an efficient, cost-effective level of water quality treatment tailored to the sensitivities and resource protection needs of the downstream receiving water to which the project site drains, or, in the case of infiltration, protection of the receiving groundwater system.

Guide to Applying Core Requirement #8

Core Requirement #8 requires that WQ treatment facilities be provided to remove pollutants from runoff discharging from the project site in accordance with either the Basic WQ Menu or the Resource Stream Protection menu found in Section 1.2.8.1.

The WQ menus are a group of facility options designed to provide levels of treatment targeted to resource protection needs.

WQ implementation requirements are the minimum requirements for analyzing and designing WQ facilities to achieve intended performance and other protection goals.

Other Important Information about Core Requirement #8

Core Requirement #8 is the primary component of an overall water quality protection strategy required by this manual. Other requirements include the following:

- Core Requirement #4: **Conveyance System, Spill Control Provisions**, Section 1.2.4—This provision generally applies whenever a project constructs or replaces onsite conveyance system elements that receive runoff from pollution-generating impervious surfaces. The provision requires that runoff from such impervious surfaces be routed through a spill control device prior to discharge from the project site or into a natural onsite drainage feature.
- Special Requirement #4: **Source Control**, Section 1.3.4—This requirement applies water quality source controls from the *King County Stormwater Pollution Control Manual* to those projects proposing to develop or redevelop a commercial, industrial, or multifamily site.
- Special Requirement #5: **Oil Control**, Section 1.3.5—This requirement applies special oil controls to those projects proposing to develop or redevelop a high-use site.

State Standards

The stormwater and surface water discharging from an individual property or project shall be of such quality as to meet Class "A" water quality standards of the State of Washington herein adopted as part of this manual by reference. No one shall introduce into the drainage waters any liquid or solid foreign substances of biodegradable or other nature that shall cause the water quality to degrade from applicable State Standards.

Key Definitions

- **Pollution-generating impervious surface (PGIS) Definition:** Those impervious surfaces considered to be a significant source of pollutants in stormwater runoff. Such surfaces include those *subject to vehicular use*[29] or storage of *erodible or leachable materials, wastes, or chemicals*,[30] and that receive direct rainfall or the run-on or blow-in of rainfall.[31] Metal roofs are also considered to be PGIS unless they are treated to prevent leaching.
- **Pollution-generating pervious surface (PGPS) Definition:** Any non-impervious surface with vegetative ground cover subject to use of pesticides and fertilizers. Such surfaces include, but are not limited to, the lawn and landscaped areas of residential or commercial sites, golf courses, parks, and sports fields.

❑ EXEMPTIONS FROM CORE REQUIREMENT #8

There are four possible exemptions from the requirement to provide a **formal water quality facility** per Core Requirement #8:

1. Surface Area Exemption for New Development

A proposed project or any **threshold discharge area** within a project is exempt if it meets all of these criteria:

a) Less than 5,000 square feet of *new PGIS*[32] will be added, AND

b) Less than 5,000 square feet of *contiguous PGIS*[33] will be created through any combination of new and/or replaced impervious surface as part of a redevelopment project, AND

c) Less than 1 acre of *contiguous PGPS*[34] will be added and/or *modified*,[35] OR there is a formal agreement with the City to implement a *landscape management plan*[36] for the PGPS areas on the site, AND

d) The project does not propose greater than $100,000 in improvements to a high-use site.

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[29] A surface, whether paved or not, shall be considered *subject to vehicular use* if it is regularly used by motor vehicles. The following are considered *regularly-used surfaces*: roads, unvegetated road shoulders, bicycle lanes within the traveled lane of a roadway, driveways, parking lots, unfenced fire lanes, diesel equipment storage yards, and airport runways. The following are not considered regularly used surfaces: road shoulders primarily used for emergency parking, paved bicycle pathways, bicycle lanes adjacent to unpaved or paved road shoulders primarily used for emergency parking, fenced fire lanes, and infrequently used maintenance access roads.

[30] *Erodible or leachable materials, wastes, or chemicals* are those substances that, when exposed to rainfall, measurably alter the physical or chemical characteristics of the rainfall runoff (examples include erodible soil, uncovered process wastes, manure, fertilizers, oily substances, ashes, kiln dust, garbage dumpster leakage, etc.).

[31] A covered parking area would be considered pollution-generating if runoff from uphill could regularly run through it, or if rainfall could regularly blow in and wet the pavement surface. The same parking area would not be included if it were enclosed by walls or if a low wall and berm prevented stormwater from being blown in or from running onto the covered area.

[32] *New PGIS* means new impervious surface (as defined on page 5.1-6) that is pollution-generating.

