

ORDINANCE NO. 1514

CITY OF LACEY

AN ORDINANCE OF THE CITY OF LACEY, WASHINGTON, AMENDING CHAPTERS 3-8 AND ADDING APPENDIX V, ALL OF THE CITY'S DEVELOPMENT GUIDELINES AND PUBLIC WORKS STANDARDS AND APPROVING A SUMMARY FOR PUBLICATION.

WHEREAS, proposed changes to the City of Lacey's Development Guidelines and Public Works Standards were reviewed by City staff and the City of Lacey Planning Commission, and

WHEREAS, the Planning Commission voted unanimously to recommend adoption of the proposed changes; and

WHEREAS, the City Council finds that the adoption of the proposed changes will be in the public interest,

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LACEY, WASHINGTON, as follows:

Section 1. Chapters 3, 4, 5, 6, 7 and 8 of the development guidelines and public works standards are hereby amended as set forth in Exhibit A, attached hereto.

Section 2. That certain document known as the "Cross-Connection Control Program," attached hereto as Exhibit B, is hereby added as "Appendix V" to the development guidelines and public works standards.

Section 3. SEVERABILITY. If any section, sentence, clause or phrase of this ordinance should be held to be invalid by a court of competent jurisdiction, such invalidity or unconstitutionality shall not affect the validity or constitutionality of any other section, sentence, clause or phrase of this ordinance.

Section 4. CORRECTIONS. The City Clerk and the codifiers of this ordinance are authorized to make corrections to this ordinance including, but not limited to, the corrections of scrivener's/clerical errors, references, ordinance numbering, section/subsection number and any references thereto.

Section 5. The Summary Attached is hereby approved for publication.

PASSED BY THE CITY COUNCIL OF THE CITY OF LACEY, WASHINGTON, this  
24<sup>th</sup> day of August, 2017.

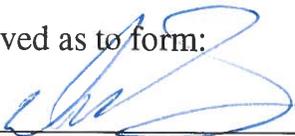
CITY COUNCIL

BY:   
Mayor

Attest:

  
City Clerk

Approved as to form:

  
City Attorney

Published: August 28, 2017

SUMMARY FOR PUBLIC ATION  
ORDINANCE NO 1514  
CITY OF LACEY

The City Council of Lacey, Washington passed on August 24, 2017, Ordinance No. 1514, entitled “AN ORDINANCE OF THE CITY OF LACEY, WASHINGTON, AMENDING CHAPTERS 3-8 AND ADDING APPENDIX V, ALL OF THE CITY’S DEVELOPMENT GUIDELINES AND PUBLIC WORKS STANDARDS AND APPROVING A SUMMARY FOR PUBLICATION.”

The main points of the Ordinance are described as follows:

1. The Ordinance amends Chapters 3-8 of the development guidelines and public works standards.
2. The Ordinance adds a new Appendix V to the development guidelines and public works standards.
3. The Ordinance approves this summary for Publication.

A copy of the full text of this Ordinance will be mailed without charge to any person requesting the same from the City of Lacey.

Published: August 28, 2017.

**EXHIBIT A**  
**ORDINANCE NO. 1514**

GENERAL PUBLIC WORKS CONSIDERATIONS

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**CHAPTER 3**

**3.000 GENERAL PUBLIC WORKS  
CONSIDERATIONS**

3.010 Standard Specifications

Design detail, workmanship, and materials shall be in accordance with the current edition of the "Standard Specifications for Road, Bridge and Municipal Construction", the "APWA Amendments to Division One", and the "Standard Plans for Road, Bridge and Municipal Construction", all written and promulgated by the Washington State Chapter of the American Public Works Association and the Washington State Department of Transportation, except where these standards provide otherwise. (LMC 14.20.010)

All applicable rules of Washington State shall be adhered to with respect to safety, construction methods, and other state requirements. (LMC 12.16.040) This includes, but is not limited to the Revised Code of Washington (RCW's) and the Washington Administrative Code (WAC's).

In cases where the Development Guidelines and Public Works Standards are in conflict with Lacey Municipal Code, the provisions of these Guidelines and Standards shall take precedence.

The following specifications shall be applicable when pertinent, when specifically cited in the standards, or when required by a higher funding authority.

- A. Conditions and standards as set forth in the City of Lacey Water Comprehensive Plan, most current edition.
- B. Conditions and standards as set forth in the City of Lacey Comprehensive Sanitary Sewer Plan, most current edition.
- C. Conditions and standards as set forth in the Lacey Development Plan, Land Use and Circulation Elements, most current edition.
- D. Conditions and standards as set forth in the Lacey Policy Plan for Comprehensive Development, most current edition.
- E. Rules and regulations as adopted in the Lacey Municipal Code\*.

## GENERAL PUBLIC WORKS CONSIDERATIONS

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- F. Conditions and standards as set forth in the Thurston County Coordinated Water System Plan, most current edition.
- G. Conditions and standards as set forth in the "Thurston Metropolitan Area Bicycle Plan," Thurston Regional Planning Council, most current edition.
- H. Criteria set forth in the Local Agency Guidelines as amended and approved by Washington State Department of Transportation, most current edition.
- I. Conditions and standards as set forth in the City of Lacey "Urban Beautification Project" plan co-sponsored by U.S. Department of Agriculture and the Washington State Department of Natural Resources, November 7, 1985.
- J. Conditions and standards as set forth in the WSDOT Design Manual as amended and approved by WSDOT.
- K. U.S. Department of Transportation Manual on Uniform Traffic Control Devices (MUTCD), as amended and approved by Washington State Department of Transportation.
- L. DOT Construction Manual as amended and approved by Washington State Department of Transportation.
- M. Rules and regulations of the State Board of Health regarding public water supplies, as published by the State Department of Health.
- N. Conditions and standards as set forth in the State of Washington Department of Ecology "Criteria for Sewage Works Design", most current edition.
- O. Conditions and standards as set forth by the State of Washington, Department of Labor and Industries.
- P. Criteria set forth in the most recent edition of Transportation and Land Development by the Institute of Transportation Engineers.
- Q. Design criteria of federal agencies including Department of Housing and Urban Development and the Federal Housing Administration.

GENERAL PUBLIC WORKS CONSIDERATIONS

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- R. Concepts as outlined in Traffic Engineering for Neo-Traditional Neighborhood Design prepared by ITE Technical Council Committee, February 1994.
- S. Traditional Neighborhood Development Street Design Guidelines prepared by ITE Transportation Planning Council Committee, October 1999.
- T. Conditions and standards as set forth in the Building Code, most current adopted edition.
- U. Other specifications not listed above as may apply when required by the City of Lacey.

### 3.015 Shortened Designation

These *City of Lacey Development Guidelines and Public Works Standards* shall be cited routinely in the text as the "Standards". This is not to infer that the Guideline portion of this book constitutes Standards, this is simply a shortened designation for the name of this document.

### 3.020 Applicability

These standards shall govern all new construction and upgrading of facilities both in the right-of-way and on-site for transportation and transportation related facilities; storm drainage facilities; sewer and water improvements; landscape and irrigation; and park, recreation, and open-space facilities within the City of Lacey and within applicable utility service areas.

These standards shall also apply as agreed to December 7<sup>th</sup>, 1995 in the "Memorandum of Understanding Urban Growth Area Zoning and Development Standards" to the portions of Thurston County that are within the City of Lacey's Urban Growth Management Area.

### 3.021 Memorandum Of Understanding

A Memorandum of Understanding adopted Dec. 7, 1995, between the City and Thurston County, governs development standards within the City's Urban Growth Area. In part, the agreement states the City of Lacey and Thurston County agree that:

Section 1: Thurston County will adopt each city's zoning standards, except that the County will retain its authority to approve administrative variances and to conditionally approve expansion of non-conforming uses and structures. It is also understood that review procedures under each of the standards will be modified to conform to existing County review procedures.

Section 2: Thurston County will maintain administration of its Critical Areas Ordinance within the Urban Growth Area, except the County will modify its ordinance to adopt each city's method of calculating development densities.

Section 3: Thurston County will adopt a Forest Practices Ordinance that applies a single approach throughout the Urban Growth Area. This approach is intended to support forest management practices

## GENERAL PUBLIC WORKS CONSIDERATIONS

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that retain and integrate significant stands of trees into the layout and design of developments within the Urban Growth Area.

Section 4: Thurston County will maintain administration of its current Subdivision Ordinance within the Growth Area, except that the County will amend either its subdivision or zoning code to reflect the different open space requirements for each of the three cities.

Section 5: Thurston County will adopt each city's street design standards. It is intended that civil engineering plan review and inspections for streets and utilities related to private development projects will be conducted by each city's staff under the direction of the County Engineer. The cities may charge plan review, permit and inspection fees as necessary to cover the cost of providing these services.

Section 6: Thurston County will adopt city design standards only for commercial and multiple-family projects greater than four-plexes.

Section 7: Thurston County will adopt the various village classifications advanced by the cities, except that some review procedures may need to be modified to accommodate existing County review processes.

Section 8: Thurston County and the cities of Lacey, Olympia and Tumwater agree that it is desirable to annex properties located within village classifications prior to securing development approvals. Where prior annexation is not possible, city staff will lead review processes for village projects. The cities may charge development review fees as necessary to cover the cost of providing these services.

Section 9: The cities of Lacey, Olympia and Tumwater will each provide 75% of the funding to support the preparation of a County bill draft version of each of their respective development standards.

Section 10: The cities of Lacey, Olympia and Tumwater will provide ongoing technical assistance and support to County staff responsible for implementing their development standards in their respective Urban Growth Areas.

Section 11: The cities of Lacey, Olympia and Tumwater agree that the standards adopted in reliance upon this agreement are the

## GENERAL PUBLIC WORKS CONSIDERATIONS

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complete requirements for developments within the Growth Area. The cities will not apply additional physical development requirements as a condition of utility connection approval.

Section 12: Thurston County and the cities of Lacey, Olympia and Tumwater agree to develop a process for the joint consideration and adoption of future code amendments affecting the Urban Growth Area. The parties further agree to establish a process for resolving disagreements over implementation of this Agreement.

### 3.025 Definitions and Terms

"Average Daily Traffic" or ADT -- The average number of vehicles passing a specified point during a 24-hour period collected over a number of days greater than one but less than one year.

"Annual Average Daily Traffic" or AADT -- The total number of vehicles passing a specified point in both directions for one year divided by the number of days in the year.

"Bicycle Facilities" -- See 4D.020 for definitions of the various bikeways.

"Building Sewer" or "Side Sewer" -- shall be that portion of the line beginning two feet outside the outer foundation wall of the structure to the sanitary sewer main. (LMC 13.04.160 and 14.06.015).

"City Engineer" -- The City Engineer or his duly authorized representative.

"City of Lacey Coordinate System" -- A ground scale coordinate system derived from the Washington Coordinate System, NAD 83/91. Units are expressed in feet. Data can be obtained from Lacey Public Works Department.

"City of Lacey Vertical Datum" -- Elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD29). Units are expressed in feet. A benchmark listing can be obtained from Lacey Public Works Department.

"Developer" -- Any person, firm, partnership, association, joint venture, or corporation or any other entity responsible for a given project.

## GENERAL PUBLIC WORKS CONSIDERATIONS

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"Director of Public Works" -- The City of Lacey Public Works Director or his duly authorized representative.

"Easement" -- The right to use a defined area of property for specific purpose/purposes as set forth in the easement document, on a plat or short plat, or as required for purposes as set forth herein.

"Engineer" -- Any Washington State licensed professional engineer who represents the developer.

"ERU" -- The unit used to calculate sewer consumption. One Equivalent Residential Unit (ERU) equals 900 cubic feet of water consumed per month. For purposes of these standards, the term ERU shall be as follows:

1. Single Family residence, including mobile homes: One ERU per living unit.
2. Duplex (two-family residence): two ERUs.
3. Residential buildings containing more than two living units: 7/10 of an ERU per living unit.
4. Commercial, industrial or other customers not readily identified as a residential customer, including but not limited to, hotels, motels, boarding or rooming houses, nursing homes, and transient (overnight) trailer parks: One ERU for each estimated 900 cubic feet of water to be consumed per month. (LMC 13.16.027)

"Force Main" -- A sewer main that transports wastewater under pressure.

"Half-Street" -- Street constructed along an edge of development utilizing half the regular width of the right-of-way and permitted as an interim facility pending construction of the other half of the street by the adjacent owner. In some instances, it may be necessary to construct more than half the street depending on the classification of the street.

"Interceptor" -- Shall be a sewer that receives flow from a number of main or trunk sewers, force mains, etc.

"Land Surveyor" -- Professional Surveyor registered in the State of Washington to practice Land Surveying per RCW 18.43.

## GENERAL PUBLIC WORKS CONSIDERATIONS

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"Lateral" -- Shall be that section of the sewer line extending from the City's main to the right-of-way or easement line (i.e., the building sewer) that has no other common sewers discharging into it. (LMC 14.06.030)

"Lift Station Pressure Main" -- The main associated with the lift station, starting at the pumps and ending at the outlet to the vault.

"LMC" -- Lacey Municipal Code.

"Lot Street Frontage" -- The distance between where the two lot lines intersect the fronting right-of-way.

"Plans" -- The plans, profiles, cross sections, elevations, details, and supplementary specifications, signed by a licensed professional engineer and approved by the Director of Public Works, which show the location, character, dimensions, and details of the work to be performed.

"Private Sewer" -- Shall be that portion of the system located on private property where no easements are granted to the City. Maintenance of a private sewer shall be the responsibility of the property owner(s).

"Private Street" -- Private vehicular access provided for by an access tract, easement, or other legal means to serve property that is privately owned and maintained.

"Project" -- General term encompassing all phases of the work to be performed and is synonymous to the term "improvement" or "work".

"Public Sewer" -- Shall be that portion of the system located within public right-of-way or easements and which is operated and maintained by the City. (LMC 13.04.120)

"Public Street" -- Publicly owned and maintained street.

"Right-of-Way" -- A general term denoting public land, property, or interest therein (e.g., an easement) acquired for or devoted to a public street, public access or public use.

"Road" -- Used interchangeably with street.

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"Sewer Main" or "Trunk" -- Shall be a sewer that receives flow from one or more mains.

"S.T.E.P. Main" -- Septic Tank Effluent Pumping main. A low pressure, sewer force main that transports only effluent from S.T.E.P. tanks.

"Street" -- Used interchangeably with road.

"Use of Pronoun" -- As used herein, the singular shall include the plural, and the plural the singular; any masculine pronoun shall include the feminine or neuter gender and vice versa; and the term "person" includes natural person or persons, firm, co-partnership, corporation or association, or combination thereof.

"Utility" -- A company providing public service including, but not limited to, gas, oil, electric power, street lighting, telephone, telegraph, water, sewer, or cable television, whether or not such company is privately owned or owned by a governmental entity.

### 3.030 Changes to Standards

From time to time, changes may be needed to add, delete, or modify the provisions of these Standards. These Standards may be changed and, upon approval of the Director of Public Works, shall become effective and shall be incorporated into the existing provisions.

The City of Lacey web site currently provides a link to the Development Guidelines and Public Works Standards. There is now an addendum section associated with this document. The addendum section is utilized for revisions to the document in between yearly revisions.

### 3.035 Severability

If any part of these City of Lacey Development Guidelines as established by ordinance shall be found invalid, all other parts shall remain in effect.

### 3.040 Design Standards

A. Detailed plans, prepared by a licensed engineer, must be submitted to the City for plan review and approval prior to the commencement of any construction. The applicant's engineer shall be a Professional Engineer, registered as such in the State of Washington. All plans must be checked, signed and stamped by

GENERAL PUBLIC WORKS CONSIDERATIONS

the applicant's engineer prior to submittal for plan review. Final plans shall be approved by the Director of Public Works prior to the start of construction.

~~A.~~

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~~C. Eight four folded, stapled~~ copies of the plans are required to be submitted along with a completed Plan Review Application form. ~~If the submittal contains 20 or more sheets, they All plans~~ shall be stapled, rolled and banded. All drawings shall be on 24" x 36" sheet size. ~~Original sheets shall be good quality reproducible ink on 4 mil., double mat Mylar. Original drawings of the approved plan shall become the property of the City of Lacey. A reproducible copy of the drawing will be returned to the applicant's engineer.~~

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~~D. Drawings in PDF format (flattened) in 24 x 36 inch size (not 11 x 17 inch) shall be provided on disk or thumb drive~~

~~B.~~

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~~E. The engineer's plan certification and checklist verification shall be submitted with the plan review application. Plans submitted without this document will not be routed for review.~~

~~Plans submitted at the time of approval shall be submitted in PDF format. These plans shall be signed by the City electronically and returned to the engineer. Also, An electronic file in AutoCad (On City of Lacey Coordinate System) or other approved software format shall be submitted for all approved final plans unless otherwise waived by the Director of Public Works. Contact the City of Lacey Land Surveyor to verify that the software version you are using is compatible with the City's version.~~

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~~Separate plan and profile drawings are required for all proposed transportation related improvements; street illumination; traffic signalization; storm drainage facilities (whether public or private); and sewer and water improvements. For specific minimum requirements, see the Plan Checklist on the following pages. On~~

~~D.A.~~

~~E.F.~~ Specifications shall be required and submitted with the plans if General Notes do not adequately cover the project requirements.

~~E.G.~~ Signed originals of all necessary easements and/or right-of-way dedication documents meeting all the current recording standards must be reviewed and approved prior to receiving signed approved plans. See Appendix B for examples.

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~~G.H.~~ The coordinates for all plans shall be based on the City of Lacey Coordinate System ~~where it is available~~. Elevation data on all plans shall be referenced to ~~the City of Lacey NGVD 1929~~ Vertical Datum. Coordinate data and benchmark listings can be obtained from Lacey Public Works Survey Division.

~~H.I.~~ Three bound copies of the Drainage Report per the City of Lacey 2010 Stormwater Design Manual are required. ~~The Maintenance Schedule for Drainage Systems (Appendix Q or most current version of the Development Guidelines and Public Works Standards) shall be included within the Drainage Report.~~ The report must be reviewed and approved prior to plan approval.

~~I.J.~~ An Engineers Estimate or an itemized contractor's Bid Estimate is required.

~~J.K.~~ Prior to Final Public Works Approval, an AutoCAD ~~electronic drawing and copy of~~ as-built bond drawings with accurate utility elevations along with PDF drawings shall be submitted to the City.

~~K.L.~~ Prior to scheduling a preconstruction conference, ~~four~~ three sets of full-size drawings (24" x 36") and 2 sets of "half-size" drawings (11" x 17") must be submitted to the City.

GENERAL PUBLIC WORKS CONSIDERATIONS

**Public Works Department**

City of Lacey  
 PO Box 3400  
 Lacey, WA 98509-3400

H.T.E. # \_\_\_\_\_

Date Received: \_\_\_\_\_

Total Fees: \_\_\_\_\_

Received by: \_\_\_\_\_

PLAN REVIEW APPLICATION	USE <b>BLACK</b> INK ONLY
Owner: _____ <u>Contact Person:</u> _____ Address: _____ City & State: _____ Zip: _____ Phone: _____ Email Address: _____ Applicant: _____ <u>Contact Person:</u> _____ Address: _____ City & State: _____ Zip: _____ Phone: _____ Email Address: _____ Engineer: _____ Contact Person: _____ Address: _____ City & State: _____ Zip: _____ Phone: _____ Email Address: _____	<p><b>PROPERTY LOCATION:</b></p> North South East West side of: (road name): _____ between (road name): _____ and (road name): _____ Property Address: _____ _____ Section ____ Township ____ Range _____ Assessor's Parcel No.: _____
<p><b>SUMMARY OF REQUEST</b> (List type of uses)</p> _____ _____ No. of proposed dwelling units: _____ Dimensions of property: _____ Total sq. ft. of site: _____ Total sq. ft. in buildings: _____ _____ Total sq. ft. in paved and covered surfaces (include buildings, driveways, streets, sidewalks, and parking lots): _____ _____ _____ _____	<p><b>TYPES OF PLAN REVIEWS NEEDED:</b>  <del>(Check applicable reviews requested)</del></p> <p> <input type="checkbox"/> Water  <input type="checkbox"/> Sewer  <input type="checkbox"/> Street or Street with curb,                      gutter &amp; sidewalk  <input type="checkbox"/> Curb, gutter &amp; sidewalk  <input type="checkbox"/> Storm (per report)  <input type="checkbox"/> Lighting  <input type="checkbox"/> Signals                 </p> <p><i>Note: Base fee amount changes July 1<sup>st</sup> of every year. See latest fee schedule for current fee amounts.</i></p> <p>_____</p> <p><b>FOR OFFICE USE</b></p> Fire District Requirements: <input type="checkbox"/> No <input type="checkbox"/> Yes Fire Flow Required: _____ gpm Misc Notes: _____ _____ _____

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The City will make a cursory check of the plans against the General Standards on the following plan checklist. If the plans meet the minimum checklist requirements as to content, they will be routed to the appropriate City staff and the plan review process will begin. If the minimum checklist requirements are not met, plans will be returned to the submitting engineer.

**ENGINEER'S CIVIL DRAWINGS CERTIFICATION**

**AND**

**CHECKLIST VERIFICATION**

**I hereby certify that the submitted civil drawings for**

\_\_\_\_\_

**(name of project) have been prepared by me or under my supervision and meet or exceed minimum standards of the City of Lacey and normal standards of engineering practice. I understand that the jurisdiction does not and will not assume liability for the sufficiency, suitability, or performance of civil drawings designed by me or under my supervision stamped by me. I also understand that the City of Lacey will conduct a general review of the plans and that as the engineer of record I am responsible for the accuracy and correctness of the plans and therefore solely responsible for all errors and omissions.**

**Prior to submitting the drawings to the City of Lacey for review, I have carefully reviewed the checklist and assure that all items provided on it have been included into the civil drawings being submitted.**

\_\_\_\_\_  
**Signature**

\_\_\_\_\_  
**Date**

\_\_\_\_\_  
**Engineer's Seal**

GENERAL PUBLIC WORKS CONSIDERATIONS

**STANDARD ITEMS: WATER, SANITARY SEWER,  
STORM SEWER, STREET, LIGHTING, AND SIGNALS**

**GENERAL STANDARDS TO BE INCLUDED ON ALL SHEETS:**

- ( ) Title Block:
  - ( ) Title:
  - ( ) Design By:
  - ( ) Drawn By:
  - ( ) Date:
  - ( ) Checked By:
  - ( ) Signature Approval Block  
(see above example):
  - ( ) Sheet Number of Total Sheets (i.e. 1 of 20, 2 of 20 etc.):
- ( ) Section, Township and Range ( in the title block)
- ( ) Engineers Stamp (signed and dated)
- ( ) North Arrow
- ( ) ~~Legend (APWA Standard Symbols)~~
- ( ) Datum - Bench Mark Designation, NGVD 1929 Elevation, and Location  
(on all sheets where elevations are referenced)
- ( ) Datum - Horizontal, City of Lacey Ground Scale (show ties to control)
- ( ) Scale Bar
- ( ) Revision Block
- ( ) Existing Items and Elevations Including Contour Information have been Surveyed by a Professional Land Surveyor Licensed in the State of Washington and Accurately Reflect the Site Conditions
- ( ) Call Before You Dig Note (on each applicable sheet). Note includes the 811 number to call along with time requirement (48 hours in advance)

FOR THE CITY OF LACEY
BY: _____
<u>PUBLIC WORKS REVIEWER</u>
DATE: _____
Plans Expire 2 Years From Above Date

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### COVER SHEET ITEMS:

- ( ) Project Title (cover sheet)
- ( ) Legend (APWA Standard Symbols)
- ( ) Director of Public Works Approval Block on the Cover sheet only
- ( ) Utility System Map (showing all proposed utilities on one drawing)
- ( ) Vicinity Map (on cover sheet only)
- ( ) Adjacent Property Lines, Ownership, Parcel Number, and Street Address
- ( ) Sheet Index providing Sheet Number of Total Sheets (i.e. water plan and profile views sheet 2 of 20, water details sheet 3 of 20 etc.)
- ( ) General Public Works Construction Notes included
- ( ) Public Works Director Sign Off included. The following statement along with an area for signing and dating is included on the cover sheet only:  
“ The following plans submitted to the City of Lacey for review have been reviewed under my supervision”

### UTILITY LAY OUT:

- ( ) Each Utility shown on a Separate Sheet (storm and roadway may be combined)
- ( ) Profile Views are included on the Same Sheet as the Plan View (unless approved by the City prior to plan submittal to be shown in an alternate location –which requires duplicate information in an additional location)
- ( ) Each Drawing Must be a Minimum of 20 or 30 Scale (the same scale shall be utilized throughout the plans)
- ( ) Base lines shall be labeled when the centerline of the roadway is not utilized

### **PLAN PORTION STANDARD ITEMS (Labeled on All Sheets)**

## GENERAL PUBLIC WORKS CONSIDERATIONS

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- ( ) Centerline and Stations
- ( ) Edge of Pavement labeled with Width Dimension provided
- ( ) Right-of-Way labeled with width Dimension provided
- ( ) Proposed Survey Monumentation Locations and Details
- ( ) Sidewalk labeled with width Dimension provided
- ( ) Planter Strip labeled with width Dimension provided
- ( ) Roadway Sections
- ( ) Existing Utilities (above and below ground)
- ( ) Existing (active and inactive) and Proposed Wells
- ( ) Identify Street Names, Existing and Proposed Right-of-Way, Lots
- ( ) Identify Match Lines with Sheet Numbers and Stations
- ( ) Easements with Width and Label "City of Lacey Utility Easement" (the City no longer labels easements "water" or "sewer;" they are utility easements)
- ( ) Define Survey Baseline
- ( ) Stations and ~~6 Foot~~ Offsets for All Structures and Fittings included for all improvements associated with a public roadway. On-site improvements may utilize either stations and offsets or northings and eastings
- ( ) Type of Pipe (actual material to be installed from the City approved material list for each utility is included)
- ( ) Flow Direction Arrows (on sewer and storm mains)
- ( ) Special Features such as Gas Tanks, Gas Mains, etc.

### **PROFILE PORTION STANDARD ITEMS**

- ( ) Profile Grades (decimal Ft./Ft)
- ( ) Existing and Finished Centerline Ground Elevations Labeled (~~205~~ foot spacing)
- ( ) Scale (horizontal and vertical)
- ( ) Stationing
- ( ) Vertical Elevation Increments
- ( ) Existing Utilities (if available)

GENERAL PUBLIC WORKS CONSIDERATIONS

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- ( ) Utility Crossings

**SANITARY SEWER**

*Plan View:*

- ( ) City of Lacey System Map (~~1" = 300'~~) Showing Tie-In to Existing System, including Line Size and Valves
- ( ) All Fittings and Structures shall be located on the South and West side of the Roadway/Drive Aisle (~~6 feet off centerline~~) as shown on the Roadway Details
- ( ) Overall map showing the entire sewer design on first sheet of sewer section
- ( ) Plan sheets associated with sewer improvements are presented starting at the connection point of the existing main (Sheet 1) and ending at the point furthest away from the connection
  
- ( ) Manhole
  - ( ) Station and Offset (or Northings and Eastings on-site) Shown at Each Manhole/Cleanout (watch spacing)
  - ( ) Manholes Numbered (start numbering at the connection point with manhole #1)
  - ( ) Show the Manhole Opening placed Over the Outfall Channel Pipe
  
- ( ) Pipe
  - ( ) Flow Direction (with arrow on pipe)
  - ( ) Distance from Water Lines
  - ( ) Type of Pipe (actual material to be installed from the City approved sewer material list is included)
  - ( ) ~~Depth at Property Line and Distance from Downhill Manhole for Side Sewer~~
  - ( ) Service to Each Lot - include Lineal Footage of each Service (pressure/gravity) ~~it is~~ Needed for Sewer Testing

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- ( ) Bearing/Distance (or station, offset, and angle) of Each Pipe Run Outside of the Right of Way
- ( ) Station ~~and~~, Offset (~~or Northings and Eastings on-site~~), ~~and~~ Size of Tees, Crosses, Elbows, Adapters, Valves and Clean Outs
- ( ) ~~Where Existing Utility Conflicts occur, include Elevations of the Tops and Bottoms of the conflicting Pipes~~
- ( ) Existing Septic Tanks/Drainfields (with note to abandon if necessary)

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*Profile View:*

- ( ) Manholes Numbered
- ( ) Invert Elevation Showing Direction, In and Out
- ( ) Rim Elevation
- ( ) Manhole Type Designation
- ( ) Grades Shown (decimal form Ft./Ft.) (minimum slopes)
- ( ) Size of Pipe
- ( ) Length of Pipe (in L.F.)
- ( ) Existing Utilities and Crossings shown
- ( ) Proposed Utility Crossings Where Existing Utility Conflicts occur, include Elevations of the Tops and Bottoms of the conflicting Pipes
- ( ) Show Fixtures (tees, crosses, valves, couplers)
- ( ) Cover Over Pipe (a minimum of 7 feet of cover is required over all gravity sewer mains, 68-inch for pressure sewer mains)

*Miscellaneous:*

- ( ) Sewer Detail Sheet (include City of Lacey details with Lacey title blocks)
- ( ) Sewer General Notes

**WATER**

- ( ) Prior to submitting Plans, the Water Modeling Results have been obtained from the City of Lacey. Appropriate Improvements have been included into the Design to satisfy Water Modeling Results

*Plan View:*

- ( ) City of Lacey System Map (~~1"=300'~~) showing Existing and Proposed Mains with Line ~~Sizes-Sizes~~. The System Map shall also include Hydrants and the Nearest Valves to the Site (one on each side of the project) to assure the Main may be quickly isolated in the Event of an Emergency

GENERAL PUBLIC WORKS CONSIDERATIONS

- ( ) All Fittings and Structures are located on the North and East side of the Roadway/Drive Aisle (~~6 feet off centerline~~) as shown on the Roadway Details
- ( ) Overall map showing the entire water design on first sheet of water section
- ( ) Plan sheets associated with water improvements are presented starting at the connection point of the existing main (Sheet 1) and ending at the point furthest away from the connection
- ( ) ~~Minimum vertical clearance of 6 feet from the top of the pipe to the lowest point of the structure~~
- ( ) ~~Where Existing Utility Conflicts occur, include Elevations of the Top and Bottom of the conflicting Pipes~~
- ( ) Fire Hydrants (Check with Lacey Fire Marshall District #3 for location)
- ( ) Blow-off (at end of line if no hydrant)
- ( ) Vacuum and Air Release Valves When Required
- ( ) A Hydrant is included at Each Intersection
- ( ) Station and; Offset (or Northings and Eastings on-site), ~~and~~ Size of Tees, Crosses, Elbows, Adapters and Valves Need Coupling Type
- ( ) Valves (3 each tee, 4 each cross – if the tee is associated with a fire hydrant, only one valve is required)
- ( ) Fire Department Connection shown if the Building requires Fire Sprinklers
- ( ) “By Separate Permit” written by the Underground Sprinkler Line (Fire Line)
- ( ) Thrust Blocking if Required at all Fittings Including In-Line Valves
- ( ) Distance from Sewer is called out on all Water Sheets
- ( ) Bearing and Distance of Each Pipe Run Outside of the Right of Way
- ( ) Service to each lot (include open tracts) has been provided
- ( ) Domestic Meters with Station, Size and Offset Information are provided for Each Building. Duplexes require a Meter for Each Unit.
- ( ) Commercial Water Services are equipped with Reduced Pressure Backflow Assemblies

GENERAL PUBLIC WORKS CONSIDERATIONS

- ( ) Sample Station provided, (call Public Works for location - see detail)
- ( ) Show Top of Pipe Elevations when pipe Installations are in Open Areas. Also, provide Elevation Call Out Information at All Fittings. At a Minimum, Elevation Call Out information Shall be provided every 2550 feet
- ( ) Contour Lines for Utility Installations occurring in Open Areas are provided

( )

Irrigation

*Profile View:*

- ( ) Existing and Proposed Utility Crossings
- ( ) Show Fixtures (tees, crosses, hydrants)
- ( ) Type of Pipe (actual material to be installed from the City approved water material list is labeled)
- ( ) Show Valves and Couplers
- ( ) Size of Watermain
- ( ) Length of Watermain in Lineal Feet.
- ( ) Cover Over Pipe

( ) Overall map showing the entire sewer design on first sheet of sewer section

( ) Where Existing Utility Conflicts occur, include Elevations of the Tops and Bottoms of the conflicting Pipes

( ) "Top of Pipe" Elevations Every 50 feet provided (in unimproved areas)

( ) Water main is designed at a consistent depth (not 'snaked' around other utilities)

( ) Minimum cover over the water main of 3.5 feet is provided. Water mains are installed at a constant depth, bending mains to avoid other utilities will not be permitted

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GENERAL PUBLIC WORKS CONSIDERATIONS

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*Miscellaneous:*

- ( ) Water Detail Sheet provided (include City of Lacey details with Lacey title blocks)
- ( ) Water General Notes provided

Irrigation

- ( ) Irrigation Plan provided for irrigation in the Right of Way
- ( ) Irrigation Meter location and size provided
- ( ) Irrigation Meters are equipped with a Double Check Valve Assembly
- ( ) Irrigation Sleeves (where irrigation mains cross to irrigate both sides of the street) is provided
- ( ) Master Control Valve Location Identified
- ( ) SealAMatic (SAM) Spray Heads are included for Slopes Greater than 3 Percent
- ( ) Power Source and Type of Service for Irrigation System

**STORM**

- ( ) ~~If Proposed Treatment Methods are not Currently Listed in the City of Lacey Drainage Design and Erosion Control Manual, Approval to incorporate an Alternate Method of Treatment into the Design has been obtained from the Drainage Manual Administrator Prior to Civil Drawing Submittal.~~

Drainage and Erosion Control Plan Report:

Please see City of Lacey ~~Drainage~~Stormwater Design ~~m~~Manual for drainage report requirements

GENERAL PUBLIC WORKS CONSIDERATIONS

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( ) ~~Cover Sheet~~ |

~~Drawings and Specification:~~ |

( ) Project Boundaries

~~( ) Sub Basin Boundaries (shown on overall storm sheet)~~ |

( ) Flow Path |

( ) ~~Existing Topography at Least 50 Feet Beyond Site Boundaries~~ |

( ) Existing Structures within 100 Feet of Project Boundary

( ) Utilities

( ) Easements, Both Existing and Proposed

( ) Environmentally Sensitive Areas (includes wetlands, streams, lakes etc.)

( ) 100 Year Flood Plain Boundary

( ) ~~Existing and Proposed Wells within project boundaries 1,200 feet of Proposed Retention Facility~~ |

( ) Existing and Proposed Fuel Tanks

( ) Existing and Proposed On-Site Sanitary Systems within 100 feet of Detention/Retention Facilities

( ) Proposed Structures Including Roads and Parking Surfaces (provide square footages of these areas)

( ) ~~Lot Dimensions and Areas~~ |

( ) Proposed Drainage Facilities and Sufficient Cross-Sections and Details to Build (include stations and offsets where necessary)

( ) ~~Wellhead Protection Areas~~ |

( ) Number at each Manhole/Catch Basin

( ) Flow Direction with Arrow on Pipe/Channel

GENERAL PUBLIC WORKS CONSIDERATIONS

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- ( ) The required Roof Drain and Dry Well system note is included on the drawings

Profile View ~~Conveyance System~~ (for private and public systems)

- ( ) Station and, Offset (or Northings and Eastings on-site), and Number at each Manhole/Catch Basin
- ( ) Manhole/Catch Basin Type and Size
- ( ) Manhole/Catch Basin Rim Elevation
- ( ) Type and Size of Pipe
- ~~( ) Stormwater conveyance pipes shall not be located in the planter strip areas~~
- ( ) Invert in and Out (include compass direction)
- ( ) Length of Pipe in Lineal Feet
- ( ) Grades (Ft./Ft.)
- ( ) Show Catch Basin Crossing Profiles (each crossing) on the Sheet Where They Occur

Erosion Control Drawing (place this section after the cover sheet in civil drawings)

- ~~( ) Soil Types~~
- ( ) Silt Fences and sediment Traps
- ( ) Mulching and Vegetation Plan
- ( ) Clearing and Grubbing Limits
- ( ) Existing and Finished Grade
- ( ) Details and Locations of all BMPs Recommended
- ( ) Location and Details of Temporary Sediment Ponds
- ( ) All Existing and Proposed Catch Basins are shown and Silt Socks referenced for Inlet Protection

GENERAL PUBLIC WORKS CONSIDERATIONS

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Construction Inspection Report

*Miscellaneous:*

- ( ) Storm Detail Sheet provided (include City of Lacey details with Lacey title blocks)
- ( ) Storm General Notes provided
- ( ) ~~Erosion Control Details with associated notes provided. Sheet provided from Appendix A of the Drainage Manual~~
- ( ) ~~Erosion Control Notes from provided from Appendix T of the Drainage Manual~~

**STREET**

*Plan View:*

- ( ) Sight Distance and Clear Sight Triangle at Intersections comply with City standards
- ( ) Flow Direction Arrows at Curb Returns Showing Grade
- ( ) Spot Elevations on Curb Returns
- ( ) Spot Elevations at existing and proposed Driveway Cuts – both sides of street
- ( ) Stationing provided at Point of Curvature PC, Point of Tangent PT, ~~Point of Intersection PI~~ and Intersections
- ( ) Curve Information Delta, Radius, Length and Tangent provided for all curves
- ( ) BCR and ECR (Begin Curb Radius, End Curb Radius) Stationed
- ( ) ~~Identify All Field Design Situations~~
- ( ) Edge of Pavement and right-of-way (EP & R/W) labeled on the Drawings
- ( ) Signing - Temporary and Proposed Permanent and a Note Indicating that the City will install both Public and Private Roadway Signs at the Developers Expense

GENERAL PUBLIC WORKS CONSIDERATIONS

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- ( ) Channelization, Striping, and Existing Signing in accordance with M.U.T.C.D., State and City Standards
- ( ) Mailbox Locations (existing and proposed) shown on drawings with Stationing
- ( ) Location of School Bus and/or IT Bus Shelter/Pad shown on drawings with Stationing – the pad meets A.D.A. standards
- ( ) Typical Roadway Sections provided for each Roadway
- ( ) Pavement Marking Details with Station and Offset in accordance with M.U.T.C.D., State and City standards
- ( ) Sidewalks provided in Accordance with the Appropriate Road Section
- ( ) 2 Percent Roadway Slope from Centerline to the Gutter is provided (the slope is also provided for stubbed roads, knuckles and Cul-de-Sacs)
- ( ) Driveway Entrances (information may be shown on tables on each sheet where cuts occur)
- ( ) Elevations
- ( ) Centerline Stationing (~~centerline~~)
- ( ) Width, Material (AC, PCC, other)
- ( ) Driveway Type
- ( ) Curb Ramps - Detail and Type
- ( ) All Curb Ramps Proposed or Existing satisfy Current A.D.A. Requirements. In accordance with detail 4-11.1, At a minimum, Spot elevations shall be provided for those critical locations as necessary to assure A.D.A slope requirements are satisfied (slopes shall be labeled on the detail)
- ( ) If the Project has 500 feet of Frontage or the Utility Poles need to be relocated, Direction to underground Overhead Utilities included in the Civil Drawings
- ( ) Landscaping Plan for Plantings within the Right of Way is provided
- ( ) Street trees called out within the Right of Way are Approved Varieties as listed in the Development Guidelines

GENERAL PUBLIC WORKS CONSIDERATIONS

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- ( ) On site landscaping plans shall be separate from Right of Way landscaping. On site landscaping shall be submitted to Community Development for approval

*Profile View:*

- ( ) Vertical Information VPI, BVC, EVC, AP, 'K' value, Low Point, High Point (for all curves)
- ( ) Proposed and existing centerline elevations provided
- ( ) Show Grades with (+ or -) Slope
- ( ) Super Elevated Roadways Identified
- ( ) Detail - Show Transitions In and Out of the Super Elevated Road Section
- ( ) Special Detail Showing Gutter Flowing Adequately is provided

*Miscellaneous:*

- ( ) Street Detail Sheet provided (include City of Lacey details with Lacey title blocks)
- ( ) Street General Notes provided
- ( ) Pavement Design AASHTO Method in conformance with details 4-6.1 and 4-6.2 provided Street Design Worksheet, with Soils Report provided, if Applicable

GENERAL PUBLIC WORKS CONSIDERATIONS

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Lighting

- ( ) Design Calculations (for roads with curves and roads that do not meet current roadway standards)
- ( ) Appropriate Street Lighting provided (pedestrian scale, roadway, or dual function or cobra head)
- ( ) Station and Offset to Lighting Fixtures and Appurtenances provided
- ( ) Pole Type, Including Manufacturer and Model Number
- ( ) Mounting Height, and Arm Length, Anchor Bolt Size/Pattern and Pole Base Construction
- ( ) Ten foot "clear zone" from the street lighting to private overhead utilities is incorporated into the street lighting design
- ( ) Power Source
- ( ) Wire Size, Type, Conduit (maximum conductor per 2 inch conduit is as follows: 7 - #8 conductors or 5 - #4. When conductors exceed the maximum, (7 - #8 or 5 - #4) an additional 2 inch conduit shall be provided). Upsizing of the Conduit Shall Not Be permitted.
- ( ) Spare 2 inch Conduit (in addition to the previous check list item) included
- ( ) ~~Line Loss Calculations~~
- ( ) Luminaire Type, Lamp Wattage
- ( ) Location of Service Disconnects (5% Max. Voltage Drop from Source to Farthest Luminaire)
- ( ) J-Box Locations and Stations
- ( ) ~~Overall 200 Scale~~ Map with Luminaire Locations Shown
- ( ) On Boulevards, Arterials and Collector Roadways Where Dual Function Pedestrian Poles are utilized, Two Circuits are shown. One Circuit is on the Right Side of the Street and One Circuit is on the Left Side of the Street.

GENERAL PUBLIC WORKS CONSIDERATIONS

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Signals (Follow WSDOT Specs Unless Otherwise Required by the City)

- ( ) Station and Offset to Signal Base, Cabinets, Ped. Lead, Loops, etc.
- ( ) Pole Type, Including Manufacturer and Model Number
- ( ) Wiring Schedule
- ( ) Signal Heads and mounting Assembly
- ( ) Detection Loops
- ( ) Opticom
- ( ) Control Cabinet, Size and Layout
- ( ) Power Source
- ( ) Conduit
- ( ) Wire Size and Type
- ( ) Phasing Schedule
- ( ) Construction Notes
- ( ) J-Box Schedule with Stationing and Type
- ( ) Pedestrian Signal type with Push Button (meeting A.D.A requirements) provided
- ( ) Controller type, Configuration, and Wiring Schematic

*Miscellaneous:*

- ( ) Street Lighting Detail Sheet provided (include City of Lacey details with Lacey title blocks)
- ( ) Lighting General Notes provided
- ( ) ~~Line Loss Calculations provided~~ |

GENERAL PUBLIC WORKS CONSIDERATIONS

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**MISCELLANEOUS**

- ( ) Easements and/or Right of Way Dedication Deeds signed by owner are provided with the civil drawings
- ( ) Detailed Engineers Estimate or Contractor's Bid for Public Works Improvements provided
- ( ) ~~Engineers Estimate or Contractor's Bid for the Entire Project, Summarized~~
- ( ) Line Loss Calculations provided
- ( ) Stormwater Maintenance Agreement (in recordable format) provided

*Additional Items:*

- ( ) Field Verify Note on drawing.- Expose Connection Points and Verify Fittings 48 Hours Prior to Distributing Shut-Down Notices
- ~~( ) ~~Give No. 15 Notice (with 15 hr) Notice to be made by time given (30 minutes)~~~~

# GENERAL PUBLIC WORKS CONSIDERATIONS

## APWA STANDARD SYMBOLS

### CHANNELIZATION SYMBOLS

SYMBOL EXIST.	PROG.	DESCRIPTION	BLOCK	LAYER
		BIKE PATH	CB/CBP	TF-CHAN-3333-S1W
		HANDICAP SYMBOL	CHS/CHSP	TF-CHAN-3333-S1W
		H.O.V. LANE SYMBOL	CHOV/CHVP	TF-CHAN-3333-S1W
		ONLY	CO/COP	TF-CHAN-3333-S1W
		RAILROAD CROSSING	CRR/CRRP	TF-CHAN-3333-S1W
		SCHOOL	CSC/CSCP	TF-CHAN-3333-S1W
		STOP	CS/CSP	TF-CHAN-3333-S1W
		LANE CONTROL ARROWS	CSA/CSP	TF-CHAN-3333-S1W
		STRAIGHT ARROW	CLS/CLSP	TF-CHAN-3333-S1W
		LEFT-RIGHT ARROW	CLR/CLRP	TF-CHAN-3333-S1W
		2-WAY LEFT TURN	C2W/C2WP	TF-CHAN-3333-S1W
		LEFT TURN ARROW	CLT/CLTP	TF-CHAN-3333-S1W
		RIGHT TURN ARROW	CRF/CRFP	TF-CHAN-3333-S1W
		LEFT-STRAIGHT ARROW	CLS/CLSP	TF-CHAN-3333-S1W
		RIGHT-STRAIGHT ARROW	CRS/CRSP	TF-CHAN-3333-S1W
		RAISED MARKERS: LANE MARKERS TYPE I	CLM1/CLM1P	TF-CHAN-3333-S1W
		LANE MARKERS TYPE II	CLM2/CLM2P	TF-CHAN-3333-S1W 3333 - USE EXIST/PROG

### SURFACE FEATURES/LANDSCAPING

SYMBOL EXIST.	PROG.	DESCRIPTION	BLOCK	LAYER
		BUS STOP	SFB/SFBSP	SF-BUS-3333-S1W
		EMBANKMENT	SFB/SFBP	SF-EMB-3333-S1W
		MAIL BOX	SFB/SFBP	SF-MAIL-3333-S1W
		RIP RAP	SFR/SFRP	SF-RIP-3333-S1W
		ROCKERY	SFR/SFRP	SF-ROCK-3333-S1W
		SHRUB	SFS/SFSP	SF-VEGE-3333-S1W
		SOD	SFS/SFSP	SF-SOD-3333-S1W
		TREE (Conifer)	SFC/SFCP	SF-VEGE-3333-S1W
		TREE (Deciduous)	SFD/SFDP	SF-VEGE-3333-S1W
		YARD LIGHT	SFL/SFLP	SF-LITE-3333-S1W 3333 - USE EXIST/PROG

### LINETYPES

LINETYPE	DESCRIPTION	COLOR	LT. NAME	LAYER
---	BUILDING LINE (EXISTING)	GREEN	EXBLDG	SF-BLDG-EXIST-LIN
---	BUILDING LINE (PROPOSED)	GREEN	CONTINUOUS	SF-BLDG-PROG-LIN
---	CREEK/DITCH CENTERLINE (EXIST.)	WHITE	DITCH	SF-DTCH-EXIST-LIN
---	CREEK/DITCH CENTERLINE (PROG.)	GREEN	DITCH	SF-DTCH-PROG-LIN
---	CURB/PAVEMENT/SIDEWALK (EX)	WHITE	CONTINUOUS	SF-222A-EXIST-LIN
---	CURB/PAVEMENT/SIDEWALK (PROG)	CYAN	CONTINUOUS	SF-222A-PROG-LIN
---	FENCE (EXISTING)	YELLOW	FNC1	SF-FENC-EXIST-LIN
---	FENCE (PROPOSED)	CYAN	FNC1	SF-FENC-PROG-LIN
---	QUADRANT (EXISTING)	YELLOW	QR1	SF-QURD-EXIST-LIN
---	QUADRANT (PROPOSED)	CYAN	QR1	SF-QURD-PROG-LIN
---	LAKE/POND	WHITE	LAKE	SF-LAKE-EXIST-LIN
---	MARSH/SWAMP PERIMETER	WHITE	MARSH	SF-SWMP-EXIST-LIN
---	RAILROAD	WHITE	RWR1	SF-RLD-EXIST-LIN
---	RETAINING WALL (EXISTING)	WHITE	ERW1	SF-WALL-EXIST-LIN
---	RETAINING WALL (PROPOSED)	CYAN	PRW1	SF-WALL-PROG-LIN
---	RIVERBANK/ShORELINE	CYAN	CONTINUOUS	SF-222B-EXIST-LIN
---	UTILITY:			222A - USE CURB/P/MS 222B - USE STN/CH/PSR
---	CENTERLINE (EXISTING)	YELLOW	EXCNL	SV-DNL-EXIST-LIN
---	CENTERLINE (PROPOSED)	GREEN	PRCNL	SV-DNL-PROG-LIN
---	CONTOUR (DEPRESSION)	YELLOW	DECI	SV-CONI-DEPR-LIN
---	CONTOUR (EXISTING)	YELLOW	CON	SV-CONI-EXIST-LIN
---	CONTOUR (PROPOSED)	CYAN	CON	SV-CONI-PROG-LIN
---	DONATION LAND CLAW (EXIST.)	CYAN	DLC	SV-DLCL-EXIST-LIN
---	DONATION LAND CLAW (PROG.)	GREEN	DLC	SV-DLCL-PROG-LIN
---	EASEMENT (PERMANENT)	CYAN	CONTINUOUS	SV-ESMT-PERM-LIN
---	EASEMENT (TEMPORARY)	CYAN	TEMPESMT	SV-ESMT-TEMP-LIN
---	MEANDER LINE	YELLOW	MEANDER	SV-MEAN-EXIST-LIN
---	PROPERTY LINE (EXISTING)	YELLOW	PROPERTY	SV-PROP-EXIST-LIN
---	PROPERTY LINE (PROPOSED)	CYAN	PROPERTY	SV-PROP-PROG-LIN
---	RANGE/TOWNSHIP LINE	GREEN	CONTINUOUS	SV-2223-EXIST-LIN
---	RESERVATION/PARK/FOREST (EX)	CYAN	PARK	SV-PARK-EXIST-LIN
---	RESERVATION/PARK/FOREST (PRO)	GREEN	PARK	SV-PARK-PROG-LIN
---	RIGHT-OF-WAY (EXISTING)	CYAN	EXROW	SV-RFOW-EXIST-LIN
---	RIGHT-OF-WAY (PROPOSED)	GREEN	CONTINUOUS	SV-RFOW-PROG-LIN
---	RIGHT-OF-WAY (LIMITED ACCESS)	CYAN	ROWL1	SV-LROW-EXIST-LIN
---	RIGHT-OF-WAY (LIMITED ACCESS)	GREEN	ROWL1	SV-LROW-PROG-LIN
---	SECTION LINE	GREEN	SECT1	SV-SECT-EXIST-LIN
---	QUARTER SECTION LINE	CYAN	QTRSECT	SV-QSCT-EXIST-LIN
---	SIXTEENTH SECTION LINE	CYAN	16THSECT	SV-16ST-EXIST-LIN
---	STATE/COUNTY/CORPORATE LIMIT	GREEN	STATE	SV-222B-EXIST-LIN
---	STATE/COUNTY/CORPORATE LIMIT	GREEN	STATE	SV-222B-PROG-LIN
---	UTILITIES (EXISTING):			222A - USE RANG/MNS 222B - USE STN/CH/PSR
---	CABLE TELEVISION (AERIAL)	RED	ATV	TV-ALN-EXIST-LIN
---	CABLE TELEVISION (BURIED)	RED	TV	TV-BUR-EXIST-LIN
---	FORCE MAIN	MAGENTA	FM	SS-PLN-EXIST-LIN
---	GAS	MAGENTA	G	OS-PLN-EXIST-LIN
---	OL	MAGENTA	O	OL-PLN-EXIST-LIN
---	POWER (AERIAL)	RED	AP	PO-ALN-EXIST-LIN
---	POWER (BURIED)	RED	P	PO-BUR-EXIST-LIN
---	SANITARY SEWER	WHITE	S	SS-GLN-EXIST-LIN
---	STREAM	MAGENTA	STE	S1-PLN-EXIST-LIN
---	STORM DRAINAGE	WHITE	D	SD-2222-EXIST-LIN
---	TELEPHONE (AERIAL)	RED	AT	TL-ALN-EXIST-LIN
---	TELEPHONE (BURIED)	RED	T	TL-BUR-EXIST-LIN
---	UTILITY SERVICE LINE (GENERAL)	YELLOW	SERV	11-SERV-EXIST-LIN
---	WATER	MAGENTA	W	WA-2222-EXIST-LIN
---	UTILITIES (PROPOSED):			11 - INDICATE UTILITY TYPE 2222 - USE ALN/BUR/OLN/PLN
---	MAIN LINE (LIST TYPE, SIZE, ETC.)	*	CONTINUOUS	11-2222-PROG-LIN
---	SERVICE (LIST TYPE, SIZE, ETC.)	*	CONTINUOUS	(P-LINE .04" WIDE) 11-SERV-PROG-LIN

**NOTES**

- PRINT APWADOC2.DOC FOR MORE INFORMATION ON SYMBOL/LINETYPE INSERTION AND USE OF APWA MENUS.
- INSERT MON OR NON-NI-CASE SYMBOLS INTO CENTER OF MONUMENTED SECTION CORNERS.
- USE WATER VALVE AND FITTING SYMBOLS FOR SEWER FORCEMAIN VALVES AND FITTINGS.
- LINETYPES ARE LOADED FROM THE APWALIN.LIN LINETYPE FILE.
- DITCH LINETYPE FLOW DIRECTION ARROW MUST BE INSERTED AT ENDS OF DASHED LINES AS SHOWN ABOVE (BLOCK NAME IS 7L7).
- COMPOSITE LINETYPES ARE DRAWN USING LISP ROUTINES IN APWA MENUS. AL - 7. LINCHEMETS ARE BASED ON DISPOSABLE LIQUID INK PLOTTER. TERNATE METHOD IS TO INSERT BLOCKS ALONG CONTINUOUS LINES AS FOLLOWS: POINT SIZE: COLOR PEN SIZE NUMBER

LINETYPE	BLOCK	SPACING (INCHES)	YELLOW	0.25	3/0
EXISTING FENCE	FP	1.0	MAGENTA	0.35	0
PROPOSED FENCE	FP	1.0	RED		
EXISTING QUADRANT	QR	1.0	WHITE		
PROPOSED QUADRANT	QR	1.0			
EXISTING RAILROAD	RR	0.5	CYAN	0.5	1
EXISTING RETAINING WALL	ERW	0.25			
PROPOSED RETAINING WALL	PRW	0.25			
DEPRESSION CONTOUR	DEP	0.1	GREEN	0.7	2 1/2
LIMITED ACCESS R.O.W.	LA	0.1			

MORE SIZES AVAILABLE IF USE REFRILLABLE PLOTTER POINTS.

