Chapter 8 Local Design Standards

This chapter contains information on specific issues for projects in Redmond to help define how to meet Redmond's local codes and regulations and to help define terms in ways that are meaningful to specific engineering design situations in Redmond.

8.1 Standard Specifications and Details

All projects shall be designed and constructed to conform to the City of Redmond Standard Specifications and Details, Current Edition. These are available on the City's website (www.redmond.gov).

8.2 Proper Drainage

The Stormwater Notebook describes minimum drainage requirements. These requirements must be addressed in all projects (Small, Medium, or Large) whether or not plans and permits are required. Even though plans and permits are not required for most Small Projects, proper drainage facilities are required with all projects.

Proper drainage directs runoff away from structures, meets legally accepted practice, and meets the intent of RMC 15.24. For projects not requiring plans or permits, drainage systems are not required by code to have detention or formally designed runoff treatment facilities. Nevertheless, if downstream conveyance capacity is not adequate, the project proponent may elect to provide detention or infiltration. Drainage systems shall be provided to prevent flooding of developed areas, connect downspouts, and provide positive drainage for footing drains.

Runoff from upslope properties must be accepted at natural and established locations at property boundaries and be discharged at natural or established downslope locations along property boundaries or to a constructed drainage system if authorized, subject to required onsite quantity and quality controls.

8.3 Stormwater Management in Wellhead Protection Zones

Wellhead Protection Zones (WPZ) were established based on proximity to City drinking water supply wells and groundwater travel times to the various well locations. A map of the WPZ is available at www.redmond.gov/Map. Zones 1 and 2 delineate the 6-month and 1-year time of travel zones for groundwater to reach the wells and are, therefore, the areas of greatest concern regarding infiltrating runoff from pollution generating surfaces. Zone 3 delineates the 5-year to 10-year time of travel zone.

In Zones 1 and 2, certain land uses and activities are prohibited, as noted in Redmond Zoning Code 21.64.050.

If a project area includes portions that are in more than one Wellhead Protection Zone, then the Stormwater Engineer will assess, using criteria found in RZC 21.64.050.d.2, whether any portion of the site may be considered to be in the Wellhead Protection Zone with fewer restrictions.

Otherwise, the whole site shall be considered to be within the Wellhead Protection Zone with more restrictions.

Stormwater systems for new development and redevelopment projects in Zones 1, 2, and 3 shall address the following:

- 1. During construction, if construction vehicles will be refueled onsite and/or the quantity of hazardous materials that will be stored, dispensed, used, or handled on the construction site is in aggregate quantities equal to or greater than 20 gallons liquid or 200 pounds solid, exclusive of the quantity of hazardous materials contained in fuel or fluid reservoirs of construction vehicles, the City may require any or all of the items listed in the Redmond Zoning Code 21.64.050.D. Generally, the following items will be required in writing as part of the TESC Plan:
 - a. Monitoring plan.
 - b. Designated project contact.
 - c. Secondary containment.
 - d. Provisions to secure hazardous materials.
 - e. Response to leaking vehicles and equipment.
 - f. Practices and procedures regarding transfer of flammable and combustible liquids.
 - g. On-site cleanup materials (materials are to be listed in the TESC Plan) and other containment and cleanup provisions. All hazardous material releases shall be contained, cleaned up, and reported.
- 2. The Drainage Report required for projects shall include a section describing how each of the items above has been addressed in the plans for the proposed project.
- 3. Infiltration for flow control or water quality treatment is limited within Wellhead Protection Zones. See Chapter 2 for more information.

The City's Wellhead Protection Program regulates stormwater infiltration systems. A stormwater infiltration system is a stormwater facility that infiltrates stormwater for flow control or treatment. Stormwater facilities that have an incidental amount of infiltration are not considered infiltration facilities, and are therefore not regulated by the Wellhead Protection Program or restricted within Wellhead Protection Zones. Stormwater facilities that are not designed to infiltrate stormwater should be lined or constructed to prevent such infiltration, where appropriate.

8.4 Conveyance System Design

8.4.1 Guidance Documents

For basic conveyance system design in Redmond use the latest edition of the Washington State Department of Transportation (WSDOT) "Hydraulics Manual" (M23-03). The manual is available from WSDOT's website at www.wsdot.wa.gov/publications/manuals/m23-03.htm.

Note that the 2005 Ecology Manual shall be used for detention sizing and stormwater treatment requirements.

For computation of hydraulic grade lines in Redmond use one of the following models:

- 1. King County Surface Water Management Backwater Analysis Program
- 2. PCSWMM by Computational Hydraulics
- 3. StormCad by Haestad Methods
- 4. Mouse by DHI Software
- 5. Equivalent model approved by the Stormwater Engineer

8.4.2 Pipe Sizing

Pipe sizing analysis shall be for the 10-year fully-developed, peak flow unless otherwise specified.

If a stormwater detention or water quality facility lies downstream of the conveyance system, that conveyance system shall be sized to convey the peak flow to the facility (i.e., a pipe draining to a pond that detains or treats the 50-year developed flow must convey the 50-year developed flow).

If a culvert (pipe section that passes under a road with an open channel at each end) conveys water under and across a City right-of-way, at a minimum the design shall be for the 25-year fully-developed peak flow.

Stormwater shall be managed such that the 50-year frequency event does not flood proposed buildings, any existing on-site buildings, or other existing buildings on contiguous parcels. Required conveyance standards may be adjusted by the Stormwater Engineer based on site and downstream conditions.

For public stormwater pipe, the minimum size shall be 12-inches. For private stormwater pipe, the minimum size shall be 6-inches. To accommodate special installation scenarios, smaller pipe may be used with Stormwater Engineer approval.

