

Table 1. Summary of Gap Analysis Findings

Code Review Category:	Overall LID Concept
Common Gaps:	Lack of a LID definition and qualifying elements for LIDs use in Tacoma
Identified Codes:	
12.08.560	SWMM Volume V, 5.1

Code Review Category:	Site Assessment
Common Gaps:	Current codes discourage LID flow and volume control measures. Current codes do not address importance of soil and vegetation conservation as it relates to LID

Identified Codes:	
13.08.040	SWMM Volume I, 2.6 SWMM Volume I, 2.7.2
	SWMM Volume I, 3.5.5 SWMM Volume I, 3.5.6 SWMM Volume I, 3.5.9

Code Review Category:	Site Planning and Layout
Common Gaps:	Current codes discourage: - minimization of total and effective imperviousness - use of open conveyance and infiltration - use of LID; special permitting requirements for LID techniques discourage its use Current codes lack: - flexibility in lot dimensional standards - landscape standards that encourage native vegetation retention

Identified Codes:		
2.02.380	13.06.510	PWDS, 1.030.F
13.04.110	13.06.502.A	PWDS, 1.040.R
13.04.170	13.06.502.A and B	PWDS, 3.060.A
13.04.190	13.06.510 Table 1	PWDS, 3.060.B
13.04.200	13.06.510 Table 2	PWDS, 4.010.A
13.04.260	13.06.510.3	PWDS, 4.020.A
13.06.105.A	13.06.512	PWDS, 4.020.C
13.06.105.C	13.06A.060	PWDS, 4.040 A&B
13.06.110.A	13.06A.070.D	PWDS, 4.040.C
13.06.110.C	13.06A.070.C	PWDS, 4.040.E
13.06.115.A	13.06A.080	PWDS, 4.040.F
13.06.115.E	13.06A.090	PWDS, 4.050.A
13.06.118.B	13.06A.100	PWDS, 4.050 C
13.06.118.D	13.09.070	PWDS, 4.060
13.06.120.C	PWDS, 1.030.A	PWDS, 4.060.A
13.06.125.C	PWDS, 1.030.F	PWDS, 4.060.B
13.06.130.C	PWDS, 1.030.D 117.2	PWDS, DR-06
13.06.140.C	PWDS, 1.030.D 117.3	PWDS, SU-03, SU-04
13.06.140.F	PWDS, 1.030.D 117.5.1	PWDS, SU-07
13.06.140.G	PWDS, 1.030.E	TCP DD-2

Code Review Category:	Construction Site Controls
Common Gaps:	None

Identified Codes:SWMM Volume II

Code Review Category: Permanent on-site LID BMPs**Common Gaps:**

Codes do not address how LID BMPs can support flow, volume and water quality requirements.

Discourages use of LID BMPs by requiring special permits.

Lacks discussion of building-related BMPs such as vegetated roofs and pin foundations.

Identified Codes:

2.01.070.B	13.04.040	SWMM Volume I, 2.6.1.3
2.01.070.F	13.06A.080	SWDM Volume I, 3.3
2.01.080.E	13.06.501	SWDM Volume I, 3.4.1 and 3.4.2
2.02.030.2	13.06.501.B.2	SWMM Volume I, 3.5.5
2.02.180	13.06.510 Table 2	SWMM Volume I, 3.5.6
2.02.190	13.06.510.B	SWMM Volume I, 5.2
2.02.330	13.06.511	SWMM Volume I, Table 5.1
2.02.440	13.06.512.B	SWMM Volume I, 7.3.3, SSC-6
2.09.050.C	13.11.340.B	SWMM Volume V, 4.6 No 8 and 9
	PWDS, 1.030.D 117.5.2	
	PWDS, 1.030.D 117.5.3	
	PWDS, 1.030.F	
	PWDS, 1.030.F	
	PWDS, 4.040 D	
	PWDS, 4.050.A	
	PWDS, 4.050.B	
	PWDS, 4.050.C	
	PWDS, 4.070.A	
	PWDS, 9.050.C	
	PWDS, DR-04, DR-05	