3.045 General Public Works Construction Notes

**GENERAL CONSTRUCTION NOTES (ALL PUBLIC WORKS IMPROVEMENTS)**

1. All workmanship and materials shall be in accordance with City of Lacey standards and the most current edition of the *State of Washington Standard Specifications for Road, Bridge and Municipal Construction* (WSDOT/APWA). In cases of conflict, the most stringent standard shall apply.
2. The contractor shall be in compliance with all safety standards and requirements as set forth by OSHA, WISHA and the State of Washington, Department of Labor and Industries.
3. All approvals and permits required by the City of Lacey shall be obtained by the contractor prior to the start of construction.
4. If construction is to take place in the County right-of-way, the contractor shall notify the County and obtain all the required approvals and permits.
5. A pre-construction meeting shall be held with the City of Lacey Construction Inspector a minimum 72 hours prior to the start of construction.
6. The City of Lacey Construction Inspector shall be notified a minimum of 48 hours in advance of a tap connection to an existing main. The inspector shall be present at the time of the tap.
7. The contractor shall be fully responsible for the location and protection of all existing utilities. The contractor shall verify all utility locations prior to construction by calling the Underground Locate Line at 811 not less than two business days and not more than 10 business days prior to any excavation. The contractor will also be responsible for maintaining all locate marks once the utilities have been located.
8. Temporary street patching shall be allowed for as approved by the City engineer. Temporary street patching shall be provided by placement and compaction of 1 inch maximum asphalt concrete cold mix. Contractor shall be responsible for maintenance as required.

## GENERAL PUBLIC WORKS CONSIDERATIONS

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9. The contractor shall be responsible for all traffic control in accordance with the *WSDOT/APWA Standard Plans for Road, Bridge and Municipal Construction* (all applicable "K" plans) and/or the *Manual on Uniform Traffic Control Devices* (MUTCD). Prior to disruption of any traffic, a traffic control plan shall be prepared and submitted to the City for approval. No work shall commence until all approved traffic control is in place.
10. Erosion control/water pollution measures shall be required in accordance with Section 1-07.15 of the *WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction* and the *City of Lacey 2010 Stormwater Design Manual*. At no time will silts and debris be allowed to drain into an existing or newly installed facility unless special provisions have been designed.
11. All surveying and staking shall be performed per the corresponding chapter of the *City of Lacey Development Guidelines and Public Works Standards*.
12. It shall be the responsibility of the contractor to have a copy of an approved set of plans on the construction site at all times.
13. Any changes to the design shall first be reviewed and approved by the project engineer and the City of Lacey.
14. If construction is to take place in other jurisdiction's right-of-way (i.e., the county, the State, the City of Olympia, or other adjacent municipalities), the contractor shall notify the jurisdiction and obtain all the required approvals and permits.
15. Prior to backfill all mains and appurtenances shall be inspected and approved by the City of Lacey Construction Inspector. Approval shall not relieve the contractor for correction of any deficiencies and/or failures as determined by subsequent testing and inspections. It shall be the contractor's responsibility to notify the City of Lacey for the required inspections.
16. The City will be given 72 hours notice prior to scheduling a shutdown. Where connections require "field verification", connection points shall be exposed by the contractor and fittings verified 72 hours prior to distributing shut-down notices.

### 3.050 Plan Review

All plans are to be submitted to the City Public Works Department along with required Plan Check fees as required in 3.070. Any necessary easements or dedications shall be signed and notarized and submitted in recordable format along with the plans. An engineer's estimate shall be submitted prior to plan approval. City staff will make a cursory check of the plans against the plans checklist on the preceding pages. Plans that meet the minimum checklist requirements ~~as to context~~, will be routed to the appropriate City staff and the plan review process will begin.

The initial turn around time for the first review of plans submitted is normally four weeks. The length of time for the initial review also depends upon the work load of the department, if there is a backlog of projects, the initial review time may be longer. For subsequent reviews, the engineer will submit ~~three one~~ sets of drawings for re-review or will be notified of additional required revisions. Additional review time will be required if revisions are necessary. Plan check fees are based on the lineal footage of the improvement being reviewed and on an hourly rate starting with the second review.

Approved plans will be returned to the Engineer only after the plan check fees have been paid.

Plans that have been approved more than two years before construction begins (i.e., a preconstruction meeting scheduled and inspection fees paid) shall be subject to re-review based on the hourly rate as established for third submittal. The re-review will concentrate on matters concerning compliance with construction materials, ADA requirements, and life/safety issues.

### 3.055 Construction Control

Work performed for the construction or improvement of City roads and utilities whether by or for a private developer, by City forces, or by a City contractor, shall be done to the satisfaction of the City and in accordance with approved plans. It is emphasized that no work shall be started until such plans are approved. The City shall approve any revision to such plans before being implemented. Failure to receive the City's approval can result in removal or modification of construction at the contractors or developers expense to bring it into conformance with approved plans.

### 3.060 Inspection

All work performed within the public right-of-way or easements, or as described in these standards, whether by or for a private developer, by City forces, or by a City contractor, shall be done to the satisfaction of the City and in accordance with the WSDOT/APWA Standard Specifications, any approved plans and these standards. Unless otherwise approved, the City must approve any revision to construction plans before being implemented.

It is the responsibility of the developer, contractor, or their agents to notify the City in advance of the commencement of any authorized work. A preconstruction meeting and/or field review shall be required before the commencement of work. The developer shall submit 4 sets of full-size drawings and 2 sets of half-size drawings, made from the approved plans, to the City prior to scheduling a preconstruction meeting. Inspection fees shall be paid prior to the preconstruction meeting. **Any necessary easements or dedications are required before plan approval.**

It is the responsibility of the developer, contractor or their agents to have an approved set of plans and any necessary permits on the job site during construction.

The City shall have the authority to enforce these standards as well as other referenced or pertinent specifications. The City will appoint project engineers, assistants and inspectors as necessary to inspect the work and they will exercise such authority as the City Engineer may delegate.

All specific inspections, test measurements or actions required of all work and materials are set forth in their respective chapters herein. Tests shall be performed at the developer or contractor's expense. Failure to comply with the provisions of these standards may result in a stop work order, removal of work accomplished, or other penalties as established by ordinance.

A project is considered final when the Public Works Director issues a Final Public Works Approval letter to the party responsible for the project.

Certificate of Occupancy shall not be released for any lot or building until final Public Works approval has been granted.

### 3.065 As-Built Drawings

As-built drawings in both hard copy and electronic forms shall be required whenever field changes are made to approved plans unless otherwise specified in this document. The as-built drawing shall be completed by the engineer, the contractor, and/or the developer and the changes shall be approved by the designing engineer as indicated by the designing engineer's signature and stamp on the drawing. The as-built drawing shall be revised electronically and submitted on Mylar-bond along with PDF drawings unless otherwise approved by the City. Original drawings with "markups" will not be accepted for the final as-built drawings. Final Public Works Approval for the project will not be given until the as-built drawing is submitted.

### 3.070 Fees

Fees, charges or financial guarantee requirements shall be as established by the City council by the passage of a resolution adopting a fee, charge, and financial guarantee requirement schedule except where specifically set forth in the Lacey Municipal Code (LMC). The City council shall further set the dollar penalty for failure to pay said fee or charge in a timely manner by passage of such resolution. (LMC 1.20.010) A copy of the fee schedule can be found in the appendix. It is the applicant's responsibility to verify that the fees in the appendix are current.

All plan check and inspection fees are due prior to the release of signature drawings~~the preconstruction meeting.~~

**In addition, there are various service and connection fees and charges. We strongly urge all applicants to request an estimate of these fees and charges from the City's Development Review Services Section as soon as practical.**

### 3.080 Permits

Before any person, firm or corporation shall commence or permit any other person, firm or corporation to commence any work to grade, pave, level, alter, construct, repair, remove, excavate or place any pavement, sidewalk, crosswalk, curb, driveway, gutter, drain, sewer, water, conduit, tank, vault, street banner or any other structure, utility or improvement located over, under or upon any public right-of-way or easement in the City of Lacey, or place any structure, building, barricade, material, earth, gravel, rock, debris or any other material or thing tending to obstruct, damage, disturb, occupy, or

## GENERAL PUBLIC WORKS CONSIDERATIONS

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interfere with the free use thereof or any improvement situate therein, or cause a dangerous condition, a Right-of-Way Access Permit shall be obtained. A separate permit shall be obtained for each separate project.

In the case of work contracted for by the Department of Public Works, the signing of the contract shall constitute a Right-of-Way Access Permit and/or a Grading Permit.

Much of the work covered under these standards will require multiple permit authority review and approvals. Several types of permits and approvals require prior approval from the authority before a building or other permit can be issued. Any questions regarding information about permits, approvals and agreements should be directed to the appropriate departments.

The following general categories describe some of the permits, approvals and agreements, along with issuing permit/code authority identified in parentheses:

## GENERAL PUBLIC WORKS CONSIDERATIONS

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### A. SEPA Review

For most projects, a SEPA Environmental Checklist must be completed by the applicant and submitted along with plans, specifications, and other information when approval or permits are being requested for a project. The SEPA Responsible Official conducts the Environmental Review and makes a SEPA Threshold Determination for the City.

### B. Construction Permits

1. Land Clearing Permit (Planning Division of the Community Development Department). A Land Clearing Permit is required for all significant tree alterations, including plants. A Land Clearing Permit is typically issued separately. A strict Inventory and Landscaping Plan is required for all Land Clearing Permits.
2. Grading Permit (Building Department). A Grading Permit is required for all excavation, grading, and earthwork construction, including fills and embankments, on public and private land. See Chapter 2 for additional Grading Permit constraints.
3. Building Permit (Building Division of the Community Development Department). A Building Permit is required for most construction work including alteration, repairs and demolition. Demolition Permits for structures greater than four thousand square feet (4,000 sq. ft.) require the submittal of an Environmental Checklist. See 3.090 and 6.010 for additional building permit constraints.
4. Right-of-Way Access Permit (Public Works Department). A Right-of-Way Access Permit is required for any work within the right-of-way as outlined at the beginning of this Chapter. Such work may include utilities work, lane closures, driveways, curbs, sidewalks, and haul routes. Permission to temporarily close a street or portion thereof for construction activities or special events is obtained through the Right-of-Way Access Permit.

### C. Approvals and other Permits

There are several other permits or approvals that may be required and referred to in these Standards: Site Plan

## GENERAL PUBLIC WORKS CONSIDERATIONS

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Review; plat and short plat approvals; and Certificate of Occupancy.

### 1. Final Plat

A Final Plat shall not be recorded and no building permit shall be issued until all Public Works improvements are completed and final approval is granted. Exceptions to this policy may be granted with the approval of the Director of Public Works, submission and approval of a Final Plat Agreement (see example in Appendix I), and a performance guarantee posted with the City as outlined in 3.090A. **No certificate of occupancy shall be issued until all public works improvements are completed and approved unless otherwise allowed by the Director of Public Works.** (LMC 14.20.020)

### 2. Final Public Works Approval

Final Public Works approval is granted for the project upon completion and acceptance of all transportation and utility work as shown on the approved civil drawings. The following items cannot be issued or authorized without Final Public Works approval:

- a) Final Plat approval (for residential developments)
- b) Installation of S.T.E.P. tanks
- c) Issuance of Certificate of Occupancy

The Final Public Works approval date constitutes the beginning of the warranty period associated with Maintenance and Stormwater bonding.

If the improvements shown on the approved civil drawings have not been completed and approved, the owner/applicant may request an exception to allow other portions of the project to continue or begin. The exception process for residential development (Final Plat) is outlined above in section 3.080 C.1. Exemptions for commercial and industrial development: a request and approval for exception from the Director of Public Works and an approved performance guarantee as outlined in 3.090 A.

## GENERAL PUBLIC WORKS CONSIDERATIONS

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In addition, there may be several other City approvals (land use) which need to be obtained as part of the project process. These elements may affect the Standards as contained in this document: Reclassification; Conditional Use; Planned Residential Development; Planned Unit Development; and Shoreline Substantial Development Permit.

### 3.090 Financial Guarantees

Financial guarantees may be required by the City to guarantee the performance of required work. A financial guarantee shall be required for maintenance as outlined in subsection B. below. The type and amount of security shall be per code, or, if not specified, shall be at the discretion of the City. Types of securities include but are not limited to a bond with a surety qualified to do a bonding business in this state, a cash deposit, an assigned savings account, a set aside letter or a letter of credit.

Final Public Works approval shall not be given until all the required work is done and approved and the maintenance financial guarantee(s) is in place.

The following are the most frequent financial guarantees required:

- A. Performance Guarantee. A Final Plat shall not be recorded and no building permit shall be issued until all Public Works improvements are completed and final approval is granted. Exceptions to this policy may be granted with the approval of the Director of Public Works, submission and approval of a Final Plat Agreement (see example in Appendix I), and a performance guarantee posted with the City in the amount, equal to 150 percent of the cost of the outstanding public works improvements, including the on-site storm system. No certificate of occupancy shall be issued until all public works improvements are completed and approved unless otherwise allowed by the Director of Public Works. (LMC 14.20.020)
- B. Maintenance Guarantee.
  1. ~~1.~~ General Public Works Maintenance Guarantee. Prior to final Public Works approval, the permittee or the contractor for the permittee shall post with the City a maintenance guarantee for the guarantee of the Public Works improvements in an amount equal

GENERAL PUBLIC WORKS CONSIDERATIONS

to 20 percent of the estimated cost of the improvements for a period of two years after the completed job is accepted by the City. Release of the guarantee will occur one year from the date of City acceptance if all maintenance has been accepted by the City. (LMC 14.20.025)

Maintenance shall include cleaning of the storm system at the end of the one-year period at the developer's expense. The developer shall be responsible for cleaning the storm conveyance system, including treatment facilities, after one year.

The above-mentioned Financial Guarantee may also be required in the event that Public Works improvements are undertaken and there is no building permit in conjunction with the project.

2. ~~SMC 14.20.025 shall be amended to read: "The developer shall be responsible for cleaning the storm conveyance system, including treatment facilities, after one year."~~

~~Maintenance shall include cleaning of the storm system at the end of the one-year period at the developer's expense. The developer shall be responsible for cleaning the storm conveyance system, including treatment facilities, after one year.~~

3.100 Utility Locations

Utilities shall be subject to the provisions as provided in the Telecommunications Ordinance (LMC 5.60) and these Guidelines.

- A. The installation of a utility as defined in Chapter 3.025, whether new, an enhancement, or a replacement project, within a right-of-way or easement, in a new or existing roadway, shall be located as shown in the typical sections on detail drawings. Deviations of location shall be approved by the Director of Public Works. Existing utilities shall be shown using the best information available. This verification may require exploration/excavation (potholing) if utilities are in conflict with the proposed design.

Underground utilities shall be installed in conduit. Direct-bury cable/wire shall not be allowed. Excess conduit may be required per LMC 5.60.100 (C).

The contractor/developer shall be responsible for utility locates in conjunction with their project until final Public Works approval is given.

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- B. All new utilities other than those located on private property shall be installed underground by the utility owning said facility and new and existing facilities shall comply with provisions as set forth in LMC 12.22, Underground Communication Facilities, and 15.10.050, Easements for Public Utilities, and provisions as set forth in franchise agreements between the City and the utility.

Utilities converted from overhead to underground on existing roadways shall be located as shown on the details for new construction. The location must be approved by the City.

- C. A right-of-way access permit is required of any utility, except City owned facilities and utilities, for any work, including replacing and upgrading existing utilities, done within the right-of-way and shall comply with all provisions as set forth in LMC 12.16, Obstruction of Streets, Chapter 3.080 of these standards, and the Telecommunications Ordinance as set forth in LMC 5.60.
- D. If the cumulative length of overhead utilities is over 500 linear feet along the project frontage or when an overhead utility is reconstructed, relocated, replaced, upgraded, or enhanced, the overhead utility is required to be relocated underground by the developer and/or utility owner. The cumulative frontage includes all sides of the subject property adjacent to a public right-of-way where overhead utilities are located. Exceptions to this standard may be allowed by the Director of Public Works after review of a documented request. (LMC 12.22.020). The following hierarchy shall be used for determining the location of the relocated utility:
1. If the affected utility is adjacent to, or on the project triggering the relocation, sufficient right-of-way or easements shall be granted to place the underground utility as shown in chapter 4 street design details.
  2. If the affected utility is “off-site” and not adjacent to the project triggering the relocation, the following options are available in order of preference.
    - a. The utility shall always be relocated underground. The undergrounded utility may be located within the right-of-way as shown on the

## GENERAL PUBLIC WORKS CONSIDERATIONS

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- appropriate roadway detail or on the adjacent lots if a utility easement is existing.
- b. The utility shall be relocated beneath the existing sidewalk. This will require removal and replacement of the sidewalk.
  - c. The utility may be relocated under the ditch or at the edge of pavement if no planter or sidewalk is present.
  - d. In rare instances the City may allow the utility to be relocated within the roadway prism if the trench is wheel cut or limited to one foot maximum width and if the utility is placed in conduit to alleviate the need for future cuts and if the trench is backfilled with C.D.F. (controlled density fill) per details regardless of whether the trench is perpendicular or horizontal to the roadway centerline.
3. If an existing overhead utility is proposing to relocate, replace, upgrade, or enhance their utility, and the proposed length of the project is over 500 feet, the utility shall be relocated underground per number 1 and 2 above.

### 3.110 Easements

- A. Where public utilities and/or their conveyance systems cross private lands, an easement must be granted to the City. The Public Works Engineering Department will generally process, record and file all easements. If the property is to be platted the easement must be conveyed when the short plat or final plat is filed. All easements not shown on a plat must be prepared by a licensed land surveyor.
- B. Easement widths shall be 15 feet for a single utility and 25 feet for dual utilities. Construction easements shall be 30 feet minimum in total width, including the permanent easement. When trench depths dictate or where pipe diameter or vault widths exceed four feet, a wider easement may be required by the City Engineer.

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In certain instances where easement widths cannot be reasonably achieved, the Public Works Director may allow a lesser easement width.

- C. Signed, notarized easements are required prior to final plan approval. Any change in design that places an amenity, i.e., water, sewer, sidewalk, etc., outside of the easement may necessitate stopping of construction until plans and easements can be resubmitted and approved. Plan review fee shall be based on the rate as established for re-submittals. Easements will be filed by the City upon plan approval.

A copy of the Easement Preparation Standards can be found in Appendix B.

### 3.120 Latecomers Agreements

Any person who constructs a [street](#), water or sewer main extension at the direction of the City, in excess of that which is required to meet minimum standards or which meets minimum standards and will benefit properties abutting the new main, may, with the approval of the Director of Public Works, enter into a contract with the City that will allow the developer to be reimbursed for that portion of the construction cost that benefits the adjoining properties and/or is in excess of the minimum standard. This contract is commonly termed a "Latecomers Agreement." The format for a Latecomers Agreement **must** be submitted for review and approval prior to plan approval to be considered. An example of a standard format for this document is located in Appendix H. Latecomers Agreements submitted after plan approval **will not** be accepted. There is a plan review fee for reviewing this document. See Appendix A or call the Public Works Department for the most current cost.

Once Final Public Works approval has been given to a project, the developer has 60 days from that date in which to submit the remaining supporting documentation to the City. This generally includes copies of all invoices and canceled checks that support the latecomer's amount claimed. During this 60-day period, only those connections approved with the project will be allowed. If no supporting documentation is received during the 60-day period, the latecomer's agreement will be deemed inactive and connections will be allowed without the City being obligated to collect a latecomer's fee.

The developer is responsible for initiating, executing and, after City approval, filing the latecomers agreement. The agreement shall include

## GENERAL PUBLIC WORKS CONSIDERATIONS

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a list of those properties that will benefit from the extension, a map outlining and designating these properties, legal descriptions as required by the City, and backup data supporting the costs submitted.

The City will collect the latecomer's fee for recorded agreements from persons wanting to connect to the water, ~~or~~ sewer or street extension and subsequently see that the developer receives the payment. (LMC 13.52.030) Latecomer's fees shall be collected prior to the connection to or use of the facility. For new construction, latecomer's fees shall be collected prior to the Preconstruction Meeting.

### 3.130 Utility Extension

- A. Anyone who wishes to extend any City utility should contact the Department of Public Works Development Engineer for an Extension/Connection Fee Estimate and any special extension requirements.
- B. Utility mains shall be extended to and through the extremes of the property being developed for loop closures and/or future development as determined by the City.

### 3.135 Annexation Requirement

Owners of properties lying outside of, but contiguous to City boundaries must apply for annexation of their property to the City prior to being served by a City owned utility. Owners of properties lying outside of but not contiguous to the City must legally commit their property to eventual annexation prior to being served by the City's utility system. (Resolution 510)

These annexation requirements will be applied to all extensions of the City's utility to areas outside the City limits. Anyone who desires to extend the City's utility system should contact the Department of Public Works for specific annexation requirements.

### 3.140 Traffic Control

- A. The developer/contractor shall be responsible for all traffic control during construction on or along traveled roadways. Traffic control shall be in accordance with the WSDOT/APWA *Standard Plans For Road, Bridge and Municipal Construction* (all applicable "K" plans) and the *Manual on Uniform Traffic Control Devices* (MUTCD). Prior to disruption of any traffic, traffic control

## GENERAL PUBLIC WORKS CONSIDERATIONS

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plans meeting the above mentioned references shall be prepared and submitted to the City for approval. No work shall commence until all approved traffic control is in place.

Additionally, City utilities constructed within Thurston County right-of-way shall follow all traffic control requirements as set forth by the Thurston County Department of Public Works.

Signs must be legible and visible and should be removed at the end of each workday if not applicable after construction hours.

- B. When road closures and detours cannot be avoided the contractor/developer shall notify the Department of Public Works Construction Inspectors. The City will require a detour plan to be prepared, submitted and approved prior to closing any portion of a City roadway.
- C. A Right-of-Way Access Permit may be required before work in the road can commence. See requirements in Chapter 3.080 and 3.100 and contact the Department of Public Works for specific permit information.

### 3.150 Call Before You Dig

All developers/contractors are responsible for timely notification of all utilities in advance of any construction in right-of-way or utility easements. The utilities one-call Underground Location Center phone number is 811.

### 3.160 Staking

All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The surveyor directing such work shall be licensed as a Professional Land Surveyor by the State of Washington.

A preconstruction meeting shall be held with the City prior to commencing staking. All construction staking shall be inspected by the City prior to construction. The minimum staking of waterlines shall be as directed by the City Engineer or as follows:

- A. Stake centerline alignment every 50 feet with cut or fill to invert of pipe maintaining 42 inches of cover over pipe.

## GENERAL PUBLIC WORKS CONSIDERATIONS

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- B. Stake alignment of all fire hydrants, tees, water meters, setters and other fixtures and mark cut or fill to hydrant flange finished grade.

### 3.170 Trench Excavation

- A. Clearing and grubbing where required shall be performed within the easement or public right-of-way as permitted by the City and/or governing agencies. Debris resulting from the clearing and grubbing shall be disposed of by the owner or contractor in accordance with the terms of all applicable permits.
- B. Trenches shall be excavated to the line and depth designated by the City to provide a minimum of 42 inches of cover over the pipe. Except for unusual circumstances where approved by the City, the trench sides shall be excavated vertically and the trench width shall be excavated only to such widths as are necessary for adequate working space as allowed by the governing agency. The trench shall be kept free from water until joining is complete. Surface water shall be diverted so as not to enter the trench. The owner shall maintain sufficient pumping equipment on the job to insure that these provisions are carried out.
- C. The contractor shall perform all excavation. Whatever obstructions are encountered shall be removed or cut out to the width of the trench or roadway section to a depth 6 inches below water main grade. Where materials are removed from below water main grade, the trench shall be backfilled to grade with material satisfactory to the City and thoroughly compacted.
- D. Trenching and shoring operations shall be in conformance with Washington Industrial Safety and Health Administration (WISHA), Washington Department of Labor and Industries (L & I) and the Office of Safety and Health Administration (OSHA) Safety Standards.

### 3.175 Thrust Blocking

Location of thrust blocking shall be shown on plans. Thrust blocks shall comply with the City thrust blocking details. The addition of restrained joint fittings may not eliminate the need for thrust blocking.

### 3.180 Bedding and Backfilling

Bedding material per the City bedding detail shall be placed and compacted around and 4 inches under the water mains by hand tools and to a height of 6 inches above the top of the water main. The remaining fill shall be compacted to 95 percent of the maximum density. Where governmental agencies other than the City have jurisdiction over roadways, the fill and compaction shall be done to the satisfaction of the agency having jurisdiction. If suitable material, as determined by the City, is not available from trenching operations, the City may order the placing of imported fill conforming to 9-03.12(3) around the water main and gravel base conforming with Section 9-30.15 of the *WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction* for backfilling the trench. Bedding and backfilling shall be required per the detail.

### 3.195 Street Patching and Restoration

See Chapter 4B.170 and 4B.180 and trench restoration details for requirements regarding street patching and trench restoration.

**LIST OF DRAWINGS**

**CHAPTER 3 – GENERAL PUBLIC WORKS CONSIDERATIONS**

<u>Title</u>	<u>Drawing#</u>
City of Lacey Utility Easement Access Road .....	3-0
Steel Plates For Roadway Trenches.....	3-2
Tracer Wire Access Port Valve Box Installation .....	3-11
Standard Valve Box Installation.....	3-12
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Bend Marker Type I For Gravel Access And Paved Areas.....	3-19
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Backflow Prevention For Vehicle Filling .....	3-21
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City Of Lacey Pipe Zones In Order Of Descending Quality .....	3-24
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## CHAPTER 4

### 4.000 TRANSPORTATION

#### 4A GENERAL CONSIDERATIONS

##### 4A.010 General

The overall goal of this chapter is to encourage the uniform development that is context sensitive to create an integrated, fully accessible public transportation system that will facilitate present and future travel demand to meet the needs of people walking, driving, transit, freight and cycling with minimal environmental impact to the community as a whole. All design standards shall follow accepted engineering practices with an emphasis on safety. Safety shall override the supplemental standards as outlined in this document. See Chapter 3.021 for development within the Urban Growth Area (UGA) boundary.

This chapter provides minimum development standards supplementing the applicable standards as set forth in Chapter 3.010.

#### 4B STREETS

##### 4B.010 General

Roadway design must provide for the maximum conditions anticipated. The width and grade of the pavement must conform to specific standards set forth herein for safety and uniformity.

##### 4B.020 Design Standards

The design of streets and roads shall depend upon their functional classification and usage. The design elements of City streets shall conform to City standards as set forth herein and current design practice as set forth in Chapter 3.010. Standard design cross-sections and structures are shown on the details at the end of this chapter. Alternate structural sections may be used based on the criteria as outlined in Chapter 4B.160. Safety shall be paramount in any roadway design.

All roadways classified as a collector and above shall meet the design standards of the WSDOT Local Agency Guidelines Manual. Local access roadways shall meet the guidelines herein. Any modification to those standards shall comply with the deviation process as established by the WSDOT *Local Agency Guidelines Manual*. Deviations require justification with safety being a prime consideration.

The layout of streets shall be based on their functional requirements, i.e., the grouping of roadways based on the service they provide. See Chapter 4B.025 for Access Management criteria and 4B.030 for Functional Classification

## TRANSPORTATION

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applications. See the table of the Minimum Street Design Standards for design criteria.

- A. Alignment. Alignment of boulevards, arterials, and collectors shall conform to the Transportation Comprehensive Plan. The City of Lacey Public Works Director shall approve deviations to the Transportation Comprehensive Plan.
- B. Grade. Street grade should conform closely to the natural contour of the land. In some cases a different grade may be required by the City Engineer. See table of Minimum Street Design Standards for specifics.
- C. Width. The pavement and right-of-way width depend on the street classification and functional requirements. See street details for specifics. Road widths shall be measured from face-of-curb to face-of-curb on all streets.
- D. The General Notes on the following page shall be included on any plans dealing with street design in addition to all applicable requirements in Chapter 3.040.

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**GENERAL NOTES (STREET CONSTRUCTION)**

1. See appropriate detail for specifications for joining new and existing asphalt.
2. Compaction of subgrade, rock, and asphalt shall be in accordance with the most current adopted version of the *WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction*.
3. Form and subgrade inspection by the City is required before pouring concrete. (See WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction 8-14.3 (1) through (4)). Twenty-four hours notice is required for form inspection.
4. See City of Lacey Development Guidelines and Public Works Standards, Chapter 4B.200, for testing and sampling frequencies.
5. The City manufactures and installs public and private street name signs, and regulatory signs at the contractor's/developer's expense. Other signs that shall be manufactured and installed by the City and paid for by the contractor/developer's will include signs for well sites, tank sites, lift stations, odor control stations, maintenance and/or fire access through an easement. (See 4B.050). Signs shall be requested at the time street construction begins.
6. Material used for all plastic stop lines, plastic crosswalk lines, plastic traffic arrows, plastic traffic letters, plastic legends, and plastic symbols shall be Type B – Pre-formed fused thermoplastic at 120 mil thickness.

Revised: 03/2014

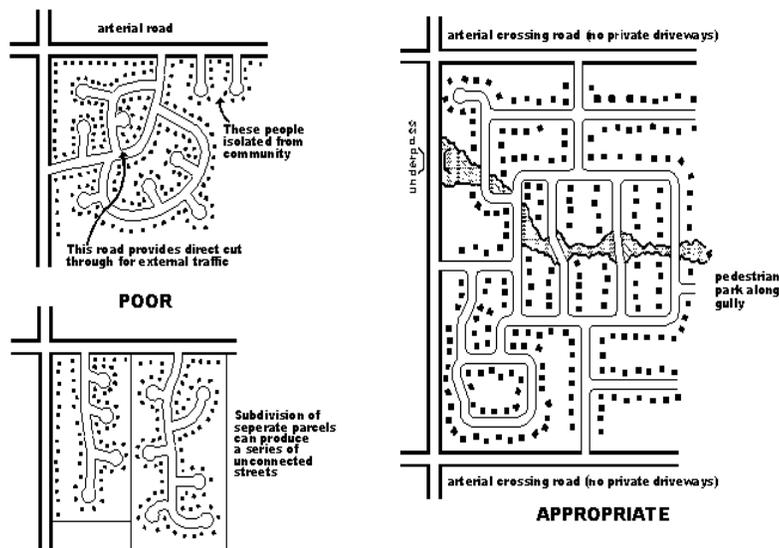
TRANSPORTATION

**MINIMUM STREET DESIGN STANDARDS**

DESIGN STANDARD	Boulevards	Arterials	Major Collector's	Minor Collector's	Major Local Residential	Minor Local Residential	Private
<b>DESIGN LIMITATIONS</b>	Access and intersections are limited.				Access limited to one driveway per SF residential lot.		
<b>MINIMUM STRUCTURAL DESIGN</b>	See Details 4-6.1 through 4-6.2						
<b>MINIMUM RIGHT-OF-WAY</b>	See Details 4-1.0 through 4-5.1						
<b>MINIMUM PAVEMENT WIDTH</b>	See Details 4-1.0 through 4-5.1						
<b>PARKING LANE</b>	None allowed	None allowed	Allowed on Type I where bulb-out parking is provided. Prohibited on Type II	Allowed on Type I where bulb-out parking is provided. Prohibited on Type II	Bulb-out parking required except in intersection transition section	Allowed	Optional, depends on easement width
<b>MINIMUM <math>\nabla</math> GRADE</b>	With curb and gutter or concrete roadway, minimum grade 0.5% On ACP roadway with no curb and gutter or curb and gutter on one side only, minimum grade 1.0%						
<b>MAXIMUM <math>\nabla</math> GRADE</b>	7.0%	7.0%	10.0%	10.0%	12.0%	12.0%	12.0%
	7 % regardless of roadway classification in Commercial and Industrial Zones						
<b>CURB</b>	Longitudinal slope minimum 0.5% on tangents Minimum curb return grade to catch basin 1.0%						
<b>SIDEWALKS</b>	See Details 4-1.0 through 4-5.1 and Chapter 4C for width variances						
<b>INTERSECTION CURB RADIUS</b>	The minor intersecting street shall control the curb radii						
<b>W/O MEDIAN</b>	35'	35'	30'	30'	25'	20'	10'
<b>WITH MEDIAN</b>	35'	35'	35'	35'	30'	25'	15'
<b>DESIGN SPEED NEW ROAD</b>	40 mph	40 mph	35 mph	35 mph	25 mph	20 mph	20 mph
<b>DESIGN SPEED EXISTING RDS</b>	5 mph above posted speed limit						
<b>MINIMUM CENTERLINE RADIUS WITHOUT</b>	455' @ 30 mph 630' @ 35 mph 860' @ 40 mph		1,120' @ 45 mph 1,430' @ 50 mph		195' @ 20 mph 305' @ 25 mph		100' Res. = 100' Com. = 195' Industrial = 195'
<b>INTERSECTION</b>	Use AASHTO for centerline radius restrictions at intersections.						
<b>SUPER-ELEVATION</b>	Requires approval of the Director of Public Works. If allowed, design shall be per AASHTO with the maximum superelevation not to exceed 4%				Not allowed		

4B.025 Access Management

The City has adopted these Access Management guidelines. State facilities shall meet these standards in addition to the access requirements as set forth in RCW 47.50, WAC 468-51, WAC 468-52 and all other applicable RCW's and WAC's. Access Management is a tool to address traffic congestion, crashes, and loss of street capacity. The intent of Access Management is to provide access for land development while preserving the flow of traffic in terms of safety, capacity and speed of travel. Studies show the uncontrolled proliferation of driveways and intersections along a given section of roadway reduces the capacity, increases the number and severity of crashes, and inhibits bicycle and pedestrian usage. In addition, poorly designed entrances and exits cause congestion and create a negative image for a commercial district. See figure below for access management examples.



The benefits of access management include:

- Safety – by reducing the number and severity of crashes;
- Operation – by reducing delays while maximizing the roadway potential capacity;
- Environmental – by lowering the amount of air pollution caused by stop-and-go operation thereby increasing fuel economy;
- Economics – by preserving public investment in the roadway infrastructure, avoiding the need for roadway widening or other roadway improvements.

The objective of Access Management:

- Establish guidelines for location and design of driveways;
- Provide access from public roadways;
- Define an access control hierarchy for all roadways;
- Regulate access location and design; intersections, signal and access spacing standards; corner clearances; joint and cross access; functional areas of an intersection; and medians;
- Provide connectivity between neighborhoods and adjoining land uses.

**A. Definitions**

For the purpose of Access Management, the following definitions shall apply:

"Curb Cut" – An access without a curb radius. Generally used on private streets and driveways.

"Curb Return" – An access with a turning curb radius and constructed to full Americans with Disability Act (ADA) standards. Curb returns shall be installed on all public streets. Private streets and commercial driveways may be evaluated on a case by case basis.

"Road or Driveway" – A traveled surface used to represent an access point onto the roadway. In this Chapter, road and driveway are treated the same; both are access points.

**B. Determination of Access Classification**

Determination of Access shall be the responsibility of the City. The developer shall provide the following information along with recommendations to assist the City in determining access locations:

1. Local land use plans, zoning, and land development regulations as set forth in adopted comprehensive plans.
2. The current and potential functional classification of the roadway. See Chapter 4B.030.

3. Existing and projected traffic volumes, accident history, and other operational considerations.
4. Existing and projected state, local, and regional planning organization transportation plans and needs, including considerations of new or improved facilities.
5. Drainage requirements.
6. The physical features of lands adjoining the roadway.
7. The type and volume of traffic requiring access.
8. The availability of alternative connections to the existing roadway network.
9. The cumulative effect of existing and projected connections on the roadway's ability to provide safe and efficient movement of people and goods.

**C. Access Spacing**

Minimum access spacing provides drivers with sufficient perception-reaction time to address one potential conflict area at a time. Access points shall be located to reduce the possibility of weaving, lane shifts, or other conflicts in the traffic stream. Existing access on both sides of the roadway shall be analyzed to determine proper location for a new access. Spacing is important to the safety and capacity of a roadway, as well as the appearance of a corridor. Bicyclists and pedestrians will benefit from the reduced conflicts generated by excessive access points. The following guidelines shall be used for minimum spacing between access points.

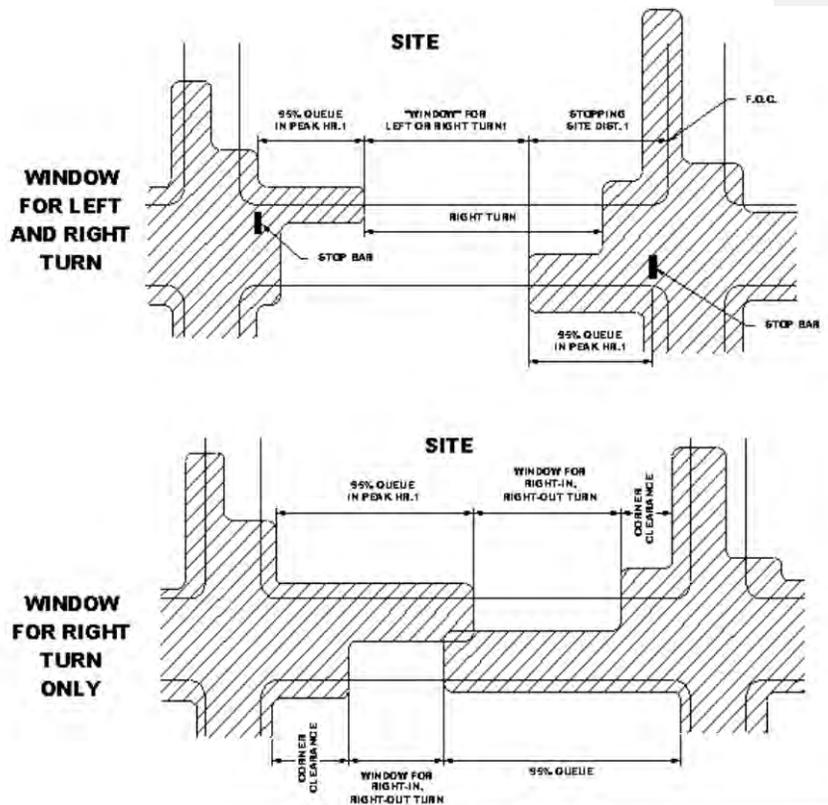
<b>Functional Classification</b>	<b>Access Spacing</b>
Boulevard	1320 feet
Arterial	660 feet
Collector	330 feet
Collectors in Business Districts	165 feet

The spacing standards are for full access. Restricted access (right-in, right-out), shall be half the amount shown in the table above provided that the requirements in 4B.025E, Medians, can be met.

If the spacing requirements and the connectivity requirements as outlined in this Chapter cannot be met, the access shall be designed using the objectives herein and as approved by the City. All distances given in this Chapter are measured centerline to centerline.

**D. Functional Area**

The functional area of an intersection is defined as the area beyond the physical intersection that comprises decision and maneuver distance plus any required vehicle storage length. The “clear area” between functional areas can be defined as the “window” in which direct access can be provided. The figure below illustrates an available window. The greater the window, the greater the flexibility in site circulation design.



The higher the speed of traffic or traffic volume, the longer the functional area needs to be. The functional area of nearby intersections determines where direct access can be provided without creating safety and congestion problems.

As the intersection functional areas become closer, direct access may be limited to right-in, right-out only. If no access window is available, site access

should only be provided to secondary roads. For specific design criteria, use the ITE *Traffic Engineering Handbook*, most current edition.

See 4B.140, Driveways, for corner clearance restrictions within the functional area of an intersection. See 4B.025E for Median opening restrictions within an intersection functional area.

#### **E. Medians**

Raised or landscaped medians in the center of a road separate opposing lanes of traffic, and shall be used to restrict turning and crossing movements. Studies show thoroughfares with raised medians are safer than undivided roads with center two-way left turn lanes. Medians prevent head-on collisions and also provide a refuge for pedestrians as they cross the roadway.

Median openings shall not occur within the functional area of an intersection. See 4B.025D for more information on Functional Areas. See 4B.140 for driveway restrictions in the functional area of an intersection. A double yellow center stripe is required 12 inches off the face of the median curb.

Medians are required as specified on the applicable roadway detail at the end of this Chapter. Medians shall be designed so as not to limit turning radius or sight distance at intersections. A non-restrictive median or two way left turn lane may be used when special conditions exist. Medians shall be formed with a WSDOT Standard Plan F1 Cement Concrete Barrier Curb or Mountable Cement Concrete Curb as applicable. Placement of the curbs shall be based on the State Design Manual requirements. Landscaping shall be installed when directed by the City Engineer. Irrigation shall be installed per Chapter 6.210.

When retrofitting existing sites where medians cannot be installed because of limited right-of-way, barrier curbs between opposing lanes of traffic shall be installed. The use of a concrete barrier island used to divert traffic (i.e. a “pork chop” shaped barrier) restricting turns to

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Right-in, right-out only, is generally not effective unless combined with a barrier curb or other appropriate treatment as determined by the City Traffic Engineer.

Reflective tubular plastic delineators and raised pavement markers shall be included with any curb or other raised features constructed within the roadway. Delineators shall be installed at the nose ends of these curbs.

### 4B.030 Functional Classification and Connectivity

Roadway hierarchy based on functional classification provides a network of streets based on distinct travel movements and the service they provide. Roadway layout shall be based primarily on the safety, efficiency of traffic flow, and functional use of the roadway. Roadways are divided into boulevards, arterials, major and minor collectors, major and minor local residential, private streets, and alleys.

Roadways of all classifications shall be planned to provide for connectivity of existing and proposed streets in relation to adjoining parcels and possible future connections as approved by Public Works. New development roadway systems should be designed so as to minimize pedestrian travel to bus stops.

Boulevards and arterials are intended for the efficient movement of people and goods and have the highest level of access control. They have limited access and accommodate controlled intersections. Boulevards and arterials have been identified in the most current adopted version of the *City of Lacey Transportation Plan*. The City Traffic Engineer will classify all new roadways.

Collectors generally connect commercial, industrial, and residential projects to other collectors, arterials and boulevards and have a moderate level of access control. Minor collectors may be used if turn lanes are not required. If the collector connects to another collector or to an arterial, the roadway shall be a major collector. The City will determine if a collector is a major or a minor, type I or type II, based on a review of the development potential of all contributing properties, the existing right-of-way if it is an existing roadway, and the necessity of turn lanes. Auxiliary left turn lanes are desired when connecting to boulevards, arterials, and major collectors. Collectors are identified in the most current adopted version of the *City of Lacey Transportation Plan*. The City Engineer, in conjunction with the County Engineer, will classify all new roadways within the UGA.

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Major and minor local residential streets shall interconnect with each other and with minor collectors and have a minimum level of access control. If the local residential street connects to a major collector or to an arterial, the street shall be a major local residential. Major local residential streets shall not transition into any other classification of roadway. Primary routes of travel shall be major local residential streets. High density, multi-family projects shall be served by a major local residential. In such developments, connectivity shall be a key design factor, although the internal flow shall be discontinuous to discourage cut-through traffic movement and excessive speed. Traffic calming techniques shall be designed into all residential subdivisions. The pedestrian network shall be paramount in the residential roadway network. Safety is always the major consideration when determining intersection locations and connectivity.

Minor local residential streets serve as land access from residences and generally connect with major local residential and minor collectors. Minor local residential streets are intended to serve low volumes and do not provide primary connectivity through the neighborhood.

Alleys in residential neighborhoods are encouraged. Alleys shall be limited to one block in length terminating with a public street on each end. Alleys shall parallel the adjacent public roads unless approved by the City.

#### 4B.035 Traffic Impact Analysis

##### **STANDARDIZED FORMAT FOR TRAFFIC IMPACT ANALYSIS**

###### A. INTRODUCTION

A Traffic Impact Analysis (TIA) is a specialized study of the impacts that development will have on the transportation system. The traffic impact analysis is an integral part of the environmental review process and specifically analyzes the generation, distribution, and assignment of traffic to and from the proposed development.

The purpose of a TIA is:

- to determine the impacts of new development traffic on the existing and proposed street network;
- to determine the layout and design of the proposed roadway system;
- to determine if the new development can meet the concurrency aspects of the Growth Management Act;
- and to determine the appropriate traffic mitigation for the development.

“Development” means a subdivision, short subdivision, binding site plan, or conditional use permit proposal to substantially intensify the use of existing land or structures, or make additions to existing structures other than one or two family residential structures, or any proposed project requiring Site Plan Review pursuant to LMC 16.84. The term shall not include individual one or two family residential lots within plats as described in LMC 14.21.050.

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These guidelines have been prepared to establish the requirements for a Traffic Impact Analysis. The Site Plan Review Committee (SPRC) and/or the Environmental Review Committee (ERC) under the review authority of LMC 14.21 are responsible under SEPA and City Ordinances for determining the need for a Traffic Impact Analysis. The Public Works Department will approve the scope of work, review the Traffic Impact Analysis and make recommendations to the SPRC and/or ERC.

All reports shall be submitted in a professional format that can be interpreted by all departments. Exhibits shall include a border with a title block identifying the project and a description with legible text clearly identifying all items. Exhibits shall be constructed with an approved graphical software.

### B. WHEN REQUIRED

To adequately assess traffic impacts on the transportation system the Environmental Review Committee (ERC) may require a Traffic Generation Worksheet be prepared to determine if a Traffic Impact Analysis (TIA) or Traffic Mitigation is required.

A full or partial Traffic Impact Analysis may be required if any of the following conditions are met:

1. The "Development" lies within the Transportation Improvement Plan Area established in the Lacey Municipal Code Section 14.21.
2. The "Development" will generate more than 50 PM Peak Hour Trips.
3. The "Development" will generate more than 100 Peak Hour trips at a time other than PM Peak Hour.
4. The Public Works Department is unable to determine the Traffic Generation characteristics of the Development.
5. The Developer feels further traffic analysis may clarify questions about the identified traffic mitigation assessment for the project.
6. The "Development" access to the roadway network may create an impact as determined by the Public Works Department.
7. The "Development" impacts an area identified by the Public Works Department that cannot meet the concurrency requirements of the Growth Management Act.
8. The "Development" may potentially affect the implementation of the street system outlined in the Transportation element of the

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Comprehensive Plan, the Transportation Improvement Program, or any other documented transportation project.

9. If modifications are required to the original TIA that is more than two years old, or where the increase in traffic volume as measured by ADT, peak hour, or peak hour of the critical movement is more than 10%.
10. The "Development" may have an impact to the roadway or transportation system as determined by the Public Works Department.

If the SPRC/ERC requires a TIA, the general guidelines for content and structure shall follow the format outlined herein.

### C. QUALIFICATIONS FOR PREPARING TIA DOCUMENTS

The Traffic Scoping or the TIA shall be prepared and stamped by an engineer licensed to practice in the State of Washington with special training and experience in traffic engineering and who preferably is a member of the Institute of Transportation Engineers (ITE). The developer shall provide the Public Works Department the credentials of the individual(s) selected to perform the report.

### D. SCOPING REPORT

If a Traffic Impact Analysis is required, the Engineer shall submit 5 copies of a Scoping Report to the Department of Community Development to assist the City of Lacey in the development of the scope of work for the TIA. The Scoping Report shall include all items in the following checklist:

- Traffic Scoping Information Worksheet (see following pages)
- Project Size in Square Feet and Acres
- General Location
- Proposed Use
- Number of Lots or Units
- Phasing Plan
- Trip Generation
- Daily Trips
- PM Peak Hour Trips
- Year of Occupancy (Horizon year of project)
- Land Use Code

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- Ambient Growth (use 4%)
- Approved Development Projects in the Vicinity
- Intersections Impacted by 20 or more PM trips
- A reduced copy of the “Site Plan” showing the type of development, street system, right-of-way limits, proposed access points, and other features of significance in the Development. The “Site Plan” shall also include pertinent “off-site” information such as dimensioning to all existing intersections and driveways with the existing channelization, land use descriptions, street right-of-way limits with respect to the existing roadway and other features of significance. Exhibit “B” illustrates an example site plan for reference purposes.
- A graphical distribution map showing site generated PM peak hour traffic from the latest version of the Thurston Regional Planning Council’s Traffic Model. Generally, traffic shall be distributed to one PM peak trip within the Transportation Plan Area. This map shall clearly identify all traffic movements and the percentage of site traffic. Include a copy of an approved link-node map or identify the Traffic Analysis Zone (TAZ) of the generic distribution used. Exhibits “E” and “F” illustrate examples of distribution maps. Exhibit “G” illustrates an example of the link-node map.
- Name, address and phone number of project developer and traffic consultant.
- If streets or intersections affected are in the neighboring jurisdictions of the City of Olympia, the City of Tumwater, Thurston County, or Washington State Department of Transportation, identify issues that may impact those jurisdictions.

The Scoping Report will be used to develop the scope of work for the Traffic Impact Analysis.

**Traffic Scoping Information Worksheet (Include Site Plan)  
Project Information**

Project Title: \_\_\_\_\_  
 Project Description: \_\_\_\_\_  
 Parcel Number(s): \_\_\_\_\_  
 Trip Generation: \_\_\_\_\_

Quantity	Units	Land Use Code and Description	Daily Generation Rate	AM Generation Rate	PM Generation Rate	Proposed Pass-by Rate

Total PM Peak Hour Trips: \_\_\_\_\_

New PM Peak Hour Trips: \_\_\_\_\_

Total AM Peak Hour Trips: \_\_\_\_\_

Total Daily Trips: \_\_\_\_\_

Year of Occupancy (Horizon Year of Project): \_\_\_\_\_

Phasing Plan: \_\_\_\_\_

Identify all intersections that are affected by more than 20 new PM Peak Hour Trips:  
 Use additional sheets if necessary.

- |          |           |
|----------|-----------|
| 1. _____ | 6. _____  |
| 2. _____ | 7. _____  |
| 3. _____ | 8. _____  |
| 4. _____ | 9. _____  |
| 5. _____ | 10. _____ |

Include: Name, address, phone number and fax number of project developer and traffic consultant. Include site plan showing all existing roadways and driveways.