8.4.3 Catch Basin and Manhole Freeboard

Pipe systems shall be designed such that the following freeboard requirements are met at catch basins and manholes:

Table 8.1 - Catch Basin and Manhole Freeboard			
Design Storm	Freeboard		
10-year	12 inches		
25-year	6 inches		
50-year	0 inches (no overtopping)		

8.4.4 Horizontal Clearance and Crossing Angle

The minimum horizontal spacing between closed storm drains and water mains, gas mains, other underground utility facilities, and all structures shall be five feet (5') horizontally. The minimum horizontal distance between any open storm drainage facilities (swales, open channels, biofiltration swales, etc.) and water mains, gas mains, and other underground facilities shall be 10 feet.

For pipe crossings, the preferred angle is 90 degrees, but 20 degrees obtuse or acute of 90 degrees is acceptable.

8.4.5 Vertical Clearance - Utilities

The minimum vertical clearance spacing between the outside of storm drain pipelines and water mains, gas mains, electrical or communication conduits, and other underground utility facilities, shall be as noted in Table 8.2. It is expected that the "Standard" vertical clearance will be provided. If that is not possible, use of Ethafoam pads or pipe sleeves may be allowed with approval from the Stormwater Engineer.

Table 8.2 - Vertical Clearance – Utilities				
Utility	Location (Above or below Storm Pipe)	Minimum Clearance	Special Requirement	
Electrical	Above or below	12 inches	Standard	
Communications	Above or below	12 inches	Standard	
Water main or gas main	Above or below	12 inches	Standard	
Water main or gas main	Above or below	6 inches	Ethafoam pad	
Sanitary Sewer	Below storm pipe	12 inches	Standard	
Sanitary Sewer	Above storm pipe	18 inches	Standard	
Sanitary Sewer	Above or below storm pipe	6 inches	Pipe sleeve and Ethafoam pad	
Liquid petroleum	Above or below	See Stormwater Engineer		

An Ethafoam pad is required for some installations to provide additional protection between adjacent utilities. The size of the pad shall be based on the outside diameter (O.D.) of the larger crossing pipe. The pad shall be O.D. by O.D. square by 2.5 inches thick minimum or as required to protect the pipes. The pad shall be a strong, resilient, medium-density, closed-cell, polyethylene foam plank (Dow Ethafoam 220, or accepted equivalent.)

A pipe sleeve is required for some installations to provide additional protection of stormwater from potential leakage from other utilities. A pipe sleeve shall be a single section of PVC pipe (no joints) with a minimum length of 3 feet to each side of pipe crossing. The pipe sleeve shall be placed around the stormwater pipe with the annular space between the pipe sleeve and the stormwater pipe filled with grout.

Additional measures may be necessary to ensure system integrity and may be required as determined by the Stormwater Engineer on a case-by-case basis.

8.4.6 Minimum Cover

The standard minimum cover over storm drainage lines is dependent on the pipe material. The Redmond Design Standards and Specifications outline cover requirements. The minimum cover over yard drain lines is 18 inches.

8.4.7 Unstable Soils

Unstable soil conditions, such as peat, shall be removed from under pipes unless special measures are approved by the Stormwater Engineer.

8.4.8 Maximum and Minimum Slopes

Maximum slope on storm drain lines is 20%, unless approved by the Stormwater Engineer. Minimum slope on storm drain lines is 0.25%, unless approved by the Stormwater Engineer.

8.4.9 Stream Culverts

Stream culverts shall be designed to have natural bottom conditions, with 1/3 of the pipe diameter buried. Culverts used for stream conveyance shall be a minimum of 24 inches in diameter. Bridges shall be the first choice for stream crossings. More information can be found in the Redmond Zoning Code 21.64.

8.4.10 Conveyance System Emergency Overflow

Sites shall be designed to prevent flooding of inhabitable buildings in the 100-year, 24-hour storm as determined by the Rational Method. The Stormwater Engineer may require this analysis as part of the design submittal.

8.4.11 Trees

Trees shall not be located within 8 feet horizontally from storm drain pipe unless root barriers are provided as approved by the Stormwater Engineer. With root barriers, trees may be no closer than 3 feet to pipes unless approved by the stormwater engineer.

8.4.12 Pump System Requirements

Pumping stormwater is the method of last resort. When no other alternatives are feasible, pump systems may be considered provided they meet the following:

- Pump: 10-year peak flow rate as calculated by the rational method
- Backup Pump
- Alternative Power Source (Emergency Generator)
- Auto-Transfer Switch Disconnecting Generator from Public Grid. Auto-Start Required.
- Audio Alarm for High Water/Pump Failure
- 3-Hour Flow Storage Volume (may be combined with water quality treatment)

In addition to these requirements, a note shall be placed on the plat or title that says, "Property owner is responsible for operation of the stormwater pump, and for any damages to offsite property if the pump fails to transfer stormwater as designed."

8.4.13 Underdrains

Underdrains shall be a minimum of 6" diameter perforated PVC per WSDOT Standard Specification 9-05.2(6). All underdrains shall have cleanouts every 75 feet, or at a minimum at all bends in the underdrain system.

8.5 Catch Basin and Manhole Requirements

8.5.1 Structure Materials

The City of Redmond Standard Specifications and Details describes structure material requirements.

8.5.2 Structure Spacing

Space catch basins in accordance with best engineering practice and the WSDOT Hydraulics Manual. To accommodate maintenance of the pipes, a manhole or catch basin (structure) shall be placed periodically with the following maximum spacing:

- 200 feet for pipes less than 12 inch or with design velocities less than 3 feet per second (fps); otherwise,
- 300 feet for pipes less than 30 inch diameter with design velocities greater than 3 fps; or,
- 400 feet for pipes equal or greater than 30 inch but less than 42 inch diameter with design velocities greater than 3 fps; or,
- 600 feet for pipes of 42 inch diameter or larger with design velocities greater than 3 fps;
 or.
- 600 feet for tight lines down steep slopes.

Structures shall be installed at the end of all dead end mainlines, at horizontal or vertical pipe bends, at changes in pipe size or material, and at pipe junctions for access.

8.5.3 Pipe Connections

Inlet pipe crowns shall not be lower than outlet pipe crowns unless specifically waived by the Stormwater Engineer. Pipe connections shall be water-tight.