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Code Reference	Category: Consideration	LID Aspect	Description	Problem or Gap
2.01.070.B	BMP: Minimal Excavation Foundations (aka 'pin foundations')	Runoff flow and volume control	Minimum building requirements - Foundations Building foundation systems shall adequately support the building. Those parts of the system constructed of wood shall be free from deterioration or dry rot. Concrete and masonry elements shall be integral without substantial fracturing or cracks. Exterior walls shall be supported on a continuous concrete or masonry foundation, or an engineer-designed foundation system, which accounts for both vertical and lateral (earthquake and wind) loads, shall be provided. In absence of a continuous masonry or concrete foundation, an approved skirting system shall be provided to prevent the entrance of rodents and other animals to the crawl space or under-floor area of the building. The building shall be anchored to the foundation system in an approved manner.	Current code does not preclude use of pin foundations. Code revisions that explicitly include pin foundations would better support the LID approach.
2.01.070.F	BMP: Vegetated Roofs	Runoff quality, flow and volume control	Roofs Roof structures shall be structurally sound and free of deteriorated or rotted materials. Roofing shall be weather tight and provide protection to the interior of the building from outside elements. Roof drainage shall be directed to approved locations. Roofs shall be maintained in good repair.	Current code does not preclude use of vegetated roofs. Code revisions that explicitly include vegetated roofs would better support the LID approach. Vegetated roofs are an acceptable BMP option in SWMM Volume V, BMP T5.31.
2.01.080.E	BMP: Vegetated Roofs	Runoff quality, flow and volume control	Repair Standards - Roofs Roof structures shall be structurally sound. Roofing shall be weather tight and provide protection to the interior of the building from outside elements. Roof drainage shall be directed to approved locations.	See entry above. Additionally, 'approved drainage locations' should include LID BMPs such as rain gardens and rain barrels or cisterns. Cisterns are an acceptable BMP option in SWMM Volume V, BMP T5.32.
2.02.030.2	BMP: Vegetated Roofs	Runoff quality, flow and volume control	Reroofing of single family or duplex residential buildings, provided the existing roof is removed prior to reroofing and that the new roofing material does not exceed five (5) pounds per square foot.	Vegetated roofs will likely exceed the five pounds per square foot weight limit. This will need to be addressed if vegetated roof codes are adopted.
2.02.180	BMP: Vegetated Roofs	Runoff quality, flow and volume control	Amendment to IBC Section 1503.4 - Roof Drainage 1503.4.1. General. Roofs shall be sloped a minimum of one unit vertical in 48 units horizontal (2 percent slope) for drainage, unless designed for water accumulation in accordance with Chapter 16 and approved by the Building Official. 1503.4.2. Roof drains. Unless roofs are sloped to drain over roof edges, roof drains shall be installed at each low point of the roof. Roof drains shall be sized and discharged in accordance with the Plumbing Code. 1503.4.3. Overflow drains and scuppers. Where roof drains are required, overflow drains having the same size as the roof drains shall be installed with the inlet flow line located two inches above the low point of the roof, or overflow scuppers having three times the size of the roof drains and having a minimum opening height of four inches may be installed in adjacent parapet walls with the inlet flow line located not more than two inches above the low point of the adjacent roof. Overflow drains shall discharge to an approved location and shall discharge at a point above the ground which can be readily observed. Overflow drains shall not be connected to roof drain lines. 1503.4.4. Concealed piping. Roof drains and overflow drains, where concealed within the construction of the building, shall be installed in accordance with the Plumbing Code.	These codes may need revision if language addressing vegetated roofs is added to other section of the Tacoma code.

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Code Reference	Category: Consideration	LID Aspect	Description	Problem or Gap
2.02.190	BMP: Vegetated Roofs	Runoff quality, flow and volume control	Amendment to IBC Section 1608 – Snow Loads 1608. Roofs shall be designed for a snow load of 25 pounds per square foot, except that if the live load determined by Section 1607 is greater than the snow load, then the live load shall be the roof design load. Potential unbalanced accumulation of snow at valleys, parapets, roof structures, and offsets in roofs of uneven configuration shall be considered. The extra load caused by snow sliding off a sloped roof onto a lower roof shall be determined in accordance with Section 7.9 of ASCE 7-02. The 25-pound-per-square-foot snow load may be reduced by 0.125 pounds per square foot for each degree of roof pitch over 20 degrees. (Repealed and reenacted by Ord. 27231 § 1; passed May 4, 2004: Ord. 26310 § 1; passed Oct. 27, 1998: Ord. 25825 § 1; passed Jan. 23, 1996: Ord. 25149 § 1; passed Jul. 21, 1992)	A similar specification should be added to the code if vegetated roofs are adopted by the code. Extensive roofs generally require an additional 15-40 lbs/sq ft load capacity. Intensive roofs require around 150- 200-lbs/sq ft, depending on planned use activities and landscaping.
2.02.330	BMP: Vegetated Roofs	Runoff quality, flow and volume control	Amendment to IRC Table R301.2(1) – Climatic and geographic design criteria for roofs.	Climatic and geographic design criteria are also applicable to vegetated roof design. Consideration should be given to including a similar table for vegetated roof design if vegetated roof codes are adopted.
2.02.380	P: Minimize curb & gutter	Minimize Effective Imperviousness	3705, and 3706 require curb and gutter, paving, and drainage shall be to minimum public works standards	Without LID permitted in the PWDS or the SWMMM this requirement would discourage LID techniques
2.02.380	P: Minimize curb & gutter	Minimize Effective Imperviousness	3708.1 and 2 require connection of drainage to either a street gutter or storm sewer or infiltration with Public Works approval.	The requirement to gain public works approval may discourage proposing LID techniques.
2.02.380	P: Pedestrian paths	Minimize Total Imperviousness	3707 - requires sidewalks for all new single family or two family dwellings.	Requires additional impervious surfaces
2.02.440	BMP: Vegetated Roofs	Runoff quality, flow and volume control	Amendment to IEBC Section A113.9 – Secondary load paths. EB Sec. A113.9. Secondary Load Paths. Primary or secondary framing supported by unreinforced masonry bearing walls or columns shall be provided with an independent secondary vertical load path constructed to support all dead and live loads. A full snow load on the roof need not be included, but a minimum ten pounds per-square-foot live load shall be assumed for the roof.	This section may need revision if vegetated roof codes are adopted
2.09.050.C	BMP: Minimal Excavation Foundations (aka 'pin foundations')	Runoff flow and volume control	Building Permit Fees - Foundations Foundation permits, while being necessary in a few instances, are normally to be discouraged. In such cases where it is judged to be necessary by the Building Official, a foundation permit fee shall be charged to cover additional City administrative costs, and said fee shall not be credited as part of the building permit fee. The foundation permit fee shall be 10 percent of the building permit fee where the building permit fee is \$7,618.86 or less. Where the building permit fee is over \$7,618.86, the foundation permit fee shall be \$761.89 plus 5 percent of the building permit fee over and above \$7,618.86, but in no instance shall it be less than \$187.93.	If pin foundations are adopted into code, the City may wish to reduce the cost of the foundation permit.
13.06.130.C	Site Planning: Cluster Development/Open Space	Minimize Total Imperviousness	R-4 L Lot Area Minimum average lot width 50', minimum lot frontage 50', square footages depends upon housing type	Minimum lot area width and square footage should be evaluated to allow reductions for LID as an incentive.
13.06.140.C	Site Planning: Cluster Development/Open Space	Minimize Total Imperviousness	PRD Utility Standards 16. All utilities, including storm drainage, within the PRD District shall be provided as set forth by the City of Tacoma.	The PRD code could encourage using LID techniques for storm water management.
13.06.140.C	Site Planning: Cluster Development/Open Space	Minimize Total Imperviousness	PRD Roadways 12. Subject to width variations, all vehicular accessways within the PRD District, both public and private, shall be constructed and improved to meet or exceed minimum City of Tacoma standards; except that all public and private vehicular accessways shall be paved with an impervious surface with necessary base preparations, in accordance with City of Tacoma standards.	It is good that the PRD allows width variations - but it could also allow pervious pavement to be used.