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### E. TRAFFIC IMPACT ANALYSIS

The level of detail and scope of work of a TIA may vary with the size, complexity, and location of the "Development". A TIA shall be a thorough review of the immediate and long-range effects of the "Development" on the transportation system.

#### 1. Prospectus

- a) Provide a "Vicinity Map" of the project area showing the transportation system to be impacted by the development. Exhibit "A" illustrates an example of a vicinity map.
- b) Provide a reduced copy of the "Site Plan" showing the type of development, street system, right-of-way limits, proposed access points, and other features of significance in the Development. The "Site Plan" shall also include pertinent "off-site" information such as dimensioning to all existing intersections and driveways with the existing channelization, land use descriptions, and street right-of-way limits with respect to the existing roadway and other features of significance. Exhibit "B" illustrates an example site plan.
- c) Discuss specific development characteristics such as type of development proposed (single-family, multi-family, retail, industrial), internal street network, proposed access locations, parking requirements, zoning, and other pertinent factors attributable to the "development".
- d) Discuss project completion, phasing plan and occupancy schedule for the "development". Identify horizon years for traffic analysis purposes.

#### 2. Existing Conditions

- a) Discuss street characteristics including functional classification, number of traveled lanes, lane width, shoulder treatment, posted speed limit, bicycle path corridors, transit routes, transit accessibility and traffic control at study intersections. An Exhibit may be used to illustrate existing transportation facilities.
- b) Identify approved nearby land development (planned or under construction) and associated traffic.
- c) Identify safety and access issues including discussions on crash potential, sight distance restrictions, traffic control, and pedestrian conflicts.
- d) Obtain all available traffic data from the City of Lacey and surrounding jurisdictions if applicable. If data is unavailable, the individual or firm

preparing the TIA shall collect the necessary data to support the discussions and analysis in the TIA.

- e) Conduct manual peak hour turning movement counts at study intersections if traffic volume data is more than 2 years old unless otherwise directed by the Public Works Department. A copy of the reduced data shall be attached to the TIA when submitted.
- f) An Exhibit shall be prepared showing existing average daily traffic (ADT) and peak hour traffic volumes on the adjacent streets and intersections in the study area. This Exhibit shall represent the "base-line" traffic volumes for analysis purposes. Complete turning movement volumes shall be illustrated as shown in Exhibits "C" and "D".

### 3. Development Traffic

This element of the TIA shall be conducted to identify the limits of the study area. The study area shall include all pertinent intersections and streets impacted by development traffic. The limits of the study area shall be representative of the specific conditions outlined in the "Scoping Process". The threshold requirement of development traffic is one vehicle in the peak hour on the adjacent streets and intersections. Each intersection and street impacted as described shall be included in the Plan Area for mitigation or analysis purposes.

### 4. Trip Generation

The methodology and procedures used in preparing the trip generation and trip distribution elements of the TIA are as follows:

Site-generated traffic from the "Development" shall be estimated using the latest edition of the ITE *Trip Generation Manual*. **Average trip rates shall be used for all land-use categories where applicable.** Trip rate equations will only be allowed for those land-uses without average rates. Table formats for trip generation shall not be interpolated. Generally, the consultant shall use individual rates for mixed-use developments.

Variations from the trip rates will be considered in the "scoping process". The consultant shall submit a letter explaining the reason for the variation and all supporting documentation. Trip generation studies shall follow standard ITE guidelines and shall be statistically valid for approval by the Public Works Department.

Site traffic shall be generated for daily A.M. and P.M. peak hour periods. A "passer-by" traffic volume discount for applicable commercial development shall be calculated based on the *Trip Generation Handbook*, most current edition, published by the Institute of Transportation Engineers (ITE). If a comparable use is not identified in the *ITE Trip Generation Handbook*, an independent study of a minimum three comparable uses shall be used. The comparable sites must be

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approved by the City. Land uses not identified in the ITE *Trip Generation Handbook* will typically have a "pass-by" rate between 0% and 25% maximum and shall be consistent with similar land uses approved by the City. If a minimum three comparable uses cannot be identified, the developer may use rates previously approved by the City for similar uses if available. "Pass-by" discounts will not be permitted for residential or office developments.

For multi-use and/or "phased" projects, a trip generation table shall be prepared showing proposed land-use, trip rates, and vehicle trips for daily and peak hour periods and appropriate traffic volume discounts if applicable.

### **5. Trip Distribution**

The Trip Distribution shall be based on the Regional Traffic Model approved by the City Public Works Department. A generic trip distribution is available for each Traffic Analysis Zone within the Urban Growth Management Area. Projects that generate more than 250 PM peak hour trips may be required to generate a project specific distribution.

The City Public Works Department shall approve the trip distribution for a "development" during the formal "scoping process".

A graphical distribution map shall be submitted showing site generated PM peak hour traffic. Generally, traffic shall be distributed to one PM peak trip within the Transportation Plan Area if a generic distribution is not used (20 trips if a generic distribution is used). This map shall clearly identify all traffic movements and the percentage of site traffic. Include a copy of the link-node map or identify the Traffic Analysis Zone (TAZ) if the generic distribution is used. Exhibits "C" through "F" illustrate examples of the distribution maps. Exhibit "G" illustrates an example of the link-node map.

### **6. Future Traffic Conditions**

Future traffic volumes shall be estimated by including a 4% annual growth rate to the existing (base-line) traffic volumes and include all traffic generated by anticipated nearby land development (projects with an approved traffic scope) when forecasting future traffic volumes. The future traffic volumes shall be representative of the year the project development shall be completed (horizon year).

The site-generated traffic shall be assigned to the street network in the study area based on the approved trip distribution. The site traffic shall be combined with the forecasted traffic volumes to show the total traffic conditions estimated at development completion. An Exhibit will be required showing daily and peak period turning movement volumes for each traffic study intersection. Exhibit "F" shows an example. In addition, an Exhibit shall be prepared showing the base-line volumes with site-

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generated traffic added to the street network. This exhibit will represent site-specific traffic impacts to existing conditions.

## 7. Traffic Operations

The Level of Service (LOS) and capacity analysis shall be conducted for each pertinent intersection in the study area as determined by the Public Works Department. The methodology and procedures for conducting the capacity analysis shall follow the guidelines specified in the current version of the *Highway Capacity Manual-Special Report 209*. The individual or firm preparing the TIA shall calculate the intersection LOS for each of the following conditions:

- Existing peak hour traffic volumes (Exhibit required).
- Future traffic volumes not including site traffic (Exhibit required).
- Future traffic volumes including site traffic (Exhibit required).
- Level of Service results for each traffic volume scenario (Table required).

The Level of Service table shall include LOS results for the key peak periods if applicable. The table shall show LOS conditions with corresponding vehicle delays for signalized intersections and unsignalized intersections. The LOS conditions and average vehicle delay shall be provided for each approach and the intersection as a whole.

If the "development" will be completed in phases, the TIA shall conduct a LOS analysis for each separate development phase. The incremental increases in site traffic from each phase shall be included in the LOS analysis for each succeeding year of development completion. An Exhibit will be required for each horizon year of "phased" development.

The capacity analysis shall be conducted using computer software compatible with the Public Works Department's software package. The individual or firm preparing the TIA shall use the latest version of TEAPAC software package, for capacity analysis of signalized intersections. SIDRA or latest version shall be used for analysis of modern roundabouts. Other computer software packages used for capacity analysis applications will not be accepted.

If the "development" impacts a traffic signal coordination system, the Public Works Department may require the TIA to include operational analysis of the system. Timing plans and proposed modifications to the coordination system may be required. The latest version of Passer II, Transyt-7F, or Syncro shall be used depending on the signal system. The Public Works Department will determine the appropriate software on a case-by-case basis.

The capacity analyses for each intersection shall be analyzed using the existing timing and phasing for both existing and future volumes. If the intersection runs

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free during the analysis period, phasing shall remain the same and existing minimums shall not be violated. All traffic signal system operational data will be made available by the Public Works Department and adjacent jurisdictions if applicable.

Generally, default values identified in the *Highway Capacity Manual-Special Report 209* shall be used in the analysis. The following values shall be used:

- Peak Hour Factor (PHF) shall be calculated for each intersection. At no time shall the PHF be higher than 0.90, regardless of the calculated value.
- Right Turn On Red (RTOR) shall not be used unless the approach has an exclusive right turn lane. If the approach has a right turn lane the maximum value shall be 100 vehicles per hour, unless approved by the Public Works Department.

Include turning movement volumes in the report. The latest City counts shall be used if available. If not, an independent count must be submitted in graphical format similar to the City's format.

A disk of the analysis model and a hard copy explanation of the scenarios by filename or line number are required. The computer worksheets that identify the input and output data shall be included in a technical appendix along with an electronic version of the program data of each capacity analysis.

For unsignalized intersections, the *Highway Capacity Manual* methodology shall be used in the analysis. If the intersection or a particular movement fails, a signal warrant analysis shall be completed for the intersection.

### **8. Access Management**

Requests for site access shall be addressed in the Traffic Impact Analysis. Recommendations shall include site access and transportation improvements needed to maintain traffic flow to, from, within, and past the site at an acceptable and safe level of service.

Areas to address include:

- Separate conflict areas. Reduce the number of access points or increase their spacing so conflict areas or maneuver areas do not overlap.
- Limit the type of conflict areas by preventing certain maneuvers.
- Remove turning vehicles or queues from through lanes
- Safety of a proposed access (sight distance both horizontally and vertically), including pedestrian features.

- Reduce the speed differential in through lanes between through vehicles and turning vehicles.
- Consider the impact of access points on adjacent or nearby properties on both sides of the roadway.

Improvements include such things as: relocation, restriction, or elimination of access point; roadway widening; turning lanes; traffic signals; modern roundabouts; and pedestrian facilities.

#### **9. Traffic Calming**

Internal traffic calming shall be incorporated into all developments to control cut through traffic and reduce speed within the development. The Traffic Impact Analysis shall identify and propose specific traffic calming measures and locations to be incorporated in the development. Traffic calming shall be aesthetically pleasing. Public transportation shall also be evaluated. The traffic-calming plan shall include an overall drawing of the development and identify specific locations and features to be included in the development. The proponent's Traffic Engineer shall work with the Public Works Department to develop a traffic-calming plan for the development.

#### **10. Alternate Modes of Transportation**

Identify deficiencies in other modes of travel and strategies to encourage these alternate modes. New developments are encouraged to implement Transportation Demand Management practices. An Exhibit should be prepared to identify existing transit routes and stops, bicycle lanes and sidewalks within the vicinity of the development. The Traffic Impact Analysis shall identify deficiencies in the system to be mitigated.

#### **11. Mitigation**

The Traffic Impact Analysis shall include a proposed mitigation plan. The mitigation may be either the construction or financial commitment of the necessary improvements, or contributions to the City for the "developments" proportionate share of the improvements.

The Level of Service standards shall be used as the threshold for determining appropriate mitigating measures in the study area. The adopted level of service standards are as follows:

1. Lacey Core Area -- LOS E  
The Lacey Core Area is defined as that area bounded by the northerly right-of-way line of Martin Way, the southerly right-of-way line of Lacey Boulevard, the westerly City limit line, and the easterly right-of-way line of Carpenter Road.
2. All areas other than the Lacey Core Area -- LOS D

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The following guidelines shall be used to determine appropriate mitigating measures of traffic impacts generated by the development.

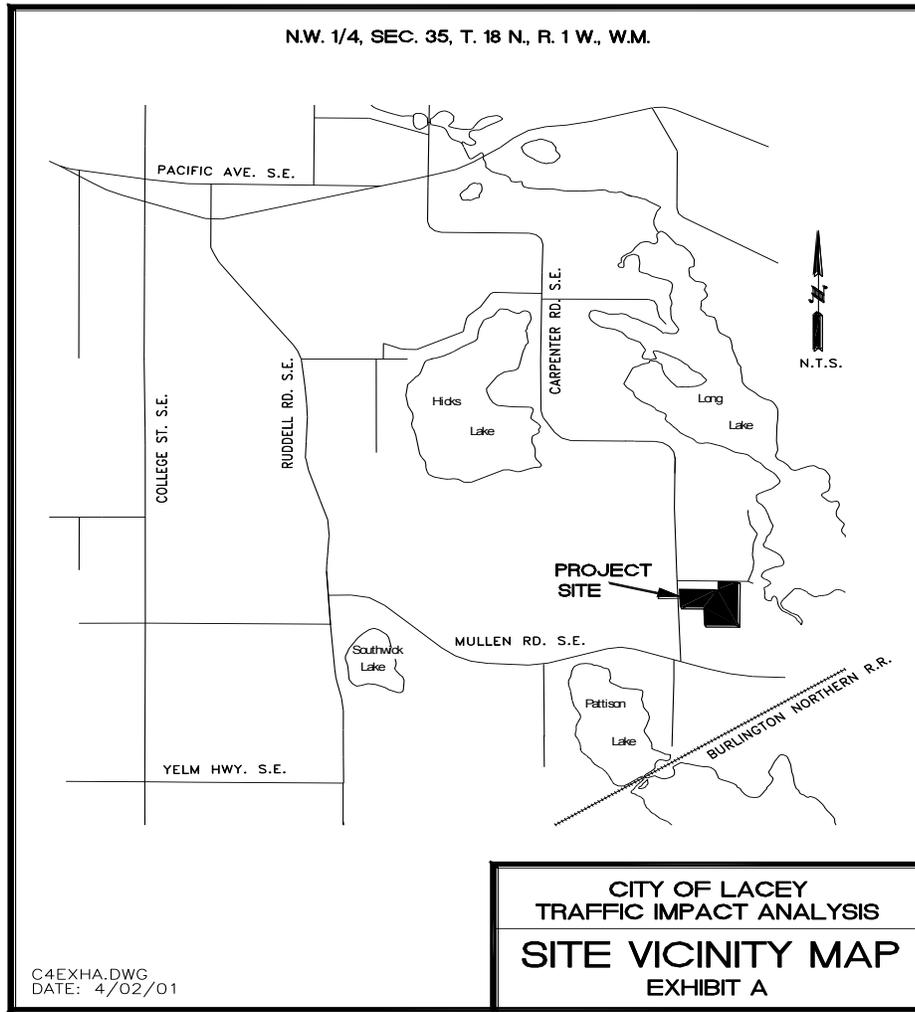
- A. To maintain the adopted Level of Service standard, the "development" shall provide a financial guarantee or construct improvements to maintain the level of service at or above the adopted standard. This improvement must be consistent with the City's *Transportation Comprehensive Plan* goals and policies.
- B. For affected transportation facilities identified in Lacey Municipal Code 14.21, the "development" will mitigate impacts by providing a proportionate share of the project cost on a per trip basis (LMC 14.21). The mitigation plan shall identify which payment option is proposed for the development. The Public Works Department will calculate the mitigation amount based on an approved distribution.

Transportation facilities affecting neighboring jurisdictions shall mitigate the impacts based on a per trip methodology approved by the jurisdiction.

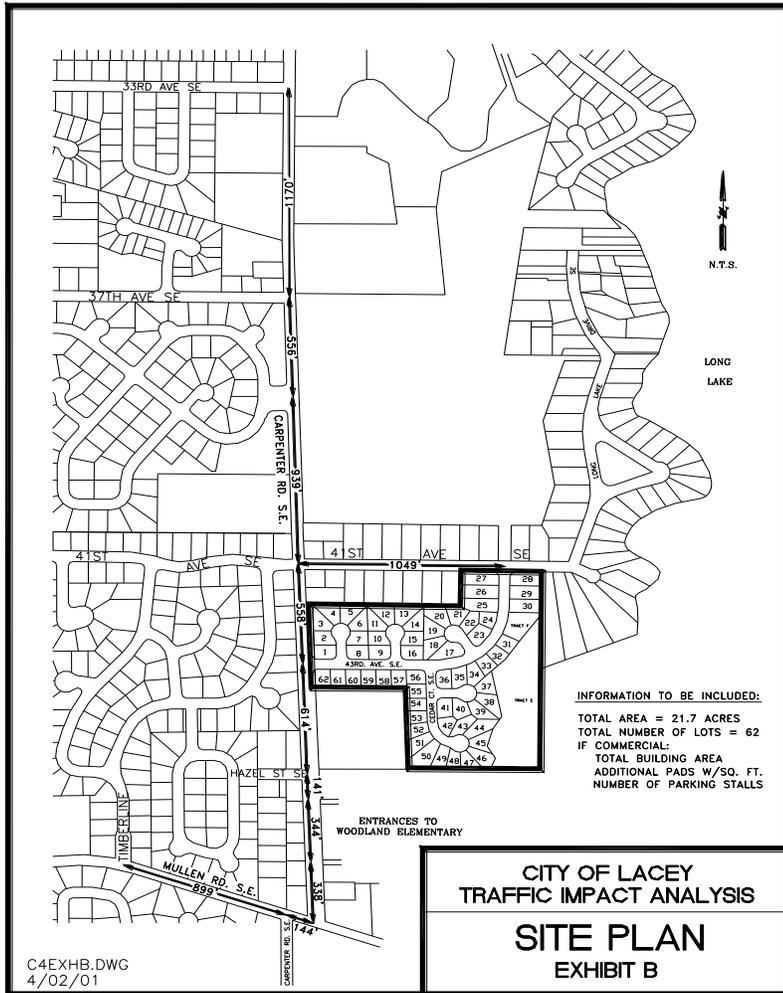
- C. On transportation facilities where the existing Level of Service condition is less than the adopted LOS standard and where no improvements are programmed to improve capacity and traffic operations, the "development" shall mitigate the intersection to an acceptable Level of Service condition or wait until the improvements are implemented.

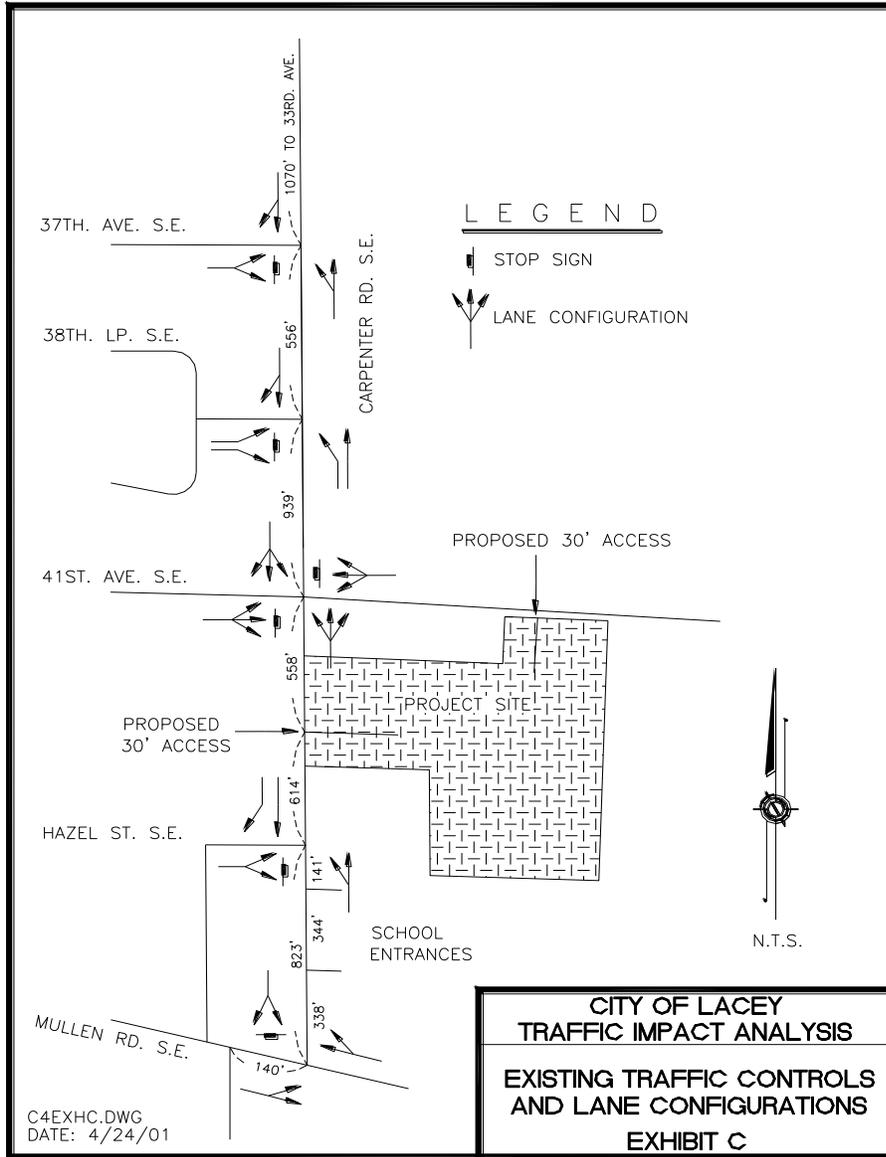
If the analysis identifies a LOS deficiency for an unsignalized intersection that is not programmed for an improvement, alternate roadway connections or non-controlled intersection improvements approved by the Public Works Department shall be appropriate mitigating measures. A controlled intersection (traffic signal, modern roundabout) to alleviate a LOS deficiency is not required. If sufficient alternate routes exist as determined by the Public Works Department mitigation will not be required.

If there are no alternatives to installation of a controlled intersection, and three or more traffic signal warrants, as outlined in the MUTCD (*Manual on Uniform Traffic Control Devices*) are satisfied within the horizon year of the development, a traffic signal or modern roundabout will be required as a mitigating measure for the "development".

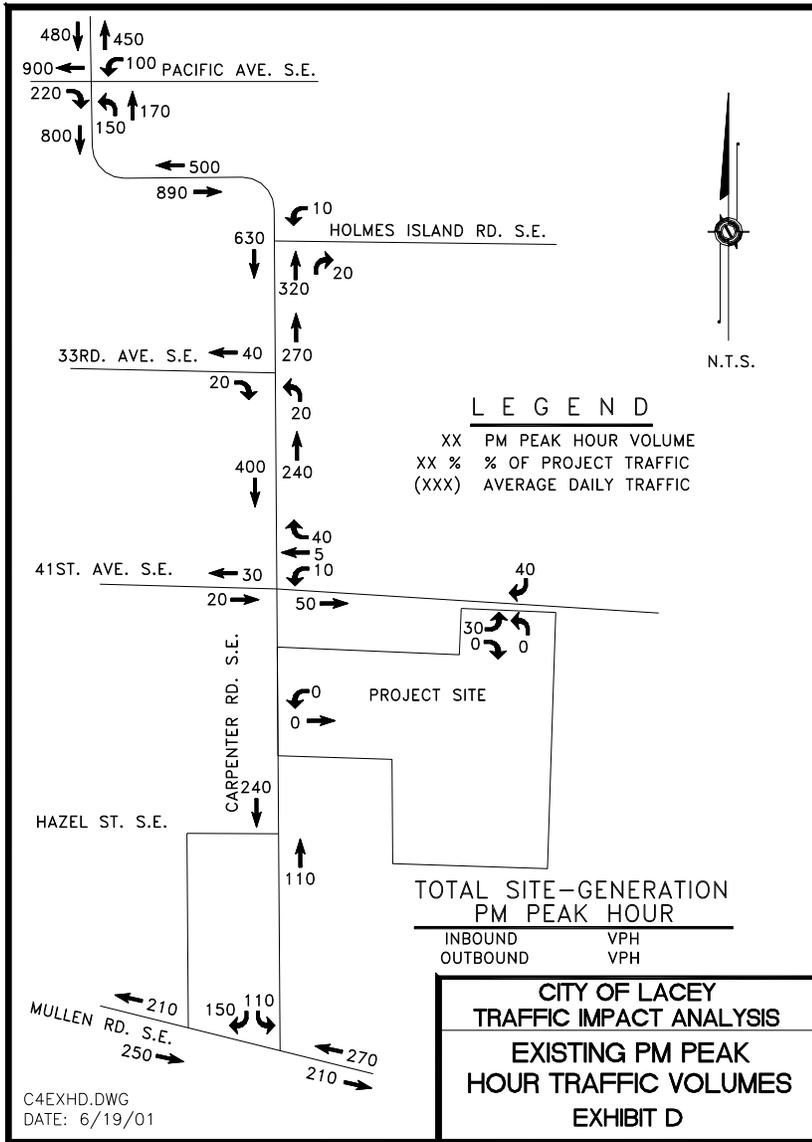


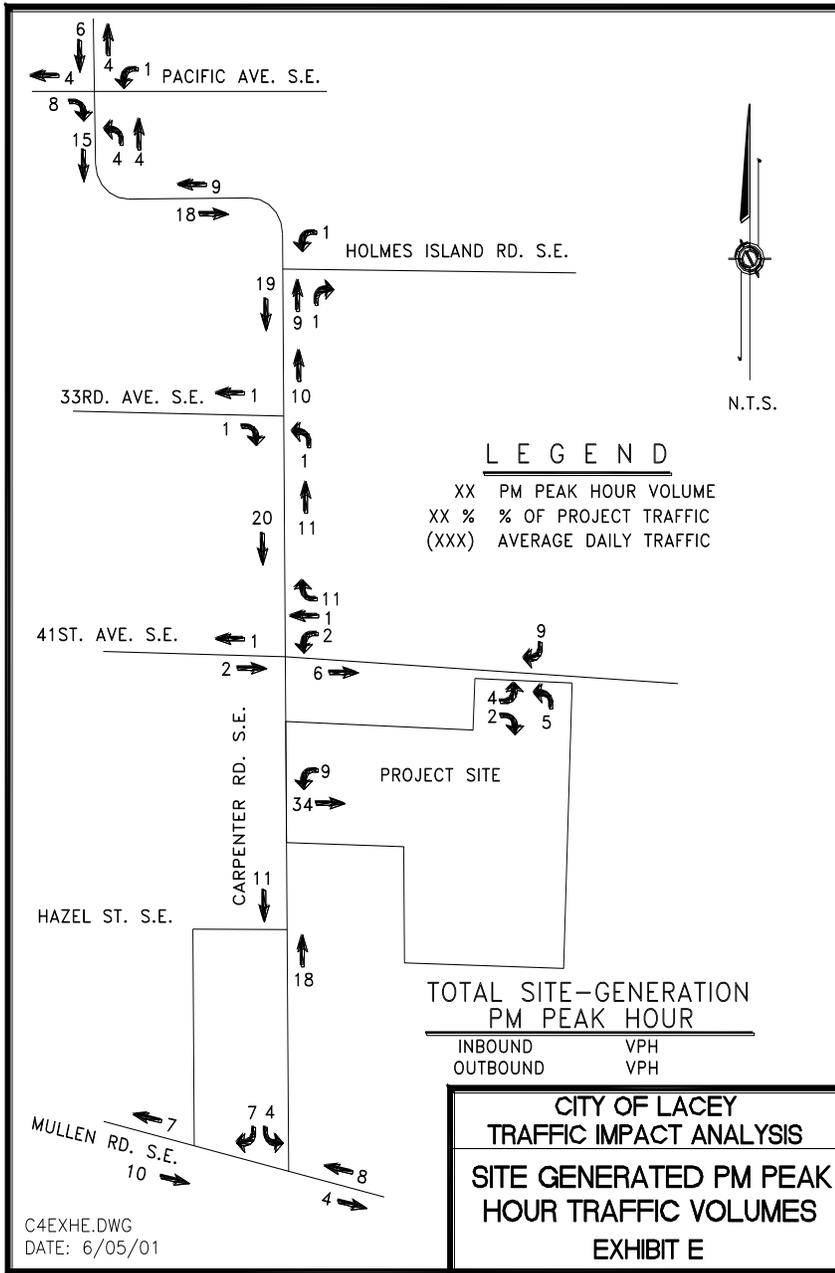
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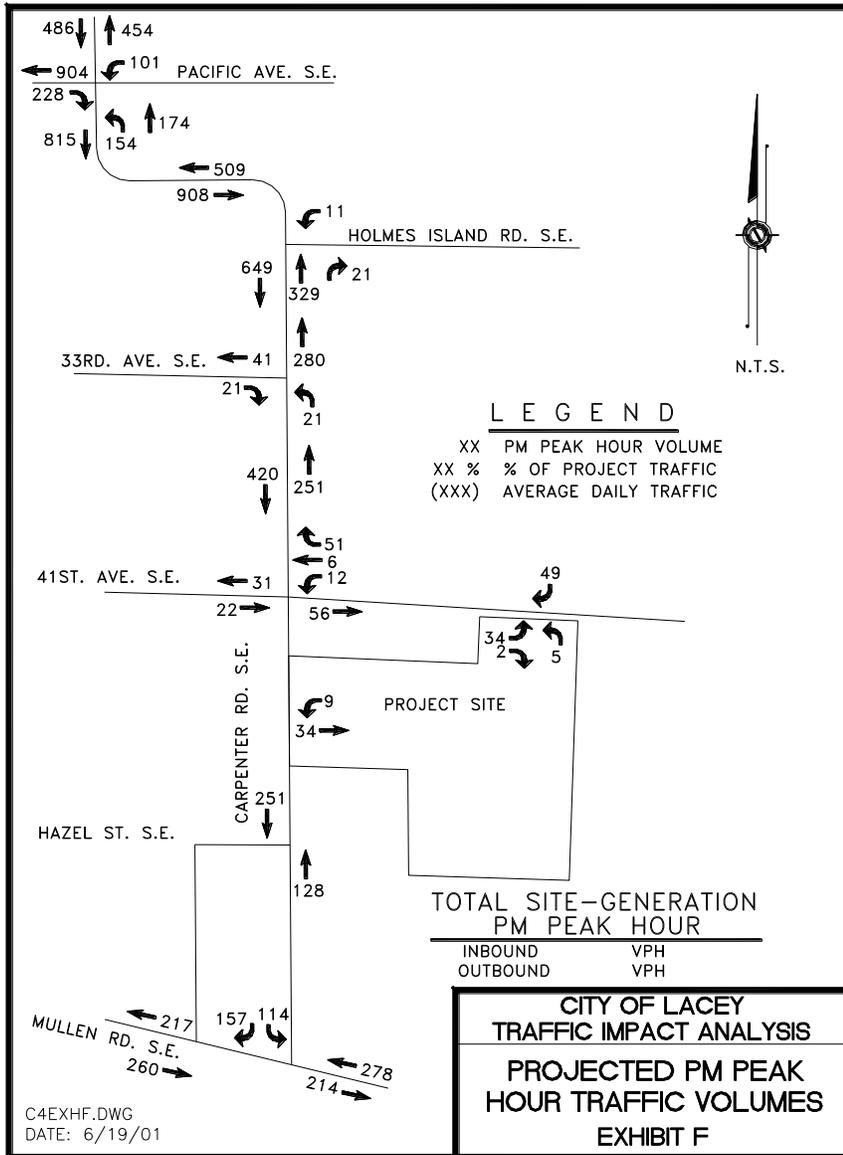


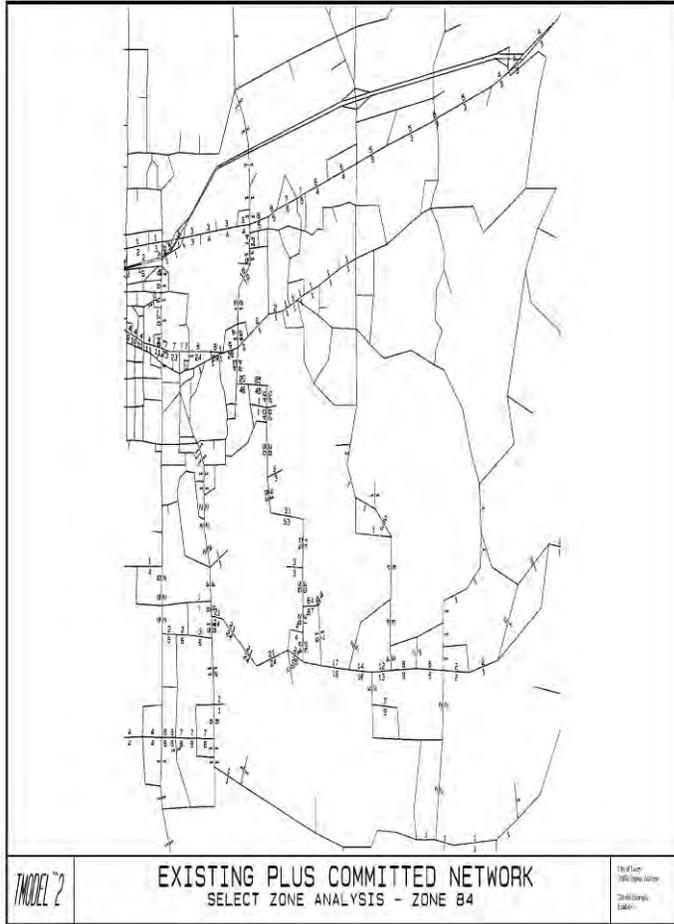


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### 4B.040 Naming

Streets and roads shall be named according to specific criteria. Street names shall be limited to 12 characters including spaces but excluding the roadway designation and quadrant (SE, NE). All streets lying north of Martin Way are designated northeast (NE). The remainder of the streets in the City are designated southeast (SE). "Avenues" run east-west and are numbered with the exception of certain long-standing historical names. "Streets" run north-south and are named. "Drives" are irregular or diagonal streets over two grid blocks in length not conforming to the grid pattern. "Roads" shall be a lengthy irregular or diagonal arterial over ten grid blocks in length. Boulevards and Parkways may run north, south, east and west, or diagonally and shall be named. Boulevards and Parkways shall be functionally classed as a major collector or an arterial and shall contain a landscaped median. "Places" shall be a north-south street, parallel to but between streets and shall carry the name of the street immediately to the west. "Ways" shall be an east-west street parallel to and between avenues and shall carry the name of the street immediately to the north. "Courts" shall be a cul-de-sac which cannot be extended. Courts are to be named or numbered and carry the number of the preceding street or avenue. "Loops" shall be small loop-type streets to carry the name of the street from which they originate. "Lanes" shall be private streets. (LMC 12.04.040) Exemptions to street name convention may be allowed with the approval of the City.

An address number will be assigned to all new buildings at the time of final plat, Site Plan Review, or at the time the building permit is issued. It is the owner's responsibility to see that the house numbers are placed clearly and visibly at the main entrance to the property or at the principal place of ingress. (LMC 12.04.080)

The developer must check with the Building Official regarding the naming of streets. This should be done at the time the subdivision is submitted and again upon approval of the subdivision. The Building Official will insure the name assigned to a new street is consistent with policies of the City. (LMC 12.04.070)

### 4B.050 Signing

The developer or contractor is responsible for providing, installing, and maintaining all construction signs and temporary traffic control devices. These shall comply with the provisions as established by the US Department of Transportation *Manual on Uniform Traffic Control Devices* (MUTCD) and the *WSDOT/APWA Standard Plans For Road, Bridge and Municipal Construction*.

Street signs for public and private roadways, including poles and hardware, will be paid for by the developer but will be approved, furnished and installed by the City to establish uniformity. A written request must be submitted to the City Public Works Department at the time street construction begins and the developer will be billed upon completion.

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All regulatory signs shall be high intensity reflectiveness grade. Street designation signs shall display street names and district destinations. (LMC 12.04.060) Street signs shall be U.S. Department of Transportation font series "B" meeting MUTCD standards.

When shortening roadway designations, the street suffixes shall meet U.S. Postal Service standards as shown in the following table.

<b>Roadway Designation</b>	<b>USPS Approved Suffix</b>
Avenue	AVE
Boulevard	BLVD
Court	CT
Drive	DR
Lane	LN
Loop	LOOP
Parkway	PKY
Place	PL
Road	RD
Street	ST
Way	WAY

### 4B.060 Right-of-Way

Right-of-way shall be dedicated for a subdivision, short subdivision, binding site plan, for a project that triggers Site Plan Review or for a conditional use permit. The requirement to dedicate right-of-way shall be determined by the City or Regional Transportation Plans, by a Traffic Impact Analysis, or as determined by Public Works. Although a right-of-way dedication may be required, frontage improvements may be deferred per chapter 4B.080 of the Development Guidelines.

Regardless of the frontage improvement requirements, right-of-way shall be dedicated in accordance with appropriate street standard identified in the Transportation Comprehensive Plan. Right-of-way dedication shall occur prior to civil plan approval or building permit issuance.

In order to construct improvements in the future, the City requires the right to make and maintain slopes for cuts or fills upon the property adjacent to the right-of-way being dedicated. This is necessary that streets may be graded to the proposed grade level in a reasonable and proper manner. This language shall be included within the right-of-way dedication deed.

Right-of-way is determined by the functional classification of a street. See details at the end of this chapter for specific right-of-way widths. See 4B.090 for radius requirements at cul-de-sac "bulb". Right-of-way at "bulb" shall be increased accordingly.

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Right-of-way requirements may be increased if additional lanes, pockets, intersection treatments, transit lanes, bus loading zones, bus shelters, operational speed, bike lanes, meandering sidewalks, tree retention, utilities, schools or future planned improvements are required as determined by the Director of Public Works. The right-of-way boundaries at intersections shall be sufficient to contain all portions of the sidewalk, curb ramps, all signal and lighting appurtenances, and any other appurtenance associated with a public utility.

Right-of-way shall be conveyed to the City on a recorded subdivision or by a right-of-way dedication deed. If the dedication is by deed, the deed shall be submitted and approved before construction begins; before a building permit is issued; before a tenant improvement is issued; or prior to certificate of occupancy, whichever comes first.

When right-of-way is conveyed to the City by plat or by dedication deed, the right-of-way centerline or other appropriate control line shall be monumented by a Washington licensed Professional Land Surveyor. A monumentation plan shall be submitted to the Public Works Survey Division for approval prior to placement of the monument positions. See Appendix B for examples of acceptable right-of-way dedication deeds.

### 4B.065 Buffers

All residential projects, whether single or multi-family, which abut a boulevard, an arterial, or any class collector street shall be required to establish a buffer from such streets. The buffer must be a separate tract of land, 20 feet in width, within the subdivision and is to be maintained by the homeowners association or individual property owners.

The buffer shall be landscaped including trees, shrubs, and ground cover contiguously, up to the back of the sidewalk whether or not the sidewalk is within or contiguous to the buffer strip. Stormwater facilities may be located within the buffer area. An irrigation system must be installed to support the required landscaping. Existing native vegetation may be used if approved by Community Development. If native vegetation is utilized, an irrigation system will not be required.

A masonry, wood or other approved solid type fence must be installed behind the buffer. The buffer is to be located on the street side of the fence.

The lots within the subdivision may go right up to the inside of the fence. The setback for the buildings on these lots is measured from their property line and does not include the buffer.

The Site Plan Review committee may delete, revise, or modify buffers as necessary to accommodate zoning or site specific conditions.

4B.070 Private Streets

A private street provides vehicular access to serve property that is privately owned and maintained.

A. Private streets may be allowed to serve the following types of properties:

1. No more than nine lots (short subdivision).
2. A planned residential development (PRD). PRDs may have public or private roadways.
3. A gated community. Gated communities must meet the criteria outlined below and specified in 4B.075.
4. Businesses or multiple dwelling units situated on one parcel. The residential private street standard is not required for apartment or condominium complexes. Also, the private street standard for commercial and industrial applications may be modified by the Site Plan Review committee to accommodate site and use specific conditions.

Private street standards are not to be applied in subdivisions greater than nine lots to avoid the use of public streets.

B. Private streets must meet all of the following conditions:

1. Private streets will be permanently established by tract or easement which provides legal access to serve private property and includes provisions for future use by adjacent property owners when applicable.
2. Private residential streets will have a minimum roadway standard of a major or minor local residential street. See Chapter 4B.030 for more information on functional classes of residential streets. See Details for typical roadway sections.
3. Private streets will be accessible at all times for emergency and public service vehicle use.
4. Private streets will not landlock present or future parcels nor obstruct public street circulation. If there is the ability for a future roadway connection, a private street will not be allowed.
5. Covenants will be verified and approved by the City and recorded with the county. The owner or homeowners association or other legal entity's covenants will specifically provide for maintenance of private streets and associated parking areas.

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6. The design and construction of sidewalks along private streets shall meet all applicable standards as for sidewalks along public roadways as specified in Chapter 4C.030.

C. Access, Structural Road Section, and Redevelopment

Driveway cuts may be used for access from public roadways onto private streets. See Chapter 4B.140, Driveways, for more information.

New structural roadway sections must meet current standards per Chapter 4B.160. The developer is responsible for roadway testing per Chapter 4B.200.

Private streets located on parcels being redeveloped may continue to exist as private streets if they meet the criteria outlined in Chapter 4B.070.B above.

D. Private Street Lighting

Short subdivisions of 4 lots or less are not required to provide internal street lighting. However, a street light may be required at the intersection with the public street as determined by the Public Works Department. An intersection street light, if required, shall meet the same standards as public street lighting.

On private streets in a subdivision of 5 lots or more, street lighting shall be required. The average maintained horizontal illumination coverage shall be the same as specified in Chapter 4E.020 for a residential street. Lighting on private streets shall remain private and shall be the homeowners association's or other legal entity's responsibility to operate and maintain.

E. Acceptance as Public Streets.

Acceptance of private streets as public streets will be considered only if the street(s) meet all applicable public street and utility standards.

F. Private Street Exemption.

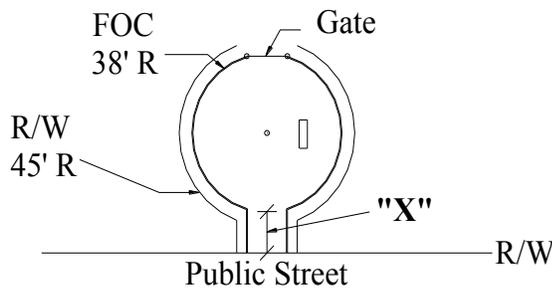
Under unusual circumstances the Site Plan Review Committee may relieve short subdivisions of 9 lots or less from some or all private street standards. At the time of preliminary short subdivision approval, the Site Plan Review Committee shall determine appropriate improvements. Each site will be reviewed in conjunction with adjacent properties and existing and potential future improvements.

A private street is not required for short plats of 2 lots or fewer.

4B.075 Gated Residential Access

Gates to neighborhoods or gated communities shall be allowed only on private streets. Private streets shall meet all the conditions as set forth in Chapter 4B.070. In addition, the following conditions shall apply:

- A. A minimum stacking distance as depicted by the drawing and shown in the table below shall be required.



**For Site Plan Review Projects**

<b>Intersecting Public Street Classification</b>	<b>"X" Distance</b>
Arterial Boulevard and Arterial	If only one access use 5 feet per PM peak hour trip. Minimum "x" distance shall be 100.
Major and Minor Collector	1 foot per PM peak hour trip. Minimum "x" distance shall be 20 feet.
Major and Minor Local Residential and private	0.5 foot per PM peak hour trip. Minimum "x" distance shall be 10 feet.

- B. A turn around shall be provided on the public right-of-way side of the gate. See example above.
- C. Mailboxes meeting U.S. Postal standards shall be located on the public side of the gate. See Chapter 4G.070.
- D. Gates shall be equipped with an emergency preemption system capable of operating from the public side of the gate to facilitate immediate entry of emergency vehicles into the development. Such system shall be a priority control system employing data-encoded infrared communication to identify the emergency response vehicle. The type of system shall be compatible with

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the traffic signal priority control system used by the City. This system must be maintained in proper working order by the owners of the development or the proper homeowners or business owners association, whichever shall be the case. LMC 14.17.020. A copy of the access key, code, or combination shall be provided to the City to facilitate access by the Water/Wastewater Departments.

4B.076 Gated Commercial Access

Gated access to commercial or industrial projects shall follow the standards as set forth in 4B.075 except, a cul-de-sac is not required. The stacking distance shall be based on vehicle length, access street classification, and entering volumes in the PM peak hour. A Traffic Impact Analysis shall be used to determine an appropriate stacking distance.

4B.080 Street Frontage Improvements

- A. All commercial and residential (including multi-family) development, subdivisions, short subdivisions and binding site plans shall install street frontage improvements at the time of construction as required by the Department of Public Works. Projects within the City limits or outside of the City limits and within the City of Lacey's UGA boundary, shall install frontage improvements per this Chapter regardless of whether the City is the water or sewer purveyor.

For new proposals, if Site Plan Review approval is necessary, frontage improvements shall be required. If an existing use is being altered or improved, frontage improvements shall be required if the project meets all of the following conditions:

1. The project requires binding site plan, conditional use permit, or SPR approval per LMC 16.84, and,
2. The site has more than 100 feet of total frontage, and,
3. The project meets the threshold requirements as determined by all applicable LMCs.

Regardless of frontage improvements being required, right-of-way shall be dedicated in accordance with appropriate street standard identified in the Transportation Comprehensive Plan.

Per the Site Plan Review approval, such improvements include but are not limited to: curb and gutter; sidewalk; roadway; street storm drainage; street lighting system; holiday lighting features; traffic signal modification, utility conduit, traffic control devices, signal interconnect, relocation or installation; public transit amenities; street signing; utility relocation; planter strips; landscaping and irrigation; and street widening all per these Standards. Plans shall be prepared and signed by a licensed civil engineer registered in the State of Washington.

- B. All frontage improvements shall be made across full frontage of property from centerline to right-of-way line. Widening and/or overlays shall have a minimum new pavement width of one lane to the centerline of a 2-lane road or to the lane line of a multi-laned road. Off project site frontage improvements may be required if determined by the City for public safety.

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- C. Utility relocations shall follow the requirements as outlined in Chapter 3.100, Utility Locations, in these Guidelines.
  - D. If contiguous properties are under the same ownership, frontage improvements shall be required if the project meets all of the following conditions:
    - 1. The project requires binding site plan, conditional use permit, or SPR approval per LMC 16.84, and,
    - 2. The contiguous sites have more than 100 lineal feet of combined frontage, and,
    - 3. The project meets the threshold requirements as determined by all applicable LMCs.
  - E. Exceptions. When the Director of Public Works deems the above such improvements cannot be accomplished, frontage improvements may be deferred, modified or waived. These exceptions shall be made a condition of Site Plan Review Approval or as a condition of subdivision, short subdivision, binding site plan, and conditional use permit approval.

Improvements may be deferred by signing a Waiver of Protest for a Local Improvement District (L.I.D.); by signing a Deferral of Frontage Improvements Agreement; or by paying a fee in lieu of constructing the improvements. If a fee in lieu of is paid, it shall be based on the engineer's estimate and the City will be responsible for constructing said facilities at a later date.

If the frontage improvements are deferred, all necessary right-of-way must be dedicated as a condition of approval. If additional right-of-way is required and the side slopes exceed 7:1 slope, then a 10 foot slope easement shall also be required to facilitate construction of future improvements. Methods of deferral, and components thereof, must be in place, signed, collected, and/or processed prior to the project scheduling a preconstruction meeting.

#### 4B.090 Cul-de-sac

Streets designed to have one end permanently closed shall typically be no longer than 400 feet as measured from the intersecting right-of-way line extended, to the center of the cul-de-sac. At the closed end, there shall be a widened "bulb" having a minimum paved traveled radius as shown in the Minimum Street Design Standards Table. See Chapter 4B.100 for dead end requirements. (LMC 15.10.020)

With the exception of cases where geographical, topographic or environmental conditions preclude interconnection, cul-de-sacs shall be discouraged. When these conditions preclude street connections, continuous non-vehicular connections shall be attempted. Cul-de-sacs may be allowed with the approval of the Director of Public Works.

Cul-de-sacs shall be required for short subdivisions bordered on 3 sides by properties developed to their maximum use.

Dead ends or a shared access may be required for subdivisions where the potential for future connectivity exists due to the proximity of underdeveloped properties.

Cul-de-sacs shall be sloped at a minimum 2% from center-to-edge to facilitate drainage.

#### 4B.100 Dead End Roadways

Where a street is temporarily dead ended, turn around provisions and a red and white barricade the full width of the roadway must be provided where the road serves more than one lot (see details). Hammerheads will not be allowed on a dead end in a residential area. Hammerheads may be allowed in commercial or industrial areas. Permanent dead ends shall be properly signed per section 3C-4 of the MUTCD.

At the end of a sidewalk to be extended in the future if there is a slope greater than 4 percent, a red and white type II barricade the full width of a sidewalk is required. See Chapter 4C.030 (G) for interim requirements at a dead-end sidewalk.

#### 4B.110 Half Street

A half street is an otherwise acceptable roadway section modified to conform to limited right-of-way on the boundary of property subject to development. See definition in Chapter 3.025. (LMC 15.10.020)

- A. A half street may be permitted subject to approval by the Director of Public Works when:
1. Right-of-way from the adjoining property suitable for future completion of a full-section roadway must be obtained prior to considering a half street improvement, and
  2. Such alignment is consistent with or will establish a circulation pattern, and
  3. The right-of-way width of the half street is not less than one-half of the proposed total width of the right-of-way and may be required to be greater than one-half the total proposed width to accommodate adequate driving lanes until the other half of the street is constructed , and
  4. The traveled way shall be surfaced the same as the designated street classification, and
  5. The half street shall be graded consistent with the centerline of the ultimate roadway section on the property line, and
  6. The roadway section meets the ultimate roadway section and all applicable stormwater requirements, and

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7. Property line edge of street shall be finished with permanent curb and gutter to insure proper drainage, bank stability and traffic safety.

4B.115 Fire Access Roads

This chapter applies to Fire Access Roads outside of the public right-of-way. Fire Department access roads shall be designed and installed per the most current adopted edition of the Fire Code as adopted and amended by the Lacey Municipal Code.

4B.125 Landscape/Planter Areas

Landscape and planter area widths shall be as shown on details at the end of this chapter. Landscaping methods shall be in compliance with section 8-02 of the *WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction*.

Landscape and planter areas shall be prepared in the following order: scarify the native soil; install the root barriers; install the irrigation system; add the topsoil; install the landscaping; add a top-dressing if applicable. See Chapter 6.210 for irrigation system requirements.

Excavate the area to be landscaped to the depth below finished grade as shown in the table below. Scarify or aerate the subgrade by tilling, disking, harrowing, or other method as approved by the City. Fracture and incorporate glacial till or other hardpans within 4 feet of the top of the finished grade. Remove debris and stones from the surface that are larger than 1 inch in any dimension. Backfill the excavated area with topsoil to the depth shown in the table below. (Work on Language) Remove all rocks, sticks, and other debris 1 inch and larger. The finished grade of topsoil at the curb shall be 1 inch below the top of curb.

	<b>Initial Excavation Depth</b>	<b>Topsoil Depth</b>
<b>Medians and Islands</b>	19 inch	18 inch
<b>Perennial Planter Strip</b>	13 inch	12 inch
<b>Grass/Lawn Planter Strip</b>	7 inch	6 inch

See Chapter 4G.100, Street Trees, for specific information on tree species, size, location, and spacing. Trees located in tree wells shall be installed per detail.

Trees located in planter strips, medians, or islands shall be installed per detail and placed in pits prepared as follows. Excavate pits 12 inches **deeper and three times the diameter** of the rootball. Thoroughly scarify the bottom of the pit by shovel cutting to a depth of 12 inches. Shovel cut pit sides to help root penetration. Only non-amended, native soil shall be used immediately below the rootball for purposes of establishing plant depth. After the proper depth of the plant material has been established, place the rootball in the center of the hole flush 1 to 2 inches above the

finished grade. Release the root covering; spread roots to a natural spread and distribution. Backfill, working the soil around the roots, with topsoil. Firm the backfilled soils to eliminate air pockets (do not compact) the backfill and provide a slight depression and watering saucer. Take care to not injure the root system while backfilling.

**Topsoil**

Topsoil shall be composed of sandy loam, loam, or loamy sand mixed with composted organic materials. The topsoil shall be 70 percent topsoil and 30 percent composted materials by volume and shall be thoroughly mixed. A soil test shall be provided for all topsoil imported to the site.

The compost shall be a weed free, well decomposed, humus-like material derived from the decomposition of grass clippings, leaves, branches, wood and other organic materials. Composts containing shavings, cedar sawdust, or straw will not be permitted. Compost shall be produced at a permitted solid waste composting facility.

All medians shall have a one foot concrete safety landing adjacent to the curbing (all sides) to aid in maintenance of the median.