[33] *Contiguous PGIS* means a discrete patch of PGIS that is all together as opposed to being separated in different locations on the project site. As used in this and other exemptions, the intent is to apply Core Requirement #8 to those redevelopment projects that are replacing and/or adding enough impervious surface in one location to allow for opportune installation of a water quality facility.

[34] *Contiguous PGPS* means a patch of PGPS that is all together as opposed to being separated in different locations on the project site.

[35] *Modified* PGPS means any existing PGPS that is re-graded or re-contoured by the proposed project.

[36] *Landscape management plan* means a King County approved plan for defining the layout and long-term maintenance of landscaping features to minimize the use of pesticides and fertilizers, and to reduce the discharge of suspended solids and other pollutants. Guidelines for preparing landscape management plans can be found in Reference Section 4-A. Submittal requirements are detailed in Section 2.3.1.4.

2. Cost Exemption for Redevelopment Projects

A redevelopment project or any **threshold discharge area** within a redevelopment project is exempt if it meets all of these criteria:

a) Less than $500,000 of total site improvements is proposed, AND

b) Less than 5,000 square feet of new PGIS will be added, AND

c) Less than 1 acre of contiguous PGPS will be added and/or modified, OR there is a formal agreement with the City to implement a landscape management plan for the PGPS areas, AND

d) The project does not propose greater than or equal to $100,000 in improvements to a high-use site.

3. Standard Infiltration Exemption

A proposed project or any drainage area within a project is exempt if the runoff from pollution-generating pervious and impervious surfaces is infiltrated in soils with a *measured infiltration rate*[37] of less than or equal to 9 inches per hour.

4. Soil Treatment Exemption

A proposed project or any drainage area within a project is exempt if the runoff from pollution-generating impervious surfaces is infiltrated in soils that meet the "groundwater protection criteria" outlined below.

Groundwater Protection Criteria: The first 2 feet or more of the soil beneath an infiltration facility must meet one of the following specifications for general protection of groundwater:

a) The soil must have a *cation exchange capacity*[38] greater than 5 and an *organic content*[39] greater than 0.5%, OR

b) The soil must be composed of less than 25% gravel by weight with at least 75% of the soil passing the #4 sieve, and the portion passing the #4 sieve must meet one of the following gradations:

- At least 50% must pass the #40 sieve and at least 2% must pass the #100 sieve, OR
- At least 25% must pass the #40 sieve and at least 5% must pass the #200 sieve.

1.2.8.1 WATER QUALITY MENUS

REQMT

Projects subject to Core Requirement #8 **must provide a facility selected from either the Basic Water Quality menu or the Resource Stream Protection menu**, whichever applies per the threshold information detailed in this section:

Redevelopment projects subject to Core Requirement #8 need only apply the Basic WQ menu. *Note: A higher standard may be imposed by an adopted resource management plan through Special Requirement #1, Section 1.3.1, or the proposed project may apply a higher standard voluntarily.*

Intent: The City of Kent contains numerous sensitive and significant water resources. The City has determined that the minimum level of treatment adequate to prevent further degradation of water quality, and to maintain the aquatic health of current fisheries, is that provided by the Resource Stream Protection menu. The Director has the option to require additional treatment, or treatment of existing impervious areas, when necessary to meet water quality standards and goals (see Reference 8-H).

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[37] *Measured infiltration rate* shall be as measured by the EPA method or the Double Ring Infiltrometer Method (ASTM D3385). For some soils, an infiltration rate of less than 9 inches per hour may be assumed based on a soil texture determination rather than a rate measurement. For more details, see the requirements in Section 5.4.1.

[38] *Cation exchange capacity* shall be tested using EPA Laboratory Method 9081.

[39] *Organic content* shall be measured on a dry weight basis using ASTM D2974.

❑ BASIC WQ MENU

The Basic WQ menu is applied where a general, cost-effective level of treatment is adequate and where more intensive, targeted pollutant removal is not needed to protect receiving bodies. In the City of Kent, the only acceptable use of the Basic WQ menu is for **redevelopment projects** that are subject to Core Requirement #8.

Treatment Goals and Options

The treatment goal for facility options in the Basic WQ menu is 80% removal of total suspended solids (TSS) for a typical rainfall year assuming typical pollutant concentrations in urban runoff[40]. TSS is the general performance indicator for basic water quality protection because it is the most obvious pollutant of concern. The basic WQ menu includes facilities such as wetponds, combined detention/wetponds, biofiltration swales, filter strips and sand filters. See Chapter 6 for specific facility options and designs.

Intent

The **Basic WQ menu** is intended to be applied to both stormwater discharges that drain to surface waters and those that infiltrate into soils that do not provide adequate groundwater protection (see Exemptions 3 and 4 from Core Requirement #8).