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Code Reference	Category: Consideration	LID Aspect	Description	Problem or Gap
13.06.140.F	Site Planning: Cluster Development/Open Space	Minimize Total Imperviousness	PRD Site Area Requirements 2. Site area. The minimum gross site area for a PRD District shall be as follows: R-1-PRD District ten acres R-2-PRD District five acres R-3-PRD District two acres R-4-L-PRD District three and one-half acres R-4-PRD District five acres R-5-PRD District ten acres	Consider allowances for PRD-style developments on smaller sites. There are very few large undeveloped tracts in Tacoma. There are currently no provisions for cottage housing developments, which might offer a good alternative to the PRD code by offering an opportunity to develop such projects on smaller sites. LID techniques should be provided as incentives for such projects.
13.06.140.G	Site Planning: Cluster Development/Open Space	Minimize Total Imperviousness	PRD Parking Regulations G. Parking regulations. Off-street parking space shall be provided in accordance with Section 13.06.510. Required off-street parking for dwellings shall not be located more than 100 feet from the dwelling or dwellings it is intended to serve unless otherwise permitted by the Hearing Examiner or Land Use Administrator. Required parking spaces shall be surfaced with an impervious surface.	Allow pervious pavement options. Also, parking in structured or underground structures should be encouraged where feasible.
13.06.501	BMP: Vegetated Roofs	Runoff quality and volume control	Roofline Standards C. Rooflines. These requirements are intended to ensure that roofline is addressed as an integral part of building design to avoid flat, unadorned rooflines that can result in an industrial appearing, monotonous skyline. Roofline features are also intended to further reduce apparent building volume and further enhance features associated with residential and human scale development.	Green roofs should be one of the options for rooflines in this section.
13.06.501.B.2	BMP: Permeable Paving	Runoff quality and volume control	Plaza Standards d. Public plaza. A public plaza of at least 800 square feet of gross floor area or 5 percent of gross floor area, whichever is greater. The plaza shall be located within 50 feet of and visible to the primary public entrance; and contain a minimum of a bench or other seating, tree, planter, fountain, kiosk, bike rack, or art work for each 200 square feet of gross floor area. Plaza contents may count toward other requirements when meeting the required criteria. Walkways do not count as plazas. Plazas shall not be used for storage. Required parking stalls may be omitted to the minimum necessary if needed to provide the plaza.	Plazas offer opportunities to incorporate pervious pavement and LID technologies into dense environments.
13.06.502.A	Site Planning: Vegetation Protection	Runoff Minimization and Water Quality Control	Native Landscaping The use of native landscaping is encouraged and permitted for any and all landscaping.	The Residential landscaping code could provide incentives to use native landscaping as is done in the Commercial and X-District landscaping code.
13.06.502.A	Site Planning: Vegetation Protection	Runoff Minimization and Water Quality Control	Native Landscaping The use of native landscaping is encouraged and permitted for any and all landscaping.	The Residential landscaping code could provide incentives to use native landscaping as is done in the Commercial and X-District landscaping code.
13.06.502.A and B	Site Planning: Vegetation Protection	Runoff Minimization and Water Quality Control	Tree Planting credits for existing tree retention	Tree retention is an important component to LID. Incentives/requirements to preserve trees in certain instances (i.e., PRDs or Cottage Housing developments, subdivisions) should be evaluated.
13.06.510	Site Planning: Driveways	Minimize Total Imperviousness	"The maximum driveway width shall be 25 feet on designated pedestrian streets and 30 feet on all other streets."	This standard conflicts with the PW Design Manual, SU-07 design. SU-07 specifies 26-foot minimum to 40-foot maximum for non-single family residence and 14-foot minimum to 30-foot maximum for single family residence and duplex. However, a maximum standard is desirable in a LID ordinance