**Maintenance**

The property owner, lessee, homeowner's or lot owner's association will be responsible for mowing, weeding, watering, tree replacement (replaced due to death, damage or disease after approval by a City representative) and tree maintenance within the respective right-of-way and common areas. See Chapter 6.210 for installation and maintenance of irrigation systems.

**4B.126 Traffic Control**

The contractor shall be responsible for all traffic control in accordance with the *WSDOT/APWA Standard "K" Plans for Road, Bridge and Municipal Construction*, and the *Manual on Uniform Traffic Control Devices (MUTCD)*. Prior to the disruption of any traffic, a traffic control plan shall be prepared and submitted to the City for approval. At no time shall a roadway be blocked without the approval of the Director of Public Works. No work shall commence until the City has approved the plan and the traffic control is in place.

There shall be no restrictions or interruptions to traffic on Saturdays, Sundays, or Holidays. In addition, there shall be no restrictions or interruptions to traffic after 12:00 noon on the day prior to a holiday or holiday weekend unless approved by the Director of Public Works.

There shall be no restrictions or interruptions to traffic on arterial roadways during the peak traffic hours of 7:00 a.m. to 9:00 a.m. and from 3:30 p.m. to 6:00 p.m., Monday through Friday, except when deemed necessary by the City. If the City determines the peak hours differ from those specified, the contractor will be required to adjust his working hours accordingly.

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No work shall be allowed in or adjacent to a residential zone between the hours of 9:00 p.m. and 7:00 a.m. A waiver to this ordinance will not be allowed except in the case of an emergency or where operations are necessary during such hours in order to promote the safety of the traveling public (Ordinance 837).

The City may require roadway work to commence at night when it is in the best interest of the public.

Two-way traffic shall be maintained at all times unless specifically approved in the traffic control plan. Flaggers shall be shown on the traffic control plan except for emergency situations. The developer is responsible for traffic control signing per Chapter 4B.050, Signing.

All lane restrictions shall be held to a minimum time and length. Lane closures shall comply with the traffic control plans, these specifications, the *MUTCD*, and the *WSDOT Standard Plans*. If the City determines that lane restrictions are causing congestion, the contractor will be required to open any lanes, as determined by the City, until the congestion is eliminated.

There shall be no delay to school buses, U.S. Postal Service or medical, fire, police, and other emergency vehicles with flashing lights or sirens.

The contractor shall maintain pedestrian access through or around the project site at all times without having pedestrians enter the travel lane.

Flaggers shall possess a current flagging card issued by the State of Washington prior to performing any traffic control work on a project. Workers engaged in flagging shall wear reflective clothing and hard hats in accordance with the *WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction*. Flagger's paddles shall meet MUTCD standards.

#### 4B.130 Intersections

An intersection may be any access point, whether a public street or a public or private driveway, onto a public street. See Chapter 4B.025 for Access Management criteria and 4B.030 for intersections as they relate to Functional Classification. See Chapter 4B.140 for driveway access issues. See Chapter 4B.150 for sight obstruction criteria.

- A. Street intersections shall be laid out so as to intersect as nearly as possible at right angles. All intersections shall be designed so as not to create a safety problem. Sharp angled intersections shall be avoided. If through traffic is not desired on the minor legs, a "T" intersection (three-legged) is preferable to the crossroad (four-legged) intersection. For safe design, the following types of intersection features shall be avoided unless approved by the City Traffic Engineer:
  1. Intersections with more than four intersecting streets;
  2. "Y" type intersections where streets meet at acute angles;

3. Intersections adjacent to bridges and other sight obstructions.

- B. On sloping approaches at an intersection, landings shall be provided with grade not to exceed 3 percent slope for a distance of 30 feet approaching any arterial or 20 feet approaching a collector or local access street, measured from nearest right-of-way line (extended) of the intersecting street.

4B.140 Driveways

A driveway is defined as an access from a public or private right-of-way or access easement onto private property whether constructed as a curb cut or a curb return. See Chapter

4B.145 Access Management for additional access information and spacing requirements.

Details of driveway sections are located at the end of this Chapter. All abandoned driveway areas along the frontage of redeveloped property shall be removed and the curbing, planter strip, sidewalk; or shoulder and ditch section shall be properly restored. All driveway approaches shall be constructed of Commercial Concrete and shall be subject to the same testing and inspection requirements as curb, gutter, and sidewalk construction.

Joint-use driveways serving two adjacent parcels are encouraged whenever feasible. A joint-use driveway serving two adjacent parcels is required if contiguous property is under the same ownership. An easement and a maintenance agreement shall be recorded for both parcels specifying maintenance and joint usage in perpetuity.

A. Residential Driveways

Residential driveways shall be those driveways constructed on private property to serve a single-family residential structure or a duplex. Residential driveways shall always be constructed as a driveway cut through the sidewalk. Formed curb returns for residential driveways shall not be permitted.

1. Residential access to a public street shall be limited to one driveway for each tract of property separately owned.
2. In new construction, residential driveways shall not be permitted to access arterials, major collectors, or minor collectors unless the property has no other reasonable access to the general street system.
3. If an existing residential parcel abuts an arterial, major collector, or minor collector, no residential access shall be allowed to those streets within 150 feet of the nearest right-of-way line of an intersecting street. The driveway shall access the roadway with the lower functional classification.
4. All residential driveway accesses shall meet the sight distance requirements of Chapter 4B.150.

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5. The maximum residential driveway width onto an arterial or collector shall be 24 feet. The maximum residential driveway width onto any other roadway classification shall be 20 feet.
  6. The minimum driveway length shall be 20 feet from the residential structure to the back of walk.
  7. Grade breaks, including the tie to the roadway, shall be constructed as smooth vertical curves. The maximum change in driveway grade shall be 8 percent within any 10 feet of distance on a crest and 12 percent within any 10 feet of distance in a sag vertical curve.

If the above standards cannot be met, the proponent will have to hire a traffic engineer to design the most appropriate access with safety being the primary design criteria.

B. Public Driveways

Public Driveways shall be those driveways constructed on private property to serve commercial, industrial, and multi-family projects. For the purpose of this Chapter, private streets serving single-family residential units are also considered a public driveway. Also see the private street standards in Chapter 4B.070.

Public driveways shall be curb cuts. A traffic engineer shall design public driveways with safety being the primary design criteria. The City Traffic Engineer shall determine if a formed curb and gutter will be allowed based on the vehicle type, ADA requirements, the use, the roadway it is accessing, and the Traffic Impact Analysis. Private streets constructed as part of a Planned Residential Development (PRD) shall meet the private street standards in Chapter 4B.070. The following criteria shall apply to all Public Driveways.

1. Access to a public street shall be limited to one public driveway connected to the lowest classified roadway for each tract of property separately owned. Property fronting more than one public street may be permitted an access to each public street if the Traffic Impact Analysis supports multiple accesses. Two or more public driveways accessing a public street will only be allowed with the approval of the City Traffic Engineer. Properties contiguous to each other and owned by the same person are considered to be one tract.
2. Commercial properties shall provide internal connections between neighboring properties. Developments must give priority to internal access before access to the public roadway system is permitted. Cross access allows vehicles to circulate between commercial properties without having to re-enter the public street system.
3. If all other access management techniques have been exhausted, the City will permit public driveways utilizing the following minimum corner clearance requirements. Corner clearance is the distance between a private access and the nearest cross road intersection and is applicable to

all roadway classifications. Corner clearance is necessary to provide adequate perception-reaction time to reduce potential downstream conflicts and is aimed at preventing the location of driveways within the functional area of an intersection. Minimum driveway setback and corner clearance requirements shall meet the most current ITE standard. The minimum corner clearance setbacks are shown in the following table.

<b>Minimum Corner Clearance</b>		
85 <sup>th</sup> Percentile Speed (mph)	Distance (in feet) from Near Side of Street to Near Side of Access Driveway	
	Major Traffic Generator	Minor Traffic Generator
30	200	150
35	260	215
40	330	260
45	395	310
50	460	345

Reference: *Traffic Engineering Handbook*

Major traffic generators are developments that require or would be required to complete a Traffic Impact Analysis per section 4B.035.

4. Public driveways shall meet the sight distance requirement of Chapter 4B.150.
5. No public driveway shall be approved where backing onto the sidewalk or street will occur.
6. Parking lot circulation and signing shall be met on site. The public right-of-way shall not be utilized as part of the parking lot flow.
7. The landing on all public driveways shall meet the criteria in Chapter 4B.130B.
8. The maximum driveway width for a two-way, public driveway with curb cuts shall be 24 feet for multi-family residential, 30 feet for commercial uses, and 45 feet for industrial uses.
9. The maximum driveway width for a two-way, public driveway with curb returns shall be the same as listed for curb cuts. A wider public driveway may be approved by the City Traffic Engineer where a substantial percentage of oversized vehicle traffic exists, where divisional islands are desired, or where multiple exit or entrance lanes are needed.
10. The maximum one-way public driveway width for a curb cut or a driveway with curb return shall be 14 feet for multi-family residential, and 20 feet for commercial and industrial uses.

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11. The storage length of a driveway must be adequate to prevent vehicles from waiting in through lanes to enter the site or causing unsafe conflicts with on-site circulation and parking. General standards appear below but these requirements will vary according to the projected volume of the individual driveway. The length shall be measured from the face of curb.

Adequate Driveway Storage Lengths	
Development Type	Minimum Driveway Throat Length*
Shopping Center > 150,000 GLA**	200 feet
Smaller Project < 150,000 GLA**	75 - 95 feet
Signalized Driveway	Based on operational analysis for 95% queue

\*\* Gross Leasable Area

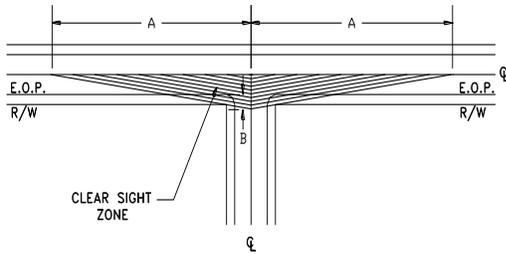
12. Road approaches and/or ingress and egress tapers may be required in industrial and commercially zoned areas as directed by the City Traffic Engineer. Tapers shall be designed per the ITE (Institute of Transportation Engineers) publication, *Transportation and Land Development*, latest edition.

#### 4B.150 Sight Obstruction

The criteria in this chapter shall be used as a reference for streetscape amenities such as signs, trees, fences, bus shelters, etc. Use AASHTO Design Standards to determine sight distance criteria for all road and intersection designs. Intersections may include public and private driveways and pedestrian crossings. See Chapter 4B.130 for intersection definition.

The area within the sight distance triangle shall be subject to restrictions to maintain a clear view on the intersection approach. The ultimate roadway width (number of lanes) per the most current version of the City's Transportation Plan shall be used to calculate the dimensions of the sight distance triangle. [Plant size at maturity must be accounted for when designing landscapes within the sight distance triangle.](#)

STOP OR YIELD CONTROLLED INTERSECTIONS



The centerline of the road is the actual physical centerline regardless of the number of lanes. Sight distance B is 15 feet measured from the near edge of pavement to the eye of the driver on the minor road. The following table shall apply to both vertical and horizontal sight distance.

Design Speed (mph)	Minimum Distance 'A' (in feet)*							Multiplier
	20	25	30	35	40	45	50	
Collector Streets	200	250	300	350	400	450	500	10
Arterials and Boulevards	240	300	360	420	480	540	600	12

**\*based on Sight of Distance per 10 mph for Design Vehicle "P" Crossing Arterial**

If your speed is not shown above, use the following formula for distance A:

$$\text{multiplier} * \text{design speed} = \text{sight distance A}$$

On roadways with 5 or more lanes or roadways with medians more than 20 feet wide, use AASHTO Design Standards.

The vertical clearance area within the sight distance triangle shall be free from obstructions to a motor vehicle operator's view between a height of 3 feet and 10 feet above the existing surface of the street.

Exclusions. Sight obstructions that may be excluded from these requirements include: fences in conformance with this chapter, utility poles, regulatory signs, trees trimmed from the base to a height of 10 feet above the street, places where the contour of the ground is such that there can be no cross visibility at the intersection, saplings or plant species of open growth habits and not in the form of a hedge which are so planted and trimmed as to leave at all seasons a clear and unobstructed cross view, buildings constructed in conformance with the provisions of appropriate zoning regulations and preexisting buildings.

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#### 4B.160 Surfacing Requirements

The following are the surfacing requirements for each application listed. These designs are based on Washington stabilometer subgrade R-value of 5. Alternate structures will be accepted based on soil tests to determine the actual Washington stabilometer R-value and completion of worksheet 4-6.2 in the drawing section at the end of this Chapter. Soil tests and a completed worksheet for each road classification shall accompany plans submitted if structures other than those shown below are used.

One soil sample per each 500 lineal feet of centerline with 3 minimum per project representative of the roadway subgrade shall be taken to determine a statistical representation of the existing soil conditions.

Soil tests shall be performed by an engineering firm specializing in soils analysis.

The soils report, signed and stamped by a soils engineer licensed by the State of Washington, shall be based on actual soils tests and submitted with the plans. All depths indicated are a minimum compacted depth.

Refer to Details for Pavement Design structures. For Hawks Prairie Business Park roadways, the primary east-west arterial shall be built to a major collector standard. The connecting collectors and interior roadways shall be built to a minor collector standard.

Fire access road structures shall meet the standards as required for a minor local residential roadway. Alternate materials, e.g. paving tiles or gravel may be approved provided the structure is designed to support fire apparatus vehicles.

##### A. Sidewalks

Surfacing: 4 inches Commercial Concrete  
Base: 1 inch Crushed Surfacing Top Course or well graded sand

Surfacing: Asphalt sidewalks will not be permitted unless otherwise approved by the Director of Public Works. (LMC 12.24.060)

##### B. Driveway

Surfacing: 6 inches Commercial Concrete  
Base: 1 inch Crushed Surfacing Top Course or well graded sand

##### C. Class I Bikepath

Surfacing: 4 inches Commercial Concrete  
Base: 1 inch Crushed Surfacing Top Course

Alternate:  
Surfacing: 2-1/2 inches Hotmix Asphalt Pavement

Base: 4 inches Ballast

Ballast shall consist of crushed, partially crushed, or naturally occurring granular material from approved sources and shall meet the *WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction* ballast specification 9-03.9(1) for grading and quality. The City Engineer or his/her representative will determine the exact point of acceptance.

The application of any asphalt to the roadway shall be restricted to the following conditions:

- ◆ The ground temperature for paving is based on the course location (surface or sub-surface) and depth of paving. Use *WSDOT Standard Specification 5-04.3(16)* to determine temperature limitations.
- ◆ Asphalt shall not be applied to wet material. Asphalt shall not be applied during rainfall, sand or dust storms, or before any imminent storms that might damage the construction. The City will have the discretion as to whether the surface and materials are dry enough to proceed with construction.
- ◆ No asphalt shall be applied which cannot be covered one hour before darkness. The City may require the Contractor to delay application of asphalt until the atmospheric and roadway conditions are satisfactory.
- ◆ Hot Mix Asphalt in accordance with *WSDOT Standard Specification 5-04* shall be utilized. The nominal compacted depth of the wearing surface shall not exceed two inches.

#### 4B.165 Pavement Markings.

Channelization and pavement markings shall be as shown on the details at the end of this chapter. All markings shall meet federal metric standards. Pavement markings shall comply with these Guidelines and all applicable MUTCD, AASHTO, and WAC standards and regulations. When striping is required, a Channelization Plan complying with the Plan Checklist shall be submitted. See Chapter 3.040 for Checklist details.

Controlled intersections shall have appropriate pavement markings. Stop bars shall be a 24 inch wide thermoplastic stripe.

If required, pigmented stamped concrete crosswalks shall be Bomanite or approved equal, with 12 inch white plastic borders. The stamped concrete pattern shall be Basketweave Used Brick. The base color shall be Brick Red. The release agent color shall be Brick Red. The full depth of concrete shall be pigmented with base color. Powdered release agent shall then be applied to give the highlights desired. The release agent shall be heavy-duty quality as recommended by the manufacturer of the stamping pattern. Concrete shall be stamped with inconsistencies in the pattern and hand finished. After a curing period of 4 days, the concrete shall be pressure washed to remove the remaining release agent. A weatherproofing sealer with moss control shall be applied to the finished surface.

In cases where crosswalks are not pigmented stamped concrete, they shall be high emphasis 24 inches wide thermoplastic.

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Hash marks shall use 8 inch plastic stripes, 5 feet on center. Raised pavement markers shall be used to highlight the border of a hashed area. All “C” curbs shall be painted “traffic yellow”.

Striping shall be required on all roadways. Striping, either with thermoplastic or raised pavement markers, in residentially zoned areas is generally not required except in the following circumstances:

- Stop bars or crosswalks may be required if a stop sign is required.
- Striping may be required in conjunction with roundabouts, traffic calming devices, radii and at neighborhood entrances.
- Striping shall be required to delineate bulb-out parking except when concrete valley gutters are present.

The thermoplastic material used to form pavement markings shall be [preformed thermoplastic material as listed on the most current version of the WSDOT Qualified Products List](#).

#### 4B.170 Temporary Street Patching

All excavations of streets and driveways, or failure of the existing pavement which will be exposed to traffic shall be temporarily patched by the end of the working day, or as directed by the City. The patch shall be constructed of 2 inches of Hot Mix Asphalt or steel plates.

Asphalt Treated Base (ATB) used for temporary restoration may be dumped directly into the trench, bladed and rolled. After rolling, the trench must be filled flush with asphalt concrete pavement to provide a smooth riding surface.

The contractor shall maintain all temporary patches until such time as the permanent pavement is in place. If, after reasonable notification, the contractor is unable to maintain a patch for whatever reason, the City will patch it at the contractor’s expense, and charge a mobilization fee of \$1000.00. The City reserves the right to perform emergency repairs as deemed necessary without contractor notification. In such cases, the contractor will still be liable for costs as noted above.

#### 4B.180 Trench Backfill and Restoration

Trench restoration shall be by a patch or overlay as required by the City.

- A. All trench and pavement cuts shall be made by sawcuts.
- B. All trenching shall be backfilled as shown in the appropriate trench restoration detail at the end of this chapter. The trench shall be compacted to 95 percent minimum density, as described in Section 2-03 of the *WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction*.

- C. If, when trenching, cement concrete is encountered, cement concrete shall be used to restore the patch. When cement concrete is anticipated or encountered, a trench restoration detail shall be designed by a Geotechnical Engineer and submitted to the City for review and approval. The Geotechnical Engineer shall address existing and proposed joint location, load transfer, and joint pinning, if applicable.
- D. Asphalt concrete pavement shall be placed on the prepared surface by an approved paving machine and shall be in accordance with the applicable requirements of Section 5-04 of the *WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction*. Fine and coarse aggregate shall be in accordance with Section 9-03.8 of the *WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction*.  
  
Surface smoothness shall be per Section 5-04.3(13) of the *WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction*. The paving shall be corrected by removal and repaving of the trench.
- E. When trenching within the roadway shoulder(s), the shoulder shall be restored to its original or better condition.
- F. The final patch shall be completed as soon as possible and shall be completed within 5 days after first opening the trench. This time frame may be adjusted if delays are due to inclement paving weather, or other adverse conditions that may exist. See 4B.160 for inclement weather constraints. Delaying of final patch of overlay work is allowable only subject to the City Engineer's approval. The City Engineer may deem it necessary to complete the work within the 5 day time frame and not allow any time extension. If this occurs, the Contractor shall perform the necessary work as directed by the City Engineer.

#### 4B.190 Staking

All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The surveyor directing such work shall be licensed as a Professional Land Surveyor by the State of Washington.

A pre-construction meeting shall be held with the City prior to commencing staking. All construction staking shall be inspected by the City prior to construction.

The minimum staking of streets shall be as directed by the City Engineer or as follows:

- A. Stake centerline every 50 feet in tangent sections and 25 feet in curved sections plus grade breaks, PVC's, PVT's, high points and low points, with cut and/or fill to subgrade.
- B. Stake top of ballast and top of crushed surfacing at centerline and edge of pavement at the above-described intervals.

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- C. Stake top back of curb at a minimum 3 foot offset at the above-described intervals with cut or fill to finished grade.

#### 4B.200 Testing

Testing shall be required at the developers or contractors expense. The testing shall be ordered by the City construction inspector from a testing lab approved by the City. Testing shall be done on all materials and construction as specified in the *WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction* and with frequency as specified in Sampling and Testing Frequency Guide located in section 9-5.7 of the *WSDOT Construction Manual*.

In addition, the City shall be notified before each phase that street construction commences (i.e. staking, grading, subgrade, ballast, base, top course, and surfacing).

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**4C SIDEWALKS, CURBS AND GUTTERS****4C.010 General**

All properties within commercial zones of the City, properties abutting arterial streets or collector streets and properties upon which there are to be public buildings, shall, in conjunction with new construction on such properties or alterations or improvements to existing structures on such properties where the estimated cost of the alterations or improvements constitute 25 percent or more of the value of the existing structures on the property, have sidewalks constructed along abutting streets (LMC 12.24.010). Curbs and gutters must also be constructed along the abutting street when the Director of Public Works determines that the conditions of drainage require curbs and gutters (LMC 12.24.020).

In cases where a sidewalk exists adjacent to the curb, the sidewalk must be moved back to accommodate a new planter strip as required in accordance with 4B.080 of this document.

Although sidewalk construction may be deferred, the necessary right-of-way shall be granted to facilitate future construction of the sidewalk. See Chapter 4B.060 for right-of-way requirements. See Chapter 4B.080 for standards regarding deferral of street frontage improvements.

Sidewalks shall be located within the right-of-way. Sidewalks may be located within an easement with the approval of the Director of Public Works.

Sidewalks shall conform to the Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way standards.

Building footings shall not be located under a public sidewalk. Footings may be located under a sidewalk if the sidewalk is in an easement and not in the public right-of-way. If building footings are to be located under a sidewalk located within an easement, all the private utilities located within that easement and under that sidewalk shall be located within conduit.

**4C.020 Design Standards**

The City has set forth minimum standards as outlined in Chapter 3.040 which must be met in the design and construction of sidewalks, curbs and gutters. Because these are minimum standards, they may be modified by the Director of Public Works should the Director feel circumstances require increased or decreased widths (LMC 12.24.070). Plans for the construction of sidewalks, curbs and gutters are to be submitted as part of the street plans when applicable.

**4C.030 Sidewalks**

All public streets shall have sidewalks on both sides of the street as shown on the roadway details at the end of this chapter. See Chapter 4B.070 for sidewalk requirements on Private Streets. For specific driveway requirements, see Chapter 4B.140. For applicable bike path information, see Chapter 4D.

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The design and construction of all sidewalks, curbs, gutters and walkways shall meet the following minimum standards:

1. Sidewalks shall be constructed of Commercial Concrete a minimum of 4 inches thick. When a portion of the sidewalk functions as a driveway, the sidewalk shall be a minimum 6 inches thick through the driveway section.
2. The width of sidewalks shall be as shown in the roadway details at the end of this chapter. When the sidewalk, curb and gutter are contiguous, the width of the sidewalk shall be measured from back of curb and gutter to back of sidewalk.
3. If sidewalk widening is required, it shall be accomplished with a monolithic width pour. This shall require removal of the existing sidewalk.
4. When existing sidewalks are removed, repairs shall be taken to the nearest expansion joint or as directed by the City.
5. The Director of Public Works may reduce the sidewalk width for sidewalks over 6 feet wide if the Public Works Department does not anticipate probable pedestrian traffic through the horizon year indicated by the traffic analysis. If the width of the sidewalk is reduced, the right-of-way width shall not be reduced. Instead, the planter width shall be increased accordingly.
6. To accommodate bicycles on sidewalks, a minimum design speed of 20 mph shall be used; however, when the grade exceeds 4 percent, a design speed of not less than 30 mph shall be used unless otherwise approved by the Director of Public Works.
7. All sidewalks must be constructed to provide for curb ramps in accordance with the standards of the ADA and state law. See Chapter 4B.070 for curb ramp requirements on private streets.
8. Form and subgrade inspection by the City are required before sidewalk is poured. Forms shall be the same height as the thickness of the sidewalk, curb and gutter, or driveway.
9. Monolithic pour of curb, gutter and sidewalk will not be allowed.
10. Sidewalks that dead-end at the project property line shall have a minimum 5 foot wide pavement ramp constructed, at a maximum 12:1 slope that abuts the sidewalk and joins to the edge of the roadway. A barricade may be required per Chapter 4B.100. When the sidewalk is extended in the future, these interim measures shall be removed.

#### 4C.040 Curb and Gutter

Commercial concrete curb and gutter per the detail at the end of this chapter shall be used for all street edges unless otherwise approved by the Director of Public Works. See Chapter 4B.090 for curb requirements around cul-de-sacs.

Form and subgrade inspection by the City are required before curb and gutter are poured.

The face or top of all new curbs shall be embossed to denote the location of water and sewer services crossings. Water services shall be marked 1/4 inch into concrete with a "W" and side sewers shall be marked with an "S".

#### 4C.060 Staking

All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The surveyor directing such work shall be licensed as a Professional Land Surveyor by the State of Washington.

A preconstruction meeting shall be held with the City prior to commencing staking. All construction staking shall be inspected by the City prior to construction.

The minimum staking of curb, gutter and sidewalk shall be as directed by the City Engineer or as follows:

1. Stake top back of curb at a minimum 3 foot offset every 50 feet in tangent sections and 25 feet in curved sections plus grade breaks, PVC's, PVT's, high point and low points, with cut or fill to finished grade.

#### 4C.070 Testing

Testing shall be required per Chapter 4B.200.

In addition, the City shall be notified before each phase of sidewalk, curb and gutter construction commences.

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## **4D BICYCLE FACILITIES**

### 4D.010 General

Bikeway or Urban Trail construction is required in conjunction with any new development or redevelopment where the estimated cost of improvements on such properties exceeds 25 percent of the value of the existing structures, or subdivision or short subdivision approval, when the need for such a bikeway is indicated in the Lacey Urban Trails Plan and the Lacey Transportation Plan.. See details at the end of this chapter for bikeway classifications. (LMC 12.24.010)

Bikeways located outside of the public right-of-way may be located within an easement or dedicated as a separate tract of land to the City of Lacey for public use. The easement or tract shall be 20 feet wide.

### 4D.020 Design Standards

The design of bicycle paths shall depend upon their type and usage. Bikepath surfacing shall be as outlined in Chapter 4B.160. Bike lanes and shared roadways shall be surfaced the same as the adjacent motor vehicle roadway.

All minimum design standards as set forth in Chapter 3.040 shall apply.

### 4D.030 Bikeway Lighting

Bikeway lighting for bike lanes, bike routes and shared roadways, shall meet the adjacent roadway lighting standards. When a class I bike path is constructed, the average maintained horizontal illumination level of 0.5 foot-candle (5 lux) to 2 foot-candles (22 lux) shall be met.

### 4D.040 Signing and Marking

In general, all bikeway facilities shall be signed per the MUTCD or as specified herein. The bike lane stripes and pavement markings shall be as shown on the details at the end of this chapter.

Bike lane signing at intersections shall be as shown on detail. See detail for bike lane striping at right-turn lanes.

Bicycle actuation at signalized intersections may be required if warranted.

### 4D.060 Staking and Testing

Staking and testing shall be done in accordance with street staking and testing as outlined in Chapter 4B.190 and 4B.200.

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**4E ILLUMINATION****4E.010 General**

All new commercial or residential subdivisions, short subdivisions or property development requiring review by the Site Plan Review Committee shall provide street lights in accordance with the standards for such improvements of the City and they shall be owned and operated by the City. (LMC 12.24.080)

All projects outside the City limits but within the City of Lacey's Urban Growth Area boundary (UGA) shall provide street lights in accordance with the standards herein. The maintenance of street lights installed by projects within the UGA boundary shall be the responsibility of the owners or Homeowners Association until such time as annexation occurs. Upon annexation, the City shall assume responsibility for maintenance of ~~the public~~ street lighting. Prior to annexation, any connections to the street lighting service (i.e. irrigation systems) shall be removed and an alternative power source provided by the Homeowner's Association.

Pedestrian scale lighting is required within all residential subdivisions, short subdivisions, Urban Villages, PRD's, and developments within the Woodland Planning District. Pedestrian scale lighting is also allowed when desired by the developer. Additionally, pedestrian scale lighting is to be installed as required in areas zoned Urban Villages or as required through Site Plan Review approval. See 4E.025.

Roadway lighting is required on Arterials and Collectors not located within the development.

**4E.020 Design Standards**

A street lighting plan submitted by the applicant and approved by the Public Works Director shall be required for all street light installations. Type of installation shall be as set forth in *WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction* and as directed by the City except where noted herein.

All public street light designs shall be prepared by an engineering firm capable of performing such work. The engineer shall be licensed by the State of Washington. All developments shall submit the lighting plan on a separate sheet. See the Plan Checklist in Chapter 3.040 for lighting plan and report components. After system is completed and approved, a set of "as-built" drawings per Chapter 3.065 shall be submitted to the City as a permanent record.

Lights shall be located in accordance with the Illumination Standards Table and the roadway details at the end of this chapter. In addition, intersections shall be illuminated to 1.5 times the highest foot candle requirement of the streets surrounding the intersection. Poles shall be opposite across the roadway or on one side of the roadway except for pedestrian scale light poles which shall be staggered. All residential intersections that require pedestrian scale lights shall have two poles on opposite legs of the intersection. Street lighting and holiday lighting must be connected to a metered service disconnect.

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For the purposes of this chapter, area classes are determined by zoning as follows:

Commercial

Business Park  
Cemetery  
Central Business Districts  
Community Commercial District  
General Commercial  
Hawks Prairie Business and Commercial District  
Hawks Prairie Commercial District  
Light Industrial/Commercial  
Mixed Use High Density Corridor  
Mixed Use Moderate Density Corridor  
Office commercial  
Woodland District

Industrial

Light Industrial  
Mineral Extraction

Residential

High Density Residential  
Lacey Historic Neighborhood  
Limited Business  
Low Density Residential  
McAllister Geologically Sensitive Area  
Moderate Density Residential  
Neighborhood Commercial  
Open Space Institutional

As new zones are created, they will be classified by the City Traffic Engineer. If road widths differ from those in the Illuminations Standards table, other—spacing will be determined by the project engineer and reviewed and approved by the City Traffic Engineer using the following criteria:

**AVERAGE MAINTAINED HORIZONTAL ILLUMINATION (FOOT CANDLES)**

Road Classification	AREA CLASS			Foot Candles
	Residential	Industrial	Commercial	
Residential/Private	0.4	N/A	N/A	0.40
Minor Collector	0.6	1.0		1.20/50
Major Collector				0.90
Arterials	0.8	1.4		1.61/40
Boulevards	0.8	1.4		1.61/40

Uniformity ratio:

- 6:1 average: minimum for residential and private
- 4:1 average: minimum for collectors
- 3:1 average: minimum for arterial and boulevard

~~Dirt Factor = 0.85~~, Lamp lumen depreciation factor = ~~0.73~~0.85

Min. Weak Point Light = 0.2fc except residential street

Average illumination at intersections ~~shall be 1.5 times higher than~~ the ~~illumination~~ average foot candles required on the ~~more highly illuminated~~ street.

~~400 Watt initial lamp lumens~~ = ~~50,000~~

Pedestrian scale lighting shall be designed to provide a presence of light within the residential neighborhoods with particular emphasis at intersections.

Pedestrian scale lighting shall supplement the required roadway lighting with dual functional poles in the Woodland Planning District, and collectors within ~~commercial~~ and residential areas.

Line loss calculations shall show that no more than five percent voltage drop occurs in any circuit. Lamp Load factor shall equal 1.2.

A maximum of three circuits shall be associated per conduit. The minimum conduit size shall be two inch for typical installation and ~~two to~~ four inch for roadway crossings at intersections. Size all conduits to a maximum 26 percent conductor fill. The ~~separate~~ City Communications ~~spare~~ conduit shall not be used for lighting purposes.

Provide junction boxes at each end of a roadway crossing, or where the conduit changes size. All junction boxes shall be located outside of the paved areas. Junction boxes are not to be placed in the pedestrian curb ramp of a sidewalk or where it will impact the ADA requirements. The maximum conduit capacities for various types of junction boxes are shown in the WSDOT Standard Plans, ~~with the exception of a Type 1 junction box which may have a maximum capacity conduit diameter of ten inches.~~

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Pole foundations shall be per details depending on the type of pole used. Pole foundations shall not be located within the clear zone. The roadway clear zone, which is typically 1.5 feet behind the face of curb, or 6.0 feet at intersections, shall be evaluated by an engineer using the guidelines set forth in the latest edition of the *AASHTO Roadside Design Guide*. No break-away foundations shall be provided for poles within the urban area, or where the City determines break-away poles would be a hazard to pedestrians ~~or building occupants~~.

**General, Light Poles:**

Poles shall meet the following minimum specifications as manufactured by General Electric, HapCo, ValmontValmont, Lumec or Lexington or as otherwise approved by the City Traffic Engineer. In existing developed areas, the City may require the use of other poles to establish uniformity within the developed area. After installation and before acceptance by the City, all poles shall be free of dents and marks.

**Shaft:**

The shaft shall be a seamless, round tapered tube of aluminum alloy 6063 per ASTM B221 and shall be full-length heat-treated after welding on the base flange to produce T6 temper.

Poles shall include a hand hole centered above the bottom of the shaft for anchor base poles. The hand hole shall be reinforced with a cast frame of aluminum alloy. Hand holes shall be located 90 degrees clockwise from the plane of the bracket arm as viewed from the top. An aluminum cover with stainless steel attachment screws shall be provided for the hand hole.

**Surface Finish:**

Roadway poles shall have a satin finish accomplished by mechanical rotary grinding or polishing.

Pedestrian poles and dual functional poles shall have a textured black powder coated finish.

**Base Flange:**

The base flange for the attachment of the shaft to the foundation shall be a one-piece cast socket of aluminum alloy 356 per ASTM B26 or B108. The flange shall be joined to the shaft by means of complete circumferential welds, externally at the top of the flange and internally at the bottom of the shaft tube.

**Hardware:**

All nuts, bolts and washers used in the fabrication of the pole shall be Grade 18-8 stainless steel per ASTM A193 Class 1 Grade B8 except for anchorage hardware.

**Anchorage Hardware:**

## TRANSPORTATION

Anchorage bolts shall be hot-dipped galvanized steel per ASTM A576, Grade 1021-1046 and shall have minimum yield strength of 50,000 psi. The top 6 inches of each bolt shall have rolled or cut threads (before galvanizing) per ASTM A307. The bolts shall be hot-dipped galvanized per ASTM A153 at the treaded end. The bolts shall include a 4 inch right angle hook at the unthreaded end. The nut, washer, and lock washer shall be fully galvanized per ASTM A153.

### Grounding:

Each pole shaft shall contain an internal lug with a 3/8 inch diameter hole for the purpose of attaching a grounding connector.

### Shaft Cap:

Each pole shall be provided with a shaft cap of aluminum alloy. The cap shall be fastened to the shaft by means of stainless steel screws.

### Bracket Arm:

Single member tapered arms (not davit or trussed) are required for arms 6 feet to 8 feet in length.

Light Pole Type	Nominal Mounting Height (ft)	Wall Thickness (in)	Pole Cross Section	Arm Shape	Pole Material	Base	Pole Finish	Arm Length (ft)	Bottom Shaft (in)	Top Shaft (in)	Bolt Circle	Anchor Bolts
Pedestrian Scale	15	0.125	Round	Post mount	Aluminum	Decorative	Black Texture	n/a	15	4	10.3/4-13	3/4 x 20
Dual Functional	40	0.219	Round	Tapered Elliptic	Aluminum	Decorative	Black Powder	6-8	8	4.5	11-12	1 x 36
Dual Functional	30	0.219	Round	Tapered Elliptic	Aluminum	Decorative	Black Powder	6-8	7	4.5	11-12	1 x 36
Dual Functional	25	0.219	Round	Tapered Elliptic	Aluminum	Decorative	Black Powder	6-8	7	4.5	11-12	1 x 36
Roadway Single Arm	40	0.188	Round	Tapered Elliptic	Aluminum	Plain	Satin Ground	6-8	8	4.5	11-12	1 x 36
Roadway Single Arm	30	0.188	Round	Tapered Elliptic	Aluminum	Plain	Satin Ground	6-8	7	4.5	11-12	1 x 36
Roadway Single Arm	25	0.188	Round	Tapered Elliptic	Aluminum	Plain	Satin Ground	6-8	7	4.5	11-12	1 x 36
Roadway Twin Arm	40	0.219	Round	Tapered Elliptic	Aluminum	Plain	Satin Ground	8	10	6	14-15	1 x 48
Roadway Twin Arm	30	0.219	Round	Tapered Elliptic	Aluminum	Plain	Satin Ground	8	10	6	14-15	1 x 48

\*Olympic Decorative Base FG25463548BK Clam Shell

### Luminaires:

Pedestrian scale luminaires shall be Lumec LED-L80 style lantern style decorative head and shall be equipped with a LED 35 watt fixture as follows:

70 watt equivalent Phillips Lumec LED fixture with a LED 35 watt fixture for dual functional poles,  
100 watt equivalent Phillips Lumec LED fixture for pedestrian poles,

SE3 Asymmetrical median cutoff optics,

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240 volts,

SFS Adapter, and  
Textured Black powder coating.

[Catalog No. L80-35WLED4K-T-PC-CS-LE3-277-FAWS-SFS-BKTXAll](#) ~~roadway style luminaires shall be:~~

[Roadway luminaires 35, 72, 200 and 400/180 Watt Phillips Lumec](#) luminaires ~~shall be: Phillips Lumec LED equivalent~~ with natural aluminum or black finish ~~to match the as required pole type,~~ powered by 240 volts, ~~and shall utilize a flexible wattage selection~~ with tool access for driver change out. The fixture shall have type III asymmetrical distribution, full cut off with 4000K color band to exceed 70,000 hours of operational life. Fixtures shall have built-in bubble level.

[Catalog No. RFS-35W16LED4K-T-R3M-UNIV-DMG-RCD](#)

[Catalog No. RFM-72W32LED4K-T-R3M-UNIV-DMG-RCD](#)

[Catalog No. RFL-180W80LED4K-R3M-UNIV-DMG-RCD](#)

All street light electrical installations including wiring conduit and power connections shall be located underground.

The General Notes on the following page need to be included on any plans dealing with street design in addition to all applicable requirements as set forth in Chapter 3.040.

Illumination Standards

ROAD CLASS	STREET WIDTH (Feet)	LUMINAIRE (Watt)	MOUNTING HEIGHT (Feet)	ARM TYPE	ARM LENGTH (Feet)	CURB OVERHANG (Feet)	MAXIMUM SPACING (Feet)	POLE CONFIGURATION	POLE TYPE
<b>RESIDENTIAL / PRIVATE</b>									
All	20-32	400-LED <sup>34</sup>	15	Post	0	-3	100	Staggered	Pedestrian
<b>MINOR COLLECTOR</b>									
<b>With Parking &amp; 3-Foot Bike Lanes</b>									
Residential	44	200-LED	30	Single	6	5	100	One-Side-Only	Dual-Function
Industrial	44	200-LED	30	Single	6	5	180	One-Side-Only	Roadway, Dual-Function
Commercial	44	200-LED	30	Single	6	5	180	One-Side-Only	Roadway, Dual-Function
<b>With Parking &amp; 5-Foot Bike Lanes</b>									
Residential	48	200-LED	30	Single	6	5	100	One-Side-Only	Dual-Function
Industrial	48	200-LED	30	Single	6	5	180	One-Side-Only	Roadway, Dual-Function
Commercial	48	200-LED	30	Single	6	5	180	One-Side-Only	Roadway, Dual-Function
<b>Without Parking &amp; 3-Foot Bike Lanes</b>									
Residential	28	200-LED	30	Single	6	5	100	One-Side-Only	Dual-Function
Industrial	28	200-LED	30	Single	6	5	180	One-Side-Only	Roadway, Dual-Function
Commercial	28	200-LED	30	Single	6	5	180	One-Side-Only	Roadway, Dual-Function
<b>Without Parking &amp; 5-Foot Bike Lanes</b>									
Residential	32	200-LED	30	Single	6	5	100	One-Side-Only	Dual-Function
Industrial	32	200-LED	30	Single	6	5	180	One-Side-Only	Roadway, Dual-Function
Commercial	32	200-LED	30	Single	6	5	180	One-Side-Only	Roadway, Dual-Function
All	32-48	72	30	Single	6	5	180	One-Side-Only	Dual-Function
<b>MAJOR COLLECTOR</b>									
<b>With Parking &amp; 3-Foot Bike Lanes</b>									
Residential	22-12/22	200-LED	30	Single	6	5	180	Both-Sides-Opposite	Dual-Function
Industrial	22-12/22	200-LED	30	Single	6	5	180	Both-Sides-Opposite	Roadway, Dual-Function
Commercial	22-12/22	200-LED	30	Single	6	5	180	Both-Sides-Opposite	Roadway, Dual-Function
<b>With Parking &amp; 5-Foot Bike Lanes</b>									
Residential	24-12/24	200-LED	30	Single	6	5	180	Both-Sides-Opposite	Dual-Function
Industrial	24-12/24	200-LED	30	Single	6	5	180	Both-Sides-Opposite	Roadway, Dual-Function
Commercial	24-12/24	200-LED	30	Single	6	5	180	Both-Sides-Opposite	Roadway, Dual-Function
<b>Without Parking &amp; 3-Foot Bike Lanes</b>									
Residential	14-12/14	200-LED	30	Single	6	5	180	Both-Sides-Opposite	Dual-Function
Industrial	14-12/14	200-LED	30	Single	6	5	180	Both-Sides-Opposite	Roadway, Dual-Function
Commercial	14-12/14	200-LED	30	Single	6	5	180	Both-Sides-Opposite	Roadway, Dual-Function
<b>Without Parking &amp; 5-Foot Bike Lanes</b>									
Residential	16-12/16	200-LED	30	Single	6	5	180	Both-Sides-Opposite	Dual-Function
Industrial	16-12/16	200-LED	30	Single	6	5	180	Both-Sides-Opposite	Roadway, Dual-Function
Commercial	16-12/16	200-LED	30	Single	6	5	180	Both-Sides-Opposite	Roadway, Dual-Function
Industrial	44-60	72	30	Single	6	5	180	Both-Sides-Opposite	Roadway
All Other	44-60	72	30	Single	6	5	180	Both-Sides-Opposite	Dual-Function
<b>ARTERIAL</b>									
Residential/Industrial	27-12/27/60	400-LED <sup>180</sup>	40	Single	6	5	240	Both Sides Opposite	Roadway, Dual-Function
Industrial/Martin Way	27-12/27/60	400-LED-180	40	Single	6	5	240	Both Sides Opposite	Roadway
Commercial/All Other	27-12/27/60	400-LED <sup>180</sup>	40	Single	6	5	240	Both Sides Opposite	Dual-Function
Martin Way		400-LED	40	Single	8	5	240	Both-Sides-Opposite	Roadway
<b>BOULEVARD</b>									
All	27-14-27/60	400-LED <sup>180</sup>	40	Twin/Single	8	1	240	Opposite Across/Median	Roadway
<b>HAWKS PRAIRIE ROADWAYS</b>									
Arterial	26-14-36/60	400-LED <sup>180</sup>	40	Twin/Single	6/8	5/1	240/220	Opposite Across/Median	Dual-Function
Minor Collector Without Parking	14-14-14-2-58	200-LED <sup>72</sup>	40/30	Twin/Single	6/8	5/1	180/0	Opposite Across/Median	Dual-Function
Collector-With Parking	22-14-22	200-LED	40	Twin	6/8	5/1	180	Opposite Across/Median	Dual-Function

**GENERAL NOTES (Street Light Construction)**

1. Electrical permits and inspections are required for all street lighting installations. The Contractor is responsible for obtaining said permits prior to any type of actual construction.
2. A pre-construction meeting shall be held with the City of Lacey Construction and Electrical Inspectors prior to the start of construction.
3. Prior to installation of any materials the Electrical Contractor shall submit for approval by the City three bound, categorized copies of material catalog cuts, specifications, shop drawings and/or wiring diagrams. Any materials purchased or labor performed prior to such approval shall be at the Contractor's risk. Mounting heights, arm length, power source, luminaire type and bolt patterns shall follow City of Lacey Development Guidelines Chapter 4E.020. Modifications of any portion of the lighting system will not be allowed without prior approval by the City. Submittals shall include project name, name of electrical contractor, date and vendor name.
4. A 500 volt megger test will be performed by the City on each circuit between conductor and ground prior to acceptance of the lighting system. The insulation resistance shall not be less than 6 megaohms to ground for runs over 2,500 feet nor less than 8 megaohms for runs under 2,500 feet. A functional test will be performed by the City in which it is demonstrated that each and every part of the system functions as specified or intended herein. (*WSDOT Standard Specifications for Road, Bridge and Municipal Construction* 8-20.3(11)).
5. All lighting poles shall be as specified in Chapter 4E.020 of the Development Guidelines. The Sonotube form shall be removed to below ground level. Pole bases shall be grouted and all luminaire heads shall be plumb and level.
6. Cement concrete bases shall follow City of Lacey Development Guidelines Luminaire Foundation detail.
7. Any modification to approved lighting plans shall be reviewed and approved by the City prior to installation. Any approved modifications shall be shown on a mylar as-built supplied to the City after the lighting installation is completed and before final acceptance. It shall be the responsibility of the Electrical Contractor to ensure these as-builts are provided to the City.
8. Private utilities require a 10 foot "clear zone" from the street light to the private utility located above ground on private utility poles. The "clear zone" separation shall be incorporated into the street lighting design to assure the required separation is provided.
9. A maximum of three circuits shall be associated per conduit. The minimum conduit size shall be two inch for typical installation and four inch for roadway crossings at intersections. Size all conduits to a maximum 26 percent conductor fill. The [separate](#) City communications spare conduit shall not be used for lighting purposes.

10. Provide junction boxes at each end of a roadway crossing, or where the conduit changes size. All junction boxes shall be located outside of the paved areas. Junction boxes are not to be placed in the pedestrian curb ramp of a sidewalk or where it will impact the ADA requirements. All junction boxes shall satisfy WSDOT Standards constructed with galvanized steel locking lids. The maximum conduit capacities for various types of junction boxes are shown in the WSDOT Standard Plans with the exception of a Type 1 junction box which may have a maximum capacity conduit diameter of 10 inches.
11. On roads classified as arterials, boulevards or collectors, the street lighting shall be separated into two circuits. There shall be a separate circuit for the right and left side of the road. Separate circuits shall be provided for street lighting internal to the subdivision from collectors and arterials.

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#### 4E.030 Holiday Lighting

Provisions to facilitate holiday lighting shall be provided by properties fronting the following roadways:

Sleater-Kinney Road from I-5 south to Pacific Avenue,

Pacific Avenue from Sleater-Kinney Road west to the City limits,

6<sup>th</sup> Avenue SE from Sleater-Kinney Road to College Street.

The Hawks Prairie Business District.

All roundabouts and pocket parks throughout the City and the UGA.

Developers are required to provide receptacles, conduit, and miscellaneous appurtenances to facilitate holiday lighting. Conduit shall be extended through the property to permit continuity for the area above. See detail for additional information.

#### 4E.035 Fiber Optic Conduit

~~Along with street lighting conduit, an additional 2-inch conduit with separate J boxes from the street lighting shall be installed for all projects requiring Public Works approval. Conduit shall be the same material and spacing utilized for street lighting improvements. This requirement will apply to all public streets.~~

All projects requiring Public Works approval shall install a communication conduit for future fiber optics on public streets. Minimum conduit size shall be two inch for typical installation and four inch for roadway crossings at intersections. Fiber Optic conduit shall be installed parallel to the street lighting conduit. Pull boxes shall be WSDOT approved for fiber optics and installed at a maximum of 500 foot spacing and at each end of a roadway crossing, or where the conduit changes size. All pull boxes shall be located outside of the paved areas, and are not to be placed in the pedestrian curb ramp of a sidewalk or where it will impact the ADA requirements

#### 4E.040 Staking

All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The surveyor directing such work shall be licensed as a Professional Land Surveyor by the State of Washington.

A preconstruction meeting shall be held with the City prior to commencing staking. All construction staking shall be inspected by the City prior to construction.

The minimum staking of luminaries shall be as follows:

1. Location and elevation to the center of every pole base.
2. Location and elevation of each service disconnect.

4E.050 Testing

All illumination systems shall be subject to an electrical inspection which shall include megger testing and a functional test. Lamp, photocell and fixture shall be under warranty for a period of one year.

4E.060 Private Utility Separation

Private utilities require a 10 foot "clear zone" from the street light to the private utility located above ground on private utility poles. The "clear zone" separation shall be incorporated into the street lighting design to assure the required separation is provided.

**4F TRAFFIC CONTROL DEVICES**

4F.010 General

Traffic control devices shall be installed per the requirements set forth herein. This work shall consist of furnishing and installing a complete and functional traffic control system meeting current City of Lacey standards.

Due to the complexity of coordinating the City's existing traffic control environment with any proposed traffic control device(s), the design and analysis of signals and other traffic control devices shall be coordinated under the direct supervision of the City Traffic Engineer. This is necessary to retain a uniformity of traffic control devices throughout the City.

Traffic control devices may include, but are not limited to; signals, traffic islands, modern roundabouts, stop or yield control devices, crosswalks or traffic calming features.

4F.020 Design Standards

If a traffic control device (including signage) is required, then the developer shall be required to pay the cost for the City's on-call, contracted traffic services, or, if the City's schedule allows, shall pay for the City to design the traffic control device. The City shall retain the right to determine the appropriate traffic control device based on an approved Traffic Impact Analysis. Design of appropriate traffic control devices may be allowed by a City approved design consultant.

Traffic control devices shall be designed in accordance with the specifications as set forth by the City of Lacey, ITE, AASHTO, FHWA and WSDOT. The *WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction* shall be used unless otherwise authorized by the City. Electrical permits are required for all electrical traffic control devices. The contractor is responsible for obtaining all permits prior to construction.

All applicable design requirements set forth in Chapter 3.040 and listed on the Plan Checklist shall be included. When analyzing intersections for traffic control devices, impacts to the entire roadway corridor shall be considered.

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All specifications and material samples shall be submitted to the City for review and approval prior to installation.

#### 4F.030 Pedestrian Crossings

The City will consider the installation of marked crosswalks at uncontrolled intersections and mid-block locations as part of public project design, general roadway evaluation and/or review of land use applications. An engineering study will be performed before a marked crosswalk is approved for a specific location or corridor. The engineering study will consider existing and projected pedestrian volumes, vehicular volumes, vehicular speeds, collisions, location characteristics, proximity to existing marked crosswalks, transit stops, existing and future adjacent land uses, adopted sub-area plans and WSDOT, FHWA, ITE, NATCO and MUTCD standards. All marked crosswalks shall be consistent with the City's Pedestrian Crossing Policy.

#### 4F.040 Staking

All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The surveyor directing such work shall be licensed as a Professional Land Surveyor by the State of Washington.

A preconstruction meeting shall be held with the City prior to commencing staking. All construction staking shall be inspected by the City prior to construction.

The minimum staking of signals shall be as follows:

- A. Location, with cut or fill to center of all pole bases.
- B. Location of all corners of controller base.
- C. Location of service disconnect.

#### 4F.050 Testing

All traffic control devices shall be subject to any necessary electrical inspections as well as requirements as set forth in Chapter 4B.200.

A signal system shall not be approved or accepted by the City until the signal has performed correctly to the City's satisfaction for a 30 day "check-out" period as outlined below.

Controller and cabinet testing shall be required by a WSDOT laboratory and/or the City of Lacey prior to being installed.

#### 4F.060 Functional Testing

Field testing of illumination, traffic signal systems, and electrical for traffic control systems shall be per Section 8-20 of the *WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction* with the following exceptions.

The insulation resistance shall not be less than 50 megaohms between the conductor and ground on all circuits of any length.

A functional test shall be made to demonstrate that each and every part of the system functions as specified.

The contractor shall perform in the presence of the City, frequency response and noise tests between each controller cabinet. The same test shall also be performed on all unused (spare) pairs between the master controller and the most distant cable termination cabinet served by the pair.