❑ SENSITIVE LAKE PROTECTION MENU

The City has determined that the Sensitive Lake Protection Menu does not adequately ensure removal of metals, and may not meet water quality goals and standards. Phosphorus is not a primary pollutant of concern in the City; lake watersheds are nearly built-out, so future development is not expected to change the trophic status or lead to declines in lake health due to excessive nutrient loadings.

❑ RESOURCE STREAM PROTECTION MENU

The Resource Stream Protection menu is applied throughout Kent.

Treatment Goals and Options

The treatment goal for facility options in the **Resource Stream Protection menu** is 50% reduction of total zinc. Zinc is an indicator of a wider range of metals typically found in urban runoff that are potentially toxic to fish and other aquatic life. The Resource Stream Protection menu includes options for using a large sand filter or a combination of two facilities in series, one of which is either a sand filter or a leaf compost filter. See Chapter 6 for specific facility options and designs.

Intent

Facility options in the Resource Stream Protection menu are intended to remove more metals than expected from the Basic WQ menu. Lower metal concentrations reduce the risk to fish of exposure to both chronic and acutely toxic concentrations of metals such as copper and zinc.

1.2.8.2 WATER QUALITY IMPLEMENTATION REQUIREMENTS

Methods of Analysis and Design

Water quality treatment facilities shall be analyzed and designed as detailed in Chapter 6.

[40] For evaluation purposes, typical concentrations of TSS in Seattle area runoff are between 30 and 100 mg/L (Table 1, "Water Quality Thresholds Decision Paper," King County Surface Water Management Division, April 1994).

Siting of Treatment Facilities

Required treatment facilities shall be located to treat the runoff from all contiguous PGIS exceeding the threshold for application of Core Requirement #8 to redevelopment projects and all new PGIS on other projects, except as allowed below under "Treatment Trades" and "Untreated Discharges." In addition, all runoff from 1 acre or more of new and/or modified contiguous PGPS must also be directed to a treatment facility.

Any other onsite or offsite runoff draining to a proposed treatment facility must be treated whether it is from a pollution-generating surface or not. This is because treatment effectiveness is determined in part by the total volume of runoff entering the facility.

Treatment of Pervious Surfaces

Pollution-generating pervious surfaces subject to Core Requirement #8 need only be treated using the Basic WQ menu. It is also possible for the facility requirement to be waived if there is a good faith agreement with Public Works to approve a landscape management plan that controls solids, pesticides, and fertilizers leaving the site.

Treatment Trades

Runoff from areas subject to water quality treatment requirements may be excused from the onsite treatment requirement if a pre-existing area of impervious surface of equivalent size and pollutant characteristics lying within the same watershed or stream reach tributary area is treated on the project site. Such substitution is subject to two restrictions:

1. The pre-existing impervious surface is not currently being treated, is not required to be treated by any phase of the proposed project, is not subject to NPDES or other permit requirements, and is not under a compliance order or other regulatory action, AND
2. The proposal is reviewed and approved by Public Works.

Untreated Discharges

If site topographic constraints are such that runoff from an area must be pumped to be treated by the water quality facility, then Public Works may allow the area runoff to be released untreated, provided that these conditions are met:

1. Treatment of the constrained area by filter strip, biofiltration, or a linear sand filter is not feasible, and a "treatment trade" as described above is not possible, AND
2. The untreated area is less than 5,000 square feet of new PGIS and is less than 5,000 square feet of contiguous PGIS being created through any combination of new and/or replaced impervious surface as part of a redevelopment project, AND
3. Any PGPS within the area to be released untreated shall be addressed with a landscape management plan unless otherwise exempt from Core Requirement #8.

Use of Experimental Water Quality Facilities

Treatment facilities other than those identified in Chapter 6 are allowed on an experimental basis if it can be demonstrated they are likely to meet the pollutant removal goal for the applicable receiving water. Use of such facilities requires an experimental design adjustment to be approved by Kent according to Section 1.4, "Adjustment Process." When sufficient data on performance has been collected and if performance is acceptable, the new facility will be added to the appropriate water quality menu for common use.

Owner Responsibility for Water Quality

Regardless of the means by which a property owner chooses to meet the water quality requirements of this manual—whether a treatment facility, a train of facilities, a treatment trade, or an experimental treatment

facility—it is ultimately the responsibility of the property owner to ensure that runoff from their site does not create water quality problems or degrade downstream beneficial uses. It is also ultimately the responsibility of the property owner to ensure that the discharge from their property is not in violation of State and Federal laws.