8.5.4 Spill Prevention Device

Multifamily, commercial, and industrial properties shall include at a minimum a spill prevention device at the last structure on the property before connecting to the public stormwater system. The minimum requirement for a spill prevention device is a downturned elbow, removable for maintenance, located on the outlet pipe leaving a type 2 catch basin. Depending on the uses on the site, the Stormwater Engineer may require additional measures of protection.

8.5.5. Knockouts

Knockouts shall be provided in structures where future extensions are anticipated. These shall be shown on the plans.

8.5.6 Drop Structures

Drop structures shall only be allowed where approved by the Stormwater Engineer. Generally, drop structures will not be approved if the drop is less than 5 feet.

8.5.7 Lot and Area Drains

Lot drains or area drains in excess of 2 feet deep and up to 5 feet deep shall be Type I catch basins. Area drains exceeding 5 feet deep shall be Type 2 catch basins with bolt-down lids.

8.5.8 Through-Curb Inlet Frames

Through-curb inlet frames shall be specified on plans at sag points, at any inlet where by-passing runoff would escape the intended control system and at every third inlet on a continuous run along a continuous slope. Through-curb inlet frames may be used at all points except at proposed or likely driveway locations.

8.6 Site Design

8.6.1 Flood Protection

All parts of any structure constructed below the 100-year flood elevation of associated waterways shall be protected from flooding using floodproofing.

Floodproof to the 100-year elevation plus 1 foot. Floodproofing shall conform to Federal Emergency Management Agency standards in effect at project vesting.

Projects planning work within Flood Control Zones shall submit a Flood Control Zone Application (Appendix E).

8.6.2 Impervious Area for Single Family Residential Plats and Short Plats

Projects creating lots for single-family houses (residential plat and short plat projects) shall provide drainage systems for all lots. The drainage systems shall address runoff quantity and quality.

8.6.3 Drainage Connections for All Lots

All types of plats and short plats (residential, commercial, industrial, and others) shall provide for drainage connections on each lot, unless otherwise approved by the Stormwater Engineer. (Low impact development measures may make the use of lot connections unnecessary.)

Drainage connection points are to be located at the low elevation point of the allowable building area of each lot. The connections must be below finished grade so as to allow connection of footing drains, roof drain leaders, and other drains.

Providing for drainage connections typically means providing a piped system from the drainage connection points described above to the drainage system in the plat or short plat. A maximum of three (3) lots may be connected to a common private collection pipe. Multiple collection pipes may be used.

In some cases it may be acceptable to include only the plan for the lot drainage connections as part of the City-approved drainage plan for the plat or short plat and defer construction until building construction on the lots.

Infiltration of runoff can reduce hydrologic impacts and water quality impacts and maintain groundwater supplies. Infiltration is generally acceptable where soils and geology are suitable. Infiltration of runoff from pollution generating impervious surfaces is limited based on Wellhead Protection Zones. See Chapter 2 of the Stormwater Notebook. Percolation tests are required at all proposed infiltration locations.

In all cases, appropriate easements must be provided, as part of the plat or short plat, for the specific drainage systems shown on the construction documents. Those documents shall also show anticipated grading, rockeries, retaining walls, etc. Construction of the lot drainage connection systems must be feasible and allow connection to the proposed plat improvements or to the documented infiltration areas. The minimum private easement width is 5 feet.

8.6.4 Single Family Roof and Foundation Drain Requirements

Size and Connection: Roof drain/foundation drain connection from the house, when required based on Figure 3.1 of Volume III of the 2005 Ecology Manual, shall be 6-inch diameter and shall be extended to a storm drain structure (not connected directly to a stormwater pipe). Foundation drains shall be separate from roof drains around the building foundation. Pipes shall be smooth wall, rigid type (sewer grade). Pipes shall not be corrugated polyethylene (such as flexible ADS). Roof and footing drain connection stubs shall be at least one 1 foot below the lowest existing elevation of the building envelope on all newly-created lots, unless a different elevation is approved or required by the Stormwater Engineer. The minimum cover over yard drain lines is 18 inches. For subdivisions, no more than three (3) roof drain stubs are allowed on a single roof drain collection pipe.

Building Footings: Building footings shall be designed, or pipe located, such that the footing shall not bear on the pipe.

8.6.5 Separation of Systems Serving Separate Owners

Stormwater facilities provided to control quantity and quality generally should be provided within the site they are serving although certain exceptions are acceptable.

Facilities for single family plats may be located in common areas (even in public roads that are created by the plat or short plat).

Water quantity and quality controls provided for the private part of a project shall be separate from water quantity and quality controls for public impervious surfaces that are part of the project. Individual lots within single family plats and short plats with public road improvements may drain to the public water quantity and quality control systems constructed to serve the development.

In some circumstances, water quantity and quality control requirements for the proposed impermeable areas may be met by adding such control(s) to equivalent existing developed areas of the site, which do not already have such controls.

8.6.6 Grading

The maximum ground slope on graded surfaces is 3 horizontal to 1 vertical (3:1) except as approved in association with roadway section in City rights-of-way where the maximum ground slope may be up to 2:1.

Proposed contours shall not create undrained, ponding areas where such areas would not be appropriate (onsite or offsite).

8.6.7 Rockeries/Retaining Walls

Rockeries or retaining walls should not cross or be near storm-drain pipes. Any crossing of a wall shall be perpendicular to the wall and special construction techniques including steel casings may be required.

Rockeries under 4 feet are not regulated. Rockeries over 4 feet shall only be used against cut slopes.

Rockeries and retaining walls shall have foundation drains (6 inches in diameter of approved materials) behind the wall connected to a defined conveyance system. Rockeries 48 inches and taller and retaining walls must be designed by a structural or geotechnical engineer. No retaining structure may be higher than 8 feet (unless a relief from general design standards is obtained). Structural retaining walls over 4 feet in height are reviewed and permitted by the Building Department following UBC Section 106.2.