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13.06.510 Table 1	Site Planning: Parking	Minimize total imperviousness	Required Off-Street Parking ratios by use	Off-Street Parking ratios only include a minimum parking requirement. A maximum parking requirement would further restrict the total impervious surface area. Consider reducing parking minimums as is done for mixed use centers (13.06.510 Table 2). Compact spaces should be encouraged. There are good standards for compact spaces in 13.06.510.B.2.f(2), and compact spaces are called out within the mixed use centers parking requirements. Shared parking is encouraged between day-oriented and night-oriented uses. Perhaps joint use parking areas for commercial districts could further reduce impervious surface quantities.
13.06.510 Table 2	Site Planning: Driveways	Minimize Total Imperviousness	Driveway Widths in Mixed Use Centers Maximum driveway size for Mixed Use Centers is 25 feet on designated pedestrian streets and 30 feet on all other streets.	Good to set maximum driveway standards for mixed use centers, should also include similar standards for LID projects in other zones.
13.06.510 Table 2	BMP: Permeable Paving	Runoff quality and volume control	The driveway standards for mixed use centers are included; it does not address surfacing requirements.	Permeable pavement should be encouraged for driveways within LID projects.
13.06.510.3	Site Planning: Parking	Minimize total imperviousness	Shared Parking Shared parking between night and day oriented uses are allowed.	Shared parking is a good way to minimize impervious surfaces. Expand of this code section should be evaluated.
13.06.510.B	BMP: Permeable Paving	Runoff quality and volume control	Parking Area Surfacing Requirements d. Surfacing of parking areas. Off-street parking areas shall be surfaced with a minimum all-weather surface, consisting of a crushed rock base with an asphalt concrete or cement concrete surface. Such surface shall have a standard thickness of two inches, unless otherwise specified by the City Engineer. Such a parking area shall provide a drainage system to the approval of the City Engineer. Alternatives to the all-weather surface may be provided, subject to the approval of the City Engineer. The alternative must provide results equivalent to paving. All surfacing must provide for the following minimum standards of approval: (1) Dust is controlled; (2) Stormwater is treated to City standards; and (3) Rock and other debris is not tracked off-site. The applicant shall be required to prove that the alternative surfacing provides results equivalent to paving. If, after construction, the City determines that the alternative is not providing the results equivalent to paving or is not complying with the standards of approval, paving shall be required.	Permeable pavement should be encouraged for parking areas within LID projects without special approval by the City Engineer.
13.06.511	BMP: Permeable Paving	Runoff quality and volume control	Transit Facilities Any single-family or multiple-family residential or commercial or industrial project that will be located on, or within 500 feet of, a street where regularly scheduled transit service is provided, and meets the project size thresholds in Table 13.06.511.D.1 below, shall be required to provide a concrete pad(s) for the required transit support facilities.	Transit supportive development is a complementary goal to LID. Permeable pavement could be encouraged instead of the concrete pad for the transit facilities.

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13.06.512	Site Planning: Pedestrian Paths	Minimize Total Imperviousness	Walkways B. Walkways (Illustrated). To support transportation choices, including walking, the following standards shall be met to assist pedestrian safety, comfort, and mobility, including access to uses from public ways and access from parking areas. 3. Minimum connection frequency. Additional walkways are required when needed to provide at least one connection to the public sidewalk for each 250 feet of street frontage. Walkways shall be located to provide the shortest practical route from the public sidewalk or walkway network to building entrances. 4. Size and materials. All walkways must either be a raised sidewalk or composed of materials different from parking lot paving and must be at least 5 feet wide, excluding vehicular overhang. When more than one walkway is required, at least one walkway must be 10 feet wide.	Continue to encourage pedestrian walkways. Add pervious pavement to design guidelines for pedestrian areas.
13.06.512.B	BMP: Permeable Paving	Runoff quality and volume control	Walkway Paving Materials 4. Size and materials. All walkways must either be a raised sidewalk or composed of materials different from parking lot paving and must be at least 5 feet wide, excluding vehicular overhang. When more than one walkway is required, at least one walkway must be 10 feet wide.	Permeable pavement should be encouraged for walkways within LID projects.
13.06A.060	Site Planning: Parking	Minimize total imperviousness	Minimum/Maximum parking ratios for downtown non-residential uses	Parking maximums are a LID-supportive measure. Parking use patterns should be analyzed to determine if parking ratios could be further reduced. Existing design incentives that encourage structured/underground parking also support LID .
13.06A.070.C	Site Planning: Parking	Minimize total imperviousness	Parking Lot Landscaping 4. All new surface parking lots , additions to parking lots, parking lots associated with buildings undergoing substantial alteration, parking lots increased in size by 50 percent, and parking lots altered on 50 percent of its surface shall provide a perimeter landscaping strip abutting adjacent sidewalks containing a combination of trees and shrubs.	Parking lot landscaping areas could be places for stormwater infiltration - this should be encouraged. Infiltration trenches should be considered.
13.06A.070.D	Site Planning: Lot Size, Setbacks	Minimize Total Imperviousness	Setbacks on Primary Pedestrian Streets Downtown 1. The maximum square feet of setback area for new and substantially altered structures and additions fronting on a Primary Pedestrian Street shall be determined by multiplying 75 percent of the linear sidewalk level frontage by a factor of 10. The setback area or areas can only be used for entrance areas and space devoted to exterior public spaces, pedestrian amenities, landscaping, or works of art. Parking is prohibited in the setback areas.	Setback areas could be places to incorporate LID features into a downtown project.
13.06A.080	Site Planning: Lot Size, Setbacks	Minimize Total Imperviousness	Public Space Attributes for Downtown 4. Exterior public space equivalent to at least 5 percent of the site area and including the following attributes: a. Seating in the amount of one sitting space for each 100 sf of area. b. Trees and other plantings. c. Solar exposure during the summer. d. Visibility from the nearest sidewalk. e. Within 3' of the level of the nearest sidewalk.	This is one of the design incentives that can be utilized to increase allowable FAR. Public space offers a place for pervious pavement, native vegetation, and other types of LID features that could encourage infiltration in a typically dense environment.
13.06A.080	Site Planning: Parking	Minimize total imperviousness	Structured Parking 10. Parking contained entirely within structures or structures on the site.	This is one of the design incentives that can be utilized to increase allowable FAR. It is good to encourage parking w/n structures or underground in order to reduce impervious surfaces.