The Contractor shall perform continuity checks from all wires to ground, to the satisfaction of the City.

The functional test for the traffic signal system shall consist of not less than five days of continuous, satisfactory operation. If unsatisfactory performance of the system develops, the condition shall be corrected and the test shall be repeated until the five days of continuous, satisfactory operation is obtained.

Before initial turn-on, the signal system shall be placed in flashing operation for at least two full working days but no more than five calendar days. The initial turn-on shall be made between 9:00 am and 2:00 pm on a Tuesday, Wednesday, or Thursday as approved by the City. Prior to turn on, all equipment as shown on the plans shall be installed and operable. This includes pedestrian signals, pedestrian pushbuttons, vehicle detectors, and roadway lighting. All louvers, visors, and signal heads shall be directed to provide maximum visibility.

Turn on of new or modified traffic signal systems shall be made only after all traffic signal circuits have been thoroughly tested as specified above. Functional tests shall start on any working day except Friday, Monday, or the day preceding or following a legal holiday.

A shutdown of the electrical system resulting from damage caused by public traffic, from a power interruption, or from unsatisfactory performance of City furnished materials may not constitute discontinuity of the functional test.

Turn-on of the new traffic control shall be accomplished by qualified factory signal technicians with three days advance notice to the City. The contractor shall not turn on any signal system or part thereof visible to any traveled roadway without the accompaniment of the City. The temporary and permanent signing and pavement marking shall be installed in accordance with the plans and specifications or as approved by the City before the new traffic controls are turned on.

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Traffic signals shall be maintained by the developer until such time as final Public Works approval is given.

**4G ROADSIDE FEATURES**

4G.010 General

Miscellaneous features included herein shall be developed and constructed to encourage the uniform development and use of roadside features wherever possible.

4G.020 Design Standards

The design and placement of roadside features included herein shall adhere to the specific requirements as listed for each feature, and, when applicable, to the appropriate standards as set forth in Chapter 3.010 and 3.040.

4G.030 Staking

All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The surveyor directing such work shall be licensed as a Professional Land Surveyor by the State of Washington.

A preconstruction meeting shall be held with the City prior to commencing staking. All construction shall be inspected by the City prior to construction.

4G.040 Testing

Testing shall be required per Chapter 4B.200.

4G.050 Survey Monuments

- A. All existing survey control monuments which will be disturbed or destroyed during construction shall be referenced prior to construction and replaced after construction by a Professional Land Surveyor licensed by the State of Washington. All applicable RCW's and WAC's will be complied with, including but not limited to, WAC 332-120, WAC 332-130, RCW 58.09, and RCW 58.24.040. The monuments shall be replaced with the proper type as outlined below at the expense of the responsible builder or developer.

- B. Street type: Boulevards; Arterials; Major Collectors; and, at the option of the City Survey Department, Bus Routes and Truck Routes.

A pre-cast concrete monument with cast iron monument case and cover installed per City of Lacey standards is required.

The monument case shall be installed after the final course on surfacing has been placed.

- C. Street type: Minor Collectors; Major and Minor Local Residential, Private, and those streets not specifically outlined in 4G.050B above.

A poured-in-place concrete surface monument per City of Lacey standards is required.

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D. Monument Locations

Appropriate inner-visible monuments shall be placed:

1. At all street intersections. At intersections when streets listed in 4G.050C intersect with boulevards, arterials or major collectors, the monuments shall be placed at the intersection of the centerline of the minor streets (listed in 4G.050C) with the right-of-way line of a boulevard, arterial or major collector.
2. At the PC and PT's of all horizontal curves or at the PI if it lies in the traveled roadway.
3. At all DLC corners, section corners, quarter corners and sixteenth corners that fall within the subdivision. Where these points fall outside of the pavement or sidewalks, a poured-in-place monument per City of Lacey standards shall be set so that the top of the monument is one-foot below the surface of the ground.

4G.060 Bus Pads, Shelters and Amenities

Different population densities dictate the number and placement of bus stops. The location of Intercity Transit and/or North Thurston Public Schools (NTPS) bus pads, shelters, or amenities will be evaluated on a case-by-case basis for each project. Intercity Transit and NTPS shall make every effort to coordinate the location of bus stops and shall work with the City Transportation section to determine the best location for the required amenity.

The first consideration in locating any bus stop or amenity shall be safety. The following considerations shall also be considered in determining a bus stop or amenity: operational efficiency, and minimizing impacts to adjacent property. Bus pullouts may be required if road geometry requires, such as determined by the City, Intercity Transit, and NTPS.

When constructed by a private developer, Intercity Transit pull out areas shall be constructed with reinforced concrete a minimum of 18 inches in thickness. This section shall be placed for the area of the pull out. If a utility decides to cut the concrete section, the entire bus pull out area must be removed and replaced.

Shelters, pavement markings and signs shall be provided by the developer and installed by Intercity Transit. Installation shall be at the developer's expense. Shelters can be purchased directly from Intercity Transit at cost plus labor to install. More details may be accessed at:

[http://www.intercitytransit.com/newsandinfo/publications/Documents/It\\_Bus\\_Stop\\_Spees\\_2010\\_Web.pdf](http://www.intercitytransit.com/newsandinfo/publications/Documents/It_Bus_Stop_Spees_2010_Web.pdf)  
<http://www.intercitytransit.com/SiteCollectionDocuments/BusStopSpecs.pdf>

Intercity Transit shelters shall be maintained by Intercity Transit. School bus stop shelters shall be maintained by the subdivision's Homeowner's Association or apartment owner, whichever is appropriate.

Developments enclosed by walls or fences shall provide openings or gates for walkways to provide direct access between developments and bus facilities.

The City and North Thurston Public Schools will use the following criteria in placement and design of school bus stops:

1. A school bus stop shall be required for each new residential subdivision or apartment complex where school children are to be boarding or deboarding unless it is determined by the North Thurston Public Schools that a new bus stop is not required because adjacent facilities already exist for the site.
2. School bus facilities shall meet the same design standards as specified for Intercity Transit except that the contractor shall install the required school bus amenities (see details).
3. Placement shall be determined by North Thurston Public Schools and the City.

#### 4G.070 Mailboxes

- A. During construction, existing mailboxes shall be accessible for the delivery of mail or, if necessary, moved to a temporary location. Temporary relocation shall be coordinated with the US Postal Service. The mailboxes shall be reinstalled at the original location or, if construction has made it impossible, to a location as outlined below and approved by the U.S. Postal Service.
- B. Mailboxes in new developments shall be clustered. Cluster mailboxes are prohibited on collectors and arterials. Mailbox locations shall be coordinated between the City and the U.S. Postal Service.
- C. Individual Mailboxes shall be set on posts strong enough to give firm support but not to exceed 4 x 4 inch wood or one 1-1/2 inch diameter pipe, or material and design with comparable breakaway characteristics. See detail for clearance requirements.

#### 4G.090 Retaining Walls

Rock, brick, concrete building block, or other approved material may be used for erosion protection of cut or fill embankments, for structurally retaining embankments, or as desired for aesthetic purposes. Retaining walls may be subject to design review.

The height of a retaining wall is that distance as measured from the bottom of the footing, regardless of whether the footing is buried or exposed, to the top of the wall. Structural walls on private property require the issuance of a Building Permit prior to construction.

Retaining walls on private property shall meet the requirements of the adopted Building Code. Retaining walls located on private property shall be set back from

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any public right-of-way line a distance at least equal to the height of the wall unless otherwise approved by the Director of Public Works. Retaining walls located on private property where the public right-of-way line is closer than the height of the wall shall not exceed 4 feet in height unless the wall is designed by a Washington State Licensed Professional Engineer and the wall meets all the requirements of the adopted Building Code. Walls meeting these criteria must be approved by the Director of Public Works and the Building Official.

Retaining walls over 4 feet in height located on a public right-of-way shall meet or exceed WSDOT design standards and be designed by a Washington State Licensed Professional Engineer.

#### 4G.100 Street Trees

All public streets within the City and the City's UGA boundary will be planted with trees to create a distinct and pleasant character for those roadways. The street trees on the following table shall be required in or along the public right-of-way, including medians. Contact the City for specific street and accent trees on arterial and collector streets. These have been specified in the current version of the Lacey Urban Forest Management Plan.

See Chapter 4B.125, Landscape/Planter Areas, for specific site preparation requirements.

- A. Planting theme
  - 1. Street tree plantings shall be in accordance with the Lacey Urban Forest Management Plan.
  - 2. Species: See following table.
- B. Planting size: Trees, 2 to 3 inch caliper, measured 6 inches above the base.
- C. Location: Trees shall be as shown on the applicable roadway details. Trees shall be spaced 35 to 50 feet on center (as directed by the City of Lacey) starting 10 to 15 feet from the property line. Also, trees shall not be planted within 50 feet of the intersection measured from the curb radius. Exceptions may be made when there are existing sidewalks. Street trees may then be planted 3 to 5 feet behind the sidewalk. Tree spacing may be adjusted slightly to allow a minimum 10 foot spacing on either side of a driveway.
- D. Maintenance: All projects, regardless of type or zoning, required to plant street trees will also be required to maintain the trees in perpetuity, regardless of ownership. Trees shall be maintained per the current version of ANSI A300, Standard Practices for Trees, Shrubs and other Woody Plant Maintenance.

The City will be responsible for pruning all street trees located in the right-of-way along arterials and collectors. The owner/homeowner's association is responsible for mowing, weeding, watering, replacement (replaced due to death, damage or disease after approval by a City representative)\_and any

TRANSPORTATION

other tree maintenance within the respective right-of-way and common areas. See Chapter 6.210 for installation and maintenance of irrigation systems. At the time of plat or site plan review approval, the City will determine responsibility for maintenance of medians.

- E. Exceptions to the planting theme may be made by the Director of Public Works. Exceptions include but are not limited to; screening industrial areas; planting around historical sites; incorporation of drought resistant techniques, maintaining natural vegetation that better serves as street landscaping or beautification.

Reference: City of Lacey Urban Beautification Project Plan and Resolution 633.

**GENERAL TREE LIST FOR LACEY**

<u>COMMON NAME</u>	<u>BOTANICAL NAME</u>	<u>CULTIVAR</u>	<u>MATURE HEIGHT</u>	<u>CROWN SPREAD</u>	<u>SPACING</u>
<b><u>Large &gt;50' Tall</u></b>					<u>40-50'</u>
<u>Sugar Maple</u>	<u><i>Acer saccharum</i></u>	<u>Commemorati on or Bonfire</u>	<u>60'</u>	<u>35'</u>	
<u>European Beech</u>	<u><i>Fagus sylvatica</i></u>		<u>50'</u>	<u>35'</u>	
<u>Rivers Purple Beech</u>	<u><i>Fagus sylvatica</i></u>	<u>Riversii</u>	<u>50'</u>	<u>40'</u>	
<u>Autumn Purple Ash</u>	<u><i>Fraxinus americana</i></u>	<u>Autumn Purple</u>	<u>50'</u>	<u>35'</u>	
<u>Tuliptree</u>	<u><i>Liriodendron tulipifera</i></u>		<u>70'</u>	<u>35'</u>	
<u>Scarlet Oak</u>	<u><i>Quercus coccinea</i></u>		<u>60'</u>	<u>40'</u>	
<u>Northern Red Oak</u>	<u><i>Quercus rubra</i></u>		<u>70'</u>	<u>45'</u>	
<b><u>Medium-Narrow Crowns 40-50' Tall</u></b>					<u>25-35'</u>
<u>Parkway Maple</u>	<u><i>Acer platanoides</i></u>	<u>Columnar-broad</u>	<u>40'</u>	<u>25'</u>	
<u>Armstrong Red Maple</u>	<u><i>Acer rubrum</i></u>	<u>Armstrong</u>	<u>45'</u>	<u>15'</u>	
<u>Bowhall Red Maple</u>	<u><i>Acer rubrum</i></u>	<u>Bowhall</u>	<u>40'</u>	<u>15'</u>	
<u>Columnar Tuliptree</u>	<u><i>Liriodendron tulipifera</i></u>	<u>Fastigiatum</u>	<u>50'</u>	<u>15'</u>	
<u>Fastigate Beech</u>	<u><i>Fagus sylvatica</i></u>	<u>Fastigiata</u>	<u>45'</u>	<u>15'</u>	
<u>Skyrocket Oak</u>	<u><i>Quercus robur</i></u>	<u>Fastigiata</u>	<u>45'</u>	<u>15'</u>	
<b><u>Medium - Wider Crowns 40-50' Tall</u></b>					<u>35-40'</u>
<u>Norway Maple</u>	<u><i>Acer platanoides</i></u>	<u>Emerald Queen</u>	<u>45'</u>	<u>40'</u>	
<u>Red Maple</u>	<u><i>Acer rubrum</i></u>	<u>October Glory</u>	<u>45'</u>	<u>35'</u>	
<u>Red Horsechestnut</u>	<u><i>Aesculus x carnea</i></u>	<u>Briotti</u>	<u>40'</u>	<u>35'</u>	
<u>Katsura Tree</u>	<u><i>Cercidiphyllum</i></u>		<u>40'</u>	<u>40'</u>	

<u>COMMON NAME</u>	<u>BOTANICAL NAME</u>	<u>CULTIVAR</u>	<u>MATURE HEIGHT</u>	<u>CROWN SPREAD</u>	<u>SPACING</u>
	<u>japonicum</u>				
Summit Ash	<u>Fraxinus pennsylvanica</u>	Summit	45'	25'	
Patmore Ash	<u>Fraxinus pennsylvanica</u>	Patmore	45'	35'	
Autumn Gold Ginkgo	<u>Ginkgo biloba</u>	Autumn Gold	40'	30'	
Honeylocust	<u>Gleditsia triacanthos</u>	Shademaster	45'	35'	
Littleleaf Linden	<u>Tilia cordata</u>	Greenspire	40'	30'	
<b>Small Trees &lt;35' Tall</b>					30-40'
Trident Maple	<u>Acer buergeranum</u>		20'	20'	
David's maple	<u>Acer davidii</u>		30'	25'	
Flame Maple	<u>Acer ginnala</u>	Flame	20'	20'	
Paperbark Maple	<u>Acer griseum</u>		25'	20'	
Tatarian Maple	<u>Acer tatarian</u>		25'	20'	
Norwegian Sunset Maple	<u>Acer truncatum x A. platanoides</u>	Keithsform	35'	25'	
Pacific Sunset Maple	<u>Acer truncatum x A. platanoides</u>	Warrenred	30'	25'	
Pyramidal European Hornbeam	<u>Carpinus betulus</u>	Fastigiata	35'	25'	
American Hornbeam	<u>Carpinus caroliniana</u>		25'	20'	
Eastern Redbud	<u>Cercis Canadensis</u>	Forest Pansy	20'	25'	
Pink Flowering Dogwood	<u>Cornus florida</u>	Rubra	20'	20'	
Chinese Kousa Dogwood	<u>Cornus kousa</u>	Chinensis	20'	20'	
Tricolor Beech	<u>Fagus sylvatica</u>	Roseomarginta	30'	20'	
Goldenrain Tree	<u>Koelreuteria paniculata</u>		30'	30'	
Rustica Rubra Saucer Magnolia	<u>Magnolia soulangiana</u>	Rustica Rubra	20'	20'	
Flowering Crabapple	<u>Malus spp.</u>	Snowdrift, Red Baron, Prairiefire	20'	20'	
Black Tupelo	<u>Nyssa sylvatica</u>		30'	20'	
Flowering Plum	<u>Prunus cerasifera</u>	Thundercloud	20'	20'	
Sargent Cherry	<u>Prunus sargentii</u>		30'	30'	
Snowgoose Cherry	<u>Prunus spp.</u>	Snowgoose	20'	20'	
Callery Pear	<u>Pyrus calleryana</u>	Redspire or Cleveland Select	35'	25'	

TRANSPORTATION

<u>COMMON NAME</u>	<u>BOTANICAL NAME</u>	<u>CULTIVAR</u>	<u>MATURE HEIGHT</u>	<u>CROWN SPREAD</u>	<u>SPACING</u>
Japanese Stewartia	<i>Stewartia pseudocamellia</i>		30'	20'	
Japanese Snowbell	<i>Styrax japonicus</i>		25'	25'	
Redmond Linden	<i>Tilia americana</i>	Redmond	35'	25'	
<b>Small Trees - Narrow &lt;35' Tall</b>					25-30'
Rocky Mt. Maple	<i>Acer grandidentatum</i>	Schmidt	25'	15'	
Crimson Sentry Maple	<i>Acer platanoides</i>	Crimson Sentry	25'	15'	
Golden Desert Ash	<i>Fraxinus oxycarpa</i>	Aureafolia	20'	18'	
Galaxy Magnolia	<i>Magnolia 'Galaxy'</i>	Galaxy	30'	15'	
Spire Cherry	<i>Prunus x hillieri</i>	Spire	30'	10'	
Red Cascade Mt. Ash	<i>Sorbus americana</i>	Dwarfcrowm	18'	8'	
Tree Lilac	<i>Syringa meyeri</i>	Palibin	7'	5'	

*\*Other species or cultivars may be appropriate but must be approved by the City of Lacey.*

If conifers are used in informal plantings, then the following species are appropriate for use in Lacey:

- Western red cedar (*Thuja plicata*)
- Mt. Hemlock (*Tsuga mertensiana*)
- Douglas-fir (*Pseudotsuga menziesii*)
- Canada Hemlock (*Tsuga canadensis*)
- Western Hemlock (*Tsuga heterophylla*)
- Giant sequoia (*Sequoia gigantea*)
- Alaska Yellow Cedar (*Chamaecyparis nootkatensis* and 'Pendula')
- Austrian pine (*Pinus nigra*)
- Deodar Cedar (*Cedrus deodara*)
- Noble Fir (*Abies procera*)
- Shore Pine (*Pinus contorta* var. *contorta*)
- Western white pine (*Pinus monticola*-blister rust resistant cultivars)
- Blue Atlas Cedar (*Cedrus atlantica* 'Glauca')
- Serbian Spruce (*Picea omorika*)
- Dawn Redwood (*Metasequoia glyptostroboides*)

Tree species specifically **forbidden** for planting in the City of Lacey:

- [Silver Maple \(\*Acer saccharinum\*\)](#)
- [Boxelder \(\*Acer negundo\*\)](#)
- [American Sycamore \(\*Platanus occidentalis\*\)](#)
- [London Planetree \(\*Platanus x acerifolia\*\)](#)
- [Red Sunset Maple \(\*Acer rubrum\* 'Red Sunset'\)](#)
- [Sycamore Maple \(\*Acer pseudoplatanus\*\)](#)
- [Lombardy Poplar \(\*Populus nigra\* 'Italica'\)](#)
- [Silver Poplar \(\*Populus alba\*\)](#)
- [Black Locust \(\*Robinia pseudoacacia\*\)](#)
- [Tree of Heaven \(\*Ailanthus altissima\*\)](#)
- [Scotch pine \(\*Pinus sylvestris\*\)](#)

Tree species discouraged:

- [Elms \(\*Ulmus\* spp.\)](#)
- [European White Birch \(\*Betula pendula\*\)](#)
- [Willows \(\*Salix\* spp.\)](#)
- [Sweetgum \(\*Liquidambar styraciflua\*\)](#)
- [Leyland Cypress \(\*Cupressus x leylandii\*\)](#)
- [Colorado Blue Spruce \(\*Picea pungens\*\)](#)

COMMON NAME	BOTANICAL NAME	CULTIVAR	MATURE HEIGHT	CROWN SPREAD	SPACING
<b>Large &gt;50' Tall</b>					40-50'
Northern Red Oak	<i>Quercus rubra</i>		70'	45'	
Tuliptree	<i>Liriodendron tulipifera</i>		70'	35'	
Autumn Purple Ash	<i>Fraxinus americana</i>	Autumn Purple	50'	35'	
Sugar Maple	<i>Acer saccharum</i>	Commemoration/ Bonfire	60'	35'	
European Beech	<i>Fagus sylvatica</i>		50'	35'	
Scarlet Oak	<i>Quercus coccinea</i>		60'	40'	
<b>Medium-Narrow Crowns 40-50' Tall</b>					25-35'
Columnar Tuliptree	<i>Liriodendron tulipifera</i>	Fastigiatum	50'	15'	
Armstrong Red Maple	<i>Acer rubrum</i>	Armstrong	45'	15'	

TRANSPORTATION

COMMON NAME	BOTANICAL NAME	CULTIVAR	MATURE HEIGHT	CROWN SPREAD	SPACING
Bowhall Red Maple	<i>Acer rubrum</i>	Bowhall	40'	15'	
Parkway Maple	<i>Acer platanoides</i>	Columnar-broad	40'	25'	
Skyrocket Oak	<i>Quercus robur</i>	Fastigiata	45'	15'	
<b>Medium – Wider Crowns 40-50' Tall</b>					35-40'
Littleleaf Linden	<i>Tilia cordata</i>	Greenspire	40'	30'	
Summit Ash	<i>Fraxinus pennsylvanica</i>	Summit	45'	25'	
Patmore Ash	<i>Fraxinus pennsylvanica</i>	Patmore	45'	35'	
Norway Maple	<i>Acer platanoides</i>	Emerald Queen	45'	40'	
Red Sunset Maple	<i>Acer rubrum</i>	Red Sunset	45'	35'	
October Glory Red Maple	<i>Acer rubrum</i>	October Glory	45'	35'	
Honeylocust	<i>Gleditsia triacanthos</i>	Shademaster	45'	35'	
Katsura Tree	<i>Cercidiphyllum japonicum</i>		40'	40'	
Red Horsechestnut	<i>Aesculus x earnea</i>	Briotti	30'	35'	
Autumn Gold Ginkgo	<i>Ginkgo biloba</i>	Autumn Gold			
<b>Small Trees &lt;35' Tall</b>					25-40'
Norwegian Sunset Maple	<i>Acer truncatum x A. platanoides</i>	Keithsform	35'	25'	
Pacific Sunset Maple	<i>Acer truncatum x A. platanoides</i>	Warrenred	30'	25'	
Crimson Sentry Maple	<i>Acer platanoides</i>	Crimson Sentry	25'	15'	30-40'
Japanese Stewartia	<i>Stewartia pseudocamellia</i>		30'	20'	
Snowgoose Cherry	<i>Prunus spp.</i>	Snowgoose	20'	20'	
Spire Cherry	<i>Prunus x hillieri</i>	Spire	30'	10'	
Flowering Crabapple	<i>Malus spp.</i>	Snowdrift, Red Baron, Prairiefire	20'	20'	
Japanese Snowbell	<i>Styrax japonicus</i>		25'	25'	
Black Tupelo	<i>Nyssa sylvatica</i>		35'	20'	
Goldenrain Tree	<i>Koelreuteria</i>		30'	30'	

COMMON NAME	BOTANICAL NAME	CULTIVAR	MATURE HEIGHT	CROWN SPREAD	SPACING
	<i>paniculata</i>				
Rocky Mt. Maple	<i>Acer grandidentatum</i>	Schmidt	25'	15'	
Galaxy Magnolia	<i>Magnolia spp.</i>	Galaxy	30'	15'	
Rustica Rubra Saucer Magnolia	<i>Magnolia soulangiana</i>	Rustica Rubra	20'	20'	
Golden-Desert Ash	<i>Fraxinus oxycarpa</i>	Aureaefolia	20'	18'	
Chinese-Kousa Dogwood	<i>Cornus kousa</i>	Chinensis	20'	20'	
Pink Flowering Dogwood	<i>Cornus florida</i>	Rubra	20'	20'	
Flowering Plum	<i>Prunus cerasifera</i>	Thunder- Cloud	20'	20'	
Paperbark Maple	<i>Acer griseum</i>		25'	20'	
Tatarian Maple	<i>Acer tatarian</i>		25'	20'	
Trident Maple	<i>Acer buergerianum</i>		20'	20'	
David's maple	<i>Acer davidii</i>		30'	25'	
Flame Maple	<i>Acer ginnala</i>	Flame	20'	20'	
Sargent Cherry	<i>Prunus sargentii</i>		30'	30'	
Amur Maple	<i>Acer ginnala</i>	Flame	20'	20'	
Black Tupelo	<i>Nyssa sylvatica</i>		30'	20'	
<b>Small Trees – Narrow &lt;35' Tall</b>					25-30'
Redmond Linden	<i>Tilia americana</i>	Redmond	35'	25'	
Pyramidal European Hornbeam	<i>Carpinus betulus</i>	Fastigiata	35'	25'	
Hedge Maple	<i>Acer campestre</i>	Evelyn	35'	30'	
Callery Pear	<i>Pyrus calleryana</i>	Redspire or Cleveland Select	35'	25'	
Ivory Silk Japanese Tree Lilac	<i>Syringa reticulata</i>	Ivory Silk	20'	15'	
Red Cascade Mt. Ash	<i>Sorbus americana</i>	Dwarfercrown	18'	8'	
Dwarf Korean Tree Lilac	<i>Syringa meyeri</i>	Palibin	7'	5'	

\*Other species or cultivars may be appropriate but must be approved by the City of Lacey.

Appropriate conifers:

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TRANSPORTATION

*Western red cedar (Thuja plicata)*

Table 3. 'Street Tree Themes' for all major and minor arterials and collectors.

STREET	SEGMENT		PRIMARY TREE	SECONDARY TREE	ACCENT TREE	UTILITY TREE
	FROM	TO				
<a href="#">Sleater-Kinney Road</a>	<a href="#">Martin Way</a>	<a href="#">14<sup>th</sup> Ave.</a>	<a href="#">Autumn Purple Ash</a>	<a href="#">Northern Red Oak</a>	<a href="#">Flowering plum</a>	<a href="#">Snowdrift crabapple</a>
<a href="#">Sleater-Kinney Road</a>	<a href="#">14<sup>th</sup> Ave.</a>	<a href="#">Chambers Lk. Rd.</a>	<a href="#">Emerald Queen Norway Maple</a>	<a href="#">Parkway Maple Redmond Linden</a>	<a href="#">Prairiefire crabapple</a>	<a href="#">Prairiefire crabapple</a>
<a href="#">Golf Club Road</a>	<a href="#">I-5</a>	<a href="#">Chambers Lk. Rd.</a>	<a href="#">Patmore Ash</a>	<a href="#">Rustica Rubra Saucer Magnolia</a>	<a href="#">Japanese Snowbell</a>	<a href="#">Prairiefire crabapple</a>
<a href="#">Judd St.</a>	<a href="#">Ruddell Road</a>	<a href="#">28<sup>th</sup> Ave.</a>	<a href="#">Japanese Stewartia</a>	<a href="#">Rustica Rubra Saucer Magnolia</a>	<a href="#">Kousa Dogwood</a>	<a href="#">Trident Maple</a>
<a href="#">Clearbrook Dr.</a>	<a href="#">Lacey Blvd.</a>	<a href="#">To End</a>	<a href="#">London Plane*</a>	<a href="#">Emerald Queen Norway Maple</a>	<a href="#">Rustica Rubra Saucer Magnolia</a>	<a href="#">Galaxy Magnolia</a>
<a href="#">College St.</a>	<a href="#">15<sup>th</sup> Ave.</a>	<a href="#">Pacific Ave.</a>	<a href="#">Northern Red Oak</a>	<a href="#">Shademaster Honeylocust</a>	<a href="#">Galaxy Magnolia</a>	<a href="#">Trident Maple</a>
<a href="#">College St.</a>	<a href="#">Pacific Ave.</a>	<a href="#">32<sup>nd</sup> Lane</a>	<a href="#">Norwegian Sunset Maple</a>	<a href="#">Shademaster Honeylocust</a>	<a href="#">Prairiefire crabapple</a>	<a href="#">Desert Ash</a>
<a href="#">College St.</a>	<a href="#">32<sup>nd</sup> Lane</a>	<a href="#">Yelm Hwy.</a>	<a href="#">Patmore Ash</a>	<a href="#">Norwegian Sunset Maple</a>	<a href="#">Snowdrift Fl. Crab</a>	<a href="#">Pacific Sunset Maple</a>
<a href="#">Rainier Road</a>	<a href="#">Yelm Hwy.</a>	<a href="#">City Limits</a>	<a href="#">Greenspire Linden</a>	<a href="#">Emerald Queen Norway Maple</a>	<a href="#">Rustica Rubra Saucer Magnolia</a>	<a href="#">Trident Maple</a>
<a href="#">Ruddell Road</a>	<a href="#">Martin Way</a>	<a href="#">Yelm Hwy.</a>	<a href="#">Summit Ash</a>	<a href="#">Tuliptree</a>	<a href="#">Japanese Snowbell</a>	<a href="#">Pacific Sunset Maple</a>
<a href="#">Ruddell Rd. Extension</a>	<a href="#">Israel Road</a>	<a href="#">Dennis St.</a>	<a href="#">Summit Ash</a>	<a href="#">Tuliptree</a>	<a href="#">Flowering Cherry</a>	--
<a href="#">Carpenter Road</a>	<a href="#">Hawks Pr. Road</a>	<a href="#">Pacific Ave.</a>	<a href="#">Tuliptree</a>	<a href="#">Rustica Rubra Saucer Magnolia-</a>	<a href="#">Japanese Snowbell</a>	<a href="#">Pacific Sunset Maple</a>
<a href="#">Carpenter Road</a>	<a href="#">Pacific Ave.</a>	<a href="#">Mullen Road</a>	<a href="#">Sugar Maple</a>	<a href="#">Emerald Queen Norway Maple</a>	<a href="#">Kousa Dogwood</a>	<a href="#">Hedge Maple</a>
<a href="#">Kinwood St.</a>	<a href="#">Capitol Blvd.</a>	<a href="#">City Limits</a>	<a href="#">Shademaster Honeylocust</a>	<a href="#">Patmore Ash</a>	<a href="#">Flowering Plum</a>	<a href="#">Pacific Sunset Maple</a>
<a href="#">Hensley, Ranger, School St.</a>	<a href="#">14<sup>th</sup> Ave. NE</a>	<a href="#">Pacific Ave.</a>	<a href="#">Red Horsechestnut</a>	<a href="#">Redmond Linden</a>	<a href="#">Rustica Rubra Saucer Magnolia</a>	<a href="#">Amur Maple</a>
<a href="#">Union Mills Rd.</a>	<a href="#">Pacific Ave.</a>	<a href="#">Marvin Rd.</a>	<a href="#">Scarlet Oak</a>	<a href="#">Shademaster Honeylocust</a>	<a href="#">Amur Maple</a>	<a href="#">Underground</a>
<a href="#">Kagy Rd.</a>	<a href="#">Mullen Rd.</a>	<a href="#">58<sup>th</sup> Ave.</a>	<a href="#">Sugar Maple</a>	<a href="#">Norwegian Sunset Maple</a>	<a href="#">Flowering Dogwood</a>	<a href="#">Rocky Mt. Maple</a>
<a href="#">Marvin Road</a>	<a href="#">44<sup>th</sup> Ave. NE</a>	<a href="#">Martin Way</a>	<a href="#">Northern Red Oak</a>	<a href="#">Emerald Queen Norway Maple</a>	<a href="#">Flowering Plum</a>	<a href="#">Galaxy Magnolia</a>
<a href="#">Marvin Road</a>	<a href="#">Martin Way</a>	<a href="#">Pacific Ave.</a>	<a href="#">Scarlet Oak</a>	<a href="#">Shademaster Honeylocust</a>	<a href="#">Snowgoose Cherry</a>	<a href="#">Red Cascade Mt. Ash</a>
<a href="#">Marvin Road</a>	<a href="#">Pacific Ave.</a>	<a href="#">City Limits</a>	<a href="#">Norwegian Sunset Maple</a>	<a href="#">Red Maple</a>	<a href="#">Rocky Mt. Maple</a>	<a href="#">Rocky Mt. Maple</a>
<a href="#">Hogum Bay Road</a>	<a href="#">Willamette Pkwy.</a>	<a href="#">Marvin Road</a>	<a href="#">Summit Ash</a>	<a href="#">Redspire Callery Pear</a>	<a href="#">Kousa Dogwood</a>	<a href="#">Amur Maple</a>

<u>STREET</u>	<u>SEGMENT</u>		<u>PRIMARY TREE</u>	<u>SECONDARY TREE</u>	<u>ACCENT TREE</u>	<u>UTILITY TREE</u>
	<u>FROM</u>	<u>TO</u>				
<u>Willamette Pkwy.</u>	<u>Marvin Road</u>	<u>Hogum Bay Rd.</u>	<u>Sweetgum</u>	<u>Patmore Ash</u>	<u>Kousa Dogwood</u>	<u>Rocky Mt. Maple</u>
<u>Hoh St.</u>	<u>Martin Way</u>	<u>Steilacoom Rd.</u>	<u>Scarlet Oak</u>	<u>Shademaker Honeylocust</u>	<u>Prairiefire Fl. Crab</u>	<u>Golden Desert Ash</u>
<u>Meridian Road</u>	<u>46<sup>th</sup> Ave. NE</u>	<u>Martin Way</u>	<u>Tuliptree</u>	<u>Patmore Ash</u>	<u>Black Tupelo</u>	<u>Rocky Mt. Maple</u>
<u>Meridian Road</u>	<u>Pacific Ave.</u>	<u>Yelm Hwy.</u>	<u>Katsura Tree</u>	<u>Pacific Sunset Maple</u>	<u>Snowgoose Cherry</u>	<u>Flowering Dogwood</u>
<u>Dutterow/Deerbrush Dr.</u>	<u>Martin Way</u>	<u>Pacific Ave.</u>	<u>Katsura Tree</u>	<u>Norwegian Sunset Maple</u>	<u>Rocky Mt. Maple</u>	<u>Trident maple</u>
<u>Hawks Prairie Road</u>	<u>Carpenter Road</u>	<u>Hogum Bay Road</u>	<u>Norwegian Sunset Maple</u>	<u>Tuliptree</u>	<u>Sargent Cherry</u>	<u>Flowering Plum</u>
<u>31<sup>st</sup>. Ave. NE</u>	<u>Marvin Road</u>	<u>Meridian Road</u>	<u>Emerald Queen Norway Maple</u>	<u>Red Sunset Maple</u>	<u>Flowering Plum</u>	<u>Golden Desert Ash</u>
<u>Britton Parkway</u>	<u>Carpenter Rd.</u>	<u>Hogum Bay Rd.</u>	<u>Sugar Maple</u>	<u>Autumn Purple Ash</u>	<u>Sargent Cherry</u>	<u>Japanese Snowbell</u>
<u>Orion Drive</u>	<u>Willamette Pkwy.</u>	<u>Meridian Road</u>	<u>Northern Red Oak</u>	<u>Sugar Maple</u>	<u>Snowgoose Cherry</u>	<u>Amur Maple</u>
<u>Martin Way</u>	<u>College St.</u>	<u>Kinwood St.</u>	<u>Autumn Purple Ash</u>	<u>Rustica Rubra Saucer Magnolia</u>	<u>Amur Maple</u>	<u>Kousa Dogwood</u>
<u>Martin Way</u>	<u>Kinwood St.</u>	<u>Ranger Dr.</u>	<u>Scarlet Oak</u>	<u>Norwegian Sunset Maple</u>	<u>Black Tupelo</u>	<u>Japanese Snowbell</u>
<u>Martin Way</u>	<u>Ranger Dr.</u>	<u>Marvin Road</u>	<u>Shademaker Honeylocust</u>	<u>Scarlet Oak</u>	<u>Snowgoose Cherry</u>	<u>Flowering Plum</u>
<u>Steilacoom Road</u>	<u>Pacific Ave.</u>	<u>City Limits</u>	<u>Katsura Tree</u>	<u>Pacific Sunset Maple</u>	<u>Snowgoose Cherry</u>	<u>Flowering Dogwood</u>
<u>Pacific Ave.</u>	<u>West City Limits</u>	<u>Carpenter Road</u>	<u>Patmore Ash</u>	<u>Autumn Purple Ash</u>	<u>Kousa Dogwood</u>	<u>Amur Maple</u>
<u>Pacific Ave.</u>	<u>Carpenter Road</u>	<u>Marvin Road</u>	<u>Tuliptree</u>	<u>Greenspire Linden</u>	<u>Black Tupelo</u>	<u>Japanese Snowbell</u>
<u>Pacific Ave.</u>	<u>Marvin Road</u>	<u>City Limits</u>	<u>Greenspire Linden</u>	<u>Tuliptree</u>	<u>Flowering Plum</u>	<u>Golden Desert Ash</u>
<u>14<sup>th</sup> Ave.</u>	<u>Carpenter Road</u>	<u>Union Mills</u>	<u>Norwegian Sunset Maple</u>	<u>Parkway Maple</u>	<u>Red Cascade Mt. Ash</u>	<u>Amur Maple</u>
<u>Lacey Blvd.</u>	<u>Sleater-Kinney Rd.</u>	<u>Pacific Ave.</u>	<u>Patmore Ash</u>	<u>Autumn Purple Ash</u>	<u>Paperbark Maple</u>	<u>Golden Desert Ash</u>
<u>21<sup>st</sup> Ave.</u>	<u>Chambers Lk. Dr.</u>	<u>Golf Club Rd.</u>	<u>Red Maple</u>	<u>Pacific Sunset Maple</u>	<u>Photinia Tree</u>	<u>Galaxy Magnolia</u>
<u>22<sup>nd</sup> Ave.</u>	<u>Golf Club Rd.</u>	<u>Shady Lane</u>	<u>Redmond Linden</u>	<u>Scarlet Oak</u>	<u>Galaxy Magnolia</u>	<u>Japanese Snowbell</u>
<u>Shady Lane</u>	<u>Lilac St.</u>	<u>Carpenter Road</u>	<u>Sargent Cherry</u>	<u>Flowering Plum</u>	<u>Paperbark Maple</u>	<u>Tree Lilac</u>
<u>25<sup>th</sup> Ave.</u>	<u>Ruddell Road</u>	<u>Lilac St.</u>	<u>Redmond Linden</u>	<u>Sargent Cherry</u>	<u>Goldenrain Tree</u>	<u>Kousa Dogwood</u>
<u>Mullen Road</u>	<u>West City Limits</u>	<u>Ruddell Road</u>	<u>Red Horsechestnut</u>	<u>Black Tupelo</u>	<u>Japanese Snowbell</u>	<u>Amur Maple</u>
<u>Mullen Road</u>	<u>Ruddell Road</u>	<u>Carpenter Road</u>	<u>Tuliptree</u>	<u>Black Tupelo</u>	<u>Snowgoose Cherry</u>	<u>Amur Maple</u>
<u>Mullen Road</u>	<u>Carpenter Road</u>	<u>Meridian Road</u>	<u>Sugar Maple</u>	<u>Northern Red Oak</u>	<u>Sargent Cherry</u>	<u>Japanese Snowbell</u>

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STREET	SEGMENT		PRIMARY TREE	SECONDARY TREE	ACCENT TREE	UTILITY TREE
	FROM	TO				
54 <sup>th</sup> Ave.	East of Ruddell Rd.	To End	Scarlet Oak	Redspire Callery Pear	Flowering Plum	Galaxy Magnolia
58 <sup>th</sup> Ave.	Kagy Road	Meridian Road	Greenspire Linden	Black Tupelo	Rocky Mt. Maple	Trident Maple
Yelm Hwy.	West City Limits	Ruddell Road	Norwegian Sunset Maple	Flowering Plum	David's Maple	Red Cascade Mt. Ash
Yelm Hwy.	Ruddell Road	Fair Oaks Road	Sugar Maple	Northern Red Oak	Tree Lilac	Trident Maple
Yelm Hwy.	Fair Oaks Road	Meridian Road	Autumn Purple Ash	Pacific Sunset Maple	Paperbark Maple	Japanese hornbeam
Compton Blvd. Ext.	Rainier Road	Yelm Hwy.	Greenspire Linden	European Beech	Tatarian Maple	Tree Lilac

\*London plane is the historically planted tree on Clearbrook Drive.

Table 3. 'Street Tree Themes' for all major and minor arterials and collectors.

STREET	SEGMENT		PRIMARY TREE	SECONDARY TREE	ACCENT TREE	UTILITY TREE
	FROM	TO				
Sleater-Kinney Rd.	Martin Way	14 <sup>th</sup> Ave.	Autumn Purple Ash	Northern Red Oak	Flowering plum	Snowdrift Crabapple
Sleater-Kinney Rd.	14 <sup>th</sup> Ave.	Chambers Lk. Rd.	Emerald Queen Norway-Maple	Parkway Maple Redmond Linden	Prairiefire Crabapple	Prairiefire Crabapple
Golf Club Rd.	I-5	Chambers Lk. Rd.	Patmore Ash	Rustica Rubra-Saucer Magnolia	Japanese Snowbell	Prairiefire Crabapple
Judd St.	Ruddell Rd.	28 <sup>th</sup> Ave.	Japanese Stewartia	Rustica Rubra-Saucer Magnolia	Kousa Dogwood	Trident Maple
Clearbrook Dr.	Lacey Blvd.	To-End	Northern Red Oak	Emerald Queen Norway-Maple	Rustica Rubra Saucer Magnolia	Galaxy Magnolia
College St.	15 <sup>th</sup> Ave.	Pacific Ave.	Northern Red Oak	Shademaster Honeylocust	Galaxy Magnolia	Trident Maple
College St.	Pacific Ave.	32 <sup>nd</sup> Lane	Norwegian Sunset-Maple	Shademaster Honeylocust	Prairiefire Crabapple	Desert Ash
College St.	32 <sup>nd</sup> Lane	Yelm Hwy.	Patmore Ash	Norwegian Sunset-Maple	Snowdrift Fl. Crab	Pacific Sunset Maple
Rainier Rd.	Yelm Hwy.	City Limits	Greenspire Linden	Emerald Queen Norway-Maple	Rustica Rubra Saucer Magnolia	Trident Maple
Ruddell Rd.	Pacific Ave.	Yelm Hwy.	Summit Ash	Tuliptree	Japanese Snowbell	Pacific Sunset

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						Maple
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4G.110 Planter Strip Landscaping

All public streets within the City and the City’s UGA boundary will be planted with landscaping materials to create a distinct and pleasant character for those roadways. The shrubs and groundcovers on the following table shall be required in or along the public right-of-way, including medians.

See Chapter 4B.125, Landscape/Planter Areas, for specific site preparation requirements.

- A. Planting theme: Landscaping materials shall be installed in accordance with the landscaping shown on the approved civil drawings.
- B. Planting size: Ground cover (i.e., kinnikinnick), 4 inch pot spaced 18 to 20 inches on center or 1 gallon pots at 20 inches on center. Low growth shrubs (i.e., Oregon grape), 1 gallon pots at 3 feet on center. Shrubs (i.e., rhododendron), 18 to 24 inches in height at 5 feet on center or 3 gallon pot at 5 feet on center.
- C. Location: Shrubs and groundcover shall be as shown on the applicable roadway sheets. Shrubs and groundcover shall be incorporated into planter strip and median areas. Sight distance requirements shall be incorporated into the civil design.
- D. Maintenance: All projects, regardless of type or zoning, required to plant shrubs and groundcover will also be required to maintain them in perpetuity, regardless of ownership. Landscaping shall be maintained per ANSI A300, Standard Practices for Trees, Shrubs and other Woody Plant Maintenance.

The owner/homeowner’s association is responsible for mowing, pruning, weeding, watering, replacement (replaced due to death, damage or disease after approval by a City representative) and any other shrub and groundcover maintenance within the respective right-of-way and common areas. See Chapter 6.210 for installation and maintenance of irrigation systems. At the time of plat or site plan review approval, the City will determine responsibility for maintenance of medians.

**Suitable Shrubs:**

<b>Common Name</b>	<b>Botanical Name</b>
Barberry	<i>Berberis thunbergii</i>
Dwarf Hinoki Cypress	<i>Chamaecyparis obtusus</i> 'Nana'
Rockrose	<i>Cystis spp.</i>
Salal	<i>Gaultheria shallon</i>
Mountain Laurel	<i>Kalmia spp.</i>
Oregongrape	<i>Mahonia aquifolium</i>
Andromeda	<i>Pieris spp.</i>
Rhododendron	<i>Rhododendron spp.</i>
Winged Euonymus	<i>Euonymus alata</i>
Otto Luyken	<i>Prunus laurocerasus</i> 'Otto Luyken'
Viburnum	<i>Viburnum davidii</i>
Savin Juniper	<i>Juniperus sabina</i>
Blue Star Juniper	<i>Juniperus squamata</i> 'Blue Star'
Pfitzer Juniper	<i>Juniperus Chinensis</i> 'Pfitzer'

**Suitable Groundcovers:**

<b>Common Name</b>	<b>Botanical Name</b>
Bunchberry	<i>Cornus canadensis</i>
Kinnikinnick	<i>Arctostaphylos uva-ursi</i>
Bar Harbor Juniper	<i>Juniperus horizontalis</i> 'Bar Harbor'
Turf*	

**\*Turf shall be permitted in applications as approved by the City of Lacey.**

## 4G.120 Parking Lots

The construction of parking lots within the City shall be governed by the Community Development Department. Access and drainage issues are governed by the Public Works Department. Contact the City of Lacey Planning Department to determine if the parking lot requires a Site Plan Review process. The configuration of the stalls shall be as outlined in the appropriate detail at the end of this Chapter.

The Public Works Department may require plans for the access. Access points to parking lots shall meet all the criteria as outlined in Chapters 4B.025, Access Management, and 4B.140, Driveways.

Plans and specifications as required in Chapter 5, Storm Drainage, shall be required to be submitted for review and approval by the City with respect to storm drainage discharge and on site retention or detention, matching street and/or sidewalk

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grades, access locations, parking layout, and to check for future street improvement conformity and City zoning regulations. (LMC 14.19.020)

Parking lot surfacing materials shall satisfy the requirement for a permanent all-weather surface. Asphalt concrete pavement and cement concrete pavement satisfy this requirement and are approved materials. Gravel surfaces are not acceptable or approved surface material types. Combination grass/paving systems are approved surface material types, however, their use requires submittal of an overall parking lot paving plan showing the limits of the grass/paving systems and a description of how the systems will be irrigated and maintained. If the City Engineer determines the grass/paving system is not appropriate for the specific application, alternate approved surfacing materials shall be utilized. (LMC 14.19.030)

TRANSPORTATION

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## CHAPTER 5

### 5.000 STORM DRAINAGE

#### 5 General Considerations

##### 5.010 General

The standards established by this chapter are intended to represent the minimum standards for the design and construction of storm drainage facilities.

The current City of Lacey Stormwater Design Manual document is considered a part of the Public Works Standards. This Manual sets forth minimum permanent stormwater management and construction stormwater pollution prevention requirements. Where conflicting information occurs between this chapter and the current City of Lacey Stormwater Design Manual, the most appropriate standard as determined by the Stormwater Design Manual Administrator shall apply.

A Grading Permit may be required when constructing storm ponds. See Chapter 2 and Chapter 3.080 for more information.

##### 5.020 Design Standards

The design of stormwater treatment and/or flow control BMPs/facilities shall depend on their type and local site conditions. The design elements of storm drainage systems shall conform to City standards as set forth herein and follow current design practices as set forth in Chapter 3.010 and 3.040. The following design considerations shall apply:

- A. No stormwater treatment and/or flow control BMPs/facilities shall be located in an area that is used to satisfy an open space requirement unless it is approved during SPR or by the City and satisfies the conditions of Chapter 5.030 and LMC 16.48.
- B. Use of designated open space areas for stormwater treatment and/or flow control BMPs/facilities and for infiltration shall satisfy all conditions of the City of Lacey for usability and landscape conformity. See Chapter 5.030 for landscape considerations.
- C. In determining usability of open space where drainage concepts are involved, staff will apply two main tests: orientation of design and overall aesthetic impression.
- D. Because the primary purpose of consolidated open space is to provide usable area for recreation activities, buffer zones, and green belt areas, the open space must be designed for this intent. Any use of this area for stormwater detention/retention must clearly be subordinate to and not detract from open space uses. Because active recreation requires primarily flat topography, the usable open space will be predominantly flat. In no

## STORM DRAINAGE

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event shall slopes exceed 4:1 (horizontal: vertical) where drainage facilities are present and a minimum of 50 percent of the linear slope length shall not exceed 7:1. Design of the combined facility, as well as ease of access into and out of the facility, will be considered by the City in review of the design of such facilities.

- E. Open space also serves an aesthetic function by providing areas of green space that are attractive and an amenity to the project site. The second test applied to open space will be that of the general impression the open space provides. The open space must be designed to give the impression of an attractive open space area available for park uses.
- F. The City shall make the sole determination whether the proposed stormwater facilities are compatible with open space and satisfy the intent of the City for open space amenities.
- G. Infiltration facilities shall not be located under a public roadway prism. Infiltration facilities may be located within the public right-of-way within a planter strip or green belt as long as the trench or swale does not interfere with the original intent of the planter strip or green belt.
- H. Stormwater facilities shall not have utilities located within them unless approved by the City during the civil plan review. Adequate separation (as determined by the City) between stormwater facilities and other utilities will also be required.

Perpendicular utility crossings within vegetated LID BMPs are allowed with the following conditions:

- Water service may be located within the facility footprint when necessary. City approval is required.
  - Water meters shall be located outside of bioretention footprint.
  - Fire Hydrants shall be located at least 5 feet outside of bioretention footprint.
  - No plantings except groundcover and sods within 5 feet of hydrant.
  - New side sewers and service drains may be located within facility footprints. Maintain clearances per Chapter 7.
  - New infiltration facilities are allowed over existing PVC or ductile iron side sewer crossings.
  - Franchise utilities (power, gas, communication) are allowed with approval from the Director of Public Works or designee and franchisee.
- I. Shared open channel conveyances, such as ditches, designed for transporting, storing, and/or infiltrating stormwater shall not be located on a lot designated for single-family occupancy. Easements proposed for such shared open channel conveyances shall not be allowed. This is necessary due to the complexity of operating and maintaining the integrity of such facilities within fenced and landscaped private property.
  - J. The use of LID BMPs is encouraged in commercial parking lots, including the use of permeable pavement and bioretention designed in accordance

## STORM DRAINAGE

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with these standards and the current City of Lacey Stormwater Design Manual.

- K. Maximum catch basin spacing shall be 300 feet on boulevards, arterials, and collectors and 500 feet on all other street classifications.
- L. The maximum depth of a retention or detention pond shall be 4.5 feet from the pond bottom to the top of the pond slope (not the water elevation). Deeper ponds may be allowed by the City's Stormwater Design Manual Administrator. If ponds over 4.5 feet deep have side slopes steeper than 4:1 (horizontal:vertical), then benches that are a minimum 3 feet wide shall be required for every 4.5 feet of depth. If ponds over 4.5 feet deep have sides flatter than 4:1, benches are not required.

#### 5.030 Landscape Considerations

The final landscape design shall be prepared by a licensed landscape architect or certified nursery person. Wherever possible, existing trees and other native vegetation around the facility shall be saved. This allows for a smooth transition to other undeveloped areas and helps retain the character of the site.

New vegetation will need to be planted regardless of how much is cleared. Plantings should be designed with specific functions in mind: soil preservation, erosion control, evapotranspiration, screening, space definition, sun and shade, and others. Use a combination of trees, shrubs, and groundcovers to provide variety and interest. Plant a mix of at least three different species of trees and/or shrubs.

Native and drought tolerant plants that will tolerate flooding and wet conditions are preferred. To ensure survival of newly planted native vegetation, it is recommended that the plants be irrigated for the entire establishment period, which may be up to five years for some tree species. In wet ponds with standing water, wetland herbaceous species (sedges, rushes, etc.) must be included.

Regional stormwater treatment wetlands and wet ponds located in residential and commercial developments should be designed with consideration for pedestrian and passive recreation facilities. Amenities around regional stormwater treatment wetlands and wet ponds such as picnic tables, benches, gazebos, etc. are encouraged. Aeration and/or recirculation of the water, such as waterfalls, cascades, and fountains should be considered for wet ponds to reduce the potential for odors to develop during the warmer months, to add visual interest, and to mask unwanted traffic noise.

Consult City staff for additional details on plant and landscape design criteria.

#### 5.035 Storm Signage

Residential subdivisions and multifamily developments shall provide pet waste station signage (see detail) prior to final Public Works approval to enhance the protection of the storm drainage system near stormwater facilities in recreation areas, open space, right of way, and parks.