8.6.8 Public Easements

Where public storm drain line easements are necessary, they shall be 20 feet in width. Easement widths of less than 20 feet may be considered by the Stormwater Engineer, in special situations, but shall not be less than 15 feet in width.

Publicly maintained water quality and detention facilities shall be located in tracts dedicated to the City. The size of the tract shall be based on the size of the stormwater facility. At a minimum, the tract shall include the entire facility, site access area, and at least 5 feet around the facility. In limited cases an easement may be permitted. If an easement is permitted, dimensions shall be determined by the Stormwater Engineer.

In cases where pipes and/or other facilities are deeper than 8 feet or have other special conditions, larger tracts or easements may be required.

All easements needed for City stormwater systems shall be provided by the developer in the name of the City. The required easements shall be shown on the construction drawings and the easement legal description or plat markup shall be submitted for review at the same time construction drawings are submitted for review.

Easements shall have language acceptable to the City, similar to the example in Appendix H.

An alternative to separately recording a City of Redmond easement form is to record an easement on the face of a plat. If this is the method used, a standard City of Redmond easement statement shall be included in the plat documents.

Buildings, structures, garages, carports, dumpster enclosures, decks, rockeries over 4 feet, etc., shall not be located in easement areas.

8.6.9 Stormwater Facilities

8.6.9.1 Maintenance Access

Unless specifically waived by the Stormwater Engineer, all stormwater facilities shall be accessible to maintenance vehicles. The Operations & Maintenance manual for the facility shall identify the equipment and access required for maintenance. Vactor access is required to all entries to vaults, flow splitters, and control structures. Vactor access to other manholes and catch basins is preferred unless provisions are made for alternative maintenance methods. Large ponds, stormwater treatment wetlands, sand filters, etc., need access for a track hoe that includes a stabilized ramp into the facility to allow for cleaning and equipment access to the entire facility. Smaller facilities may be allowed to eliminate the ramp if provisions for access are spelled out in the Operations & Maintenance manual. Smaller facilities like rain gardens or biofiltration swales need a work area adjacent to the facility to support maintenance activities.

For facilities that require Vactor maintenance, the preferred configuration is to have the Vactor truck approach a structure opening with the front of the vehicle with limited maneuvering required from the nearby street. Acceptable access includes an improved roadway surface within 10 feet of a manhole with overhead clearance to 20 feet to allow for boom operation. Materials for construction of an improved roadway surface may include asphalt concrete, cement concrete, structurally stabilized vegetated surface, crushed surfacing, or other surfacing as approved by the Stormwater Engineer. Maintenance access roads shall be designed with 40 foot inside radius on curves, with slopes less than 15% and with widths as determined by the Stormwater Engineer (but not less than 10 feet).

The Stormwater Engineer may require maintenance access roads to be located in separate tracts. Facilities that must be located on steep slopes shall be designed to minimize any requirements for maintenance access. A plan for accessing such facilities with Vactor flex hose or measures to minimize required maintenance shall be identified in the Operations & Maintenance manual.

Outlet control valves shall be detailed so as to be operable from the surface (not subject to confined space entry requirements) unless approved otherwise by the Stormwater Engineer. The specific detail for these valves depends on the type of valve and shall be subject to approval by the Stormwater Engineer. Gravity-flow draw-down systems (for ponds, vaults, etc.) shall be provided with an outlet control valve.

8.6.9.2 Facility Maintenance

Provision shall be made for long-term maintenance of water quality and detention facilities.

8.6.10 Transfer of Assets to the Public

When projects include construction of improvements that will be turned over to the public, a Public Utility & Stormwater Facilities Bill of Sale Form (Appendix F) and a Developer Extension Asset Summary (Appendix G) shall be completed and submitted to the Development Services Division of Public Works.

8.7 Low Impact Development (LID)

8.7.1 LID Overview

Low impact development (LID) is a stormwater management and land development strategy applied at the parcel and subdivision scale that emphasizes conservation and use of on-site natural features integrated with engineered, small-scale hydrologic controls to more closely mimic predevelopment hydrologic functions and provide runoff treatment. Implementation of LID benefits streams, lakes, and Puget Sound by moderating the impacts of stormwater runoff generated by the built environment. These techniques may be accessory or alternative to traditional, structural stormwater management solutions. Information on the scope, benefit, and applicability of LID can be found in the Low Impact Development Technical Guidance Manual prepared by the Puget Sound Action Team and Washington State University, Pierce County Extension.

Use of LID is one way to implement the following Comprehensive Plan policies:

- <u>NE-9:</u> Encourage environmentally friendly construction practices such as the build green program and low impact development.
- <u>NE-10:</u> Encourage projects which utilize alternative technologies, engineering, and plans which emphasize Low Impact Development strategies through incentives and flexibility in application of regulatory requirements.

8.7.2 Intent of LID

The City encourages the use of LID techniques, including techniques for stormwater management.

These goals are to:

- Maintain or restore the pre-developed condition surface water flow volumes, durations and frequencies;
- Retain or restore native forest cover to capture, infiltrate and evaporate all or a portion of the rainfall on the site;
- Cluster development and minimize land disturbance;
- Preserve or restore the health and water-holding capacity of soils;
- Incorporate natural site features that promote infiltration of stormwater;
- Minimize total impervious surfaces and effective impervious surfaces;
- Reduce or eliminate piped stormwater conveyance and conventional detention ponds;

- Manage stormwater through infiltration, bioretention, and dispersion; and
- Manage stormwater runoff as close to its origin as possible.

8.7.3 Land Use

LID is not merely the use of specific stormwater management facilities, but is an approach to land development that integrates with and responds to the natural conditions of a site. A low impact development should strive to minimize the impact of development on the pre-developed hydrologic condition. From a land use perspective, this is accomplished by minimizing the development envelope and minimizing impervious surfaces.