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Code Reference	Category: Consideration	LID Aspect	Description	Problem or Gap
13.06A.080	BMP: Vegetated Roofs	Runoff quality and volume control	Green Roofs 6. Landscaping covering at least 15 percent of the surface of the roof and/or the use of "green roofs" which reduce storm water runoff. Access by building occupants is encouraged.	This is one of the design incentives that can be utilized to increase allowable FAR. Green roofs are not defined in this chapter or Title 13 in general. This needs to be further defined in the code to give more guidance to developers wishing to utilize this incentive.
13.06A.090	Site Planning: Lot Size, Setbacks	Minimize Total Imperviousness	Park & Open Space Standards for Downtown 3. Build an off-site park, open space, or community gardens with a value equivalent to at least 1 percent of construction costs within the downtown zoning district where the development is located. Alternatively, a payment may be paid to the City in lieu of actual park development. Payments shall be used by the City for developing and improving park space within the same downtown zoning district.	This is one of the special features that can be used to achieve maximum FAR. The money/open space being invested into park development could benefit the downtown and should provide opportunities to incorporate LID features. For example, it could be invested in 'green street' development.
13.06A.100	Site Planning: Lot Size, Setbacks	Minimize Total Imperviousness	Downtown Master Planned Development (DMPD) is possible at a large (50,000 sf plus) scale.	Developments that are large in scale offer a chance to use LID technology. While downtown development is typically dense, large sites may offer places for open space/LID techniques.
13.08.040	Site Planning: Vegetation Protection	Runoff minimization	Approval factors In determining whether an application made for classification under Chapter 84.34 RCW should be approved or disapproved, cognizance may be taken of the benefits to the general welfare of preserving the current use which is the subject of application, and consideration may be given as to whether or not preservation of current use of the land will (a)... (b) protect streams or water supplies; (c) promote conservation of soils, wetlands, beaches or tidal marshes...	While this code applies to critical areas, a similar requirement with respect to vegetation and soils above a set threshold infiltration capacity would go far to support an LID ordinance or to establish criteria for projects that are classified as "LID".
13.09.070	Site Planning: Narrow Streets	Minimize total imperviousness	South Tacoma Groundwater Protection District A. Stormwater infiltration units used to receive storm water from any street, paved parking area or other pollution-generating impervious surface are prohibited; however, if a business requests to infiltrate under the Exceptions Process outlined in the City of Tacoma Surface Water Management Manual Volume I, Chapter 3.1 as may be amended from time to time and in the opinion of the City of Tacoma Public Works Department, or its successor agency, no other reasonable alternative exists to manage stormwater runoff from the site, then the Public Works Department, with concurrence of the Department, may approve such private stormwater management system subject to building permit review and approval of a design by a licensed professional engineer.	This chapter is about the South Tacoma Groundwater Protection District. Perhaps LID strategies to handle stormwater/minimize impervious surfaces would be good incentives for certain types of development in this area. Soil quality would have to be evaluated - does it meet CEC requirements for aquifer discharge? If not, can it be amended to meet requirements?
13.11.340.B	BMP: Bioretention Areas	Runoff quality and volume control	"Low-impact uses and activities consistent with the stream or wetland buffer function may be permitted within a buffer that has not been reduced depending upon the sensitivity of wetland and intensity of activity or use. These may include pedestrian trails, viewing platforms, utility easements and storm water management facilities such as grass-lined swales that are used to sustain existing hydrologic functions of the critical area."	This code supports LID very well
PWDS 4.040.C	Site Planning: Narrow Streets	Minimize Total Imperviousness	Cross Sections (Streets) The City standard street section consists of a typical crown section...	Depending on site design considerations, a side slope (sheet flow) cross-section may be more desirable for LID projects.
PWDS, 1.030.A	Site Planning: Minimize curb & gutter	Minimize Effective Imperviousness	Street improvements, curb and gutter, sidewalk, and drainage for new developments are required according to the City of Tacoma Amendments to the 2003 International Building Code (as provided in section 2.02.090 of the Tacoma Municipal Code) and the site-specific development conditions.	Curb and gutter concentrates surface flows, increasing effective imperviousness. Where possible, runoff should be dispersed to open areas, or diverted to infiltration facilities. Where infiltration is not possible, runoff should be diverted to biofiltration areas for water quality treatment before final disposal to the storm sewer system.