1.3 SPECIAL REQUIREMENTS

This section details the following five special drainage requirements which may apply to the proposed project depending on its location or site-specific characteristics:

- Special Requirement #1: Other Adopted Area-Specific Requirements, Section 1.3.1
- Special Requirement #2: Developments within Floodplain/Floodway, Section 1.3.2
- Special Requirement #3: Flood Protection Facilities, Section 1.3.3
- Special Requirement #4: Source Control, Section 1.3.4
- Special Requirement #5: Oil Control, Section 1.3.5

1.3.1 SPECIAL REQUIREMENT #1: OTHER ADOPTED AREA-SPECIFIC REQUIREMENTS

Other adopted area-specific regulations may be adopted and include additional requirements that have a more direct bearing on the drainage design of a proposed project. An example is a basin plan or lake management plan that is adopted by the City.

- **Basin Plans** (BPs): The City may adopt basin plans to provide for the comprehensive assessment of resources and to accommodate growth while controlling adverse impacts to the environment. A basin plan may recommend specific land uses, regional capital projects, and special drainage requirements for future development within the basin area it covers.

- **Lake Management Plans** (LMPs): The City may adopt lake management plans to provide for comprehensive assessment of resources and to accommodate growth while controlling adverse impacts from nutrient loading to selected lakes. A lake management plan may recommend nutrient control through special drainage and source control requirements for proposed projects within the area it covers.

Threshold	Requirement
IF a proposed project is in a basin plan or lake management plan...	**THEN the proposed project shall comply with the drainage requirements of the basin plan or management plan, respectively.**

Application of this Requirement

The drainage requirements of adopted area-specific regulations such as basin plans shall be applied in addition to the drainage requirements of this manual unless otherwise specified in the adopted regulation. Where conflicts occur between the two, the drainage requirements of the adopted area-specific regulation shall supersede those in this manual.

Examples of drainage requirements found in other adopted area-specific regulations include the following:

- More or less stringent flow control
- More extensive water quality controls
- Forest retention requirements

- Infiltration restrictions
- Groundwater recharge provisions
- Discharge to a constructed regional flow control or conveyance facility.

1.3.2 SPECIAL REQUIREMENT #2: DEVELOPMENTS WITHIN FLOODPLAIN/FLOODWAY

Floodplains and floodways are subject to inundation during extreme events. The 100-year floodplains are delineated to minimize flooding impacts to new development and to prevent aggravation of existing flooding problems by new development. Regulations and restrictions concerning development within a 100-year floodplain are found in Chapter 14.09 of the Kent City Code.

The State Flood Control Program has designated the Green River Valley as a Flood Control Zone Number Two. Washington State law requires a flood control zone permit for all new development in or on the floodplain within the designated flood zone.

A condition of the issuance of an approved flood control zone permit is the requirement to flood proof, usually by land filling the proposed building site. The proposed finished floor elevations of all new buildings shall be located at least one foot above the existing 100-year floodplain elevation. The as-built elevations must be verified and an Elevation Certificate must be completed and returned to the City of Kent Public Works Department. The floodplain elevations adopted by the City of Kent are delineated on the Flood Insurance Rate Maps. Copies of these maps are available for review at the Public Works Department.

The following requirements relate to mapping of the floodplain/floodway and compensatory storage requirements.

Threshold	Requirement
IF a proposed project contains or is adjacent to a stream, lake, wetland, or closed depression, or if other Kent regulations require study of flood hazards . . .	THEN the 100-year floodplain boundaries (and floodway, if available or if improvements are proposed within the 100-year floodplain) based on an approved flood hazard study (described below) shall be delineated on the site improvement plans and profiles, and on any final subdivision maps prepared for the proposed project.
IF a proposed project proposes to fill within a FEMA designated floodplain that is outside of the floodway (also known as the floodway fringe)...AND if the proposed project is located in the Green River Valley	THEN the development must provide offsetting storage for 50% of the pre-development floodway fringe storage capacity that was provided on the property that is to be filled.
IF a proposed project proposes to fill within a FEMA designated floodplain that is outside of the floodway (also known as the floodway fringe)...AND if the proposed project is located outside of the Green River Valley.	THEN the development must provide offsetting storage for 100% of the pre-development floodway fringe storage capacity that was provided on the property that is to be filled.

Application of this Requirement

If an approved flood hazard study exists, then it may be used as the basis for delineating the floodplain and floodway boundaries provided the study was prepared in a manner consistent with this manual and other Kent flood hazard regulations. If an approved flood hazard study does not exist, then one shall be prepared based on the requirements described in Section 4.4.2, "Floodplain/Floodway Analysis."

Projects proposing to fill or alter the floodplain and/or floodway must prepare a flood hazard study that analyzes and documents the effect of the proposed development and mitigating measures.

1.3.3 SPECIAL REQUIREMENT #3: FLOOD PROTECTION FACILITIES

Developing sites protected by levees, revetments, or berms requires a high level of confidence in their structural integrity and performance. Proper analysis, design, and construction is necessary to protect against the potentially catastrophic consequences if such facilities should fail.