8.7.3.1 Minimize Development Envelope

Minimizing the development envelope means confining lots and land uses to confine development and activity areas to the smallest impact area. While the City's development standards are generally designed for conventional development that consumes most or all of a development site with buildings, infrastructure and activity areas, the Redmond Zoning Code provides several mechanisms to focus development on a site. Residential clustering can be accomplished through the clustering provisions of RZC 21.08, in particular, the Green Building and Green Infrastructure Incentive Program in RZC 21.08.330.

8.7.3.2 Retain Areas of Native Vegetation

Minimizing the development envelope allows retention of a portion of the site in its natural or pre-developed state. In addition to offering an aesthetic amenity and opportunities for passive recreation, preservation of natural open spaces provides areas for dispersion of stormwater generated on the developed portion of the site. The extent to which dispersion to a natural area may be allowed depends on the size of the preserved area relative to the tributary area as well as underlying soil types. Where native forest is preserved or restored to disturbed areas, a portion of the rain that falls on the site will be intercepted and evaporated or absorbed. While preservation of significant natural areas is a challenge in urban areas, conservation of existing habitat is a key element of LID. LID projects should preserve or re-establish a minimum of 35 percent of the overall site area in native vegetation. (This 35 percent does not include any critical areas that are already required to be set aside.) Areas retained as native open space are most effective for dispersion when located downslope of proposed development areas.

8.7.3.3 Preserve Native Soils

In addition to retention of areas of native vegetation, preservation of native soils is an important aspect of low impact development. Native soils have a significantly higher capacity to absorb, retain and transmit water than soils remaining on a site following conventional development. Commonly, native soils are graded and removed from development sites. In the process, the underlying soils are significantly compressed, resulting in a reduction in the ability of the soils to absorb water from the surface.

Prior to any clearing or grading, areas of the site more conducive to infiltration should be identified (see Site Assessment below), and site design should preserve such areas. Ground

disturbance should be limited to road, utility, building pad, landscape areas, and the minimum additional area needed to maneuver equipment. A 10 foot perimeter around the building site can provide adequate work space for most activities. The number and extent of construction access roads should be limited and located where future roads and utility corridors will be placed. Where prior clearing or grading has occurred, soils should be restored according to the requirements in the City of Redmond Standard Specifications, Section 9.14, in all areas except where impervious surfaces are proposed.

8.7.3.4 Compost Amendment of Soils

Compost amendment of soils shall be in accordance with Redmond Standard Specifications and Details, Section 9.4, for disturbed areas of development that will not be impervious surfaces post construction. Amending soils may be a more viable alternative to preservation of native soils for some sites, and can realize many of the same benefits.

8.7.3.5 Minimize Impervious Surfaces

Minimizing the development envelope may also limit the extent of new roadways and other impervious surfaces. Limiting impervious surfaces is a primary emphasis of low impact development. Impervious surfaces can be minimized by limiting vehicular and pedestrian infrastructure (e.g., roads, driveways, parking areas, and sidewalks), to the minimum functional needs of the facilities. Redmond Zoning Code provides opportunities for modifying street standards through RZC 21.08.330 (Green Building and Green Infrastructure Incentive Program). The Rustic Street Standards in Appendix 2 of the RZC, while not applicable to all areas or all roadway use conditions, represent a good template for LID road design. LID techniques to minimize impervious surface area also include the use of various pervious paving materials, minimal excavation foundations, and green roofs. These alternatives to conventional development techniques decrease the effective impact of new surfaces and buildings on the pre-developed conditions.

8.7.4 LID BMPs

To achieve the intent of LID, stormwater should be managed on-site to the greatest extent possible.

8.7.4.1 LID BMPs

The following onsite BMPs, subject to modifications within this Stormwater Notebook or requirements in the Redmond Municipal Code, should be considered:

- Permeable pavements;
- Dispersion;
- Vegetated rooftops;
- Rainwater harvesting;
- Reverse slope sidewalks;
- Minimal excavation foundations; and
- Bioretention.

Descriptions of these BMPs, along with design criteria, maintenance standards, and modeling guidance, can be found in Appendix F of Volume III of the 2005 Ecology Manual.

Other BMPs may be considered for use by the Technical Committee, provided that the committee finds that there is reasonable scientific justification that such BMPs will provide equal or better flow control and water quality results, and that long-term performance is assured.

8.7.4.2 Treatment BMPs

The only LID BMPs that may be approved for water quality treatment are:

- Dispersion, when consistent with DOE BMP T5.30; and
- Bioretention, when consistent with the design criteria in the Ecology Manual. Any stormwater that infiltrates through designed bioretention soil mix shall be considered to have received the equivalent of Enhanced Treatment.

8.7.4.3 LID in Wellhead Protection Zones

Refer to Section 8.3 for limitations or constraints for infiltration from pollution generating impervious surfaces in Wellhead Protection Zones.

Infiltration of runoff from pollution generating surfaces is limited in Wellhead Protection Zones 1 and 2. Infiltration of clean water from roofs and sidewalks is encouraged throughout the City subject to site constraints.

8.7.5 Site Assessment for LID

All large projects are required to submit a site assessment for LID. If infiltration and/or dispersion are not feasible options, the applicant shall provide justification to demonstrate why.

Unless waived or modified by the City Engineer, all requests to use LID BMPs to achieve conformance with the City's stormwater regulations shall require a site assessment. This initial inventory and assessment process will provide the baseline information necessary to design strategies that preserve natural resources, preserve areas most appropriate to evaporate, transpire, and infiltrate stormwater, and help to achieve the goal of maintaining predevelopment natural hydrologic conditions on the site. The assessment should result in a series of maps identifying streams, lakes, wetlands, buffers, steep slopes and other hazard areas and hydrologic features, significant wildlife habitat areas, and permeable soils offering the best available infiltration potential. Maps can be combined as hard copies or in electronic mapping formats to delineate the best areas to direct development.