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PWDS, 1.030.D 117.2	Site Planning: Minimize curb & gutter	Minimize Effective Imperviousness	All new construction other than Group R, Division 3, occupancies, shall install street improvements to minimum Public Works Department Standards and constructed in accordance with the Public Works Department Design Manual for the location, including, but not limited to, street paving, concrete curbs and gutters, storm drainage, utility relocation, and sidewalks on all lot frontages facing on dedicated street rights-of-way. When a lot adjoins an alley or street intersection, improvements shall also be installed at the alley or street intersection. Alleys shall be improved to City of Tacoma standards when any access to the site is provided from the alley.	see previous
PWDS, 1.030.D 117.3	Site Planning: Minimize curb & gutter	Minimize Effective Imperviousness	Construction of Group R, Division 3, occupancies shall require the development of cement concrete curb and gutter, paving, and drainage of all dedicated streets along the lot frontages, except, in cases where the topography or other conditions make it impractical, the Building Official may modify this street regulation.	see previous
PWDS, 1.030.D 117.5.1	Site Planning: Minimize curb & gutter	Minimize Effective Imperviousness	Satisfactory surface drainage shall include, but not be limited to: Conveying all site drainage to the street gutter or storm sewer.	see previous
PWDS, 1.030.D 117.5.2	BMP: Bioretention Areas	Runoff quality and volume control	Satisfactory surface drainage shall include, but not be limited to: Conveying all site drainage to an approved engineered infiltration system. Infiltration systems are only allowed when City storm sewers are not available. Infiltration systems shall be designed per Public Works Department standards	"approved engineered infiltration system" should include bioretention systems.
PWDS, 1.030.D 117.5.3	BMP: Bioretention Areas	Runoff quality and volume control	Satisfactory surface drainage shall include, but not be limited to: Conveying all site drainage to an existing acceptable drainage course. The City of Tacoma requires prior approval to direct site drainage to drainage courses.	"acceptable drainage course" should include biofiltration swale systems.
PWDS, 1.030.E	Site Planning: Minimize curb & gutter	Minimize Effective Imperviousness	Samples of some of the requirements associated with developing new plats are as follows: Concrete curb, gutter and sidewalk on all adjacent street frontages (asphalt wedge curb elsewhere).	see previous
PWDS, 1.030.F	Site Planning: Narrow Streets	Minimize Total Imperviousness	Requirements for Short Plats/Private Accessways ..."the minimum street section requirements for short plats and private accessways based on the number of lots being developed": (from table): Pavement Width 28 feet for greater than 4 lots; 24 feet for 3 or 4 lots; 16 feet with an additional 4 feet graded and graveled for 2 lots.	This standard requires excess impervious surface. Street widths can be reduced and permeable paving options added. The requirement for cement concrete walk on both sides of the street for projects with more than 4 lots could be adjusted.
PWDS, 1.030.F	Site Planning: Driveways	Minimize Total Imperviousness	Requirements for Short Plats/Private Accessways ..."the minimum street section requirements for short plats and private accessways based on the number of lots being developed": (from table): Cement/Concrete driveway required at entrance to all private access and all residential lots	No minimum/maximum driveway width standards are given in the PWDS. No mention of shared driveways (except in the case of private access roads). There should also be mention of pervious paving for driveways
PWDS, 1.030.F	Site Planning: Minimize curb & gutter	Minimize Effective Imperviousness	Requirements for Short Plats/Private Accessways: ..."the minimum street section requirements for short plats and private accessways based on the number of lots being developed": (from table): curb and gutter required on both sides for greater than 4 lots. Curb and gutter not required for 1 to 4 lots.	see previous
PWDS, 1.030.F	BMP: Permeable Paving	Runoff quality and volume control	Requirements for Short Plats/Private Accessways: ..."the minimum street section requirements for short plats and private accessways based on the number of lots being developed": (from table): Cement concrete driveways and sidewalks are required	Pervious paving options should be encouraged for LID projects.
PWDS, 1.030.F	BMP: Permeable Paving	Runoff quality and volume control	J. Conditions of Approval of the Final Plat: 2. Surfacing of all roadways, bike routes, and pedestrian ways with an all-weather surface approved by the City Engineer	"all-weather surface" should explicitly include pervious paving options
PWDS, 1.040.R	Site Planning: Minimize curb & gutter	Minimize Effective Imperviousness	"Frontage Improvements" – includes the construction of street, sidewalk, curb and gutter on all adjacent City of Tacoma right-of-way.	see previous

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Code Reference	Category: Consideration	LID Aspect	Description	Problem or Gap
PWDS, 3.060.A	Site Planning: Minimize curb & gutter	Minimize Effective Imperviousness	Typical Sections A typical roadway section shall be included on the plans for each unique cross section of roadway and/or at the beginning and end of a transition section. ... The typical roadway section shall also include: the street section, the type and/or dimensions of the curb, the crossslope or a relationship from the crown to the gutter, the dimensions of sidewalk, the dimensions of the planter strip, the relationship to the top of the cut or the toe of the fill, the slope of the planter strip and sidewalk, and any other existing or proposed improvements that reoccur and is paramount to the design.	Should add language saying that typical sections will also include biofiltration/bioretention structures for LID projects.
PWDS, 3.060.B	Site Planning: Minimize curb & gutter	Minimize Effective Imperviousness	For each cross section, the elevation and offset of the centerline and/or crown, the meetline, both gutter lines, and the existing front of walks shall be identified where applicable.	Should add language saying that typical sections will also identify the location of biofiltration/bioretention structures for LID projects.
PWDS, 4.010.A	Site Planning: Narrow Streets	Minimize Total Imperviousness	Design Speed The designated speed limit for Tacoma residential streets is 25 mph which corresponds to a 30 mph design speed. Alleys shall be designed using a 20 mph design speed.	These design speeds may be inappropriate if narrower street design standards are adopted for LID projects.
PWDS, 4.020.A	Site Planning: Minimize curb & gutter	Minimize Effective Imperviousness	Temporary vs. Permanent Improvements The City generally classifies a permanent street section as consisting of concrete curb and gutter and/or sidewalk in combination with a standard residential or arterial street section (as defined in this chapter).	Modify to allow street sections that include biofiltration/bioretention practices for LID projects
PWDS, 4.020.C	Site Planning: Narrow Streets	Minimize Total Imperviousness	Horizontal Curves Generally, non-arterial streets shall be designed with a standard pavement cross-section (2% crown) where feasible (Refer to 4.040.C).	Depending on site design considerations, a side slope (sheet flow) cross-section may be more desirable for LID projects.
PWDS, 4.040 A&B	Site Planning: Narrow Streets	Minimize Total Imperviousness	Provides Street and Lane Width Dimensions	Explore reduction of street and lane widths
PWDS, 4.040 D	BMP: Permeable Paving	Runoff quality and volume control	Pavement Sections	Permeable pavement sections are not addressed.
PWDS, 4.040.C	Site Planning: Narrow Streets	Minimize Total Imperviousness	Cross Sections (Streets) The City standard street section consists of a typical crown section...	Depending on site design considerations, a side slope (sheet flow) cross-section may be more desirable for LID projects.
PWDS, 4.040.E	Site Planning: Minimize curb & gutter	Minimize Effective Imperviousness	Curb and Gutter City of Tacoma standard cement concrete curb and gutter shall be constructed unless otherwise approved (Standard Plan No. SU-03).	Should also allow biofiltration/bioretention practices for LID projects such as curbs with breaks to allow surface water to flow to biofiltration facilities.
PWDS, 4.040.F	Site Planning: Minimize curb & gutter	Minimize Effective Imperviousness	Asphalt Wedge Curb In areas where curb and gutter is not required, all new asphalt pavement shall include an asphalt wedge curb.	Modify to include biofiltration/bioretention practices for LID projects
PWDS, 4.050.B	BMP: Permeable Paving	Runoff quality and volume control	Private Access Ways (Serving up to 4 Lots) Type I or II concrete driveway provided where the private access way enters onto public right-of-way where permanent concrete curb and gutter is existing or proposed.	Pervious paving options should be encouraged for LID projects.
PWDS, 4.050.C	Site Planning: Narrow Streets	Minimize Total Imperviousness	Alleys The typical paved width of an alley in a residential area is 16 feet...	The specified alley width is not a problem, but other paving options such as combination impervious and pervious paving will improve stormwater management for LID projects
PWDS, 4.050.C	Site Planning: Minimize curb & gutter	Minimize Effective Imperviousness	Alleys The typical paved width of an alley in a residential area is 16 feet, with wedge curbs on both sides.	Modify to include biofiltration/bioretention practices for LID projects
PWDS, 4.050.C	BMP: Permeable Paving	Runoff quality and volume control	Alleys The typical paved width of an alley in a residential area is 16 feet...	Pervious paving options should be considered for LID projects.