Threshold	Requirement
IF a proposed project either: • contains or is adjacent to a stream that has an existing flood protection facility (such as a levee, revetment, or berm), OR • proposes to construct a new or to modify an existing flood protection facility . . .	THEN the flood protection facilities shall be analyzed and/or designed to conform with the Federal Emergency Management Administration (FEMA) regulations (44 CFR) and the State Flood Control Program.

Application of this Requirement

The applicant is required to demonstrate conformance with FEMA regulations using the methods specified in Section 4.4.2. In addition, certain easement requirements (outlined in Section 4.1) must be met to allow City access for maintenance of the facility.

1.3.4 SPECIAL REQUIREMENT #4: SOURCE CONTROLS

Water quality source controls prevent rainfall and runoff water from coming into contact with pollutants, thereby reducing the likelihood that pollutants will enter public waterways and violate water quality standards. King County prepared a *Stormwater Pollution Control Manual* for citizens, businesses, and industries to identify and implement source controls for activities that often pollute water bodies. Kent provides advice on source control implementation upon request. The City may, however, require mandatory source controls at any time through formal code enforcement if complaints or studies reveal water quality violations or problems.

Threshold	Requirement
IF a proposed project is either: • a commercial, industrial, or multifamily site development, OR • a redevelopment project proposing improvements to an existing commercial, industrial, multifamily site . . .	THEN the project must provide water quality source controls applicable to the proposed project in accordance with the *King County Stormwater Pollution Control Manual.*

Application of this Requirement

When applicable, structural source control measures, such as car wash pads or dumpster area roofing, shall be shown on the site improvement plans submitted for engineering review and approval. Other nonstructural source control measures, such as covering storage piles with plastic or isolating areas where pollutants are used or stored, are to be implemented after occupancy and need not be addressed during the plan review process. All commercial and industrial projects (irrespective of size) undergoing drainage review are required to implement applicable source controls.

1.3.5 SPECIAL REQUIREMENT #5: OIL CONTROL

Projects proposing to develop or redevelop a high-use site (defined below) must provide oil controls in addition to any other water quality controls required by this manual. Such sites typically generate high concentrations of oil due to high traffic turnover or the frequent transfer of oil.

A high-use site is any one of the following:

- A commercial or industrial site subject to an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area, OR
- A commercial or industrial site subject to petroleum storage and transfer in excess of 1,500 gallons per year, not including routinely delivered heating oil, OR
- A commercial or industrial site subject to use, storage, or maintenance of a fleet of 25 or more diesel vehicles that are over 10 tons gross weight (trucks, buses, trains, heavy equipment, etc.), OR
- A road intersection with a measure ADT count of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersection roadway, excluding project proposing primarily pedestrian or bicycle use improvements.

The oil control requirement for high-use sites applies to all sites that generate high concentrations of oil, regardless of whether the project creates new impervious surface or makes site improvements to an existing high-use site. The traffic threshold identified focuses on vehicle turnover per square foot of building area (trip generation) rather than ADT alone. This is because oil leakage is greatest when engines are idling or cooling. In general, all-day parking areas are not intended to be captured by these thresholds except for diesel vehicles, which tend to leak oil more than non-diesel vehicles. The petroleum storage and transfer stipulation is intended to address regular transfer operations such as service stations, not occasional filling of heating oil tanks.

Threshold	Requirement
IF a proposed project either: • develops a site that will have high-use site characteristics (defined above), OR • is a redevelopment project proposing $100,000 or more of improvements to an existing high-use site.	THEN the project must treat runoff from the high-use portion of the site using oil control treatment options from the High-Use menu (described below and detailed in Chapter 6).

High-Use Menu

High-use oil control options are selected to capture and detain oil and associated pollutants. The goal of treatment is to have no visible sheen in runoff leaving the facility, or to have less than 10 mg/L total petroleum hydrocarbons (TPH), depending on the BMP. Oil control options include facilities that are small, handle only a limited site area, and require frequent maintenance, as well as facilities that treat larger areas and generally have less frequent maintenance needs. Facility choices include catch basin inserts, linear sand filters, and oil/water separators. See Chapter 6 for specific facility choices and design details.

Application of this Requirement

For high-use sites located within a larger commercial center, only the impervious surface associated with the high-use portion of the site is subject to treatment requirements. If common parking for multiple businesses is provided, treatment shall be applied to the number of parking stalls required for the high-use business only. However, if the treatment collection area also receives runoff from other areas, the treatment facility must be sized to treat all water passing through it.