The site assessment shall be a component of the project submittal. At a minimum, the site assessment shall include the following:

 A survey prepared by a registered land surveyor showing existing public and private development, including utility infrastructure, on and adjacent to the site, major and minor hydrologic features, including seeps, springs, closed depression areas, drainage swales, and 2 foot contours up to 10 percent slope and 5 foot contours for slopes above 10 percent. Spot elevations shall be at 25 foot intervals.

- 2. Location of all existing lot lines, lease areas and easements.
- 3. A soils report prepared by a licensed geotechnical engineer or licensed engineering geologist. The report shall identify:
 - Underlying soils on the site utilizing soil pits and soil grain analysis to assess infiltration capability on site. The frequency and distribution of test pits shall be adequate to direct placement of the roads and structures away from soils that can most effectively infiltrate stormwater;
 - b. Percolation tests if appropriate or requested by the Stormwater Engineer;
 - Topographic and geologic features that may act as natural stormwater storage or conveyance and underlying soils that provide opportunities for storage and partial infiltration;
 - d. Depth to wet season high groundwater;
 - e. Geologic hazard areas and associated buffer requirements as defined in RZC 21.64.060;
 - f. Distance from site boundaries to any areas within 200 feet of the site identified as landslide hazard areas or having a slope of 40 percent or steeper with a vertical relief of 10 feet or more; [Note: the City may require the applicant to expand the 200 feet to encompass a larger area if there are concerns for downstream geological hazards.]
 - g. Identification of Wellhead Protection Zone(s); and
 - h. For previously cleared or graded sites, analysis of topsoil according to the soil requirements in the City of Redmond Standard Specifications, Section 9.14.1.
- 4. A survey of existing native vegetation cover and wildlife habitat by a qualified biologist identifying any forest areas on the site, species and condition of ground cover and shrub layer, and tree species, seral stage, and canopy cover.
- 5. A streams, wetland, and water body survey and classification report by a qualified biologist showing wetland and buffer boundaries consistent with the requirements of RZC 21.64.030 and Critical Areas Reporting Requirements (RZC Appendix 1).
- 6. Flood hazard areas on or adjacent to the site.
- 7. A preliminary drainage report providing analysis of the existing site hydrologic conditions on the site and recommendations for type, location, and restrictions on LID BMPs.
- 8. Other studies as deemed necessary by the Stormwater Engineer.

Applicants for LID projects should meet with engineering and planning staff following completion of the site assessment and prior to site design. Staff will provide feedback on additional analysis that may be required, preliminary recommendations on meeting the City's stormwater regulations and options for low impact options for site design. It is recommended that applicants consult the Low Impact Development Technical Guidance Manual for additional information on LID site planning, site preparation, and BMPs.

8.7.6 Maintenance

All BMPs, impervious surface area restrictions, maintenance agreements, preserved native areas and any other requirements or restrictions imposed as conditions of approval under this chapter shall be recorded as covenants, deed restrictions, easements, or other legally binding limitations and commitments in a form approved by the City. Easements or rights of access shall be provided to the City to allow inspection, maintenance and repair, as necessary, to ensure that approved drainage systems are preserved and maintained according to the conditions of approval. BMPs approved on private property under the provisions of this chapter shall remain the responsibility of the person or persons holding title to the property, their heirs and assigns.

Native forest or other natural areas preserved or established as part of a dispersion BMP approved under the provisions of this chapter shall require, as a permit condition, that the native forest area tract or tracts be protected in accordance with the requirements set forth for general critical area protective measures in RZC 21.64.

8.7.7 Evaluation and Monitoring

The Stormwater Engineer may require implementation of a monitoring and evaluation program designed to measure the performance of the drainage system or specific elements that are approved for a project under the provisions of this chapter.

8.8 Regional Facilities Program

As a part of the City's coordinated, regional approach to managing stormwater City-wide, some projects will have the requirement or option of contributing a fee, in lieu of building site-specific facilities for flow control or runoff treatment. The fee shall be used toward construction of regional stormwater facilities. The City has responsibility for ensuring that:

- Potential impacts from all new development or redevelopment within the City are addressed in a manner that meets the City's obligations on a watershed basis to protect water quality and prevent erosion of streams.
- Funds received for construction of regional facilities are used for that purpose.

To meet these responsibilities, the City's program, administered by the Natural Resources Division of the Public Works Department, includes procedures for:

- coordinating with the Development Services Division's review of development and redevelopment projects;
- determining what projects are eligible for "fee in lieu";
- accounting for areas that have been treated by existing regional facilities;
- accounting for funds that have been received for construction of new regional facilities;
 and.
- locating, designing, and constructing regional facilities.

With the exception of downtown, for new development projects (Section 2.4.2), regional facilities must be operational to be eligible for "fee-in-lieu". Redevelopment projects (Section

2.4.1) are eligible if associated regional facilities are operational or are on the City's Six-year Stormwater Capital Improvement Plan.

To be eligible for "fee-in-lieu", project areas must drain to the applicable regional facility. For public road projects, the project area must drain to the same receiving water as the existing or proposed regional facility.

A project's participation in the Regional Facilities Program is dependent upon where the site is located. Appendix L shows a map of the City's proposed regional facilities and also the City's Regional Facilities Surcharge Areas. Applicants should review the maps to determine if sites fall within regional surcharge areas, and then use the appropriate flow charts below to determine site requirements related to this program.

8.8.1 Downtown

Projects located within the Downtown surcharge area are subject to the Downtown sub-basin stormwater capital facilities charge, per RMC 13.20.045. As described within the RMC, sites located next to the Sammamish River may be eligible to opt out of the regional facilities program with approval of the Technical Committee.

Projects may be required to construct some offsite stormwater improvements such as connecting the pipe into the stormwater system or upsizing existing pipes within the system to prevent downstream flooding. Sites may also be required to construct improvements onsite to meet Minimum Requirement #5.

The City's Downtown Facilities Map, shown in Appendix P, identifies planned offsite improvements that may be required of the applicant, depending on the location and scope of the proposed development. The required offsite improvements should be discussed with the Stormwater Engineer early in the planning process. Downstream analysis using the City's model may be required of the applicant.