The developer shall install stormwater facility signage for the following stormwater facilities prior to final Public Works approval: detention ponds, infiltration basins, wet ponds, and combined ponds. The City may require stormwater facility signage for permeable pavement facilities.

The developer shall install pesticide prohibition signs for Media Filter Drains (MFD) within the 1-year time of travel zone for a wellhead protection area or within a Category I critical aquifer recharge area.

#### 5.040 Conveyance

Pipe: Storm drain pipe within a public right-of-way or easement shall be sized to carry the maximum anticipated runoff from the possible contributing area using a

## STORM DRAINAGE

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25 year, 24 hour storm event model or a continuous time series model with 25 year conditions, whichever is more stringent.

All storm pipe shall be a minimum of 12-inch diameter for mains and 8-inch diameter for laterals within the right-of-way. Laterals less than 12-inch in diameter must be approved by City staff as supported by situation variables. When private stormwater (i.e., roof, lot, or footing drains) cannot be infiltrated on individual lots, the minimum standard piping connection to the public system shall be 8-inch PVC. The 8-inch main used for connection shall begin at the right-of-way. The connection to the catch basin or manhole shall be cored.

The minimum cover above the top of the storm drain pipe shall be 2 feet. Where the minimum depth includes the roadway section, structural calculations for the appropriate H-loading shall be submitted along with the plans. All pipe specified where the cover is 2 feet or less shall be concrete or ductile iron of a class determined by the structural calculations.

All pipe for storm mains shall comply with the requirements specified in the Storm General Notes on the following pages.

Channels: The City encourages the use of open vegetated channels to convey stormwater runoff when possible. Any open channels proposed to be located within public right-of-way shall require special approval from the Director of Public Works.

Private stormwater conveyance piping shall not be located within the public right-of-way. Where soils or other conditions prohibit infiltration on individual parcels (as determined by the Stormwater Design Manual Administrator), stormwater may be conveyed to the stormwater facilities associated with the residential or commercial development. In that case, the stormwater conveyance system located in the public right-of-way shall be sized to accommodate the additional stormwater. The minimum private stormwater conveyance pipe size within the right of way shall be 8 inch diameter. Multiple roof drains shall be terminated at a common junction structure outside of the Right of Way (i.e., catch basin or manhole). The minimum connection from the common junction structure to the City's storm system shall be through an 8-inch main connecting to a City catch basin or manhole.

### 5.050 Staking

All surveying and staking shall be directed by a Professional Land Surveyor licensed in Washington State.

A preconstruction meeting shall be held with the City prior to commencing staking. All construction staking shall be inspected by the City prior to construction.

The minimum staking of storm sewer systems shall be as follows unless directed otherwise by the City Engineer:

- A. Stake centerline alignment every 50 feet with station and cut or fill to invert of pipe.

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- B. Stake location of all catch basins, manholes, and other fixtures for grade and alignment with cut or fill to rim and invert of all pipes.
- C. Grade stake or slope stake (as appropriate) at intervals, sufficient to control location, size, and depth of stormwater treatment and/or flow control BMPs/facilities.

### 5.060 Erosion Control

See the current City of Lacey Stormwater Design Manual for specific erosion control requirements. Sites subject to a Construction Stormwater Pollution Prevention Plan (SWPPP) must have the SWPPP approved prior to any site disturbing activity. All erosion control measures shall be implemented and maintained throughout the entire site development process and a financial vehicle shall be provided to ensure removal of temporary erosion control measures after the project is developed. At time of building permit issuance, the permit holder will be issued an erosion control sign. The sign shall be posted and maintained in a visible location on the project site. The removal or lack of a posted erosion control sign will result in a stop work order until the erosion control sign is properly posted.

### 5.070 Trench Excavation

See Chapter 3.170 for requirements regarding trench excavation.

### 5.080 Backfilling

See Chapter 3.180 for requirements regarding backfilling.

### 5.090 Street Patching and Restoration

See Chapter 4B.170 and 4B.180 for requirements regarding street patching and trench restoration.

### 5.100 Maintenance

The City shall maintain all stormwater system elements, except vegetated LID facilities, located within the public rights-of-way. The developer, homeowner association, or other responsible entity shall be responsible for maintaining stormwater system elements and landscaping, including vegetated LID facilities, located within the public rights-of-way in accordance with Chapter 4 of the Development Guidelines and Public Works Standards.

The developer, homeowner association, or other responsible entity shall be responsible for maintaining all stormwater system elements located outside of the rights-of-way in accordance with the Lacey Municipal Code Chapter 14.25 and the current Stormwater Design Manual.

All stormwater facilities shall be maintained in accordance with the standards established in the maintenance agreement that is on file with the County. In the absence of established maintenance agreements, stormwater facilities shall be

Commented [MF1]: This paragraph is probably worth having one last internal City discussion to think about example projects and whether the outcome of this section for each example is what the City desires.

The main reason for this comment is that there could be some examples where the City might need to maintain bioretention in the right of way. But maybe not.

Commented [RM2]: Might add a sentence to address easements dedicated to the City ?!

Commented [MF3R2]: No change for now. Doug may check with Rick.

## STORM DRAINAGE

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maintained in accordance with the relevant standards from the City of Lacey Stormwater Design Manual.

## STORM DRAINAGE

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### GENERAL NOTES (STORM DRAIN CONSTRUCTION)

1. All approvals and permits required by the City of Lacey shall be obtained by the contractor prior to the start of construction. A grading permit for storm pond construction may be required.
2. Storm drain pipe material shall be on the WSDOT Qualified Products list for the specification listed below and approved by the City prior to installation:
  - A. Plain Concrete Storm Sewer Pipe or Reinforced Concrete Storm Sewer Pipe per WSDOT Standard Specification 9-05.7.
  - B. Solid Wall PVC Storm Sewer Pipe per WSDOT Standard Specification 9-05.12(1).
  - C. Ductile Iron Sewer Pipe per WSDOT Standard Specification 9-05.13.
  - D. Hancor Blue Seal™ and Advanced Drainage Systems (ADS/Hancor) N-12 HDPE and (ADS/Hancor) SaniTite up to 36 inch in diameter per WSDOT Standard Specifications 9-05.20 and 9-05.24.
  - E. Contech DuroMaxx steel rib reinforced polyethylene pipe, in diameters from 24 inch to 60 inch per WSDOT Standard Specification 9-05.22.
3. All storm drainage systems shall be tested per WSDOT Standard Specification Section 7-04.3. Testing shall be done by the contractor.
4. Testing of the storm sewer shall include video recording of the main by the contractor. Immediately prior to video recording, enough water shall be run down the line so it comes out the lower catch basin. A copy of the video recording shall be submitted to the City of Lacey. Acceptance of the line will not be made until after the recording has been reviewed and approved by the City. Testing shall take place after all underground utilities are installed and compaction of the roadway subgrade is complete.
5. Special structures, oil/water separators, and outlet controls shall be installed per plans and manufacturers' recommendations. Where oil/water separators are connected to a sewer system, they shall be installed with a P-trap or check valve to prevent odors.
6. All disturbed areas shall be stabilized in accordance with Core Requirement 2 of the current City of Lacey Stormwater Design Manual. For sites where vegetation has been planted through hydroseeding, the financial guarantee will not be released until the vegetation has been thoroughly established.
7. Where connections require "field verifications", connection points will be exposed by contractor and fittings verified 48 hours prior to distributing shut-down notices.
8. All catch basins/manholes shall have pads per Lacey standard detail.
9. Any changes to the design shall first be reviewed and approved in writing by the project engineer and the City of Lacey.

## STORM DRAINAGE

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10. All storm pipe shall be a minimum of 12-inch diameter for mains and 8-inch diameter for laterals crossings. When private stormwater (i.e. roof, lot, or footing drains) cannot be infiltrated on individual lots, the minimum standard piping connection to the public system shall be 8-inch PVC. The 8-inch main used for connection shall begin at the right-of-way, The connection to the catch basin or manhole shall be cored.
11. All storm mains and stormwater treatment and/or flow control BMPs/facilities areas shall be staked for grade and alignment by an engineering or survey firm licensed to perform such work.
12. The minimum staking of storm sewer systems shall be as follows:
  - A. Stake location of all catch basins, manholes, and other fixtures for grade and alignment.
  - B. Stake location, size, and depth of stormwater treatment and/or flow control BMPs/facilities.
  - C. Stake finished grade of all stormwater features, including but not limited to catch basin/manhole rim elevations, overflow structures, weirs, and invert elevations of all pipes in catch basins, manholes, and pipes that daylight.
13. Pipe size, slope, cover, etc., shall be as specified in the City of Lacey Development Guidelines and Public Works Standards.
14. All driveway culverts shall be of sufficient length to provide a minimum 3:1 slope from the edge of the driveway to the bottom of the ditch at the culvert end. Culverts shall have beveled end sections to match the side slope.
15. If drainage outlets (stub-outs) are to be provided for each individual lot, the stub-outs shall conform to the following:
  - A. Each outlet shall be suitably located at the lowest elevation on the lot, so as to service all future roof downspouts, footing drains, driveways, yard drains, and any other surface or subsurface drains necessary to render the lots suitable for their intended use. Each outlet shall have free-flowing, positive drainage to an approved storm water conveyance system or to an approved outfall location.
  - B. Outlets on each lot shall be located with a five-foot-high, 2-inch by 4-inch stake marked "storm" or "drain." The stub-out shall visibly extend above surface level and be secured to the stake.
  - C. Drainage easements are required for drainage systems designed to convey flows through individual lots.
  - D. The developer and/or contractor is responsible for coordinating the locations of all stub-out conveyance lines with respect to the utilities (e.g., power, gas, telephone, television).

## STORM DRAINAGE

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- E. All individual stub-outs shall be privately owned and maintained by the lot home owner.
16. The storm drainage system shall be constructed according to approved plans on file with the City. Any material deviation from the approved plans will require written approval from the City and shall be corrected in the as-built drawings.
17. All areas subject to clearing and grading that have not been covered by impervious surface, incorporated into a drainage facility, or engineered as structural fill or slope shall be amended in accordance with the current City of Lacey Stormwater Design Manual and then seeded, planted, and mulched or similarly stabilized after construction to the satisfaction of the City. For sites where grass has been planted through hydroseeding, the performance bond will not be released until the grass has been thoroughly established, unless otherwise approved by the City.
18. All erosion control and stormwater facilities shall be regularly inspected and maintained by the contractor during the construction phase of the development project.
19. No final cut or fill slope shall exceed 2:1 without stabilization by rockery or by a structural retaining wall.
20. The project engineer shall verify the locations, widths, thicknesses, and elevations of all existing pavements and structures, including utilities and other frontage improvements, which are to interface with new work. The Contractor shall provide all trimming, cutting, saw cutting, grading, leveling, sloping, coating, and other work, including materials as necessary to cause the interface with existing works to be proper, without conflict, acceptable to the engineer and the City, complete in place, and ready to use.
21. Compaction of all fill areas shall be per current APWA specifications. Fill shall be provided in 6" maximum lifts and shall be compacted to 95 percent of its maximum relative density. Deviation from this standard may be approved by the Director, or designee, where recommended by the licensed professional engineer for planned or existing infiltration facilities.

Revised: 03/2017

**REQUIRED STANDARD NOTES FOR CONSTRUCTION SWPPP DRAWINGS**

The following Standard Construction SWPPP Notes are required for use in Construction Stormwater Pollution Prevention Plans (SWPPP). They are followed by additional Standard Notes for BMPs that are required for plans showing specific types of BMPs. Plans shall also identify with phone numbers the persons or firms responsible for the preparation of (design engineer) and maintenance of (CESCL) the Construction SWPPP.

**Standard Construction SWPPP Notes**

- Site inspections shall be conducted by a person who is knowledgeable in the principles and practices of erosion and sediment control. For project sites that that require a Construction SWPPP, a Certified Erosion and Sediment Control Lead (CESCL) shall be identified in the Construction SWPPP and shall be on site or on call at all times.
- Approval of the Construction SWPPP does not constitute an approval of permanent road or drainage design (e.g. size and location of roads, pipes, restrictors, channels, retention/detention/infiltration facilities, utilities, etc.).
- The implementation of the Construction SWPPP and the construction, maintenance, replacement, and upgrading of these Construction SWPPP facilities is the responsibility of the applicant/contractor until all construction is completed and approved and vegetation/landscaping is established.
- The clearing limit boundaries shown on this plan shall be clearly flagged in the field prior to construction. During the construction period, no disturbance beyond the flagged clearing limits shall be permitted. The flagging shall be maintained by the applicant/contractor for the duration of construction.
- The Construction SWPPP facilities shown on this plan must be constructed in conjunction with all clearing and grading activities, and in such a manner as to ensure that sediment and sediment-laden water do not enter the drainage system, roadways, or violate applicable standards for surface water quality, groundwater quality, or sediment quality.
- The Construction SWPPP facilities shown on this plan are the minimum requirements for anticipated site conditions. During the construction period, these Construction SWPPP facilities shall be upgraded as needed for unexpected storm events and to ensure that sediment and sediment-laden water do not leave the site during the course of construction, including construction on individual lots.
- The Construction SWPPP facilities on active sites shall be inspected daily by the applicant/contractor. The facilities shall be maintained, repaired, or augmented as necessary to ensure their continued function.
- The Construction SWPPP facilities on inactive sites shall be inspected at least monthly and within 48 hours following a major storm event ( $\geq 1$ " rainfall in 24 hours) by the applicant/contractor. The facilities shall be maintained, repaired, or augmented as necessary to ensure their continued function.

## STORM DRAINAGE

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- Storm drain inlets operable during construction shall be protected so that stormwater runoff does not enter the conveyance system without first being filtered or treated to remove sediment. At no time shall more than 1 foot or 1/3 of the BMP volume (whichever is less) of sediment be allowed to accumulate within a storm drain inlet protection BMP. All catch basins and conveyance lines shall be cleaned as part of project completion and acceptance. The cleaning operation shall not flush sediment-laden water into the downstream system.
- Stabilized construction entrances shall be installed at the beginning of construction and maintained for the duration of the project. Additional measures may be required to ensure that all paved areas are kept clean for the duration of the project.
- Roads shall be inspected daily and cleaned thoroughly as needed to protect downstream water resources or stormwater infrastructure. Sediment shall be removed from roads by shoveling or pickup sweeping and shall be transported to a controlled sediment disposal area.
- From October 1 through April 30, no soils shall remain exposed and unworked for more than 2 days. From May 1 to September 30, no soils shall remain exposed and unworked for more than 7 days. Soils shall be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast. Linear construction activities, such as right-of-way and easement clearing, roadway development, pipelines, and trenching for utilities, shall comply with these requirements. These stabilization requirements apply to all soils on site, whether at final grade or not. The City of Lacey may decrease these time limits if it can be shown that a development site's erosion or runoff potential justifies a different standard.
- Contact the City for approval prior to all clearing, grading, and other soil-disturbing activities that occur between October 1 and April 30. Such work shall only be permitted if shown to the satisfaction of the City that the transport of sediment from the construction site to receiving waters will be prevented. The City may require supplemental SWPPP documentation for wet season work.
- Soil stockpiles must be stabilized and protected from erosion.
- Handle and dispose of all pollutants, including waste materials and demolition debris that occur on site in a manner that does not cause contamination of stormwater. Woody debris may be chopped and spread on site.
- Use spill prevention measures, such as drip pans, when conducting maintenance and repair of vehicles and equipment.
- Report Spills Monday through Friday, 7:00 a.m. to 3:30 p.m. (360) 491-5644. After hours, you can leave a voicemail at the number above, or select the option to be connected to Thurston County Central Dispatch, who will notify the City's stand-by Spill Response Staff.

### **Standard Notes for BMPs**

Standard notes must be provided on the drawings for BMPs proposed in the Construction SWPPP. Standard notes for common BMPs are provided below. For other BMPs provide notes

## STORM DRAINAGE

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that describe the performance standards the BMPs must achieve and actions to take if the performance goals are not achieved.

(A) Use the applicable WSDOT standard plan on drawings showing **silt fences**. Silt Fence with Backup Support (I-30.10-02), Silt Fence (I-30.15-02), High Visibility Silt Fence with Backup Support (I-30.16-00), High Visibility Silt Fence (I-30.17-00), Temporary Silt Fence for Inlet Protection in Unpaved Areas (I-40.10-00).

(B) Use the applicable WSDOT standard plan on drawings showing **catch basin filters** or **silt fence for inlet protection**. Storm Drain Inlet Protection (I-40.20-00), Temporary Silt Fence for Inlet Protection in Unpaved Areas (I-40.10-00). Include additional notes when other inlet protection BMPs are proposed.

(C) Use the applicable WSDOT standard plan on drawings showing **erosion control blankets**. Biodegradable Erosion Control Blanket Placement on Slopes (I-60.10-01), Biodegradable Erosion Control Blanket Placement for Ditches (I-60.20-01).

(D) Place the following standard notes on plans for projects with **construction entrances**:

### **BMP C105: Stabilized Construction Entrance/Exit Notes**

1. The rock pad shall be at least 12 inches thick and 100 feet long. Width shall be at least 15 feet and be the full width of the vehicle ingress and egress area. Smaller pads may be approved where required size is impractical.
2. Material shall be 4" to 8" quarry spalls, a 4-inch course of asphalt treated base (ATB), or use existing pavement. Do not use broken/crushed concrete, cement, or calcium chloride.
3. A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the following standards:
  - o Grab Tensile Strength (ASTM D4751): 200 psi minimum
  - o Grab Tensile Elongation (ASTM D4632): 30 percent maximum
  - o Mullen Burst Strength (ASTM D3786-80a): 400 psi minimum
  - o AOS (ASTM D4751): 20 to 45 (U.S. standard sieve size)
4. For single-family residential lots pad may be reduced in length to fit site, to no less than 20 feet long, and in depth, to 6 inches thick with 4-inch to 6-inch quarry spalls.
5. Additional quarry spalls shall be added periodically to maintain proper function of the pad.
6. If the entrance is not preventing sediment from being tracked onto pavement, then alternative measures to keep the streets free of sediment shall be used. This may include replacement/cleaning of the existing quarry spalls, an increase in the dimensions of the entrance, or the installation of a wheel wash.

(E) Place the following standard notes on drawings showing **seeding**:

**BMP C120: Temporary and Permanent Seeding Notes**

1. Seed mixture and application rate shall be:  
  
*(Designer shall insert appropriate Seed Mix Table from SDM Chapter 5).*
2. When applied with hydromulch, apply in two phases:
  - a. Phase 1 – Install all seed and fertilizer with 25 to 30 percent mulch and tackifier onto soil in the first lift.
  - b. Phase 2 – Install the rest of the mulch and tackifier in the second lift.
3. If feasible, seed between April 1 and June 30 or between September 1 and October 1.
4. Seed beds planted between July 1 and August 30 shall be irrigated until 75 percent grass cover is established.
5. Seed beds planted between October 1 and March 30 shall be mulched with straw or an erosion control blanket until 75 percent grass cover is established.
6. Confirm the installation of all required surface water control measures prior to seeding.
7. Seed beds shall be firm and rough prior to seeding. Where compaction is required for engineering purposes, slopes shall be track walked before seeding.
8. Backblading or smoothing is prohibited on seed beds steeper than 4:1.
9. It is recommended that areas being seeded for final landscaping conduct soil tests to determine the exact type and quantity of fertilizer needed. Minimize use of fertilizer adjacent to water bodies and wetlands.

(F) Place the following standard notes on plans for projects where **sod is to be placed**:

**BMP C124: Sod Placement Notes**

1. Sod shall be free of weeds, of uniform thickness (approximately 1 inch thick), and shall have a dense root mat for mechanical strength.
2. Amend 4 inches (minimum) of compost into the top 8 inches of the soil if the organic content of the soil is less than 10 percent or the permeability is less than 0.6 inches per hour.
3. Fertilize according to the supplier's recommendations.

(G) Place the following standard notes on drawings showing **mulching**:

**BMP C121: Mulching Notes**

1. When mulch is used for erosion control, soil must be completely and uniformly covered, without shadow areas where soil shows through.
2. Mulch comprised of straw, coarse compost, chipped site vegetation, or wood strands / wood straw shall be applied at least 2 inches thick.
3. Hydraulically applied erosion control products (Hydromulch) shall be from the WSDOT QPL for standard specification:
  - a. 9-14.2(2)C Short-Term Mulch when mulch is used for 3-6 months
  - b. 9-14.2(2)B Moderate-Term Mulch when mulch is used for 6-12 months
  - c. 9-14.2(2)A Long-Term Mulch when mulch is used for 12-18 months
4. Hydromulch application rate and technique shall be in accordance with the manufacturer's recommendation for the given slope and soil type.

(H) Place the following standard notes on drawings showing **plastic covering**:

**BMP C123: Plastic Covering Notes**

1. Plastic sheeting shall have a minimum thickness of 6 mil.
2. Place plastic into a small (12-inch wide by 6-inch deep) slot trench at the top of the slope and backfill with soil to keep water from flowing underneath.
3. Overlap all seams a minimum of 8 inches.
4. Place sand bags every 3 to 6 feet along seams and tie them together with twine to hold them in place. All sandbags must be staked in place.
5. Inspect plastic regularly for rips, tears, and open seams and repair or replace immediately.

(I) Place the following standard notes on plans for projects where **sod is to be placed**:

**BMP C124: Sod Placement Notes**

1. Sod shall be free of weeds, of uniform thickness (approximately 1 inch thick), and shall have a dense root mat for mechanical strength.
2. Amend 4 inches (minimum) of compost into the top 8 inches of the soil if the organic content of the soil is less than 10 percent or the permeability is less than 0.6 inches per hour.
3. Fertilize according to the supplier's recommendations.

(J) Place the following standard notes on drawings showing **gradient terraces**:

**BMP C131: Gradient Terraces**

## STORM DRAINAGE

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1. The terrace spacing shall be calculated in accordance with the SWPPP and no greater than 50 feet between terraces.
2. The terrace shall have enough capacity to handle the peak runoff expected from a 2-year, 24-hour design storm without overtopping.
3. Channel grades may be either uniform or variable with a maximum grade of 0.6 foot per 100-foot length (0.6 percent). For short distances, terrace grades may be increased to improve alignment. The channel velocity shall not exceed that which is nonerosive for the soil type.
4. Stabilize outlets to prevent erosion. Stabilize outlets to prevent erosion.

(K) Place the following standard notes on drawings showing **interceptor dikes and swales**:

### **BMP C200: Interceptor Dike and Swale Notes**

1. The upslope side of the dike shall provide positive drainage to the dike outlet.
2. Provide energy dissipation measures around the outlet as necessary to prevent erosion.
3. Release sediment-laden runoff through a sediment trapping facility.
4. Stabilized dike and/or swale and channel during construction.
5. Subbasin tributary area shall be 1 acre or less.
6. Apply seed and mulch within 5 days of dike construction (see Mulching) for slopes less than five percent.
7. Install channel protection with sod, erosion control blankets, rock lining, and check dams on slopes greater than 5 percent.

(L) Place the following standard notes on drawings showing **pipe slope drains**:

### **BMP C204: Pipe Slope Drain Notes**

1. The soil around and under the pipe and entrance section shall be thoroughly compacted to prevent undercutting.
2. The flared inlet section shall be securely connected to the slope drain with watertight connecting bands.
3. Pipe sections shall be securely fastened together with watertight fittings, and be securely anchored every 10- to 20-feet with steel T-posts and wire.

## STORM DRAINAGE

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4. Interceptor dikes shall be used to direct runoff into a slope drain. The height of the dike shall be at least 1 foot higher than the top of the inlet pipe.
5. The area below the outlet must be stabilized with a rip-rap apron.
6. Check inlet and outlet points regularly, especially after storms, remove debris or obstructions from the inlet and repair any erosion around the outlet.

(M) Place the following standard notes on drawings showing **check dams**:

### **BMP C207: Check Dams Notes**

1. Construct check dams from rock that is large enough to stay in place given the expected design flow through the channel or use rock or pea-gravel filled bags. Straw bales shall not be used.
2. Place rock by hand or by mechanical means (no dumping of rock to form dam).
3. Place check dams perpendicular to the flow of water.
4. The dam should form a triangle in cross-section.
5. The maximum spacing between the dams shall be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.
6. In the case of grass-lined ditches and swales, all check dams and accumulated sediment shall be removed when the grass has matured sufficiently to protect the ditch or swale—unless the slope of the swale is greater than 4 percent.
7. Seed the area beneath the check dams immediately after dam removal.
8. Inspect check dams for performance and sediment accumulation during and after each runoff producing rainfall. Remove sediment when it reaches one-half the sump depth.
9. If significant erosion occurs between dams, install rock or erosion control blanket to protect that portion of the channel.

(N) Place the following standard notes on drawings showing **triangular sediment filter dikes**:

### **BMP C208: Triangular Silt Dike (TSD) (Geotextile-Encased Check Dam) Notes**

1. Dikes shall be triangular, 10- to 14 inches high in the center and 20- to 28 inches at the base. A 2 foot apron extends beyond both sides of the triangle along its standard section of 7 feet. A sleeve at one end allows attachment of additional sections as needed.

## STORM DRAINAGE

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2. Install parallel to the flow of water with ends curved up to prevent water from flowing around the ends.
3. When multiple units are installed, the sleeve of fabric at the end of the unit shall overlap the abutting unit and be stapled.
4. Triangular silt dams shall be inspected for performance and sediment accumulation during and after each runoff producing rainfall. Sediment shall be removed when it reaches one-half the height of the dam.
5. Immediately repair any damage or any undercutting of the dam.

(O) Place the following standard notes on drawings showing **outlet protection**:

### **BMP C209: Outlet Protection Notes**

1. Protect the receiving channel at the outlet of a culvert from erosion by rock lining a minimum of 6 feet downstream and extending up the channel sides a minimum of 1 foot above the maximum tailwater elevation or 1 foot above the crown, whichever is higher. For large pipes (more than 18 inches in diameter), outlet protection lining of the channel shall be four times the diameter of the pipe.
2. Where discharge velocity at the outlet is less than 5 feet per second (pipe slope typically less than 10 percent), use 2- to 8-inch riprap. Minimum thickness is 1 foot.
3. At the base of slopes steeper than 10 an engineered energy dissipater shall be used.
4. Place filter fabric or erosion control blankets under riprap to prevent scour and channel erosion.
5. Bank stabilization, bioengineering, and habitat features may be required for disturbed areas.
6. Add rock as needed to maintain the intended function.
7. Remove any accumulated sediment from the energy dissipater.

(P) Place the following standard notes on drawings showing **straw wattles**:

### **BMP C235: Wattles Notes**

1. Wattles shall be 8 to 10 inches in diameter and installed perpendicular to the flow direction and parallel to the slope contour.
2. Straw roll installation requires the placement and secure staking of the roll in a trench, 3 inches to 5 inches deep, dug on contour. Runoff must not be allowed to run under or around roll.

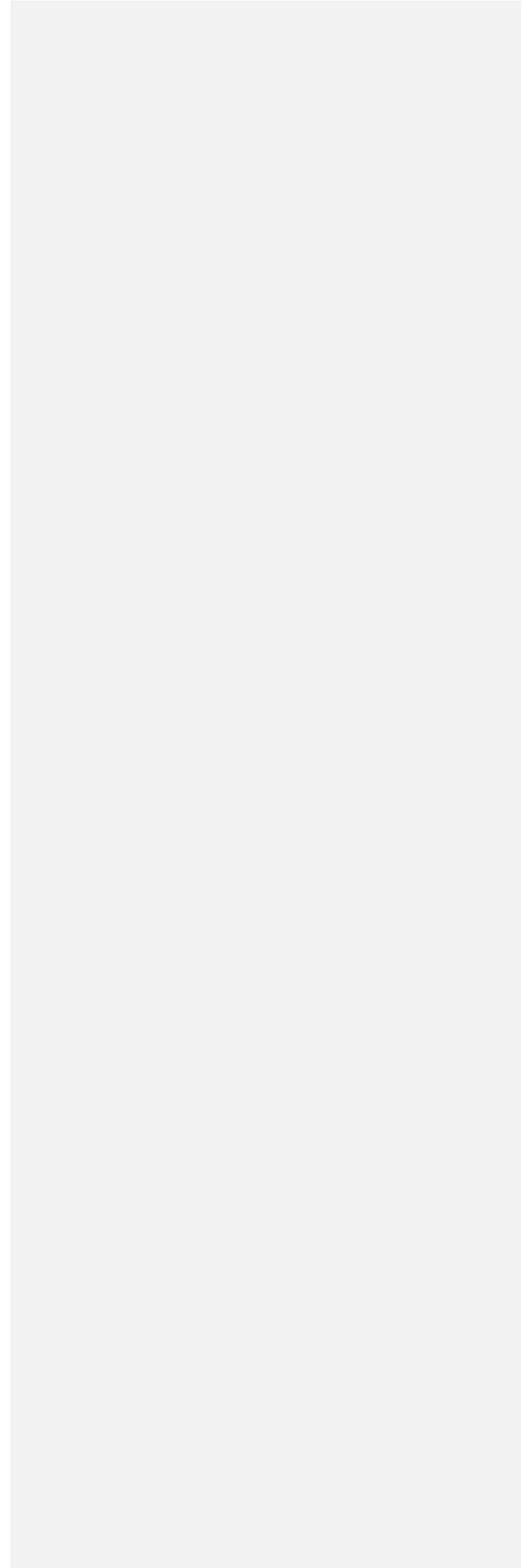
## STORM DRAINAGE

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3. Construct trenches on contours at intervals of 10 to 25 feet apart depending on the steepness of the slope, soil type, and rainfall. The steeper the slope, the closer together the trenches.
4. Install the wattles snugly into the trenches and abut tightly end to end. Do not overlap the ends.
5. Install stakes at each end of the wattle, and at 4-foot centers along entire length of wattle. Stakes should be driven through the middle of the wattle, leaving 2 to 3 inches of the stake protruding above the wattle.
6. Wooden stakes should be at least 0.75 by 0.75 by 24 inches. Willow cuttings or 0.375-inch rebar can also be used for stakes. Note: rebar must be removed at end of project if used, while other fasteners maybe permitted to remain if all parts of the wattles are biodegradable and shown in plans for permanent erosion control.
7. Inspect the slope after significant storms and repair any areas where wattles are not tightly abutted or water has scoured beneath the wattles.

STORM DRAINAGE

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## CHAPTER 6

### 6.000 WATER

#### 6.010 General

Any extension of the Lacey Water System must be approved by the Department of Public Works (DPW), and all extensions must conform to Department of Health (DOH) and the Coordinated Water System Plan, City of Lacey Water System Plan, and the City of Lacey Fire Code Official's requirements.

In designing and planning for any development, it is the developer's responsibility to see that adequate water for both domestic use and fire protection is attainable. The developer must show in the proposed plans how water will be supplied and, as required by the City, whether adequate water pressure and volume will be available to meet fire flow requirements. An analysis of the system shall be required to confirm that fire flow requirements will be met.

All new residences and businesses within the corporate City limits or the City's Urban Growth area shall connect to a public water supply provided that the property lies within 200 feet of a public water main, or when made a condition of project approval. When additional improvements occur to a developed parcel within 200 feet of a public water main, all structures on that parcel shall be connected to water. – Verify with planning commission discussion

Anyone who wishes to extend or connect to the City's water system shall contact the Department of Public Works for appropriate approvals and a connection fee estimate. This fee estimate is an estimate of the costs due the City for a waterline extension or connection. A copy of the estimate form may be found in Appendix C.

Prior to the release of any water meters, all Public Works improvements must be completed and approved including granting of right-of-way or easements and Special Power of Attorney for Annexation if required, and all applicable fees must be paid. For Exceptions to this policy see section 3.080 C.2.

Issuance of building permits for new construction shall not occur until final Public Works approval is given. As an exception to this policy, building permits may be issued upon completion and acceptance of the required fire protection facilities and the requirements as outlined in 3.080 C.2 have been met. **The certificate of occupancy will not be issued until final Public Works approval is given for all improvements.**

#### 6.020 Design Standards

The design of any water extension/connection shall conform to City Standards and any applicable standards as set forth herein and in Chapters 3.010 and 3.040. Mains and fittings shall be located on the north or east side six feet off of centerline of the roadway, drive aisle, private drive or easement. On boulevards and arterial

roadways, the location of the watermain and fittings shall be located as directed by the City, see chapter 4 street details.

The layout of extensions shall provide for the future continuation, water quality and/or "looping" of the existing system. Specific looping requirements shall be determined during plan review by the City. Dead end mains shall only be installed if looping is impractical due to topography, geology or as determined by the City. At a minimum, two connection points on separate mains to provide dual feeds for the development shall be required. In addition, main extensions shall be extended as required in Chapter 3.130.

In order to prevent transient water conditions and increased pressure losses, water main velocities shall not exceed 10 feet per second during peak and fire flow conditions.

Maintaining consistent slope of the watermain in design shall take precedence over the storm system design. Exceptions or conflicts shall be reviewed and resolved during the plan review process.

The General Notes on the following page shall be included on any plans dealing with water system design.

#### 6.024 Water Modeling

Water modeling shall be required to adequately size and loop mains in order to achieve fire flow and peak hour demands. Modeling will be completed by the City Water Resources Engineer after a request and adequate information has been received.

Peak hour demand modeling will only be completed when requested by the applicant or required by the City Engineer.

Fire flow (flow and pressure) will be determined through modeling under conditions specified by the City. A physical fire flow test will not replace the requirement for modeling. [Physical fire flow testing will only be conducted by City staff or under the direct supervision of City staff.](#)

**GENERAL NOTES (WATER MAIN INSTALLATION)**

1. Water mains up to 10" shall be AWWA C900 DR14 or ductile iron standard thickness class 52. Water mains larger than 10" shall be ductile iron standard thickness class 52. See Chapter 6.030B for more detailed pipe specifications.
2. All water mains shall be delivered from the manufacturer with pipe dust caps installed. The caps shall remain on the pipe until the time of installation.
3. Gate valves shall be resilient wedge, NRS (Non Rising Stem) with O-ring seals. Valve ends shall be mechanical joint or ANSI flanges. Valves shall conform to AWWA C-515 latest revision. Valves shall be Mueller, M & H, Kennedy, Clow R/W, Waterous Series 2500, EJ Flowmaster or American AVK.
4. **Existing valves shall be operated by City employees only.**
5. Hydrants shall be City approved as specified on the hydrant details and shall be bagged until the system is approved.
6. The contractor with the assistance of the City inspector shall install, chlorinate and fill the water main, including appurtenances. Testing shall include the main, valves, service lines and appurtenances. After testing is completed, the newly constructed system shall be flushed. After flushing chlorinated water from disinfected lines, the City shall measure chlorine residual to verify that flushing is complete. This will be completed prior to the City taking microbiological samples.
7. All pipe and services shall be installed with continuous tracer tape installed 12" to 18" under the final ground surface. The marker shall be plastic non-biodegradable, metal core backing marked "water" which can be detected by a standard metal detector. Tape shall be 3 inch wide Terra Tape "D" or approved equal. In addition to tracer tape, install direct bury, U.S.E. 12 gauge blue coated copper wire, wrapped around or taped to the pipe, as shown on detail. Low voltage grease-type splice kits shall be used on tracer wire. After the wire nut is used to connect the wire together an overhand knot shall be tied just outside the grease kit to prevent it from coming apart. Continuity testing of the wire will be done by the City.
8. All service line locations shall be marked on the top or face of the curb with an embossed "W" 3 inches high and 1/4 inch into concrete.
9. The City will be given 72 hours notice prior to scheduling a shutdown. Where connections require "field verification", connection points shall be exposed by the contractor and fittings verified 72 hours prior to distributing shut-down notices.
10. Separation between water and sewer shall be maintained per DOE standards. See Development Guideline Chapter 6.130 for more information.
11. A concrete pad per detail shall be installed around all valve boxes and blow-offs that are not in a pavement area.

12. At any connection to an existing line where a new valve is not installed, the existing valve must be pressure tested to City standards prior to connection. If an existing valve fails to pass the test, the contractor shall make the necessary provisions to test the new line prior to connection to the existing system or install a new valve.
13. The minimum burial depth of all water lines shall be 42 inches. The Contractor shall maintain a minimum of 18 inches of vertical separation between sanitary sewers/reclaimed water and water mains. To accommodate crossings, the minimum cover for water main of 42 inches may be reduced to 30 inches upon approval by the City to provide for as much vertical separation as possible. When a reduced depth is allowed, ductile iron piping and/or casings may be required. See 6.080 for casing specifications.
14. It shall be the contractor's responsibility to field verify the location and depth of the existing main and provide the fittings required to make the connection to the existing main.
15. The contractor shall install a temporary 2 inch brass blow off for flushing and sampling on the existing and/or new water main. The blow off shall be constructed with a standard 2 inch tapping saddle and Ford brass corporation stop with 2 inch brass pipe extended up to finished grade. When flushing and sampling are completed, the 2 inch pipe shall be removed. The corporation stop shall be shut off and capped tight with a threaded brass cap.
16. When an existing City water main is to be abandoned, it shall be the developer's responsibility to coordinate and abandon the existing main. It shall also be the developer's responsibility to install and transfer existing water services to the new main.
17. Sand shall be placed around and under service lines and meter boxes by hand to a height of 6 inches above and 6 inches below the line(s) and boxes. Excavation for the meter box shall be an additional one foot around the entire box and backfilled with sand per City detail.
18. Meters 3 inches or larger in size must be ordered from City Utility Billing by the contractor/developer a minimum of 10 weeks in advance of installation.
19. All valve box, blow-off and manhole lids shall be clean and clear of asphalt or concrete before scheduling a walk through.
20. The water main and appurtenances and service connections to the meter setter shall be tested in sections of convenient lengths under a hydrostatic pressure equal to 150 psi in excess of that under which it will operate. In no case shall the test pressure be less than 225 psi.
21. All water mains and service lines shall be bedded per detail 6-26 and meeting the pipe bedding specification chart requirements.

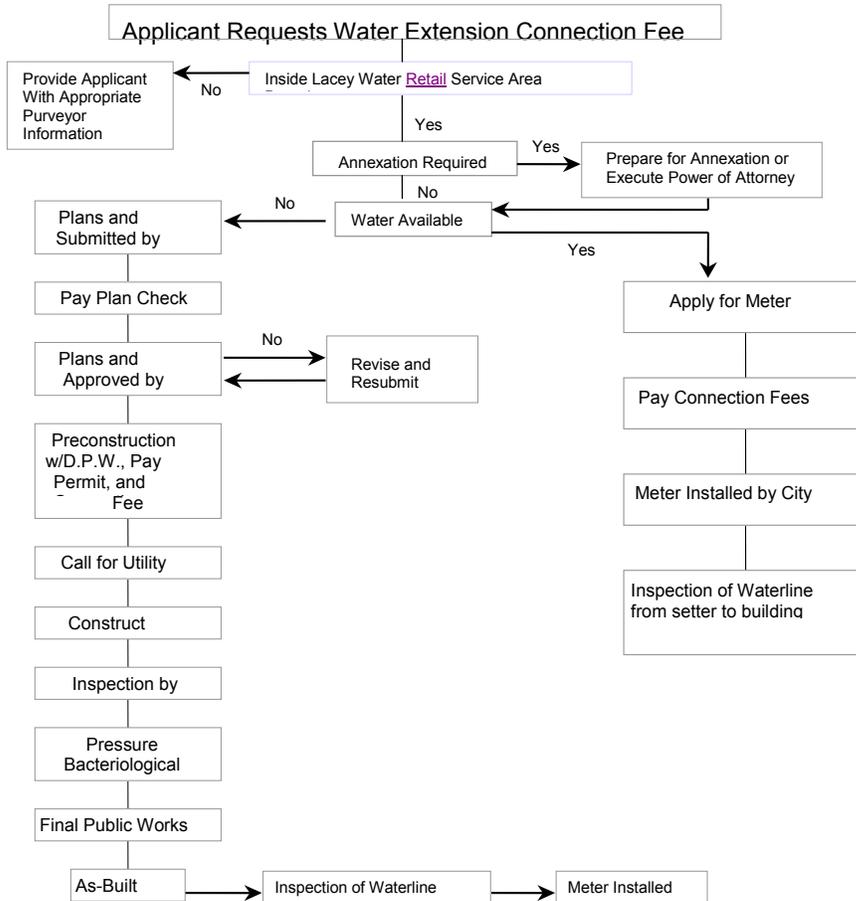
22. All brass pipe and fittings shall be manufactured in the United States of America and comply with public law 111-380 (reduction of lead in Drinking Water Act). Imported brass pipe and fittings shall not be permitted.

23. When using a hydrant meter to fill a tanker truck or portable tank of any kind, an approved permanently installed air gap of at least two times the inside diameter of the fill pipe is required. See detail. Any air gap on tanker trucks or portable tanks used within the City of Lacey water system must be inspected annually by a certified Backflow Assembly Tester (BAT) and a typical backflow prevention test report submitted to the Lacey Cross-Connection Specialist. [\(See Appendix V\)](#)

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Revised: 03/2014

**PROCESS TO OBTAIN WATER SERVICE**



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#### 6.025 Wellhead Protection Areas

The wellhead protection area designated for each of the City's wells is an irregular boundary determined by topography, water flow patterns (both above and below ground), soil types, flow rates and other criteria. Please contact the Public Works plan review staff or the Water Resources Department to determine whether your project is situated within a wellhead protection area. In order to protect the public water supply, all applicable portions of the Critical Aquifer Recharge Areas Protection ordinance as specified in LMC 14.36 and the following criteria shall apply to any project or portion of a project which is partially or completely located within a wellhead protection area.

- ◆ Existing private wells within the City of Lacey shall comply with Department of Ecology standards.
- ◆ The drilling of new exempt wells, or redevelopment of existing exempt wells, shall be prohibited within the City's critical aquifer recharge areas except where use of such wells is for the purpose of City of Lacey water supply, or resource protection, environmental monitoring or remediation of contamination.
- ◆ All storm water shall be directed away from the well's 100 foot sanitary setback. Storm water shall not penetrate the same aquifer supplying the well within the well's 1-year time-of-travel zone.
- ◆ A storm and erosion control plan requiring treatment of stormwater is required. Depending on the individual characteristics of the project, and the susceptibility of the particular wellhead to contamination, more stringent treatment requirements than those required in City of Lacey 2010 Stormwater Design Manual will be imposed by the City.
- ◆ If the project is to be platted, it must be noted within the covenants of the plat and in the General Notes of any engineering plans that the project is located within the one, five, or ten year time-of-travel zone wellhead protection area.
- ◆ All garbage bins and dumpsters, except in single family subdivisions, shall be covered in a manner that prevents rainwater from entering the containers. A sanitary drain shall be provided for compaction-style dumpsters that may generate leachate.
- ◆ In commercial projects, where hazardous products are stored or used, a spill and containment plan shall be implemented. Depending on the nature of a project, more stringent spill and containment requirements than those required in the City of Lacey 2010 Stormwater Design Manual will be imposed by the City.

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- ◆ Integrated pest management shall be utilized in choosing landscaping. This is required to minimize the use of pesticides, fertilizers, etc. Contact Thurston County Environmental Health for the most current Integrated Pest Management standards.
  - ◆ Land spreading disposal facilities (as defined by WAC 173-304 and WAC 173-308) are prohibited within the designated one-year time-of-travel zone.
  - ◆ Wastewater treatment facilities, including wastewater reclamation facilities, are prohibited within designated one-year time-of-travel zones. Infiltration of reclaimed water for the purposes of disposal or groundwater augmentation, which does not include irrigation at agronomic rates, is also prohibited within designated one-year time-of-travel zones.
  - ◆ Animal operations with over 200 animal units shall be prohibited within the designated one-year time-of-travel zone. LMC 14.36.215. Examples of prohibited animal operations within the one-year time-of-travel include, but are not limited to, dairies, stables, horse boarding/training, auction facilities, feedlots, and poultry raising.
  - ◆ Gas stations, petroleum products refinement, reprocessing, and storage (except underground storage of heating oil or agricultural fueling in quantities less than 1,100 gallons for consumptive use on the parcel where stored), and liquid petroleum products pipelines are prohibited within the designated one-year time-of-travel zone. LMC 14.36.215. Examples of prohibited petroleum storage within the one-year time-of-travel zone includes maintenance/fueling facilities for municipal, county, state, school district, transit, airports, railroads and buses. Gas stations without an attendant are prohibited within designated one-, five- and ten year time-of-travel zones.
  - ◆ Automobile wrecking yards and junk, scrap, or salvage yards are prohibited within the designated one-year time-of-travel zone. LMC 14.36.215.
  - ◆ Wood waste landfills shall be prohibited within the designated one-year time-of-travel zone. LMC 14.36.215.
  - ◆ Dry cleaners, excluding drop-off only facilities are prohibited within the designated one-year time-of-travel zone. LMC 14.36.215.
  - ◆ Landfills (municipal sanitary solid waste and hazardous waste) are prohibited within the designated one-, five-, and ten-year time-of-travel zones. LMC 14.36.215.
  - ◆ Hazardous waste transfer, storage and disposal facilities are prohibited within the designated one-, five-, and ten-year time-of-travel zones. LMC 14.36.215.

- ◆ Wood and wood products preserving is prohibited within the designated one-, five- and ten-year time-of-travel zones. LMC 14.36.215.
- ◆ Chemical manufacturing is prohibited within the designated one-, five- and ten-year time-of-travel zones. LMC 14.36.215.
- ◆ For any use proposed within the designated one-, five- and ten-year time-of-travel zones which uses, stores, handles or disposes of hazardous materials, refer to LMC 14.36 for appropriate specifications.

#### 6.030 Main Line

- A. Water mains shall be sized to provide adequate domestic flow plus fire flow at the required residual pressure. Fire flow requirements will be determined by the City of Lacey Fire Code Official however, the quantity of water required will in no case be less than 750 GPM at 20 psi residual pressure for single family and duplex occupancies (IBC R3) and a cumulative 1500 gpm at 20 psi residual for all other occupancies. Check with City of Lacey Fire Code Official for Group U requirements. Fire hydrants shall be located on water mains 6 inches diameter and larger.

The minimum water main size for standard distribution mains shall be 8 inches diameter. The minimum water main size for commercial and industrial applications shall be 12 inch installed in the public right-of-way. On-site water mains shall be looped and sized for the maximum expected fire flow. Larger size mains are required in specific areas as outlined in the Water Comprehensive Plan along existing transmission corridors. Nothing shall preclude the City from requiring the installation of a larger sized main if the City determines a larger size is needed to meet fire protection requirements or for future service.

Public mains serving cul-de-sacs or non-extendible, dead end areas may not be less than two inches in diameter.

- B. All pipe for water mains shall comply with one of the following types:

Ductile Iron Pipe: Ductile iron pipe may be used on mains up to ten inches diameter. Ductile iron pipe shall be used on mains over ten inches in diameter. Ductile iron pipe shall conform to AWWA C 151 standard thickness class 52 and have a cement mortar lining conforming to AWWA C 104. All pipes shall be joined using non-restrained joints which shall be rubber gaskets, push on type or mechanical joint, conforming to AWWA conforming to AWWA C 111. All water mains shall be delivered from the manufacturer with pipe dust caps installed. The caps shall remain on the pipe until the time of installation.

Pipes with less than 42 inches of cover shall only be allowed in extreme conditions when topography or design conditions (when the engineer has done the due diligence but still conditions) does not provide ample space for

the piping and with the approval of the Director of Public Works, ductile iron pipe shall be used. The thickness class shall be 52.

PVC Pipe: PVC pipe may be used on mains four inches through 10 inches in diameter with a minimum of 42 inches of cover. All PVC pipe shall conform to the latest revision of AWWA C900 DR 14 standards.

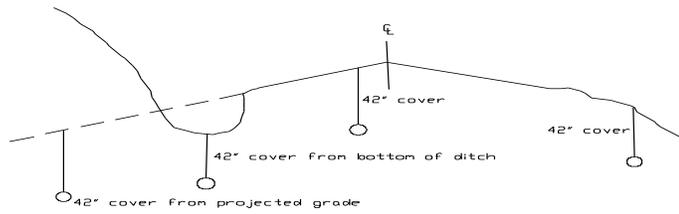
Two inch diameter service lines shall be NSF Approved, PE4710 blue polyethylene pipe manufactured from virgin materials. Pipe shall meet the following specifications:

- ANSI/AWWA C901
- ASTM D1248, ASTM D 3350, ASTM D 2239, ASTM D 3035 and ASTM D 2737,
- Pressure Class 200, SIDR - 7(Standard Inside Dimension Ration-Pressure Rated),
- Cell classification 345464C,

Pipe shall be manufactured by Interstate Plastics, Philips Driscopipe, Eagle Pacific, Superlon Plastics, U.S. Poly or approved equal.

- C. All fittings shall be ductile iron compact fittings conforming to AWWA C 153. All shall be cement mortar lined conforming to AWWA C 104. Plain end fittings shall be ductile iron if mechanical joint retainer glands are installed on the plain ends. All fittings shall be connected by flanges or mechanical joints. All retaining follower glands shall be ductile iron and of a pipe restraint design.
- D. All pipe and services shall be installed with continuous tracer tape installed 12 to 18 inches under the final ground surface. The marker shall be plastic non-biodegradable, metal core or backing which can be detected by a standard metal detector. Tape shall be 3 inch wide Terra Tape "D" or approved equal. In addition to tracer tape, install 12 gauge, direct bury, U.S.E. blue coated copper wire, wrapped around or taped to the top of pipe, brought up and tied off at valve body as shown on detail.
- E. The minimum cover for all water mains from top of pipe to finish grade shall be 42 inches. If the pipe is offset to the edge of the road, the actual roadway cross grade shall be projected out and used to measure cover to top of pipe. This will require more fill over the pipe in a fill section but allows the pipe adequate cover in the event of future roadway cuts or widening. If the pipe is located under a ditch, or on the "downhill" slope of the roadway cross section, the minimum cover over the pipe shall be 42 inches regardless of projected grades.
- F. When minimum cover of the water main is in conflict with other utilities, the engineer shall be required to provide the top and bottom elevations of the pipes in conflict. The adjustment of elevation when the minimum cover cannot be met shall be as directed by the City.

- G. When designing a water main through an unimproved area, the engineer shall provide a future design of the area to prevent design/construction of shallow mains. The design shall include elevations of the top of pipe at 25 foot intervals. All pipe installed in unimproved areas shall be ductile iron.



#### 6.040 Connection To Existing Water Main

If a tap or cut-in is being made by anyone other than the City, the City Inspector shall have the contractor sign the Verification of Disinfected Equipment Form.

The existing or new valve against the new connection or the tapping valve shall be pressure tested prior to any new connection.

~~After the contractor installs the new main, the contractor shall be responsible for disinfecting and flushing it per specifications in Chapter 6.200 of the City of Lacey Development Guidelines and Public Works Standards and AWWA guidelines.~~

The developer's engineer shall be responsible for determining the scope of work for connection to existing water mains. See detail. ~~Cut-in tees may be allowed only with the approval of the Director of Public Works.~~

The contractor shall install a temporary 2 inch brass blow off for flushing and sampling on the existing and/or new water main. The blow off shall be constructed with a standard 2 inch tapping saddle and Ford brass corporation stop with 2 inch brass pipe extended up to finished grade. When flushing and sampling are completed the 2 inch pipe shall be removed. The corporation stop shall be shut off and capped with threaded brass cap.

It shall be the Contractor's responsibility to field verify the location and depth of the existing main and the fittings required to make the connections to the existing mains.

No ~~tap connection~~ shall be made to an existing main on a Friday or day before a holiday without Public Works approval.

**A City representative shall be present throughout the entire connection or tapping procedure.**



PO Box 3400  
 Lacey, WA 98509-3400  
 (360) 491-5600

**Verification of Disinfected Equipment**

Warning: The City of Lacey maintains a chlorinated public water supply. Care shall be taken to reduce the risk of contamination.

Date:		City Representative:	
Location:			Size:
Project Name:		Public Works File Number:	
Type of Connection Being Made Check One: <input type="checkbox"/> Connection/extension <input type="checkbox"/> Tap <input type="checkbox"/> Cut-in			
Contractor or Tapping Company Information Name: _____ Address: _____			
City:		State:	Zip:
Phone Number: _____ (    ) _____			
Contractor: _____			

Only tapping machines equipped with a “flow-through” release bib shall be allowed.