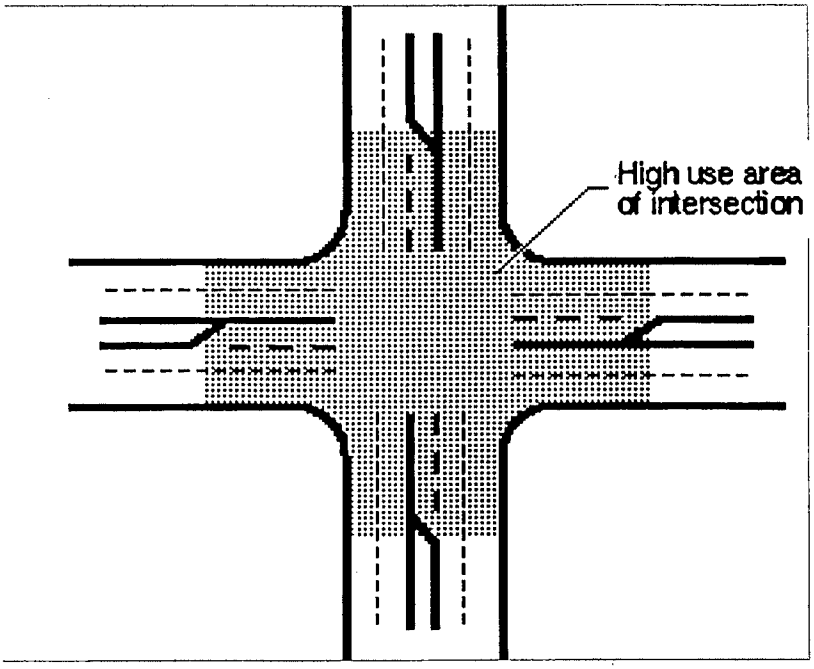
High-use roadway intersections shall treat lanes where vehicles accumulate during the signal cycle, including left- and right-turn lanes and through lanes, from the beginning of the left-turn pocket (see Figure 1.3.5.A below). If no left-turn pocket exists, the treatable area shall begin at a distance equal to three car lengths from the stop line. If runoff from the intersection drains to more than two collection areas that do not combine within the intersection, treatment may be limited to any two of the collection areas.

Note: For oil control facilities to be located in public road right-of-way and maintained by Kent, only coalescing plate or baffle oil/water separators shall be used unless otherwise approved by an adjustment.

Methods of Analysis

The traffic threshold for the High-Use menu shall be estimated using information from *Trip Generation*, published by the Institute of Transportation Engineers, or from a traffic study prepared by a professional engineer or transportation specialist with experience in traffic estimation.

FIGURE 1.3.5.A TREATABLE AREAS FOR HIGH-USE ROAD INTERSECTIONS



1.3.6 REDEVELOPMENT REQUIREMENTS

Stormwater management for redevelopment projects is addressed in many separate sections of this manual. In an effort to clarify the requirements for redevelopment, these sections have been compiled and are presented below.

Redevelopment projects are required to go through drainage review if they are subject to a Kent development proposal, permit, or approval (such as those listed on page 5.1-6) AND:

Propose $100,000 or more of improvements to an existing **high-use site**, OR

Propose $500,000 or more of site improvements and create 5,000 square feet or more of **contiguous pollution-generating impervious surface** through any combination of **new and/or replaced impervious surface.**

Redevelopment Projects proposing $100,000 or more of improvements to an existing **high-use site** are subject to "Category 3" Targeted Drainage Review, and require the following:

Core Requirement #1: Discharge at the Natural Location

Core Requirement #5: Erosion and Sediment Control

Core Requirement #6: Maintenance and Operations

Core Requirement #7: Financial Guarantees and Liability

Core Requirement #8: Water Quality

Special Requirement #4: Source Control

Special Requirement #5: Oil Control

In addition, a "Category 3" project that installs oil controls that construct or modify a 12-inch ditch are also a "Category 2" project that may also include the following:

Special Requirement #1: other adopted requirements

#3: flood protection facilities

Redevelopment Projects proposing $500,000 or more of site improvements and creating 5,000 square feet or more of **contiguous pollution-generating impervious surface** through any combination of **new and/or replaced impervious surface** are subject to full drainage review. The requirements for these projects are listed in Table 1.1.2.A and include flow control (Core Requirement #3) and Water Quality (Core Requirement #8)

1.3.6.1 FLOW CONTROL REQUIREMENTS

When analyzing a redevelopment project for flow control, flows must meet the area specific flow control standard by using KCRTS and comparing **existing site conditions** with proposed site conditions for the applicable frequency and/or duration criteria.

Redevelopment projects may be granted an exemption from Core Requirement 3 - Flow Control under one scenario - the Peak Flow Exemption Using Flow Control BMPs, as follows:

IF the project improvements in the threshold discharge area generate less than a 0.1 cfs increase in the existing site conditions 100-year flow rate AND flow control BMPs are applied as specified in Section 5.2, AND the project improvements do not significantly impact a "severe erosion problem" or a "severe flooding problem", AND the project is not located in a Landslide Hazard Drainage Area.