8.8.2 Overlake

Projects located within the Overlake surcharge area are subject to the Overlake sub-basin stormwater capital facilities charge, per RMC 13.20.047.

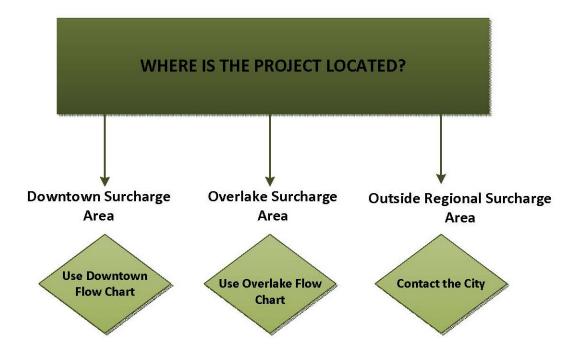
Sites located south of the location of the proposed NE 26th Street are required to construct onsite treatment for all pollution generating surfaces.

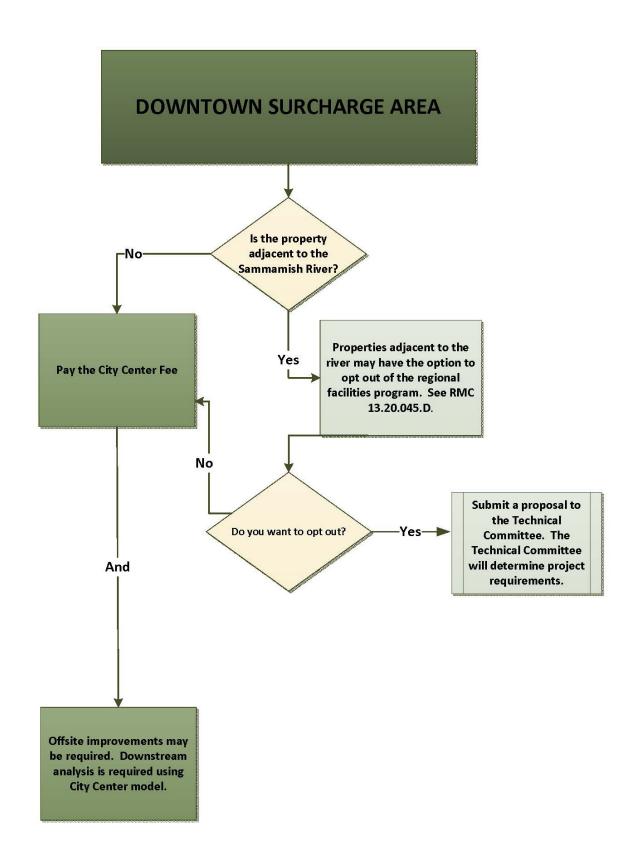
New development (Section 2.4.1) projects are required to construct interim treatment and/or flow control facilities if regional facilities meeting those requirements have not yet been constructed. (The City doesn't believe there are any sites in Overlake that would be classified as "new development").

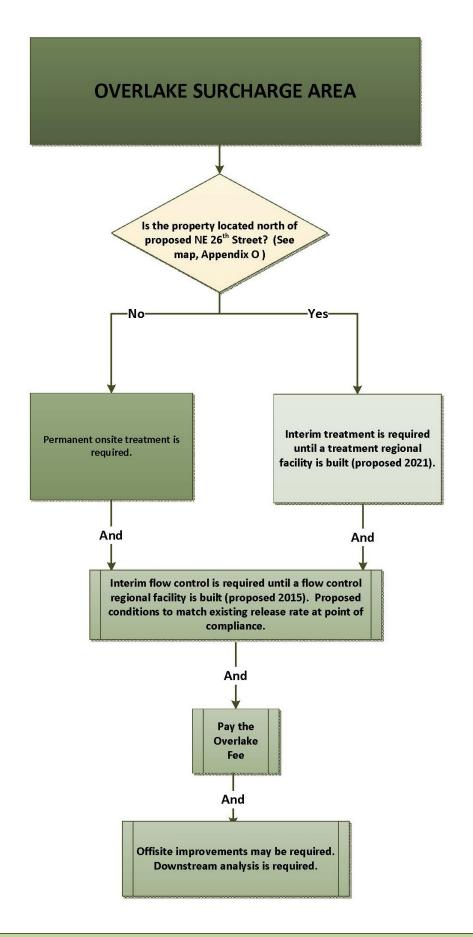
Applicants may also be required to construct improvements onsite to meet Minimum Requirement #5. The City's Overlake Facilities Plan, shown in Appendix O, identifies planned offsite improvements that may be required of the applicant, depending on the location and

scope of the proposed development. The required offsite improvements should be discussed early in the planning process. Downstream analysis using the City's model may be required of the applicant.

REGIONAL FACILITIES PROGRAM







8.8.3 Outside Regional Surcharge Areas

Projects that are not located within the Downtown or Overlake surcharge areas may have the option of negotiating with the City to participate in construction of a regional facility (or use of an existing regional facility) to meet their stormwater requirements. This is effectively a public/private partnership to facilitate private development and public retrofitting of stormwater management. A proposal describing the project will be reviewed by the City to determine if the project may be eligible.

This proposal must include:

- Full drainage report
- Downstream analysis
- Discussion of cumulative impacts
- Proposed fee
- Summary of offsite improvements
- Identified location for regional facility
- Summary of benefits to the City

Due to the large amount of City resources required to accommodate such a request, most sites that lie outside the designated regional surcharge areas are not eligible to participate in this program. Contact the Natural Resources Division for further information.

8.9 Other Development Topics

8.9.1 Internal Building Changes as Redevelopment

Redevelopment projects that are confined to existing interior spaces shall not require new drainage controls (except those drainage systems described above as may be required by the City for proper drainage).

If redevelopment projects include any work involving the exterior part of the site, the project shall be subject to redevelopment requirements under this Stormwater Notebook. Where exterior work occurs, the value of the interior work shall be included in determining the extent of exterior redevelopment requirements.