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Code Reference	Category: Consideration	LID Aspect	Description	Problem or Gap
PWDS, 4.060	Site Planning: Loop Roads in preference to cul-de-sacs	Minimize Total Imperviousness	Dead Ends In general, dead-end (cul-de-sac) streets shall not be longer than 500 feet. Any dead-end street in excess of 150 feet in length shall terminate in a turnaround with a minimum curb radius of 45 feet. A center island with a maximum width of 30 feet may be constructed within the cul-de-sac. Any dead-end street with four or fewer lots accessing the street may satisfy this requirement with the construction of a T-type or branch turnaround subject to approval by the City Engineer. (13.04.190 TMC)	Dead ends and cul-de-sacs should be discouraged for LID projects. Where cul-de-sacs are unavoidable and center islands are used, the center island should include a biofiltration/bioretenion facility. T-type branch turnarounds should be allowed as an acceptable LID design standard that is NOT subject to special approval.
PWDS, 4.060.A	Site Planning: Narrow Streets	Minimize Total Imperviousness	Figure 4-2 Standard T-Type Turnaround for Private Access and Residential Streets serving 3 to 4 lots. Ingress/Egress - 32 feet wide Top of "T" - 20 feet wide	Widths should be reduced for LID projects and should incorporate pervious pavement where possible
PWDS, 4.060.B	Site Planning: Loop Roads in preference to cul-de-sacs	Minimize Total Imperviousness	Cul-de-Sacs Cul-de-sacs shall be constructed where a dead end street will serve five (5) or more residential lots. Cul-de-sacs shall be designed to meet the minimum requirements set forth in the Public Works Standard Plan No. DR-06 as found on the govME website under document 8/2/2004 4-11 information, standard plans. The construction of an inner curb as shown on the standard plan is an option, although not recommended.	Dead ends and cul-de-sacs should be discouraged for LID projects. Where cul-de-sacs are unavoidable and center islands are used, the center island should include a biofiltration/bioretenion facility.
PWDS, 4.070.A	BMP: Reverse Slope Sidewalks	Runoff flow and volume control	Sidewalks The standard sidewalk measures five (5) feet from front of walk to back of walk	No slope requirements are mentioned. Dispersing sidewalk runoff to open areas or biofiltration/bioretenion areas, as opposed to gutters, is the LID-preferred approach.
PWDS, 9.050.C	BMP: Permeable Paving	Runoff quality and volume control	Requirements for Maintenance Access Easements At a minimum, accessways shall be surfaced with six (6) inches of crushed rock, a minimum of 12 feet in width, or other approved all weather surface, to allow year round equipment access to the conveyance facility.	Pervious paving options should be encouraged for LID projects.
PWDS, DR-04 and DR-05	BMP: Bioretention Areas	Runoff quality and volume control	Typical Street Right of Way Details	Sections do not promote open drainage options.
PWDS, DR-06	Site Planning: Narrow Streets	Minimize Total Imperviousness	Minumum Standard for Cul-de-Sac	Inner curb within the bulb is labelled as optional and "not recommended". The not recommended should be removed to promote LID techniques within this area. Inner build could also be shown as a depression versus a raised island to permit raingardens/biofiltration.
PWDS, SU-03 and SU-04	Site Planning: Minimize curb & gutter	Minimize Effective Imperviousness	Cement Concrete Curb and Gutter, Cement Concrete Sidewalk	Standard Details do not provide a curb cut option to allow drainage to surface flow behind curb/sidewalk.
PWDS, SU-07	Site Planning: Driveways	Minimize Total Imperviousness	"Driveway width non single family residence 28' min. to 40' max. Driveway width for single family residence/duplex 14' min to 30' max."	This standard driveway plan does not allow for smaller driveways.
SWDM Volume I, 3.3	BMP: Permeable Paving	Runoff quality and volume control	Definitions	Pervious Paving Options and how they are included in threshold determinations should be defined.
SWDM, Volume I, 3.4.1 and 3.4.2	BMP: Permeable Paving	Runoff quality and volume control	New Development and Redevelopment Applicability of the minimum requirements.	Reference to how pervious paving options are considered in the thresholds.
SWMM Volume I, 2.6	Site Assessment: Hydrologic Analysis	Runoff minimization	Tacoma Watersheds - Identifies Watershed Flow Control and Quantity requirements for each basin	Several of the basins permit no flow control. Provisions to reduce runoff should be encouraged.
SWMM Volume I, 2.6.1.3	BMP: LID BMPs Overall	Runoff quality and volume control	South Tacoma Ground Water Protection District - prohibits infiltration in this area without City pre-approval	This discourages the use of LID techniques such as permeable paving options. Boundary should be reviewed. Appropriateness of soil quality for water quality treatment should also be reviewed and should consider whether soil amendments would improve soil quality sufficiently.
SWMM Volume I, 2.7.2	Site Assessment: Hydrologic Analysis	Runoff minimization	In Lieu of Flow Control Policy	In cases where "in lieu of" flow control is allowed, LID should be encouraged