1.3.6.2 WATER QUALITY CONTROL REQUIREMENTS

Redevelopment projects may be granted an exemption from Core Requirement #8 - Water Quality Control under two scenarios:

1. Surface Area Exemption

   IF a) less than 5,000 square feet of new PGIS will be added; AND b) less than 5,000 square feet of contiguous PGIS will be created through any combination of new and/or replaced impervious surface as part of the redevelopment project; AND c) less than 1 acre of PGPS will be added or modified, OR there is a formal agreement with the City of Kent to implement a landscape management plan for the PGPS areas; AND d) the project does not propose greater than $100,000 in improvements to a high use site.

2. Cost Exemption

   IF a) less than $500,000 of total site improvements is proposed; AND b) less than 5,000 square feet of new PGIS will be added; AND c) less than 1 acre of contiguous PGPS will be added and/or modified, or there is a formal agreement with the City of Kent to implement a landscape management plan for the PGPS areas; AND d) the project does not propose greater than or equal to $100,000 in improvements to a high use site.

Redevelopment projects subject to Core Requirement #8 need only apply the Basic Water Quality Menu, regardless of the location of the development. Only one of the following facility options must be chosen to meet the requirement (see Section 6.1.1):

- Biofiltration Swale

- Filter Strip
- Wetpond
- Wet vault
- Stormwater Wetland
- Combined Detention and Wetpond
- Sand Filter

In addition, these facilities need only be sized to treat the runoff from the new and/or replaced impervious surface that is subject to Core Requirement #8. Any other onsite or offsite runoff draining to a proposed treatment facility must be treated whether it is from a pollution-generating surface or not. This is because treatment effectiveness is determined in part by the total volume of runoff entering the facility.

Redevelopment Projects involving greater than or equal to $100,000 in improvements to a high use site are required to meet Special Requirement #5 – Oil Control. Runoff from the high-use portion of the site must be treated using oil control treatment options presented in Chapter 6.

1.4 ADJUSTMENT PROCESS

For proposed projects subject to drainage review by Public Works, this process is provided for the occasions when a project proponent desires to vary from one of the core or special requirements, or any other specific requirement or standard contained in this manual. Proposed adjustments should be approved prior to final permit approval, but they may be accepted up to the time Kent approves final construction or accepts drainage facilities for maintenance.

Types of Adjustments

To facilitate the adjustment process and timely review of adjustment proposals, the following types of adjustments are provided:

- **Standard Adjustments:** These are adjustments of the standards and requirements contained in the following chapters and sections of this manual:
  - Chapter 2, *Drainage Plan Submittal*
  - Chapter 4, *Conveyance System Analysis and Design*
  - Chapter 5, *Flow Control Design*
  - Appendix C of the King County Manual, *Small Site Drainage Requirements* (detached)
  - Appendix D of the King County Manual, *Erosion and Sediment Control Standards* (detached).

  Requests for standard adjustments will be accepted only for permits pending approval or approved permits that have not yet expired.

- **Complex Adjustments:** Complex adjustments typically require more in-depth review because they deal with more complicated requirements or requirements that affect basic City policies or other agencies. These adjustments deviate from the requirements contained in the following chapters and sections of this manual:
  - Chapter 1, *Drainage Review and Requirements*
  - Chapter 3, *Hydrologic Analysis and Design*
  - Chapter 6, *Water Quality Design*
  - Appendix D of the Kent Construction Standards, *Maintenance Requirements for Privately Maintained Facilities*

  Requests for complex adjustments will be accepted only for permits pending approval or approved permits that have not yet expired.

- **Preapplication Adjustments:** This type of adjustment may be requested when the applicant needs an adjustment decision to determine if a project is feasible or when the results are needed to determine if a project is viable before funding a full application. The approval of preapplication adjustments is tied by condition to the project proposal presented at a preapplication meeting with Public Works.

- **Experimental Design Adjustments:** This type of adjustment is used for proposing new designs or methods that are not covered in this manual, that are not uniquely site specific, and that do not have sufficient data to establish functional equivalence.

- **Blanket Adjustments:** This type of adjustment may be established by the City based on approval of any of the above-mentioned adjustments. Blanket adjustments are usually based on previously approved adjustments that can be applied routinely or globally to all projects where appropriate. Blanket adjustments are also used to effect minor changes or corrections to manual design requirements or to add new designs and methodologies to this manual.

1.4.1 ADJUSTMENT AUTHORITY

The Kent Public Works Department shall have full authority to approve or deny all types of adjustments for any proposed project subject to drainage review by Public Works.