The contractor listed above hereby certifies that the equipment being used to tap or cut into the City of Lacey’s public water supply has been properly disinfected. The contractor listed above also certifies that this equipment, including blades, has only and solely been used on a potable water supply.

Print Name: \_\_\_\_\_

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

#### 6.050 Service Interruption

The contractor shall give the City a minimum of 72 hours notice of any planned connection to an existing pipeline. This includes all cut-ins, live taps and extensions. Notice is required so any disruptions to existing services can be scheduled. The City will notify customers involved or affected by the water service interruption. The contractor shall make every effort to schedule water main construction with a minimum interruption of water service. In certain situations, the City may dictate scheduling of water main shutdowns so as not to impose unnecessary shutdowns during specific periods to existing customers.

#### 6.060 Hydrants

- A. Existing hydrants within the construction project shall be upgraded to current standards or replaced as determined by the City.
- B. The minimum lead from the service main to the fire hydrant shall be three (3) feet as specified on detail.
- C. Fire hydrants shall have two, 2-1/2 inch outlets and one 4-1/2 inch pumper port outlet fitted with a 5 inch Storz adapter. All port threads shall be National Standard thread. The hydrant operating nut shall be 1.25 inch pentagon and always open counter-clockwise. The valve opening shall be 5-1/4 inch diameter. The hydrant shall have a positive and automatic barrel drain. Hydrant shall be of the "safety" or break-away style.
- D. Hydrant leads shall not exceed 60 feet. If a hydrant is required 60 feet or more from the main, the main shall be extended, a tee shall be installed and the hydrant lead shall commence from the second tee. The lead from the service main to the fire hydrant up to 17 feet shall be restrained mechanical joint. For installations exceeding 19 feet, either restrained mechanical joint or field lock gaskets shall be required. Hydrant extensions shall use restrained joints from the main to the hydrant.

Approved hydrants are as shown on the hydrant detail. All hydrants shall be bagged by the contractor until system is approved.

- E. The Department of Public Works and City of Lacey Fire Code Official work together to insure that adequate hydrant spacing and installation are achieved.

Unless otherwise required by the City of Lacey, the following guidelines shall apply for hydrant number and location:

1. On arterials or boulevards, hydrants may be required on both sides of the roadway as determined by the Director of Public Works.
2. At least one hydrant shall be installed at all intersections.

3. Hydrant spacing of 330 feet shall be required in all areas except single family and duplex residential areas.
4. Hydrant spacing of 660 feet shall be required for single family and duplex residential areas.
5. A hydrant shall be located at the end of all mains six inches or larger if the end of the line is more than 200 feet from the previous hydrant.
6. Hydrants located in cul-de-sac or dead end areas which, either by design, topographic or manmade feature, prohibit straight line distance measurement, shall be located to serve no more than 120,000 square feet or have a maximum travel distance of 330 feet. Where a cul-de-sac or dead end exceeds 330 feet, a hydrant shall be required.
7. When any portion of a proposed commercial building is in excess of 400 feet from a fire hydrant on a public street, on-site hydrants may be required by City of Lacey Fire Code Official. Such hydrants shall be located per City of Lacey Fire Code Official and easements for such hydrants shall be granted to the City.
8. An additional fire hydrant may be required at a commercial, institutional, industrial, or converted business if an existing structure is enlarged, altered, repaired, or moved when the floor area exceeds 500 square feet and/or when structural additions, alterations and/or repairs to any portion of an existing structure within any 12 month period exceeds 25 percent of the value of the structure over 500 square feet.
9. Buildings or structures having a water flow requirement of 1,500 gpm or more shall be supplied by adequately sized and looped water mains around the building with hydrants spaced per the International Fire Code. Sizing and looping of water mains will be confirmed by the City using water modeling.
10. Hydrants shall be a minimum 40 feet from any commercial or industrial building.
11. A two-way, blue reflective hydrant marker per the striping detail shall be required perpendicular to each hydrant. Hydrant markers shall be placed ~~four~~ eight inches from the centerline on the same side of the road as the hydrant. The installation and payment of the two-way blue Raised Pavement Markers shall be the responsibility of the owner and/or contractor.
12. For additional hydrant installation requirements, see Section 14.07, International Fire Code of the Lacey Municipal Code.

A scaled down plan view of the proposed water system shall be included on the plans. The scale shall be appropriate to show the entire proposed system. This plan view shall show the location of all the proposed hydrants plus the location of the appropriate existing hydrants adjoining the project. If the project only includes the addition of one or two new hydrants, the locations of at least 3 existing hydrants in the project vicinity need to be shown on the plan view.

- F. Fire hydrants shall be set as shown on the hydrant detail.
- G. For requirements regarding use, size and location of a fire department connection (FDC) and/or post indicator valve contact City of Lacey Fire Code Official. Location of FDC shall be shown on water plans.
- H. Where needed, the Department of Public Works or City of Lacey Fire Code Official may require hydrants to be protected by two or more bollards. See detail and per IFC section 508.5.6. The unobstructed area around the hydrant shall be five (5) feet.
- I. Fire hydrants meeting required fire flow must be installed, tested, and accepted prior to the issuance of a building permit.

#### 6.062 Hydrant Meters

Hydrant meters may be obtained by completing the required paperwork with Public Works at the Maintenance Service Center (1200 College St SE). A deposit is required. Once the deposit is made, the meter may be picked up by the applicant. ~~A rental fee, water usage and utility tax are billed on a monthly basis. Also, any damages incurred and final billing are assessed upon returning the meter to the Maintenance Service Center. Those fees are subtracted from the deposit paid and a refund check is mailed to the applicant.~~

The contractor shall insure that measures to prevent backflow, cross connections and contamination of the City system comply with AWWA standards. All water distributed through hydrant meters is considered to be at high risk of contamination due to cross-connection, means of backflow prevention are required.

When using a hydrant meter to fill a tanker truck or portable tank of any kind, an approved permanently installed air gap of at least two times the inside diameter of the fill pipe is required. See detail. Any air gap on tanker trucks or portable tanks used within the City of Lacey water system must be inspected annually by a certified Backflow Assembly Tester (BAT) and a typical backflow prevention test report submitted to the Lacey Cross-Connection Specialist.

Water distributed through a hydrant meter for uses other than tank filling shall be protected from backflow and isolated from the potable water system with an approved ~~Double Check Valve Assembly (DCVA). In circumstances where a High Health Cross Connection Hazard exists, an RPBA shall be required as directed by the City of Lacey.~~ Reduced Pressure Backflow Assembly (RPBA). A Double Check

Valve Assembly (DCVA) will only be allowed with approval from the City's Cross-connection Specialist for low hazard uses. Proof of this device must be shown to obtain a water meter.

Whenever a mechanical means of backflow protection is required (RPBA or DCVA), the contractor shall insure that the assembly is tested by a certified BAT immediately upon installation. Along with the testing, a test report must be submitted to the City of Lacey Public Works Department within 7 days of meter rental. A Backflow Prevention Assembly certification tag must be affixed to the hydrant meter while in use.

See section ~~6.110~~Appendix V Backflow Prevention for additional information on backflow prevention assemblies and their installation requirements.

#### 6.065 Fire Sprinkler Underground Line

For general layout of fire sprinkler underground piping, valves and fixtures, see details. All components of the underground sprinkler system beyond the City isolation valve are the property and responsibility of the facility owner.

In no instance shall domestic or irrigation service connections be made to the fire sprinkler underground piping.

The fire sprinkler underground piping shall not be pressure tested until the distribution main up to the City isolation valve has been tested and approved by Lacey Public Works.

Fire sprinkler underground piping shall be installed and approved in accordance with N.F.P.A. 24 standards. The City of Lacey Fire Code Official will witness testing of the fire sprinkler underground piping and approve the contractor's materials and testing certificate for installation of the underground piping.

The fire sprinkler piping from the City isolation valve to the backflow prevention assembly shall be hydrostatically tested at 225 psi for 15 minutes and flushed.

A Reduced Pressure Detector Assembly (RPDA) shall be used to isolate fire sprinkler systems that inject chemical foam or other fire retardant, or utilize pumps or fire wells.

A Double Check Detector Assembly (DCDA) shall be used to isolate fire sprinkler systems that are not designed with the ability to inject chemical foam or other fire retardant.

When a portion of a fire sprinkler system is charged with a chemical to prevent freeze damage, that portion shall be independently isolated with a ~~RPDA~~Reduced Pressure Backflow Assembly (RPBA).

When the DCDA is installed in a vault, drainage and/or other means of water removal must be provided to insure the valve will not become submerged.

When the DCDA is installed in a vault outside the facility, the Fire Sprinkler Underground contractor shall insure the assembly is tested and functioning properly. The satisfactory test and documentation must be performed by a Washington State Certified BAT and submitted to the Lacey Cross-Connection Specialist prior to Certificate of Occupancy.

The City isolation valve shall not be permanently opened before all testing has been satisfactorily completed.

See section ~~6.110~~[Appendix V](#), Backflow Prevention, for additional information on DCDA and RPDA installation requirements.

#### 6.070 Valves

All valves and fittings shall be ductile iron with ANSI flanges or mechanical joint ends. **All existing valves shall be operated by City employees only.**

Valves shall be installed in the distribution system at sufficient intervals to facilitate system repair and maintenance, but in no case shall there be less than one valve every ~~1000~~ [500](#) feet. There shall be three valves on each tee (excluding hydrant tees) and four valves on each cross. Valves installed with tees and crosses shall be flanged together. All valves shall open counter-clockwise. Additional valves and valve spacing may be required by the City during plan review.

- A. Gate Valves, 2 inch to 16 inch: The design, materials and workmanship of all gate valves shall be Ductile Iron Body resilient wedge valves conforming to AWWA C515 latest revision. Gate valves shall be resilient wedge non-rising stem (NRS) with two internal O-ring stem seals. [Valves 16 inch or larger may require a 90 degree operator](#). Gate valves shall be Mueller, M & H, Kennedy, EJ Flowmaster, Clow, Waterous Series 2500 or American AVK.
- B. Butterfly Valves: Butterfly valves shall only be permitted under special circumstances as determined during review by the Director of Public Works. Butterfly valves shall conform to AWWA C504, Class 150B, with cast iron short body, O-ring stem seals, geared operator designed for underground installation, and a 2 inch square operating nut. Butterfly valves shall be Mueller, Linseal III, Kennedy, M & H, Pratt Groundhog, or Allis Chalmers.
- C. Valve Box: All valves shall have a standard EJ or an Olympic Foundry VB-950 water valve box set to grade with a 6 inch ASTM 3034 SDR 35 PVC riser from valve to within 4 to 6 inches of valve box top. Valve boxes and lids shall be manufactured in the United States of America and stamped accordingly. If valves are not set in paved area, a concrete pad shall be set around each valve box at finished grade. In areas where valve box falls in road shoulder, the ditch and shoulder shall be graded before placing asphalt or concrete pad. See detail.

- D. Valve marker Post: Valve marker posts shall be 4 inch x 4 inch reinforced concrete or schedule 40 steel posts 5 feet long stamped with "W" and distance to valve in blue. Post shall be painted with 1 base coat and 2 coats white oil base enamel. The need for valve marker posts will be determined during plan review. See detail.

#### 6.075 Bend Markers

When the direction of the main changes due to a bend, bend markers are required when water lines are located within an easement outside the right-of-way. See bend marker details.

#### 6.080 Casing

The casing shall be as follows: one quarter inch steel casing pipe or ductile iron class 52. In special cases C-900 DR 14 PVC pipe may be allowed. Casing spacers and end seals are required. A minimum of three sets of spacers are required per 20 feet of pipe. Spacers shall be as manufactured by Uni-Flange®, Calpico Inc. or approved equal. No more than one inch of clearance between the top of the casing and to top of the spacer is allowed.

The joints of the transmission pipe within the casing pipe shall be restrained with a Restrained Casing Spacer made by Uni-Flange®, or if using Calpico Inc. insulators, the pipe joints shall be restrained with a restraint system approved by the City of Lacey. Restrained joints shall be required on the transmission line one pipe length past either end of the casing pipe. Additional restraints may be required by the City.

#### 6.090 Air and Vacuum Release Valve

Air and vacuum release valves (ARV) shall be installed on the same side of the street (water north & east) as the main, behind the sidewalk on the property corner (residential applications). For mains up to 12 inches diameter ARV's shall be as shown on the detail. The engineer shall size the ARV for mains 14 inches diameter and larger.

ARV's must be installed so as not to create a cross connection situation. Measures to prevent backflow, cross connections, and contamination of the City system shall comply with AWWA standards.

The installation shall be set at the high point of the line when required. ARV's shall not be installed in areas subject to high ground water or flooding. Where possible, pipes are to be graded to prevent the need for an air release valve.

The ARV unit shall be insulated to keep the unit from freezing during the winter months. Requirements for insulation shall be per the detail.

#### 6.095 Brass

All brass pipe and fittings shall be manufactured in the United States of America and comply with public law 111-380 (reduction of lead in Drinking Water Act). Imported brass pipe and fittings shall not be permitted.

6.100 Blow-off Assembly

For water mains less than 6 inches in diameter a blow-off shall be located at the end of the main. The blow-off assembly shall be as shown on the details at the end of this Chapter. The pressure rating for blow-off assemblies shall be 200 psi. If located in cul-de-sacs, the blow-off assembly shall be placed as shown on the detail. See Chapter 6.060 for hydrant requirements at the end of 6 inch and larger mains.

6.110 Backflow Prevention

A. General

Real or potential unprotected cross-connection with the City of Lacey water system shall be prohibited under all circumstances. To protect the Lacey water system from any real or potential cross-connection, the City requires either an approved air gap or an approved, testable mechanical backflow prevention assembly.

[See Appendix V, Cross Connection Control Program Manual for more information on City of Lacey backflow prevention requirements.](#)

~~The installation of appropriate and approved backflow prevention assemblies is required by WAC 240-290-490 and LMC 13.48.070 to protect the City of Lacey's water system from possible contamination. All water system connections to serve newly constructed and existing buildings or properties with domestic potable water, fire sprinkler systems or irrigation systems shall comply with the minimum cross-connection and backflow prevention requirements as established by the Washington State Department of Health (DOH), the American Water Works Association (AWWA), the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research and the City of Lacey's Cross Connection & Backflow Prevention Manual.~~

~~Go to City of Lacey website for more information on backflow prevention.~~

C. Design and Selection Criteria

6.120 Service Connection

A. All service connections relating to new development shall be installed by the developer at the time of mainline construction. Services shall not be connected to a hydrant lead, the extendable section for a future main or the sprinkler underground line. The City will install a water meter after the application has been made and all applicable fees have been paid. Water meters will be set only after the system is inspected and approved. The use of construction bibs or "cheaters" is prohibited.

- 
- B. When water is desired to a parcel fronting an existing main but not served by an existing setter, an application must be made to the City. Upon approval of the application and payment of all applicable fees, the City will tap the main, and install the meter, box, and setter. If the main is on the opposite side of the road from the parcel needing service, it shall be the developer's responsibility to provide a casing under the roadway. The contractor installing the casing shall coordinate with the City of Lacey for depth location and size of casing. Each end of the casing shall be capped and marked. The minimum casing size shall be 4 inch polyethylene. For larger casing requirements refer to Chapter 6.080.

Service taps larger than 2 inches, connecting to an existing main, shall be made by the contractor per Chapter 6.040. Service taps that require crossing an arterial street in excess of two lane widths shall be made by the contractor. These types of services shall be denoted on the plans.

Domestic or irrigation meters 3 inch or larger in size must be ordered through the City by the contractor/developer 10 weeks in advance of the installation date.

A casing is required when a new service is to be connected to an existing water main and it crosses the centerline of the roadway. The applicant is responsible for this work. Outside of the Lacey City limits, contact Thurston County for the required right-of-way ([encroachment](#)) permit(s) and restoration requirements, if any. If Thurston County allows trenching, a casing shall be required.

- B. When water service connection is required to also serve as a residential fire service, the developer or applicant must submit fire flow calculations and requirements to the City for review and approval. [The meter shall at a minimum be ¾ by ¾ inch.](#) Additional fees may be required for upgrading of an existing water service to a residential fire service. Typical design for a residential fire system will be a flow through system for water quality purposes.
- D. Service lines shall be as specified herein. No glued joints will be accepted. Service lines shall be installed perpendicular to and 22½° above horizontal of the main. Tracer tape and wire wrapped around the pipe shall be installed on all service lines. When connecting to an existing system where the roadway cannot be cut, a casing shall be required.

One and one-half to two inch diameter service lines shall be NSF Approved, PE3408 blue polyethylene pipe manufactured from virgin materials. Pipe shall meet the following specifications:

- ANSI/AWWA C901
- ASTM D1248, ASTM D 3350, ASTM D 2239, ASTM D 3035 and ASTM D 2737,

- Pressure Class 200, SIDR - 7(Standard Inside Dimension Ration-Pressure Rated),
- Cell classification 345464C,

Pipe shall be manufactured by Interstate Plastics, Philips Driscopipe, Eagle Pacific, Superlon Plastics, U.S. Poly or approved equal.

Service saddles with stainless steel straps shall be as shown on the details or approved equal. All clamps shall have rubber gasket and iron pipe threaded outlets.

Corporation stops shall be as shown on the appropriate detail or approved equal with iron pipe threads conforming to AWWA C 800. Stainless steel inserts shall be used with pack joints and polyethylene pipe.

- E. With the exception of public and private school sites, new installation of master meters will not be allowed.
- F. ~~After January 1, 2007, w~~When connection to the public water system is desired by a customer (or required by the City) connected to a well exempt from the provisions of RCW 90.44.050, the “exempt” well must be properly decommissioned per DOE standards prior to making the connection. If the existing exempt well is actively providing domestic supply water, the well may continue to provide water to existing customers until connecting to the City water system. Prior to obtaining water from the City water system, the exempt well must be physically disconnected from all pipes to insure the well can no longer provide water to the site. In addition, within 60 days of the start of City water service, the exempt well must be decommissioned in accordance with WAC 173-160-381 (Standards for Decommissioning Well); if the well is not decommissioned within 60 days of the start of water service, water service will be discontinued until the City receives a well log documenting that the exempt well was decommissioned.

When connection to the public water system is desired by a customer connected to an existing well that has a water right issued by the Washington Department of Ecology, a physical disconnect between the well and the public water system must be made and maintained. This is necessary to assure that an unapproved auxiliary water supply (the customer’s well) will not contaminate the City’s water supply. Provided it is in compliance with DOE setback standards and purpose of use restrictions on the customers water right for said well, the customer’s “permitted” well may be kept serviceable for irrigation purposes only. In addition, if a well is to be used for irrigation, an RPBA shall be required and installed as premise isolation at the public water supply service connection. If an existing well is not to be used for irrigation purposes, it must be decommissioned per DOE standards. No water meter will be installed until the RPBA is installed and a cross connection inspection has been completed to the satisfaction of the City. See Appendix V, Cross Connection Control Manual for more information.

- F. Lots or pads created by plats, re-plats, short plats, or binding site plans shall have a water service installed as required below.

In single family subdivisions, (including mobile home and manufactured home subdivisions) a service shall be provided to each lot or pad, including open tracts and landscaping in the right-of-way. If a domestic and an irrigation meter are desired at a particular lot or tract, additional services shall be installed.

Duplexes shall have a separate service installed for each living unit regardless of how many duplexes are on a single lot. Example: One duplex on one lot shall have two services; two duplexes on one lot shall have four services and so on. A subdivision of duplexes shall have at least one service installed at all open tracts.

Multi-family and commercial complexes shall have at least one meter installed per separate building and a separate irrigation meter(s) if an irrigation system is installed. Additional meters to a multi-family or commercial building may be installed if desired. At least one service shall be installed to provide service to the open tracts.

- G. Sample stations may be required per the City detail. The requirement for the location and type of the sample station will be determined by the City during the plan review. Sample stations shall be located behind the walk on a property line, in an open space, or in a utility easement whenever possible and shall generally be centrally located in the project at a low point if possible.
- H. Service configuration shall be as shown on details at the end of this Chapter. Meters 3 inches and larger shall not be placed in a traffic bearing location. For services larger than 3 inches, the engineer shall submit a detail for approval that addresses the following:
- meter type (turbine, compound, etc.) and size,
  - a valve shall be located on both sides of the meter,
  - a lockable bypass is required,
  - check valves shall be required on the bypass and the meter,
  - supports (jack stands) are required under the meter and bypass,
  - the vault specified shall provide an 18" clear space from the vault wall to the closest edge of the meter, valves, or pipe,
  - the vault shall have a double lid ~~with a reader lid insert,~~
  - the distance from the top of the meter to the bottom of the lid shall be 24 inches minimum and 30 inches maximum,
  - a ladder shall be provided in the vault,
  - drainage must be provided for the meter pit.
  - the inside depth of the vault shall not exceed four feet from the top finish grade to the inside floor elevation.

#### 6.121 Water Meter Purchasing

In an effort to eliminate unaccounted water, the use of construction bibs or other devices used to obtain water without a water meter shall not be permitted. Water meters shall be purchased and installed prior to building permit issuance.

The following requirements shall apply to projects located within the Lacey water service area.

##### Residential and Commercial Projects:

1. The installation of a domestic water meter prior to issuing the residential or commercial building permit is required. Irrigation meters must be purchased with the payment of plan check and inspection fees.
2. The Building Official will ensure a meter is in place at the time of the first inspection. Public Works Inspectors, Meter Readers and the Operations staff will report any construction bibs or connections other than City of Lacey meters as they transit construction projects. Utility Billing staff will monitor AMR (automated meters) to detect abuse/damage through the use of error reports.

##### Irrigation Meters:

1. Irrigation meters must be purchased with the payment of plan check and inspection fees.
2. Operations staff will be responsible to verify that irrigation meters are installed at the time of the walk through inspection.

##### General Water Meter Requirements:

1. For all projects that receive City of Lacey water, builders/developers will be billed for the cost of replacement or repair of all damaged meters.
2. When devices other than City of Lacey water meters are found in violation of City policy, violators shall be charged with a misdemeanor.
3. Any project that has received a building permit prior to the 2009 Development Guidelines approval are vested and allowed to utilize construction water (for 90 days) as previously permitted; however all are encouraged to purchase their meters at the earliest date possible.

#### 6.125 Marking Service Lines

The location of all service lines shall be marked on the face or top of the cement concrete curb with a "W" 3 inches in height and 1/4 inch into the concrete.

#### 6.130 Water Main/Sanitary Sewer and Reclaimed Water Crossings

The Contractor shall maintain a minimum of 18 inches of vertical separation between sanitary sewers/reclaimed water and water mains. To accommodate crossings, the minimum cover for water main of 42 inches may be reduced to 30 inches upon approval by the City to provide for as much vertical separation as possible. When a reduced depth is allowed, ductile iron piping and/or casings may be required. See 6.080 for casing specifications. The water system shall not be intentionally designed with burial depth less than 42 inches to accommodate separation requirements.

Pressure sewers/reclaimed water shall only be installed under water lines. The vertical separation of 18 inches shall be at a minimum of 10 feet on either side of the crossing. The longest standard length of water pipe shall be installed so that the joints will fall equidistant from any sewer crossing. In some cases where minimum separation cannot be maintained, it may be necessary to encase the water pipe and/or the sewer/reclaimed water service per Section 6.080.

6.140 Water Main / Sanitary Sewer / Reclaimed water in Parallel

Refer to the City of Lacey details for water main/ reclaimed water and sanitary sewer in parallel installation.

### 6.190 Hydrostatic Tests

After the water main and appurtenances and service connections to the meter setter have been installed, filled and sterilized, the system shall be tested in sections not to exceed 1,500 feet in length. Testing requirements shall include existing water mains that are taken out of service and/or modified for development.

The tests shall be conducted under a hydrostatic pressure equal to 150 psi in excess of that under which it will operate. In no case shall the test pressure be less than 225 psi for 15 minutes. Any leaks or imperfections developing under said pressure shall be remedied by the contractor. All valves within the system shall be tested to the meter setters. Insofar as possible, no hydrostatic pressure shall be placed against the opposite side of the valve being tested. Test pressure shall be maintained while the entire installation is inspected.

The contractor shall provide all necessary equipment and shall perform all work connected with the tests. The test pump shall be clean and disinfected and shall only be used on potable water supplies. Tests shall be made after all connections have been made and the roadway section is constructed to subgrade. This is to include any and all connections especially the water meter setters as shown on the plan. The contractor shall perform the test to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the line has been released before requesting the City to witness the test.

### 6.200 Sterilization and Flushing

A. Prior to the acceptance of the work, sterilization of water mains shall be accomplished by the contractor in accordance with the latest revision of AWWA standard C-651 for disinfecting water mains. Testing and sampling shall take place after all underground utilities are installed and compaction of the trench to subgrade or finish grade is complete.

1. The Contractor shall provide extra safeguards to prevent water, contamination, rocks, sand or foreign matter from accumulating in the pipe.
2. Unless otherwise approved by the Engineer, the method for disinfecting water mains shall be by dry Calcium Hypochlorite as defined in Section 7-09.3(24)D of the WSDOT Standard Specifications and AWWA C651-14 Sec. 4.1.3 and Sec. 4.3. If adhesives are used to secure chlorine tablets to the pipe interior, they must meet the requirements of NSF/ANSI 61 and AWWA C651-14 Sec. 4.3.3.

3. Filling and testing of new water mains shall not commence until such time that the entire testing process can be completed in a timely manner. Highly chlorinated water will not be allowed to sit in newly constructed water mains for longer than 7 days.
4. If trench water, contaminants, or debris enter pipes during construction, the pipes shall be flushed at  $\geq 3$  feet per second to remove the all contamination, and disinfected using either the continuous feed or slug method.
5. The City inspector will open the water valves to fill the new main at the request of the contractor. A minimum chlorine concentration of 25 mg/L shall be established throughout the line. After the main is filled, the valves shall be closed by the City inspector and the line left undisturbed for 24 hours. A minimum free chlorine residual of 10 mg/L shall remain following this period.
6. After the main has been filled, hydrostatic pressure testing shall be conducted by the contractor in the presence of the City inspector.
- 4.7. After the 24-hour contact time has passed, the contractor shall thoroughly flush the disinfected water main to the sewer or an approved receptacle under the supervision of the City inspector. Flushing mains shall require the assistance of City utility personnel and shall be coordinated with the Engineer three working days in advance. Flushing mains larger than six inches may require the assistance of City staff to ensure adequate flush velocities are achieved. Flushing will not be complete until chlorine levels in the new main are representative of residuals within the City main system. It will be the contractor's responsibility to measure chlorine residuals during flushing using a method that is accepted by the Washington State Department of Health for drinking water samples. At no time shall chlorinated water from a new main be flushed directly or indirectly into a body of fresh water. This is to include lakes, rivers, streams, drainage ways, and any and all other waters where fish or other natural aquatic life can be expected, and stormwater facilities in hydraulic continuity with these fresh water systems.
8. After the main has been thoroughly flushed, water samples shall be taken. Only the City inspector will close the water valves to ensure that the new section is isolated. The valves are to remain closed until microbiological samples for all the connections are satisfactory.
9. The City inspector will request microbiological samples to be collected by City staff per AWWA C651-14 Sec. 5.1 Option A or B. Option B may not be able to be used if the pressure in the line is too low to allow the

sample tap to run continuously for 15 minutes without opening the system valve. To demonstrate that the new water main was adequately sterilized, under Option A two consecutive sets microbiological samples, collected at least 16 hours apart with no flushing in between, must indicate a presence of detectable chorine and an absence of coliform bacteria in the new main. Results are typically provided within four (4) working days but may take up to (7) working days.

B. Subsequent action will be taken based on initial results of microbiological tests.

1. If coliform bacteria are absent in two consecutive sets of new main samples, the City will open valves to the new and the existing system. At that time, the testing process for the new section of main shall be considered complete.
2. If coliform bacteria are present in any of the new main samples, but there is absence of fecal coliforms or E. Coli., the contractor shall take action as directed by the City inspector, which may include re-flushing or re-chlorinating the water main. Re-chlorination shall be done with the continuous feed method as described in the AWWA standard for disinfecting watermains. The City shall then take follow-up samples from the new main to ensure that the entire section was adequately sterilized as determined by the results of microbiological sample (s) collected following the process in A 9.
3. If coliform bacteria are present in two consecutive full rounds of samples, or in samples collected from the new section collected under step B.2., or if fecal coliforms or E. Coli were detected in any of the new main samples, the City shall ensure that a microbiological sample is collected from the existing water system “upstream” of the project. If the “upstream” sample(s) indicate(s) that coliforms are present in the City water system, go to “C” below. If the “upstream” sample indicates an absence of coliforms in the City water system, the contractor shall re-disinfect the new mains with sodium hypochlorite solution using the continuous feed method as described in the AWWA Standard for Disinfecting Water Mains, and then proceed with steps A.7and A.8 above.

C. If an “upstream” sample indicates the presence of coliform bacteria in the City water system, the City shall follow State Department of Health regulations and guidance for addressing the presence of coliforms in the distribution system. The City will calculate system compliance for coliform bacteria and take appropriate action per the City of Lacey Coliform Monitoring Plan under the supervision of the City of Lacey Water Resources Division. Follow-up actions may include, but are not limited to: identifying and correcting the likely source(s) of contamination, flushing, testing, and/or public notification. Disinfection and testing of the new main(s) shall not resume until the City water supplying the project tests free of coliforms. At that time, the contractor

shall take action as directed by the City inspector, including re-flushing the water main prior to the City requesting another set of microbiological samples. If the initial treatment results in an unsatisfactory bacteriological test, the original chlorination procedure shall be repeated by the contractor until satisfactory results are obtained.

- D. Pipe and fittings used in connections to existing mains shall be less than one pipe length (generally less than 20 ft), and spray disinfected, swabbed or immersed for disinfection as per AWWA C651-14 Sec. 4.10 and 4.11 (1% chlorine solution).

Due to extensive revisions this section was deleted, see revisions above

- A. ~~Prior to the acceptance of the work, sterilization of water mains shall be accomplished by the contractor in accordance with the AWWA standard for disinfecting water mains. Testing and sampling shall take place after all underground utilities are installed and compaction of the trench to sub-grade or finish grade is complete. The following testing requirements shall include existing water mains that are taken out of service and/or modified for development.~~

## 6.210 Irrigation

All irrigation systems located within the public right-of-way shall be designed by a State of Washington registered landscape architect or City approved design firm. Parts lists shall be submitted with each project.

Prior to submitting the design, the contractor/engineer/landscape architect shall hire an independent Certified Landscape Irrigation Auditor, as certified by The Irrigation Association, to review and approve the proposed design.

After the irrigation system is installed, the contractor shall provide an irrigation audit to be performed on the new system by an independent Certified Landscape Irrigation Auditor (CLIA), as certified by the Irrigation Association, prior to final field observation by the Engineer. The CLIA shall test for proper coverage as determined by the Landscape Irrigation Auditor Handbook, most recent edition. The CLIA shall provide written certification that the irrigation system installed provides proper coverage as provided in the handbook.

The General Notes on the following pages are required on all plans for City operated or maintained irrigation systems or on any owner association operated or maintained irrigation systems located within the public right-of-way.

Irrigation systems shall be designed and installed with an approved backflow prevention assembly in accordance with [Chapter 6.110 Appendix V](#) of this manual.

A separate irrigation meter shall be provided for each irrigation system and median. Residential irrigation may be exempt. The City Engineer shall review and approve the irrigation design. The irrigation system shall be installed after the area has been properly prepared. See Chapter 4B.125 for soil preparation requirements. The pipe trenches shall be no wider than is necessary to lay the pipe or install equipment.

Systems shall be in compliance with City of Lacey water conservation policies.

The median system shall be a completely separate system with its own separate appurtenances.

Irrigation sprinklers shall be situated so as to not wet any public street or sidewalk. Spray heads shall not be used in planters less than 3 feet wide. Drip irrigation methods shall be employed in areas less than 3 feet wide to prevent overspray. Turf heads shall be placed at finished grade as measured from the top of the sprinkler. Shrub heads shall be 12 inch pop up type placed at finished grade unless otherwise specified. Drip irrigation emitters shall be installed in accordance with the manufacturer's recommendations.

Installation and maintenance of irrigation systems in roadway planter strips shall be as shown in the table below. The system owner shall be responsible for the on-going utility expenses and annual backflow prevention assembly testing.

	<b>Single Family Residential Zones</b>	<b>Multi-Family &amp; All Other Zones</b>
<b>Arterial Boulevard</b>	Developer installs, Homeowners Association maintains or a Community Facilities District may be established per LMC 3.46	Developer installs. Owner or Owners Association maintains or a Community Facilities District may be established per LMC 3.46
<b>Arterials</b>	Developer installs, Homeowners Assn. maintains. If the association doesn't maintain, a Community Facilities District may be established at the City's discretion per LMC 3.46.	Developer installs. Owner or Owners Association maintains (the City will maintain where existing covenants don't address this issue)
<b>Collectors</b>	Developer installs, Homeowners Assn. maintains	Developer installs, Owners Association maintains
<b>Residential</b>	Developer installs & Homeowners Assn. maintains	Owner installs, owner maintains

**GENERAL NOTES (IRRIGATION SYSTEMS)**

1. It shall be the responsibility of the contractor to have a copy of an approved set of the landscaping plans signed by the Director of Public Works on the construction site at all times.
2. Temporary erosion control/water pollution measures shall be required in accordance with section 1-07.15 of the *WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction* and the *Drainage Design and Erosion Control Manual for Lacey*. At no time will silts and debris be allowed to drain into an existing or newly installed facility unless special provisions have been designed.
3. Electrical permits and inspections are required for all irrigation services within the City of Lacey. The contractor is responsible for obtaining permits prior to any type of actual construction. Prior to installation of any materials, the irrigation contractor shall submit for approval by the City, five copies of material catalog cuts, specifications, shop drawings and/or wiring diagrams. Any materials purchased or labor performed prior to such approval shall be at the contractor's own risk.
4. A clearly marked service disconnect shall be provided for every automatic irrigation installation unless otherwise stated on a City approved set of plans. The location and installation of the disconnect shall conform to the National Electrical Code (NEC) and City of Lacey standards. The service disconnect shall be City approved.
5. All low voltage wire shall be a minimum size of #14 UF from each control valve to the terminal interface.
6. All low voltage splices shall be of a type equal to a Spears DS 400 or a City approved equal. All splices shall be done in valve control boxes. Direct burial splicing will not be allowed.
7. The automatic controller components shall be as specified in Chapter 6.210 section H of the Development Guidelines.
8. The City shall be given 72 hours notice prior to scheduling a shutdown. Where connections require "field verification", connection points shall be exposed by the contractor and the fittings verified 48 hours prior to distributing shut-down notices.
16. All materials specifications from Section G Material Specifications of this paragraph shall be shown on the plans.
17. A separate irrigation meter shall be provided for each irrigation system and median. Residential irrigation may be exempt. The City Engineer shall review and approve the irrigation design. The irrigation system shall be installed after the area has been properly prepared. See Chapter 4B.125 for soil preparation requirements. Pipe trenches shall be no wider than is necessary to lay the pipe or install equipment. The top 18 inches of topsoil shall be kept separate from the subsoil and shall be replaced as the top layer when backfill is made.

18. The median system shall be a completely separate system with its own separate appurtenances for City owned medians.
19. All irrigation lines to be installed under existing pavement or areas to be paved shall be installed within a casing. The casing shall be a minimum 4 inch diameter or twice the diameter of the encased pipe. The casing shall be steel casing (minimum schedule 40), ductile iron thickness class 52 or C900 Class DR 14 PVC pipe. The irrigation casing shall extend a minimum of 1 foot beyond the structure under which casing is being jacked or bored. Any time an irrigation line is located within the right of way, a locate wire (12 gauge U.S.E. purple coated copper wire) shall be installed. Locate wires shall originate in the DCVA box and terminate at the end of the system.
20. Upon final acceptance of the work, the contractor shall submit two as-builts per Chapter 3.065.
21. Privately owned sprinkler heads built along slopes in excess of 2 percent shall contain check valves.

Revised: 03/2014

A. Layout of Irrigation System

The contractor shall stake all irrigation heads and mark all proposed trenches within the irrigation system per the approved plans prior to installing the system. Alterations in layout may be expected, i.e., to conform to ground conditions and to obtain full and adequate coverage to the landscaping. However, no alterations shall be made without prior authorization by the City.

B. Excavation

All soil shall be prepared as specified in 4B.125 prior to trenching. Trenches shall be no wider at any point than is necessary to lay pipe or install equipment. Trench bottoms shall be of relatively smooth sand 4 inches below and 6 inches above the pipe.

Detectable marking tape shall be placed in the trench 6 inches directly above, parallel to, and along the entire length of all nonmetallic water line and nonmetallic conduit. The width and depth of the tape shall be as recommended by the manufacturer or the City.

C. Piping

The irrigation main line is the line containing the supply usually situated between the irrigation meter and the irrigation control valves. The irrigation lateral lines are the lines between the irrigation control valves and the connections to the irrigation heads. Swing joints, thick walled poly pipe, flexible risers, rigid pipe risers, and associated fittings are not considered part of the lateral line but incidental components of the irrigation heads.

All water lines shall be a minimum of 18 inches below finished grade as measured from the top of the pipe. Where possible, mains and laterals or section piping shall be placed in the same trench.

All irrigation lines to be installed under existing pavement or areas to be paved, shall be installed within a minimum 4 inch diameter or twice the diameter of the encased pipe. The casing shall be steel casing (minimum schedule 40) or C900 DR 14 PVC pipe. The irrigation casing shall extend a minimum of 1 foot beyond the structure under which casing is being jacked or bored.

B. Backflow Prevention Assembly

Most irrigation systems shall be designed and installed with a DOH approved Double Check Valve Assembly (DCVA) to prevent backflow. If the irrigation system is designed with the ability to provide fertilizer or other chemical injection, or if a booster pump is required, a DOH approved Reduced Pressure Backflow Assembly (RPBA) shall be required to prevent backflow.

Please see [Chapter 6.110 Appendix V](#) for BPA installation details include clearances, freeze protection, site selection and drainage.

C. Valve and Backflow Prevention Assembly (BPA) boxes

Valve and BPA boxes shall be installed flush to grade outside of play and high vehicular and pedestrian traffic areas.

Valve and BPA boxes shall have at least 12" of rock underlay to promote proper drainage.

Valve and BPA boxes shall have filter fabric underlayment installed at the bottom to prevent rodent intrusion and sediment builds up.

Valve and BPA boxes shall be supported with bricks or concrete blocks as approved by the City to prevent settlement.

F. Pipe Connections

During construction, pipe ends shall be plugged or capped to prevent entry of dirt, rocks, or other debris.

PVC pipe, couplings and fittings shall be handled and installed with care and in accordance with the manufacturer's recommendation. For gasketed connections, the outside of the PVC pipe shall be chamfered to a minimum of 1/16 inch at approximately 22 degrees. For all other connections, pipe and fittings shall be joined by solvent welding. Solvents used must penetrate the surface of both pipe and fittings which will result in complete fusion at the joint. The solvent and cement shall be of a type recommended by the pipe manufacturer.

Threaded PVC joints shall be assembled using Teflon tape as recommended by the pipe manufacturer.

On plastic to metal connections, work the metal connection first. Use a non-hardening compound on threaded connections. Connections between metal and plastic are to be threaded utilizing female threaded PVC adapters with a threaded schedule 80 PVC nipple only.

Due to the tendency of excess "pipe joint compound" to foul the check valve seats on Backflow Prevention Assemblies (BPA's), only Teflon tape used in moderation may be applied to pipe connections in the vicinity of any BPA.

Due to the potential for electrolysis, galvanized nipples and fittings are not allowed in the vicinity of BPA's.

G. Electrical Wire Installation

The electrical controller shall be located in an open space or in a utility easement whenever possible.

All control wires shall be labeled at the controller, splice boxes and at the valves in the field.

Wiring between the automatic controller and the automatic valves shall be direct burial, #14 and may share a common neutral. A minimum of two spare # 14 UF yellow wires shall be installed from the controller to the furthest valve in each direction, looping through each control valve box. There shall be a 2 foot loop left in each control valve box. Separate control conductors shall be run from the automatic controller to each valve. When more than one automatic controller is required, a separate common neutral shall be provided for each controller and the automatic valve which it controls. Wire shall be installed adjacent to or beneath the irrigation pipe. Plastic tape or nylon ty-wraps shall be used to bundle wires together at 10 foot intervals, and the wire shall be "snaked" from side to side in the trench. When necessary to run wire separate from the irrigation pipe, the wire shall be bundled and placed under detectable marking tape. When lateral pipe lines have less than 18 inches of cover, direct burial wire shall be installed below the pipe at a minimum depth of 18 inches from finished grade.

Wiring placed under pavement and walls or through walls, shall be placed in irrigation casing. See 6.210 Section C.

Splices will be permitted only at junction boxes, valve boxes, or at control equipment. A minimum of 2 feet of excess conductor wire shall be left at all splices and terminal and control valves to facilitate inspection and future splicing.

H. Material Specifications

As a means of keeping the City's parts inventory to a minimum and maintenance personnel familiarized and knowledgeable about product operation, the following is a list of approved products to be used on all jobs in which the City will be responsible for maintenance and operations. Requests for approved equals need to be submitted to the City of Lacey Public Works Department, Development Review section.

**Material Specifications**

<b>Description</b>	<b>Approved Device</b>
Pop Up Spray Heads	Rainbird 1800 PRS SAM <ul style="list-style-type: none"> <li>• minimum of 6" pop up</li> <li>• installed on Toro Funny Pipe</li> </ul>
Gear Driven Rotary Heads	Hunter I-20 and I-40 Series <ul style="list-style-type: none"> <li>• installed on prefabricated O-Ring PVC Swing Joints</li> <li>• check valves on all heads</li> </ul>
Remote Control Valve and Master Valve	Weathermatic 21000DW series installed with isolation ball valve and double union. A master valve shall be installed directly after the DCVA.
Quick Coupling Valves	West Ag 4V100-R-Y or Rainbird 44RC <ul style="list-style-type: none"> <li>• installed at point of connection and at the furthest valve at the far end of the main line</li> <li>• installed on prefabricated O-Ring PVC Swing Joints</li> </ul>
Double Check Valve Assembly	Febco 850U or DOH approved equal

Description	Approved Device
Reduced Pressure Backflow Assembly	Wilkins 975XL or DOH approved equal
Flow Sensing Device	Data Industrial IR series <ul style="list-style-type: none"> <li>• installed with master control valve</li> <li>• wiring between flow sensor and irrigation controller shall be a twisted pair direct burial 2-conductor shielded 18 AWG or larger stranded copper wire with appropriate ratings for distance of run. Wire shall be a single run with no splices.</li> <li>• master control valve shall be the same valve as the remote control valve</li> </ul>
Automatic Controller (for City owned and maintained systems)	Toro Sentinel with stainless steel cabinet and full surge protection <ul style="list-style-type: none"> <li>• shall be grounded conforming to NEC specifications</li> </ul>
Valve Boxes	<ul style="list-style-type: none"> <li>• Carson 910-12B for Quick Coupler</li> <li>• Carson 1419B for remote control valve</li> <li>• Other boxes shall be sized accordingly</li> </ul>
Shut-Off Valves	Schedule 80 PVC KBI, Spears ball valve or approved equal
Drip Irrigation	Netafim check valve with Netafim disk filter and fittings

I. Flushing

All main supply lines shall receive two fully open flushings to remove debris that may have entered the line during construction. The first flushing shall be completed prior to installing valves or testing.

All lateral lines shall receive one full-open flushing prior to placement of sprinkler heads, emitters, and drain valves. Note, drain valves on main lines are not recommended. Quick couplers shall be installed on the downstream side at the cross connection device and at each terminus of the main line from

the cross connection device. The flushing shall be of sufficient duration to remove any dirt and debris that have entered the lateral lines during construction.

J. Testing

All gauges used for testing water pressure shall be certified correct by an independent testing laboratory immediately prior to use on the project. Gauges shall be retested when ordered by the inspector.

Automatic controllers shall be tested by actual operation for a period of two weeks under normal operating conditions. Should adjustments be required, the Contractor shall do so according to the manufacturer's recommendation or under the City's direction until the operation is satisfactory to the City.

All main lines shall be purged of air and tested with a minimum static water pressure of 150 psi for 60 minutes without introduction of additional service or pumping pressure. Testing shall be done with one pressure gauge installed on the line in a location determined by the City inspector. Lines which show loss of pressure exceeding 5 psi after 60 minutes will be rejected.

All lateral lines shall be purged of air and tested in place at operating line pressure with a pressure gauge and with all fittings capped or plugged. The operating line pressure shall be maintained for 30 minutes with valves closed and without introduction of additional pressure. Lines which show leaks or loss of pressure exceeding 5 psi at the end of specified test period will be rejected.

The contractor shall correct rejected installations and retest for leaks as specified herein.

The Backflow Prevention Assembly installation shall be inspected and approved by the City of Lacey Cross-Connection Specialist prior to testing.

Following a satisfactory inspection a Washington State Certified "Backflow Assembly Tester" shall be employed by the contractor to test the backflow prevention assembly for proper functioning. If deficiencies are found, repair or replacement and retesting is required before final approval.

K. Backfill

Backfill shall not be started until all piping has been inspected, tested and approved by the City inspector, after which, backfilling shall be completed as soon as possible. All backfill material placed within 6 inches of the pipe shall be free of rocks, roots, or other objectionable material which might cut or otherwise damage the pipe.

Backfill from the bottom of the trench to approximately 6 inches above the pipe shall be by continuous compacting in a manner that will not damage

pipe or wiring and shall proceed evenly on both sides of the pipe. The remainder of the backfill shall be thoroughly compacted, except that heavy equipment shall not be used within 18 inches of any pipe. The top 6 inches of the backfill shall be of topsoil material.

L. Adjusting System

Before final inspection, the contractor shall adjust and balance all sprinklers to provide adequate and uniform coverage. Spray patterns shall be balanced by adjusting individual sprinkler heads with the adjustment screws or replacing nozzles to produce a uniform pattern.

M. System Operation

The irrigation system shall be completely installed, tested and operable prior to planting unless otherwise specified in the plans or as approved by the City. The contractor shall be responsible for all maintenance, repair, and testing, inspecting and automatic operation of the system until all work is considered complete as determined by the final inspection.

N. As-Built Plans

Upon final acceptance of the work, the contractor shall submit two as-builts per Chapter 3.040 J and 3.065.

WATER

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## CHAPTER 7

### 7.000 SANITARY SEWER

#### 7A GENERAL CONSIDERATIONS

##### 7A.010 General

Sanitary sewage refers to waste water derived from domestic, commercial and industrial pretreated waste to which storm, surface, and ground water are not intentionally admitted. Pretreatment shall follow all the requirements as set forth by Lacey, Olympia, Tumwater, Thurston County Cleanwater Alliance (LOTT).

Any extension of Lacey's sanitary sewer system shall be approved by the Department of Public Works and shall conform to the City of Lacey Comprehensive Sanitary Sewer Plan, Thurston County Health Department, Department of Ecology (DOE), and Washington State Department of Health (DOH) requirements. Specific site conditions may require variance from the comprehensive plan and require approval from the Director of Public Works.

All new homes and businesses constructed within the corporate City limits shall connect to public sewer. A new On-site Sewer System (OSS) may be allowed only where all the following conditions are met: The project site was a parcel of record prior to January 1<sup>st</sup> 2016; the proposed use of the site is for one single family dwelling unit; the existing public sewer system is located more than 200 feet from the property line; and the site is suitable for an OSS meeting all Thurston County Environmental Health standards.

All new homes and businesses constructed within the or the City of Lacey's Urban Growth area shall connect to public sewer, regardless of distance, when made a condition of land use approval or where the provided that public sewer is within 200 feet of the property line of the parcel. Also, connection to sewer shall be required regardless of distance to existing sewer when made a condition of approval.

Where an existing OSS has failed or is otherwise in need of repair, except for "minor repairs" as defined in the Sanitary Code for Thurston County, the property shall connect all structures to the public sewer system. Where the public sewer is greater than 200 feet from the property line or is inaccessible via right of way or existing easement, the Director may approve OSS repairs in lieu of a connection if the connection is determined to be infeasible at the present time. In the case of private residential or commercial development where the developed property abuts a right of way in which a public sewer is located or where a service connection is otherwise provided, all structures generating sewage shall be required to connect to the public sewer regardless of distance from the public sewer (LMC 13.08.020). When additional improvements occur to a developed parcel within 200 feet of a public sewer main, or the parcel is otherwise required to connect to public sewer, all

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## SANITARY SEWER

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structures on that parcel shall be connected to sewer and the OSS shall be abandoned per Thurston County standards.

Anyone who wishes to extend or connect to the City's sewer system should contact the Department of Public Works for a sewer extension/connection fee estimate. The design of the proposed sewer shall start from the existing system. The manhole numbers shall start at the cast in place or from the first manhole at the connection point or existing manhole. Mains and fittings shall be located on the south or west side six feet off of centerline of the roadway, drive aisle, private drive or easement. On boulevards and arterial roadways, the location of the sewer main and fittings shall be located as directed by the City, see Chapter 4 street details.

Prior to the operation of any sewer systems, all Public Works improvements shall be completed and approved and all applicable fees shall be paid. In the event that a sewer project has no new water meters to trigger payment of the connection fees, the sewer connection fees shall be paid prior to the start of construction.

See Section 3.025 for definitions of specific sewers. Maintenance of the building or side sewer and lateral shall be the responsibility of the property owner.

### 7A.015 Building Sewers

Lots created by plats, re-plats, short plats, or binding site plans shall have a sewer service installed as required below. All building sewers are private and shall be installed in accordance with these standards and the Uniform Plumbing Code (UPC). Gravity sewer laterals shall have a cleanout installed at the right of way (see detail).

In single family subdivisions, (including mobile home and manufactured home subdivisions) a service shall be provided to each lot or pad. In cases where this is not practical, exceptions may be granted by the City in accordance with the UPC.

Duplexes on a gravity, grinder or S.T.E.P. sewer, regardless of the number of units on a lot, may have a single or dual service provided to each building. In the case where a S.T.E.P. system services a duplex, the duplex shall be served by one 3,000 gallon tank assembly. The tank servicing a duplex shall have a duplex electrical control box designed to operate if either side were to disconnect from the power source.

Services for multi-family and commercial complexes shall be as required in the ~~IBC~~ UPC. Generally, this requires a minimum of one side sewer to each separate building. See section 7B.055 for more gravity side sewer requirements.

The location of all side sewers shall be marked on the face or top of the cement concrete curb with an "S" 1/4 inch into the concrete.

Commercial sewer laterals shall be connected at a manhole. If a manhole does not exist, a new manhole shall be installed.

All sewer services for private lots and those not required to connect to a manhole shall be extended from the main to 1 foot behind the right-of-way in the utility easement with a cleanout and then extended to the back of the utility easement.

7A.016 Grease ~~Traps~~ [Interceptors](#)

Commercial systems that have kitchen or cooking facilities such as churches, community gathering places, restaurants, schools, etc. shall require installation of a grease ~~trap~~ [interceptor](#).

The grease ~~interceptor trap~~ shall be designed, installed and constructed according to ~~Thurston County Health Dept. applicable local regulations requirements~~ and the [International Building-Uniform Plumbing Code](#). The grease ~~interceptor trap~~ shall be installed on the gravity building sewer between the building and the tank. Grease ~~interceptors traps~~ shall be approved and inspected by the City of Lacey Building Section of Community Development. Grease ~~interceptors traps~~ shall be maintained by the customer to the satisfaction of the City of Lacey, [LOTT Cleanwater Alliance](#) and DOH requirements. Verification of grease ~~interceptor trap~~ maintenance shall be provided to the City of Lacey yearly [and upon request](#).

7A.017 Roof Drains and Stormwater discharges to Sanitary Sewer

Only sanitary wastewater shall be discharged to the sanitary wastewater system. Roof drains and other storm water sources shall be strictly excluded.

7A.020 Sanitary Sewer/Water Main Crossings

See Chapter 6.130 for requirements regarding sewer and water separation.