8.9.2 Site Improvements Involving Hazardous Materials

Site improvements to existing facilities that would otherwise not be subject to stormwater system improvement but involve hazardous materials shall meet the water quality requirements of this Stormwater Notebook, Redmond Municipal Code (RMC) 15.24, RMC 15.06 and RZC 21.64.050. There are also specific source control BMPs in Volume IV of the Ecology Manual.

8.9.3 Dumpster Area Stormwater Drainage

Dumpster areas are classified into one of three (3) groups. Generally, as an introduction, Group 1 is for small containers (not over 1.5 cubic yards) and single family sites, Group 2 is for all other sites that are not listed in Table 8.3, and Group 3 is for all sites involving uses listed in Table 8.3.

Quite often, the land uses at a site change over time. A development may initially have a Group 1 or Group 2 dumpster area. At a later time, if this site's land use changes and a Group 3 dumpster area becomes appropriate, the City may require an upgrade to the Group 3 specifications. For existing developments which need to add dumpster areas, these guidelines generally apply, but requirements may be adjusted or alternatives accepted by the Stormwater Engineer based on the particular characteristics of the existing situation. If compactors are used, the dumpster area is in Group 2 or Group 3 regardless of dumpster capacity. A dumpster area may contain more than one cart or dumpster. To be considered separate areas two (2) dumpster areas need to be separated by at least 25 feet.

8.9.3.1 Group 1: Single Family Parcels and Dumpster Areas having Total Dumpster Capacity not over 1.5 Cubic Yards

Group 1 Dumpster Areas include:

- 1. All dumpster areas where the volume of the container(s) does not exceed 1.5 cubic yards and compactors are not used.
- 2. All dumpster areas in single family lots except where certain on-site businesses are conducted. For single-family lots where on-site businesses create additional pollutant potentials in the dumpster area, the dumpster areas may be assigned to Group 2 or Group 3 by the Stormwater Engineer.

No special requirements apply to Group 1 dumpster areas.

8.9.3.2 Group 2: Dumpster Areas having Capacities Over 1.5 Cubic Yards and Uses Not Listed in Table 8.3

Group 2 dumpster areas include areas where the capacity of the dumpster(s) exceed 1.5 cubic yards or dumpsters have compactors and site uses are not included in Table 8.3.

For Group 2 dumpster areas, special requirements apply. Surface drainage from dumpster areas may be connected to the storm drainage system, provided:

- 1. Dumpster areas are sloped to drain out onto paved, impervious surfaces (such as parking lots).
- 2. No storm drain inlets are located in the dumpster area.
- 3. Runoff from the dumpster area flows over the paved surface at least 15 feet prior to entering a catch basin.
- 4. Catch basins receiving runoff from dumpster areas are Type II, 48 inch diameter minimum, with a "tee" fitting providing floatables separation (and a cleanout port with gasketed cover) but no overflow standpipe.
- 5. Potential pollutants are not put in the dumpsters on any routine basis.

If pollutants are put in the dumpster on any routine basis, the City may require the dumpster area to meet the requirements for Group 3 dumpster areas.

8.9.3.3 Group 3: Dumpster Areas having Capacities Over 1.5 Cubic Yards and Uses Listed in Table 8.3

Group 3 dumpster locations include areas where the capacity of dumpster(s) exceeds 1.5 cubic yards or dumpsters have compactors and the site uses include any uses described in Table 8.3.

In Group 3 dumpster areas, surface drainage from the dumpster areas may be handled in one of two ways:

Preferred Alternative:

Surface drainage from dumpster areas may be connected to the sanitary sewer, provided:

- 1. The dumpster area is covered.
- 2. The surface drain from the dumpster area to the sanitary sewer is directed through a City-approved baffle-type oil/water separator.
- 3. Any issues are resolved with the Fire Department (they may require fire sprinklers) and the Planning Department (regarding aesthetic and site-planning issues).

Alternative if the Preferred Alternative is not feasible:

Surface drainage from dumpster areas may be connected to the storm drainage system, provided:

- 1. No storm drain inlet is located in the dumpster area.
- 2. Dumpster areas are sloped to drain out onto paved, impervious surfaces (such as parking lots).
- 3. Runoff from the dumpster area flows over the paved surface at least 15 feet prior to entering a catch basin.
- 4. Catch basin(s) receiving runoff from dumpster areas are Type I or Type II.
- 5. Storm drain pipe(s) from catch basins receiving dumpster area runoff convey the runoff through a baffle-type oil/water separator prior to connection to other parts of the storm drainage system. The flow rate for design of the separator shall be the sum of two rates. The first rate is the peak 50-year storm runoff in cubic feet per second that can enter the separator from contributing areas (Rational Method acceptable). The second rate is the capacity of the dumpster(s) in cubic feet, divided by 5 minutes (300 seconds) to yield cubic feet per second.
- 6. The storm drain pipes that carry flow from the catch basins receiving dumpster area runoff to the separator shall be gasketed pipe that meets the requirements for sanitary sewer pipe as noted in the City of Redmond Standard Details.

Table 8.3 - Dumpster Area Group 3 Land Uses

Dumpster areas are in Group 3 if they serve land uses that are normally associated with the following types of waste materials:

- Accumulated food wastes
- Vegetable or animal grease
- Used oil
- Liquid feedstock
- Cleaning chemicals
- Liquid or solid dangerous waste (as defined by the Department of Ecology under WAC Chapter 173-303). The Development Services Division may require special handling for any items on this list and not allow their discharge to the storm or sanitary sewer systems.

Additional guidance regarding applicable uses is contained in the 2005 Ecology Manual. The determination about a specific use in Redmond will be made by the City's Technical Committee.

Note that multi-family residential uses (including town homes), printing and publishing businesses, restaurants, gas stations, vehicle maintenance facilities, and dry cleaners are examples of common uses in Redmond that are typically included in Group 3.