1.4.2 CRITERIA FOR GRANTING ADJUSTMENTS

Adjustments to the requirements in this manual may be granted provided that granting the adjustment will achieve the following:

1. Produce a compensating or comparable result that is in the public interest, AND
2. Meet the objectives of safety, function, appearance, environmental protection, and maintainability based on sound engineering judgment.

Where it has been demonstrated that meeting the criteria for producing a compensating or comparable result will deny reasonable use of a property, the applicant shall produce the best practicable alternative as determined by the Director of Public Works. The director or his/her designee shall assess the case to affirm that denial of reasonable use would occur and to require the practicable alternative that best achieves the spirit and intent of the requirement. Public Works staff shall provide recommendations to the director on the best practicable alternative to be required.

Granting any adjustment that would be in conflict with the requirements of any other Kent department will require review and concurrence with that department.

Experimental Design Adjustments

Experimental design adjustments that request use of an experimental water quality facility or flow control facility will be approved by Public Works on a limited basis if, upon evaluation, Public Works agrees the following criteria are met:

1. The new design is likely to meet the identified target pollutant removal goal or flow control performance based on limited data and theoretical considerations, AND
2. Construction of the facility can, in practice, be successfully carried out, AND
3. Maintenance considerations are included in the design, and costs are not excessive or are borne and reliably performed by the applicant or property owner, AND
4. A share of the cost of monitoring to determine facility performance is contributed by the applicant or property owner.

Conditions for approval of these adjustments may include a requirement for setting aside an extra area and posting a financial guarantee for construction of a conventional facility should the experimental facility fail. Once satisfactory operation of the experimental facility is verified, the set aside area could be developed and the financial guarantee released.

1.4.3 ADJUSTMENT APPLICATION PROCESS

Standard and Complex Adjustments

The application process for standard and complex adjustments is as follows:

- Requests for standard and complex adjustments will be accepted only for permits pending approval or approved permits that have not yet expired.

- The completed adjustment request application forms must be submitted to Public Works along with sufficient engineering information (described in Chapter 2) to evaluate the request. The application shall note the specific requirement for which the adjustment is sought.
- If the adjustment request involves use of a previously unapproved construction material or construction practice, the applicant should submit documentation that includes, but is not limited to, a record of successful use by other agencies and/or evidence of meeting criteria for quality and performance, such as that for the American Association of State Highway and Transportation Officials (AASHTO) and the American Society of Testing and Materials (ASTM).
- A fee reduction may be requested if it is demonstrated that the adjustment request requires little or no engineering review.

Preapplication Adjustments

The application process is the same as for standard and complex adjustments except that requests will be accepted prior to permit application, but only if:

- The applicant provides justification at a preapplication meeting with Public Works that an adjustment decision is needed to determine the viability of the proposed project, AND
- Sufficient engineering information to evaluate the request is provided.

Experimental Design Adjustments

The application process is the same as for standard and complex adjustments except that requests will be accepted prior to permit application.

Blanket Adjustments

There is no application process for blanket adjustments because they are initiated and issued solely by the City.

1.4.4 ADJUSTMENT REVIEW PROCESS

The general steps of the review process for specific types of adjustments are presented as follows.

Standard and Complex Adjustments

- Public Works staff will review the adjustment request application forms and documentation for completeness and inform the applicant in writing as to whether additional information is required from the applicant to complete the review. The applicant will also be informed if Public Works determines that special technical support is required in cases where the adjustment involves a major policy issue or potentially impacts a Public Works drainage facility.
- The Public Works director or designee will review and either approve or deny the adjustment request following Public Work's determination that all necessary information has been received from the applicant.
- Approvals of standard and complex adjustments will expire upon expiration of the permit to which they apply.

Preapplication Adjustments

The review process is the same as for standard and complex adjustments except that approvals will expire one year after the approval date, unless a complete permit application is submitted and accepted.

Experimental Design Adjustments

- Public Works staff will review the submitted material and inform the applicant as to whether additional information is required to complete the review. Public Works will also inform the applicant as to how much time is estimated to complete the review.
- The Public Works Director or designee will review and either approve or deny the adjustment request in writing.

Blanket Adjustments

Blanket adjustments will be established by Public Works based on:

1. A previously approved standard, complex, preapplication, or experimental design adjustment and supporting documentation, AND
2. Information presenting the need for the blanket adjustment. Typically, blanket adjustments should apply globally to design or procedural requirements and be independent of site conditions.

1.4.5 APPEAL PROCEDURE

The applicant may appeal the denial or approval conditions of an adjustment request by submitting a formal letter to the Public Works Director within 15 working days of the decision. This letter must include justification for review of the decision, along with a copy of the adjustment request with the conditions (if applicable) and a listing of all previously submitted material. The Public Works Director shall respond to the applicant in writing within 15 working days; this decision shall be final. A per-hour review fee will be charged to the applicant for City review of an appeal.