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Code Reference	Category: Consideration	LID Aspect	Description	Problem or Gap
SWMM Volume I, 3.5.5	BMP: Disperse Roof Runoff	Runoff quality and volume control	Minimum Requirement #5: On-Site Stormwater Management Where infiltration or dispersion is not feasible because of very small lot size (<8,000 square feet), impermeable soils, or where there is a potential for creating drainage problems on adjacent lots, downspouts shall be connected to the City storm system. If the storm system is not directly adjacent to the property, the system shall be extended at the proponent's expense.	Where roof runoff dispersal is impractical, the water should be captured (and stored if necessary) for other uses such as landscape irrigation or toilet flushing. Roof runoff from pollutant generating impervious surfaces (e.g. roofs with unisolated HVAC systems) should be directed to a biofiltration system.
SWMM Volume I, 3.5.5	BMP: Rainfall Harvesting	Runoff flow and volume control	Supplemental Guidelines Rain barrels are mentioned as an innovative stormwater management BMP that may be used if approved by the City.	Rain barrels are a standard recommendation for LID. Requirements for special approvals can discourage their use. Codes or guidance should be developed that allow blanket approval of rain barrels and cisterns for LID projects.
SWMM Volume I, 3.5.5 SWMM Volume I, 3.5.6	Site Assessment: Soil Analysis	Maximize site infiltration capacity	These sections emphasize benefits of infiltration through dispersion and to infiltration systems, and give clear, well-defined requirements for soil analysis.	A shortcoming of these sections is that infiltration and dispersion "shall only be used with the pre-approval of the City Engineer". This may discourage use of infiltration and dispersion in favor of conventional approaches that don't require special approval.
SWMM Volume I, 3.5.6	BMP: LID BMPs Overall	Runoff quality and volume control	Water Quality Minimum Requirements	Does not address how LID techniques can be used to address this minimum requirement.
SWMM Volume I, 3.5.9	Site Assessment: Hydrologic Analysis	Runoff minimization	Basin/Watershed Planning	Does not identify areas where infiltration is feasible and permitted without pre approval. Could identify areas where LID BMPs are encouraged.
SWMM Volume I, 5.2	BMP: LID BMPs Overall	Runoff quality and volume control	BMP and Facility Selection Process	This section also identifies that infiltration requires pre-approval. This section should encourage the use of LID BMPs
SWMM Volume I, 7.3.3, SSC-6	BMP: Soil Amendments	Runoff quality and volume control;	This section discusses soil characteristics necessary for infiltration and bioinfiltration facilities and allows use of soil amendments to achieve required cation exchange capacity (CEC).	These guidelines support LID and should be referenced in LID codes and design criteria.
SWMM Volume I, Table 5.1	BMP: LID BMPs Overall	Runoff quality and volume control	Provides Suggested Stormwater Treatment Options	Section does not identify LID BMPs
SWMM Volume II	Construction Site Controls	Runoff Reduction, Soil/Vegetation Protection	This manual is based on the Washington State Department of Ecology's Stormwater Management Manual for Western Washington and provides detailed direction for planning and implementing construction site controls.	If properly implemented and enforced, this manual provides good support for construction of LID projects.
SWMM Volume V, 4.6 No 8 and 9	BMP: Inspection and Maintenance	Long-term control of runoff rate, quantity, and quality.	Provides detailed maintenance recommendations for typical biofiltration and wet biofiltration swales.	Does not discuss periodic evaluation of cation exchange capacity. This recommendation should be considered to assure these systems are meeting long-term treatment goals.
SWMM Volume V, 5.1	LID Concept overall		On-Site Storm Water Management This Chapter presents the methods for analysis and design of on-site storm water management Best Management Practices (BMPs). Many of these BMPs, although being used elsewhere, are new locally. Efforts are underway to further develop these "low impact development" concepts in Western Washington. Ecology will update these BMPs when local standards are established. The City will update these BMPs as information is made available by Ecology.	While low impact development includes specific on-site stormwater management practices, LID also includes site planning and design approaches that minimize runoff generation. A broader definition of LID is recommended.
TCP DD-2	Site Planning: Parking	Minimize Total and Effective Imperviousness	"Parking facilities should be designed to contribute to an attractive appearance of the streetscape and to provide customers with convenient access to the building."	This code should be modified to include appropriate design standards for LID projects. Appropriate practices include pervious paving, bioretention areas, and covered parking that includes vegetated roofs or rainfall harvesting.