7A.025 Casing

The casing shall be as follows: one quarter inch steel casing pipe or ductile iron class 52. In special cases, C-900 DR 14 PVC pipe may be allowed. Casing spacers are required. A minimum of three sets of spacers are required per 20 feet of pipe. Spacers shall be as manufactured by Uni-Flange®, Calpico Inc. or approved equal. No more than one inch of clearance is allowed per set of spacers or insulators.

The joints of the transmission pipe within the casing pipe shall be restrained. Casing Spacers shall be manufactured by UniFlange®, or if using Calpico Inc. insulators; the pipe joints shall be restrained with a restraint system approved by the City of Lacey. Restrained joints shall be required on the transmission line one pipe length past either end of the casing pipe. Additional restraints may be required by the City.

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Directional boring or horizontal directional drilling (HDD) is approved for use with high density polyethylene pipe (HDPE) or CertainTeed Certa-Lok C900/RJ Restrained Joint PVC pipe for the installation of sewer pressure mains. The process, alignment, depth and soil type being drilled shall be called out on the plans and approved by the City during design. Under no circumstances shall gravity sewer mains and or gravity sewer services be installed using the directional boring (HDD) method. The process for HDD shall follow the standard 3 step process of (1) drilling the pilot hole (2) enlarging the hole, back reaming (3) pulling through the transmission pipeline. The use of drill fluid such as bentonite or polymer is required. A proper sized hole and ample amount of drill fluid shall be used to prevent damage to the pipe being installed. During the installation of the transmission pipe a second smaller HDPE CL 200 pipe minimum  $\frac{3}{4}$  inch diameter shall be pulled through alongside the transmission pipe. The smaller pipe shall have a standard 12 gauge direct bury U.S.E. green coated copper tracer wire pulled through and connected to the tracer wire of the main at each end using the low voltage grease-type splice kits. Soils that have too many cobbles may not be approved by the City for HDD.

Concrete, Control Density Fill (CDF) or other methods of encasement not listed above shall not be allowed.

### 7A.030 Staking

All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The surveyor directing such work shall be licensed as a Professional Land Surveyor by the State of Washington.

A pre-construction meeting shall be held with the City inspector prior to commencing staking. All construction staking shall be inspected by the City prior to construction.

The minimum staking of sewer lines shall be as directed by the City Engineer or as follows:

- A. All staking shall include a hub and an informational stake with station(s) and offset(s)
- B. Stake location of mainline pipe shall be at a minimum every 50 feet with cut or fill to invert of pipe.
- C. Stake location of all manholes and cleanouts for alignment and grade with cut or fill to rim and invert of pipes.
- D. Stake locations of laterals for alignment and grade with cut or fill to cleanout rim and invert of pipes at the right-of-way line.

### 7A.060 Street Patching and Restoration

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See Chapter 4B.170 and 4B.180 for requirements regarding street patching and trench restoration.

7A.070 Testing

Prior to acceptance and approval of construction, the following tests shall apply to each type of construction.

A. Gravity Sewer

1. Prior to acceptance of the project, the gravity sewer pipe shall be subject to a low pressure air test per WSDOT/APWA Standards. The contractor shall furnish all equipment and personnel for conducting the test under the observation of the City inspector. The testing equipment shall be subject to the approval of the City. The contractor shall provide a minimum of 2 complete sets of test gear to test two (2) sections of pipe manhole to manhole at the same time. The contractor shall perform an air pre-test prior to notifying the City to schedule the actual test. The acceptance air test shall be made after trench is back filled and compacted and the roadway section is completed to sub grade.

All wyes, tees, and end of side sewer stubs shall be plugged with flexible joint caps, or acceptable alternates, securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

2. Testing of the sewer main shall include a television inspection by the contractor. The camera shall be equipped with a rotating head to allow televising of the side sewers as mainline inspection is occurring. The camera unit shall be equipped with a measuring device that is in plain view ahead of the camera. The device shall be 1 inch in diameter and on a flexible shaft. Television inspection shall be done after the WSDOT low pressure air test # 7-17.3(2) F has passed, the pipe line cleaned and before the roadway is paved. Immediately prior to a television inspection enough water shall be run down the line so it comes out the lower manhole, unless televising is done right after the cleaning has taken place. A copy of the video tape and written report shall be submitted to the City. Acceptance of the line will be made after the tape has been reviewed and approved by the Inspector. Any tap to an existing system needs to be televised as well. Televising shall start at the closest manhole to the tap and extend 15 feet beyond the tap.
3. A negative air pressure "vacuum" test of all manholes is also required.

The negative air pressure "vacuum" test shall be used for testing concrete manholes. The test shall be in accordance with ASTM C 1244-93 except that the duration shall be 5 seconds per foot as measured from the bottom of the manhole channel to the ring

## SANITARY SEWER

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regardless of manhole diameter. The minimum test time shall be 40 seconds for all manholes 8 feet or shallower. A vacuum of 10 inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head shall be closed, and the vacuum pump shall be shut off. The time shall be measured for the vacuum to drop to 9 inches of mercury. The manhole shall pass if the time for the vacuum reading to drop from 10 inches to 9 inches of mercury meets or exceeds the time calculated.

4. A mandrel test in accordance with Section 7-17.3 (2)G of the WSDOT/APWA Standard Specifications shall be required on all sewers except laterals as defined in Section 3.025 of these standards as directed by the City.

### B. Lift Station Pressure Main

1. Prior to acceptance of the project, the pressure line and service lines shall be subjected to a hydrostatic pressure test of ~~200~~ 175 pounds for 4 hours and any leaks or imperfections developing under said pressure shall be remedied by the contractor. No air will be allowed in the line. The main shall be tested between valves. Insofar as possible, no hydrostatic pressure shall be placed against the opposite side of the valve being tested. The ~~200~~ 175 psi pressure test shall be maintained while the entire installation is inspected. The contractor shall provide all necessary equipment and shall perform all work connected with the tests. Tests shall be made after all connections have been made. This is to include any and all connections as shown on the plan. The contractor shall perform all tests to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the line has been released before requesting the City to witness the test.
2. A water test for all wet wells in accordance with the manhole water test for gravity sewer shall be required. The water test shall be made by the contractor first by filling the manhole up with water and letting it sit for 24 hours to allow the water to saturate the concrete. After 24 hours the manhole shall be filled to the top. The water cannot drop more than 0.05 gallons in 15 minutes per foot of head above invert to pass. Upon completion of the water test, the water shall be pumped out of the manhole.

- ~~3.~~ 3. A mandrel test in accordance with Section 7-17.3 (2) G of the WSDOT/APWA Standard Specifications shall be required as directed by the City.

~~3.4.~~ 3.4. All pressure mains shall be pigged with a soft foam swab a minimum of one size larger than the pipe the entire length of the main.

### C. S.T.E.P/Grinder Pressure Main System

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1. Prior to acceptance of the project the pressure mainline and service lines shall be subject to a hydrostatic pressure test of ~~200 17½~~ pounds for 15 minutes and any leaks or imperfections developing under said pressure shall be remedied by the contractor ~~and any leaks or imperfections developing under said pressure shall be remedied by the contractor.~~ No air will be allowed in the line. The main shall be tested between valves. Insofar as possible, no hydrostatic pressure shall be placed against the opposite side of the valve being tested. The pressure test shall be maintained while the entire installation is inspected.

The contractor shall provide all necessary equipment and shall perform all work connected with the tests. Tests shall be made after all connections have been made. The contractor shall perform all tests to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the line has been released before requesting the City to witness the test.

2. A water test of the septic, S.T.E.P. or grinder tank at the factory and on site after installation is required in accordance with the criteria outlined in Chapter 7E.060.

~~3.3.~~ Electrical inspection and testing of all electrical components of the system is required. All tested parts shall pass before the City accepts the system. Additionally all electrical structures shall have a concrete base or floor. The concrete base or floor shall extend 4 feet to the front and 1 foot on all sides. The generator requires the pad be extended 4 feet beyond where the doors are located.

~~4.~~ All pressure mains shall be pigged with a soft foam swab a minimum of one size larger than the pipe the entire length of the main.

#### 7A.080 Effluent Spills

The LOTT Alliance's NPDES permit requires that all sanitary sewer collection system spills, including those occurring from STEP systems, and reclaimed water spills are reported to the Washington State Department of Ecology and, in most cases, the Department of Health. The cities of Lacey, Olympia, and Tumwater are required to report sewage and reclaimed water spills (reclaimed water spills greater than 500 gallons) to LOTT, which in turn notifies the state agencies. The following reporting requirements need to be followed by partner jurisdiction staff to ensure timely reporting:

1. All spills need to be reported to the LOTT Clean Water Alliance at **360-528-5700** as soon as practical by the responding jurisdiction, but never later than **20** hours after the spill is discovered. LOTT must report spills verbally to Ecology within 24 hours.

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Exceptions:

- a. If the spill enters any type of waterway – pond, creek, river, or Puget Sound – it must be reported immediately to LOTT at the number listed above and to Thurston County Environmental Health at 360-867-2626 or after hours and on weekends at 360-867-2661
  - b. If there is a need to directly bypass a pump station or collection line to a waterway this must be reported to LOTT as soon as the decision is made – preferably prior to initiating the bypass as Ecology must be immediately notified.
2. Provide as much information and detail as possible during the report:
    - a. Name of person reporting spill and contact phone number
    - b. Name of person in charge of spill management and cleanup
    - c. Location by address or nearest street and cross-street
    - d. Start & stop times of the spill
    - e. Volume of the spill (estimate is ok)
    - f. Cause of the spill and type of water (raw sewage, step system effluent, reclaimed water in amounts greater than 500 gallons, etc...)
    - g. Clean up actions (diverted, vactored, lime to ground area, etc...)
    - h. Actions taken to prevent reoccurrence of the spill
    - i. If photos were taken of the spill, email a representative sample of the spill photos to [lauriepiece@lottcleanwater.org](mailto:lauriepiece@lottcleanwater.org) or [kenbutti@lottcleanwater.org](mailto:kenbutti@lottcleanwater.org) .
  3. If the spill does enter a receiving water body it is likely that the jurisdiction will need to make two or more reports – the initial report with information available at the time and follow-up report(s) with all the details listed above.
  4. The point of contact for questions concerning these requirements is the LOTT Operations Supervisor at 360-528-5749 or the Operations and Facilities Director at 360-528-5727 - [lauriepiece@lottcleanwater.org](mailto:lauriepiece@lottcleanwater.org)

#### 7A.090 Effluent Pretreatment and Treatment

Effluent pretreatment and treatment shall comply with the document titled “LOTT Discharge and Industrial Pretreatment Regulations” as set forth in Lacey Municipal Code 13.10.010. The purpose and policy to this document is as follows. This document sets forth uniform requirements for direct and indirect contributors into the wastewater collection systems and the Regional Wastewater Treatment Facility for the Cities of Lacey, Olympia and Tumwater

and for Thurston County. This adopted document enables Lacey, Olympia, Tumwater and Thurston County to comply with all applicable State and Federal laws required by the Clean Water Act of 1977 and the General

Pretreatment Regulations (40 CFR, Part 403). The objectives of this document are as follows:

- To prevent the introduction of pollutants into the municipal wastewater system which will interfere with the operation of the system or contaminate the resulting sludge.
- To prevent the introduction of pollutants into the municipal wastewater system which will pass through the system, inadequately treated, into receiving waters or the atmosphere or otherwise be incompatible with the system.
- To improve the opportunity to recycle and reclaim waters and sludge from the system; and
- To provide for equitable distribution of the cost of the municipal wastewater system.

This document provides for the regulation of direct and indirect contributors to the municipal wastewater system through the issuance of permits to certain non-domestic users and through enforcement of general requirements for the other users; authorizes monitoring and enforcement activities, requires user reporting, assumes that existing customer's capacity will not be preempted, and provides for the setting of fees for the equitable distribution of costs resulting from the program established.

Contact LOTT or the Lacey Public Works plan review staff for further information or a copy of this document (Ordinance 957 and Resolution 714)

#### 7A.100 Easement Access/Entry and Roadway

The structure of the roadway shall be a minimum of 12 inches in depth of which the top 6 inches shall be 1 ¼ inch crushed rock and the bottom 6 inches shall be at a minimum ballast per WSDOT standard Specifications 9-03.9(1). When soil conditions are not ideal, the soils shall be tested by a Geotechnical Laboratory and if necessary additional depth for the roadway structure shall be added.

When the Access Roadway is connected to a Public road through a curb or driveway cut the first fifteen feet of the access shall be paved to eliminate the unwanted rocks on the sidewalks or roadway that is unsafe and unsightly.

The access roadway shall be installed over the utility with the minimum width as required by the detail of this chapter. When the easement is required for 2 utilities then the access roadway may be installed in the middle of the utilities keeping in mind that all structures that extend to the finish surface of the roadway shall be in the structured section.

SANITARY SEWER

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All access roadway shall have a turn around with a radius big enough for the trucks using it to negotiate the turn easily. Turning radii shall also be addressed for ease of turns.

**7B GRAVITY SEWER**

## 7B.010 General

All sewers shall be designed as a gravity sewer whenever physically possible or as outlined in the Comprehensive Sanitary Sewer Plan.

## 7B.020 Design Standards

The design of any sewer extension/connection shall conform to City Standards, Department of Ecology's "Criteria of Sewage Works Design", and any applicable standards as set forth herein and in Sections 3.010, 3.040 and 7A.010.

The layout and depth of extensions shall provide for the future continuation of the existing system as determined by the City. See Chapter 3.130 for utility extension information.

New gravity sewer systems shall be designed on the basis of an average daily flow of not less than 100 gallons per day per person (250 gal/day/ERU). See table 2, Design Basis For New Sewage Works for other non-residential sewer flow rates. These flow rates are assumed to cover normal infiltration, but an additional allowance shall be made where conditions are unfavorable. For some commercial and industrial applications, the design engineer may propose to use flow rates other than those found in Table 2. Any such proposal shall include water consumption records, sewer discharge records, fixture counts, or other forms of documentation justifying the proposed flow rates, and is subject to the review and approval of the Public Works Department.

All gravity sewer facilities and conveyance piping shall be sized to accommodate the peak hourly flow of the contributing basin. Peak hourly flow is defined as the average flow rate times the peaking factor plus the discharge of any upstream pump stations. The peaking factor shall be calculated from the following equation:

$$P.F. = \frac{18 + \sqrt{\text{population in thousands}}}{4 + \sqrt{\text{population in thousands}}}$$

Conveyance for pressure sewer systems (STEP or Grinder) shall be designed to accommodate the peak flow from all individual systems plus the discharge of any upstream pump stations without adversely affecting the performance of any pump connected to the system. Peak flow for individual STEP or Grinder systems shall be calculated by one of the following equations:

$$Q_p = 15 + [(0.5) \times (\text{number of dwellings})]$$

Or:

$$Q_p = 15 + [(0.15) \times (\text{population})]$$

Where:  $Q_p$  = peak flow in gallons per minute

SANITARY SEWER

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The General Notes on the following page shall be included on any plans dealing with sanitary sewer design.

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**GENERAL NOTES (SANITARY SEWER MAIN INSTALLATION)**

1. Gravity sewer main shall be PVC, ASTM D 3034 SDR 35 or ASTM F 679 with joints and rubber gaskets conforming to ASTM D 3212 and ASTM F 477.
2. Pre-cast manholes shall meet the requirements of ASTM C 478. Manholes shall be Type 1-48 inch manhole unless otherwise specified on the plans. All manhole bases shall be positive seal type as manufactured by Predl Systems North America Inc. or approved equal. Joints shall be rubber gasket conforming to ASTM C 443 and shall be grouted from the inside. Lift holes shall be grouted from the outside and inside of the manhole. (See Note 1.) Connection of a pipe line to a system where a manhole is not available shall be accomplished by the use of a saddle type or cast-in-place manhole. This is accomplished by pouring a concrete base and setting manhole sections on it. The existing pipe shall not be cut into until the manhole is vacuum tested and approved by the City. (See detail)
3. Manhole frames and Logo Lids shall be EJ or Olympic Foundry WSDOT style ductile iron casting marked "City of Lacey", "Sewer", "Made in USA", "Confined Space", "Permit Required" and conforming to the requirements of ASTM A-30, Class 25. The frames and lids shall be free of porosity, shrink cavities, cold shuts, cracks, or any surface defects which would impair serviceability. The frames and lids shall be machine finished or ground on seating surfaces so as to assure a non-rocking, self seating fit in any position and be interchangeable in other standard manhole frames.

Lock-type covers shall be required in all multi-family complexes, on school grounds, on manholes containing odor control devices or as determined by the City. The manhole opening shall be centered over the outlet channel regardless of the location of the ladder rungs. All casting shall be coated with a bituminous coating prior to delivery to the job site.

4. Side sewer services shall be PVC, ASTM D 3034 SDR 35 with flexible gasket joints (see detail). Side sewer connections shall be made by a tap to an existing main or a wye branch from a new main connected above the spring line of the pipe. When a tap is used to connect a new service lateral to an existing sewer main, televising from the closest manhole to 15 feet past the tap is required. Foreign objects and debris shall be removed by high pressure cleaning and/or vacuum removal.
5. All sewer mains shall be field staked for grades and alignment in accordance with section 7A.030 of the Development Guidelines.
6. All plastic pipe and services shall be installed with continuous green tracer tape 12 inches to 18 inches under the proposed finished sub grade. The marker shall be plastic non-biodegradable, metal core or backing, marked "sewer" which can be detected by a standard metal detector. Tape shall be Terra Tape "D" or approved equal. The tape shall be furnished by the contractor.
7. All side sewer locations shall be marked on the face of the curb with an embossed "S" 3 inch high and 1/4 inch into concrete.

## SANITARY SEWER

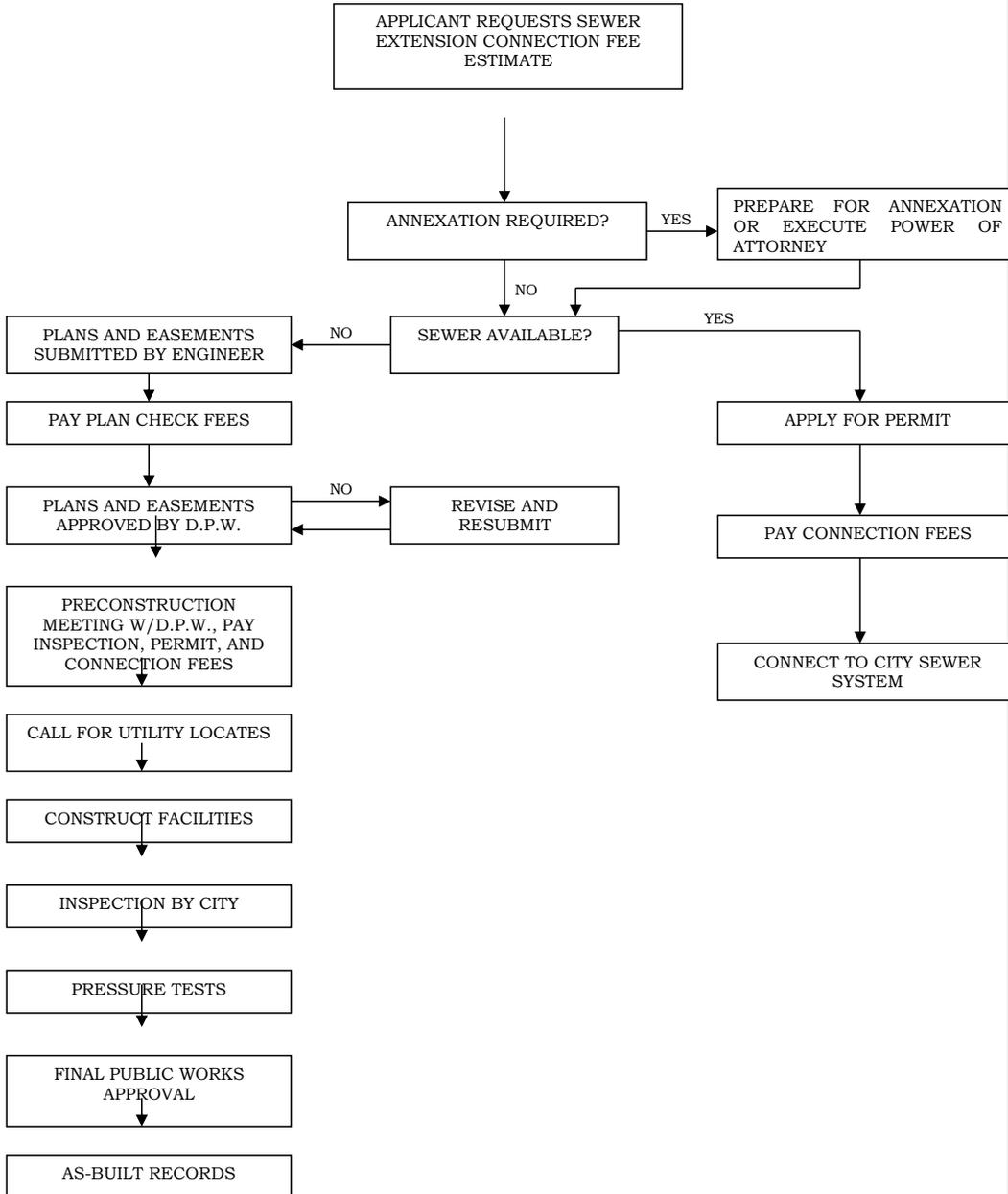
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8. Bedding of the sewer main shall be a minimum 6 inches of 3/8 inch minus pea gravel under the pipe and a minimum of 12 inches of 3/8 inch minus pea gravel over the pipe. When working in sensitive soils a barrier above the pea gravel may be required to prevent the fine soils from migrating into the pea gravel. All pea gravel shall be washed. Compaction of the backfill material shall be required in accordance with the above mentioned specification (See Note #1). The applicable Chapter 4-8 Trench Restoration details and detail 7-20 shall be used.
9. Install a 4' x 4' square x 8 inch thick concrete pad with #4 rebar around all manhole frames and cleanouts that are not in a pavement area.
10. All lines shall be high velocity cleaned and pressure tested prior to paving in conformance with the above referenced specifications, see note 1. Hydrant flushing of lines is not an acceptable cleaning method. Testing of the sanitary sewer main shall include videotaping of the main by the contractor. Immediately prior to videotaping, enough water shall be run down the line so it comes out the lower manhole. A copy of the video tape shall be submitted to the City of Lacey inspector. Acceptance of the line will be made after the tape has been reviewed and approved by the inspector. A vacuum test of all manholes in accordance with Lacey standard is also required. Testing shall take place after all underground utilities are installed and compaction of the roadway sub grade is completed. After the paving and raising of manholes are complete, the Developer shall clean and videotape the sewer conveyance system again at the Developers expense. The method of cleaning shall be high velocity water pressure cleaning. All rocks and debris shall be removed and disposed at the Developer's expense.
11. Contractors shall be responsible for cleanup of any debris in new or existing manholes and mains associated with the project after the new lines are cleaned as outlined above. The sewer system shall be televised to assure the system is clean.
12. Encasement material shall include 1/4 inch steel, ductile iron and in special or unusual cases C-900 DR 14 PVC pipe may be allowed if approved by the Director of Public Works in advance. Concrete, CDF and other methods of encasement shall not be allowed.

Revised: 03/2014

**PROCESS TO OBTAIN SEWER SERVICE**



SANITARY SEWER

**Table 2. DESIGN BASIS FOR NEW SEWAGE WORKS**

Discharge Facility	Design Units	Flow* (gpd)	BOD (lb/day)	SS (lb/day)	Flow Duration (hr)
Dwellings	Per person	100	0.2	0.2	24
Schools w/showers and cafeteria	Per person	16	0.04	0.04	8
Schools w/o showers and cafeteria	Per person	10	0.025	0.025	8
Boarding schools	Per person	75	0.2	0.2	16
Motels at 65 gal/person (rooms only)	Per room	130	0.26	0.26	24
Trailer courts at 3 persons/trailer	Per trailer	300	0.6	0.6	24
Restaurants	Per seat	50	0.2	0.2	16
Interstate or through highway restaurants	Per seat	180	0.7	0.7	16
Interstate rest areas	Per person	5	0.01	0.01	24
Service stations	Per vehicle serviced	10	0.01	0.01	16
Factories	Per person per 8-hr. shift	15-35	0.03-0.07	0.03-0.07	Operating Period
Shopping centers	Per 1,000 sq. ft. of ultimate floor space	200-300	0.01	0.01	12
Hospitals	Per bed	300	0.6	0.6	24
Nursing homes	Per bed	200	0.3	0.3	24
Homes for the aged	Per bed	100	0.2	0.2	24
Doctor's office in medical center	Per 1,000 sq. ft.	500	0.1	0.1	12
Laundromats, 9 to 12 machines	Per machine	500	0.3	0.3	16
Community colleges	Per student and faculty	15	0.03	0.03	12
Swimming pools	Per swimmer	10	0.001	0.001	12
Theaters, drive-in type	Per car	5	0.01	0.01	4
Theaters, auditorium type	Per seat	5	0.01	0.01	12
Picnic areas	Per person	5	0.01	0.01	12
Resort camps, day & night, w/limited plumbing	Per campsite	50	0.05	0.05	24
Luxury camps w/flush toilets	Per campsite	100	0.1	0.1	24

\* Includes normal  
filtration

Taken from: "Criteria for Sewage Works Design" By: State of Washington Department of Ecology December 1998

7B.040 Main Line - Gravity

- A. Size. Sewer mains shall be sized for the ultimate development of the tributary area. Nothing shall preclude the City from requiring the installation of a larger sized main if the City determines a larger size is needed to meet the requirements for future service.

The minimum size for sub mains and mains shall be 8 inch inside diameter. The minimum size for a lateral shall be 6 inches. See definitions in Chapter 3.025.

- B. Material. Sewer main shall be PVC, ASTM D 3034, SDR 35 or ASTM F 789 with joints and rubber gaskets conforming to ASTM D 3212 and ASTM F 477.
- C. Depth. Gravity sewer will typically have a minimum depth of 7 feet to provide gravity service to adjoining parcels. Actual depth will be determined by slope, flow, velocity and elevation of existing system. Greater depths may be required to serve adjacent properties and to facilitate future line extensions.

~~E. D. Service Connections. If not made at an existing manhole, all residential service sewer connections to a new the main shall be made with a wye connection; connections to an existing main shall be made with a tap. Commercial connections shall be made at a manhole.~~

F. All new mains connecting to existing mains require the installation of a cast-in-place saddle manhole.

E-G. Flow. At no time shall a gravity sewer be installed with a reverse direction of flow. The maximum deflection angle through a manhole shall not exceed 90 degrees.

F-H. Termination of Mains. All sewer mains shall end with a manhole.

7B.050 Connection to Existing System

When connecting to an existing system, all new sewer connections shall be physically plugged until all tests have been completed and the City approves the removal of the plug.

- A. Connection of new pipe lines to existing manholes shall be accomplished by using provided knock-outs with sand collars. Where knock-outs are not available, the manhole shall be core drilled for a core and seal boot connection. The transition of connecting channels shall be constructed so as not to interrupt existing flow patterns.
- B. Connection of a pipe line to a system where a manhole is not available shall be accomplished by the use of a saddle type or cast-in-place manhole. This is accomplished by pouring a concrete base and setting

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## SANITARY SEWER

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manhole sections on it. The existing pipe shall not be cut into until the manhole is vacuum tested and approved by the City. (See detail)

- C. Connections to manholes requiring a drop shall follow the criteria as outlined in Section 7B.100
- D. All multi-family, commercial and industrial sewer lateral connections shall be made at the manhole. A manhole shall be installed for lateral connections if one is not available. All new connections to existing manholes shall be channeled to meet existing flow line.
- E. Taps shall not be allowed to protrude into the existing main. A City inspector shall be notified 48 hours prior to any tap of a City sewer main. A City Inspector shall be present to witness the tap. The mainline at the tap location shall be televised from the nearest manhole a minimum of 15 feet beyond the tap after tapping and prior to approval to insure compliance. Taps shall be Romac's style CB sewer saddle with Ductile+Plus saddle, stainless steel strap and rubber gasket meeting ASTM D-2000 3 BA715 or City approved equal. The manufactured bevel on the pipe to be inserted into the saddle shall be cut off to avoid pushing the pipe into the main.

### 7B.055 Building Sewer (lateral)

- A. A building or side sewer refers to the extension from a building beginning two feet outside the outer foundation wall at the structure to a cleanout at the right-of-way line (LMC 13.04.160 and 14.06.015). Side sewer laterals from the main to the right-of-way line shall be minimum 6 inch diameter ending at a clean out. Maintenance of the building or side sewer is the responsibility of the property owner. Prior to connection of a building or side sewer to the public sewer a connection permit shall be obtained. Materials and design criteria for a building sewer are covered by the IBC as adopted by LMC 14.06. Inspection of the building or side sewer is the responsibility of the Community Development Department.
- B. Each separate commercial/industrial building shall have its own separate side sewer connection to a manhole. The side sewer from the City's manhole to the building connection manhole shall be the responsibility of the owner of the building. When multiple side sewers are connected to one manhole the private side sewer shall start from that manhole. Each building owner shall be responsible for its own side sewer. If a manhole does not exist, one shall be installed, see 7A.015 for more information. Side sewers for single family residential properties shall not be connected to the system at the manhole. Manhole sizing where side sewers are connected shall be the same as designated in section 7B.060 of this manual.

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- C. Location of clean out for building sewer is governed by the IBC as adopted by LMC 14.06.010.

7B.060 Manholes and Logo Lids

Precast manholes shall meet the requirements of ASTM C 478. All manhole bases shall be positive seal type as manufactured by Predl Systems North America Inc. or approved equal. Cast-in-place bases shall be 3000 psi commercial concrete installed per detail. Manholes shall be Type 1, 48 inch diameter minimum. The minimum clear opening in the manhole frame shall be 24 inches. Joints shall be rubber gasketed conforming to ASTM C 443 and shall be grouted from the inside. Lift holes shall be grouted from the outside and inside of the manhole. Manholes constructed of other materials may be approved by the Director of Public Works, provided they meet the requirements of 2.318 of Department of Ecology's "Criteria for Sewage Works Design". Material specifications need to be submitted for review before an alternate material will be considered. See drawing numbers 7-1 and 7-2 for details.

The manhole opening shall be centered over the outlet channel regardless of ladder rung locations.

Manhole frames and Logo Lids shall be EJ or Olympic foundry WSDOT style ductile iron casting marked "City of Lacey", "Sewer", "Confined Space", Permit Required" and conforming to the requirements of ASTM A-30. Class 25 and made in the United States of America.

The frames and lids shall be free of porosity, shrink cavities, cold shuts, cracks, or any surface defects which would impair serviceability. The frames and lids shall be machine-finished or ground-on seating surfaces so as to assure a non-rocking, self seating fit in any position and be interchangeable in other standard manhole frames. All manhole frames and lids with defects shall be replaced with new. All castings shall be coated with a bituminous coating prior to delivery to the job site.

Lock-type covers shall be required in all multi-family complexes, on school grounds, on manholes containing odor control devices or as determined by the City.

Where lock-type castings are called for, the casting device shall be such that the cover may be readily released from the ring and all movable parts shall be made of non-corrosive materials and otherwise arranged to avoid possible binding.

Safety steps shall be fabricated of polypropylene conforming to an ASTM D-4101 specification, injection molded around a 1/2 inch ASTM A-615 grade 60 steel reinforcing bar with anti-slip tread. Steps shall project uniformly from the inside wall of the manhole. Steps shall be installed to form a continuous vertical ladder with rungs equally spaced on 12 inch centers wrapped around the manhole to the shelf. The top two safety steps (hand holds) shall not be installed in the manhole.

## SANITARY SEWER

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Gravity sewers shall be designed with straight alignment between manholes. Curved alignment of the sewer will not be permitted.

Manholes shall be provided at a maximum of 400 foot intervals for 8 inch to 15 inch sewers, 500 foot intervals for 18 inch to 30 inch sewers, at intersections, and at changes in direction, grade, pipe size or as directed by the City. (See also Section 7B.080). Greater spacing may be permitted in larger sewers.

Minimum slope through the manhole shall be 1/10th of one foot from invert in to invert out.

The manhole opening shall be centered over the outlet channel regardless of the location of the ladder rungs.

Manhole Sizing shall be determined by the following criteria:

- A. 48 inch Manhole
  - 1. 2 connecting pipes, 8 inch to 12 inch diameter.
  - 2. 3 connecting pipes, 8 inch to 10 inch diameter, perpendicular.
  - 3. 4 connecting pipes, 8 inch diameter, perpendicular.
- B. 54 inch Manhole
  - 1. 2 connecting pipes, 8 inch to 12 inch with less than 45° deflection
  - 2. 3 connecting pipes, 10 inch to 12 inch diameter, perpendicular
  - 3. 4 connecting pipes, 10 inch to 12 inch diameter, perpendicular
- C. 72 inch Manhole
  - 1. 2 connecting pipes, 15 inch to 18 inch diameter with less than 45° deflection
  - 2. 3 connecting pipes, 15 inch diameter, perpendicular
  - 3. 4 connecting pipes, 15 inch diameter, perpendicular

In the above criteria "deflection" refers to the angle between any 2 pipe channels in the manhole.

For other pipe configurations, the size of the manhole shall be approved by the City.

The above configurations will provide adequate shelves and room for maintenance and televising mains.

7B.070 Slope

All sewers shall be designed and constructed to provide peak design flow velocities of not less than 2.0 feet per second based on Manning's formula using an "n" value of 0.013. Peak design flow shall not exceed 80% depth of flow in the pipe. Average design flow should be greater than 20% depth of flow in the pipe, or 2.0 fps. Surcharging of manholes will not be allowed. The following minimum slopes should be provided; however, slopes greater than these are desirable.

Sewer Size (Inches)	Minimum % Slope % (Feet per 100')
8	0.40 (0.0040 Ft/Ft)
10	0.28 (0.0028 Ft/Ft)
12	0.22 (0.0022 Ft/Ft)
14	0.17 (0.0017 Ft/Ft)
15	0.15 (0.0015 Ft/Ft)
16	0.14 (0.0014 Ft/Ft)
18	0.12 (0.0012 Ft/Ft)
21	0.10 (0.0010 Ft/Ft)
24	0.08 (0.0008 Ft/Ft)
27	0.07 (0.0007 Ft/Ft)
30	0.06 (0.0006 Ft/Ft)
36	0.05 (0.0005 Ft/Ft)

Sewers shall be laid with uniform slope between manholes.

7B.080 Increasing Size

Manholes shall be provided where pipe size changes occur. Where a smaller sewer joins a larger one, the invert of the larger sewer should be lower. To maintain the same energy gradient, an approximate method for securing these results is to place the 0.8 depth point of both sewers at the same elevation.

7B.090 High Velocity Protection

Where velocities greater than 15 feet per second are expected, special provisions such as thrust blocking and piping materials shall be made to protect against displacement by erosion and shock.

7B.100 Drops

Straight grades between inverts ~~are preferred over drops~~ shall be used whenever possible when connecting to an existing manhole. Care shall be taken when designing steep grades or sweeps so as not to create a situation of excessive velocity or excavation. Grade changes associated with "sweeps" shall not be allowed unless otherwise approved by the Director of Public Works.

Drop connections will only be allowed for sewer lines/laterals 8 inches in diameter or smaller, or where the line velocity would otherwise exceed 8 feet per second. An outside or inside drop (inside drops on existing manholes

## SANITARY SEWER

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only, with City approval connection shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. ~~Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert shall be filleted to prevent solids deposition.~~ All drop structures shall be constructed per details and shall enter the manhole in a channel.

### 7B.110 Clean outs

Clean outs are not an acceptable substitute for manholes on City sewer mains, Cleanouts may be installed at future main extensions and shall be installed for side sewer laterals at the right-of-way line.

All clean outs in the City right-of-way or easements shall be extended to grade. A 3 foot square by 8 inch thick concrete pad with #4 rebar shall be installed around all clean outs that are not in a pavement area. See clean out detail.

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**7C LIFT STATIONS****7C.010 General**

The need for a sewage lift station, as identified in the Wastewater Comprehensive Plan or necessary for a development as determined by the City, shall be presented by the Developer in a design report. The Developer shall provide information and design the lift station to comply with the following minimum standards.

Lift station sites together with access to the site shall be deeded to the City. Sites for lift stations shall not count toward open space requirements. The minimum site area shall be 5000 square feet. When selecting the site, special care shall be taken to ensure minimum setbacks, truck turning radius, vehicle length and access requirements can be met.

The lift station shall be located as far as feasible from present and/or proposed residential areas. Sites shall be of sufficient size (based on a 1:1 ratio from the depth of the wet well to the property line on all sides and include all vaults, cabinets, structures, and appurtenances) for vehicle access, maintenance and future expansion or addition, if applicable. The entire site shall be at a maximum slope of 2%.

The lot frontage shall be a minimum of 50 feet wide and provide a minimum paved driveway approach of 20 feet wide and 40 feet deep.

The site design shall include the distance required for the approach manhole and piping. The approach pipe length shall be a minimum of 100 feet (200 feet is preferred) from the last manhole to the wet well. It shall also have a minimum slope of 2 percent and a maximum of 6 percent.

Prior to Site Plan Review or plat submittal, a pre-design meeting with the City shall occur to define the lift station location and lay out in accordance with Lacey lift station details. After guidance from the City is provided, a layout shall be provided to the City and approved prior to Site Plan Review or plat submittal.

**7C.020 Design Report**

If a lift station is determined to be necessary, the Developer shall perform a study prepared and stamped by a Professional Engineer licensed in the State of Washington, to determine that the lift station installation is sized to serve the overall sewage flows generated within the potential service area. The service area study shall include the Developer's plat boundary area and any future service areas that will discharge to the lift station as determined by the City. The final service area shall be the entire area which could be served by the installation of the lift station(s).

The design of any lift station shall conform to City of Lacey standards, Department of Ecology's "Criteria for Sewage Works Design" and applicable standards as set forth in herein and in sections 3.020, 3.040 and 7A.010. The station's design flow capacity shall be based on the sizing criteria in Section 7B.020. Documentation of present and future service area flow rates for lift station size and capacity determination shall be included in the report.

If the force/pressure main ties into an existing force main, an engineer's report shall be provided showing the new lift stations effect on existing pumps within the system.

The average and low inflow conditions shall be analyzed to determine the effects of retention of sewage in the wet well. The retention of sewage shall not create odor problems at the wet well or outfall manhole. The design report shall indicate what mitigation measures will be implemented if odor problems are anticipated, or realized after lift station start up and operation.

The wet well shall be sized to provide full submergence of the pumps as recommended by the pump manufacturer. The design shall provide for adequate distance between the approach pipe inlet and outlet elevations to provide for proper programming of pump intervals (lead pump call, lag pump call and high level float override). Cycle times shall be calculated from pump off to pump on for each duty pump (excludes standby pump). The wet well shall have adequate capacity to provide a maximum of six (6) starts per hour under inflow conditions equal to one-half (1/2) of the pumps' capacity.

The lift station shall be sized to meet the maximum calculated flow rate. The size of the receiving sewer shall have adequate capacity for the pump station discharge. At least two (2) pumping units shall be provided at each lift station installation. Where flows into the new station are anticipated to have large portions of fibrous debris, special consideration shall be given to the pump type/design. The pumps shall have sufficient flow and pressure capacity to efficiently handle the peak design flow with 1 pump out of service, and be selected by the stamping licensed professional engineer.

Three hard copies along with an electronic copy of the final Design Report shall be submitted to the City and approved by the City prior to submitting the civil drawings for approval. As a minimum, the report shall include:

1. Project description
2. Projected flows and map of contributing basin
3. Connection point with downstream capacity
4. Wet well sizing and buoyancy calculations
5. Run time calculation and cycle time
6. Pump station head calculation and system curve
7. Pump selection and wet well details
8. Site layout with plan and profile views including the wet well, approach pipe, electrical cabinet and generator
9. Pressure main size, length and material (see section 7D, Pressure Sewer)
10. For pressure mains greater than 1,100 feet in length, a transient analysis shall be completed and identified water hammer conditions mitigated.
11. Electrical requirements and Generator sizing
12. Lift station voltage (confirmed by Puget Sound Energy)
13. Odor and corrosion calculations:

A detailed analysis and report prepared by an engineering firm with experience in hydrogen sulfide formation and remediation shall be provided for the following:

- a. Collection system to the lift station
- b. Lift station wet well
- c. Pressure main
- d. Downstream gravity system
- e. Verification that odors will not be detected at the lift station site or at the point of release, or the Developer will provide odor control and corrosion reduction at the appropriate locations in accordance with current City of Lacey odor and corrosion control method. See also chapter 7D.080 Pressure Main Termination.

14. Geotechnical analysis for wet well and lift station site
15. Backfill and compaction specifications

#### 7C.030 Design Drawings

The drawings shall be prepared by a Professional Engineer licensed in the State of Washington at a minimum 1:30 scale to show details of the site. See Chapter 3.040. Electronic files are available of the City Standard Lift Station details and electrical wiring diagrams. The Developer's Engineer shall scale and customize the drawings and review all dimensions to ensure the City's lift station layout can be accommodated per the details.

The detailed engineered drawings shall accurately depict the equipment selected by the Engineer. The drawings shall include an equipment list showing manufacturer, model number, and size or capacity for all structures, mechanical and electrical components.

The Developer shall furnish a site layout for the lift station installation per details. Minimum set backs shall be included as depicted on the site layout details.

~~The lift station shall be located as far as feasible from present and/or proposed residential areas. Sites shall be of sufficient size (based on a 1:1 ratio from the depth of the wet well to the property line on all sides and include all vaults, cabinets, structures, and appurtenances) for vehicle access, maintenance and future expansion or addition, if applicable. The entire site shall be at a maximum slope of 2%.~~

~~The lot frontage shall be a minimum of 50 feet wide and provide a minimum paved driveway approach of 20 feet wide.~~

1. Complete lift station
2. Standby power generation system
3. Electrical wiring diagrams
4. Telemetry compatible with existing system, including complete start up and revising existing screens at Lacey Operation Center.
5. 2 inch water service with heated Reduced Pressure Backflow Assembly (RPBA) and wash down hydrant.

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6. Odor control, as applicable for location and capacity.
  7. Site soil conditions. Excavation, select backfill and compaction requirements as determined by a geotechnical engineer.
  8. Cuts and fills to provide level site for maintenance.
  9. Asphalt or concrete pavement for access as directed by the City.
  10. Concrete within the maintenance area shall encompass all components of the site, per detail.
  11. Landscaping per City of Lacey development criteria.
  12. Six foot high (minimum) black chain link fence with top and bottom rails enclosing the site and a minimum fifteen foot wide lockable access gate.
  13. Sign with lift station identification number and street address (to be paid for by the developer and manufactured by the City).
  14. Site lighting.
  15. All site enclosures such as the control cabinet, generator, etc., shall be keyed the same.
  16. The plans shall include an adequate distance between the last manhole and the wet well to accommodate the approach pipe design per the detail.

#### 7C.040 Submittals

After the lift station plans have been approved and prior to the pre-construction conference, the Developer or the Developer's Contractor shall provide submittal data as one single submittal for all proposed equipment. The data shall be provided in printed format bound into a single three-ring binder. The data shall be divided into sections as indicated below, separated by tabbed sheets. Three (3) copies shall be provided in printed format and all data in the submittal shall be included on one electronic medium (CD or DVD) for City use. The electronic media shall be submitted with the printed media. Additional printed copies may be submitted for return to the Developer or Contractor with markup notes. Re-submittals (if required) shall only include the corrected items.

The following minimum information shall be provided:

1. Pump Data
  - Size and type
  - Pump design performance curves
  - Pump factory test performance curves
  - Head and flow capacity
  - Solids handling capacity
  - Manufacturer/distributor
  - Pump volute and impeller Coating submittal

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|------------------------------------|--|
| 2. Motor Data                      | <ul style="list-style-type: none"> <li>• Size and type</li> <li>• Horsepower</li> <li>• Service factor</li> <li>• Motor insulation</li> <li>• Full load current draw</li> <li>• Voltage requirements</li> <li>• Frame and type of mount</li> <li>• Manufacturer/distributor</li> </ul>   |
| 3 Controls                         | <ul style="list-style-type: none"> <li>• Timers and relay mounting</li> <li>• Motor starter size</li> <li>• Phase monitor</li> <li>• NEMA type 3R enclosure</li> <li>• Thermal magnetic circuit breaker</li> <li>• GFI outlet</li> <li>• Indicating lights, switches, resets</li> <li>• Level controller</li> <li>• Terminal and fuse blocks</li> <li>• Elapsed time meters and event counters</li> <li>• Component manufacturer/distributor</li> <li>• Current transformers</li> <li>• Ammeters</li> <li>• Programmable Logic Controller</li> <li>• Human Machine Interface Module</li> </ul> |
| 4. Telemetry                       | <ul style="list-style-type: none"> <li>• Telemetry and SCADA system (shall be compatible with City system)</li> <li>• Lift station radio communication path terrain analysis certified by Accu-Com Inc.</li> </ul>   |
| 5. Standby Power Generation System | <ul style="list-style-type: none"> <li>• Diesel generator</li> <li>• <a href="#">Generator system ratings</a></li> <li>• Fuel storage tank</li> <li>• Automatic Transfer switch</li> <li>• Battery charger and engine heater</li> <li>• Sound attenuating enclosure</li> <li>• <a href="#">Exhaust silencer</a></li> <li>• <a href="#">Rain Shroud</a></li> <li>• <a href="#">5-year extended warranty required</a></li> </ul>   |
| 6. Maintenance                     | <ul style="list-style-type: none"> <li>• Warranty (See Ch 3 bond requirements)</li> <li>• Staff training upon completion</li> <li>• Tools and equipment required</li> </ul>  |

## SANITARY SEWER

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7. Electrical Service
- Specifications (service size, voltage, motor size, enclosure type, etc.)
  - Source of power [and service provided by Puget Sound Energy](#)
  - Power and Load Calculations
  - One line diagram
  - Primary distribution equipment
  - Service entrance
  - Branch circuit protection
  - Mechanical equipment power requirements
  - Control diagrams & schematics
  - Schedules of fixtures, panel boards & switch gear
  - Shop drawings
  - [Arc flash calculations](#)
  -
8. [Lighting](#)
- Exterior lighting
9. Wet Well
- Size
  - Storage capacity
  - Access hatch [and operating handle](#)
  - Locking mechanism
  - Penetration seals
  - Safety entry equipment
  - [Safety grate](#)
  - Safety rail system
  - Manufacturer Specifications
  - [Corrosion protection, material, application, warranty.](#)
  - [Access hatch seal](#)
10. Valve Vault
- Size
  - Access ladder
  - Access hatch (3 door hatch LW Model HTD)
  - Penetration seals
  - [Manufacturer](#)
  - [Maximum 48-inches from finish grade to floor](#)

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11. Piping

- Size and material
- Valves
- Flow meter
- Pressure transmitter
- Pressure gauges
- Bypass pumping fittings
- Pipe supports
- Corrosion protection, material, application, warranty

12. Testing Plan

- Factory test
- Operational test & start up.
- Pressure test
- Start up & training

The design drawings may be used to provide the information required in the items above. Design drawings shall be reviewed and verified for completeness and compliance by the Design Engineer prior to submittal to the City.

The City's review does not relieve the Engineer and/or Developer of the responsibility for constructing a lift station that is trouble free and suitable for its purpose.

The general notes for gravity sewer and pressure sewer construction found in section 7B and 7D of this chapter shall accompany the following Lift Station General Notes on the plans. [Additional General Construction notes found in section 3.045 apply.](#)

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**GENERAL NOTES (LIFT STATION INSTALLATION)**

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1. Any construction changes to the lift station design shall first be reviewed and approved by the project engineer and the City of Lacey.
2. Contractors shall be responsible for cleanup of any debris in the wet well, tanks, vaults and site associated with the project prior to start up.
3. Prior to backfill, all mains, tanks, wet well, electrical conduits (electrical conduit inspection shall be coordinated through the City inspector with the City Maintenance Department) and vaults shall be inspected and approved by the City of Lacey Construction Inspector. Approval shall not relieve the contractor for correction of any deficiencies and/or failures as determined by subsequent testing and inspections. It shall be the contractor's responsibility to contact City of Lacey to request the required inspections.
4. The Developer shall coordinate power service with serving utilities and make arrangements for power service connection. It shall be the Developer's responsibility to maintain power service for private lift stations serving commercial properties or developments.
5. All pipe and fittings in the wet well shall be, DR11 ~~34084710~~ HDPE or ductile iron thickness class 52. Ductile iron pipe and fittings shall be epoxy lined and polyethylene coated to a minimum of 10 mils thick on the inside and outside with coatings approved for constant contact with H<sub>2</sub>S (hydrogen sulfide) such as ENDURON Protecto 401 or 3M Scotchkote 134 fusion bonded epoxy. Coatings shall be applied according to the manufacturers' requirements by a certified applicator of the product. Coatings shall not be applied to pipe, fittings or valves in the field. All bolts, fasteners, brackets and hardware in the wet well shall be 316 stainless steel.
6. **Prior** to testing and start-up of the lift station, ~~three~~ two hard copies along with an electronic copy of the Operation and Maintenance Manual, together with the number of approved copies required by the Developer, shall be submitted to the City for review and approval. The lift station information checklist found in Section 7C. 085 shall be filled out by the developer and included on the face of the engineered as-built drawings and in the Operation and Maintenance manual.
7. The Developer, at its own expense, shall arrange for an authorized factory-trained representative of the company or companies supplying the various items of equipment to check the installation, adjust and test the equipment furnished before the acceptance of the work by the City. The factory representative shall be responsible to check and resolve any unacceptable vibration of the pump assemblies. Furthermore, the Developer's representative(s) shall assist and instruct the City's operating staff in adjusting and operating the equipment during the initial start-up

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period. Said representative shall be experienced and knowledgeable of the equipment being tested. ~~Prior to the start up being requested, the Developer shall conduct a successful pre-start up. The pre-start up shall include calibration and testing of all equipment on the pre-start up checklist.~~

8. An instruction program shall be held for City personnel at the Developer's expense. Developer shall furnish the services of qualified instructors from the various equipment manufacturers. Program shall cover basic system operation theory, routine maintenance and repair, and "hands on" operation of equipment. Training shall not proceed until all operation and maintenance manuals are complete and accepted by the City.
9. Developer is responsible to construct and start up a complete and trouble-free system. All design errors and/or construction defects discovered during start up or the warranty period stated in the agreement with the City shall be corrected at the Developer's expense. The City will not accept any facility until successful full operation of all components has been demonstrated. The Developer shall conduct a pre-start up without City staff to verify proper operation of all lift station components prior to scheduling a start up with City of Lacey staff.
10. Developer shall lubricate all equipment as required by the part or component manufacturer.
11. Wet well shall have a rail system installed per Lacey Standard 7C.050 ~~under hatch opening~~ prior to start up and acceptance.
12. Lift station and generator, site, driveway, access, concrete areas, lighting and water service shall all be completed prior to start up and inspection request.
13. Generator and fuel storage tank shall be mounted on concrete pad. The fuel tank shall be full of fuel at the time of start up. Generator shall have weather proof, sound dampening enclosure; block heater; battery charger; auto exerciser; radiator louvers or protection; and shall comply with all requirements in chapter 7C.070.
14. Telemetry set up, including revision of telemetry computer monitors at the Maintenance Service Center, shall be coordinated with TSI Inc. Set up shall be completed prior to start up request and acceptance.
15. ~~The following items Spare parts~~ shall be provided for the station at time of start up acceptance.
  - ~~• One set of mechanical seals.~~
  - ~~• with impeller coated with Metalclad Ceramally CP+AC as manufactured by ENEON Corporation~~
  - One complete re-build kit for each pump and motor.
  - One spare soft start assembly
  - Certified pump performance testing
  - Arc flash and short circuit Calculations

Additionally, any special tools specific to the pump manufacturer shall be provided to the City of Lacey at start up.

16. Duplicate pump and motor data plates shall be provided to the City of Lacey at the time of start up. Acceptance of the pumps will be contingent upon factory test data conformance with design performance data. Contractor shall be required to remove pumps from wet well for inspection at time of start up .
17. The developer shall provide test data from a state Department of Health certified Backflow Assembly Tester for all backflow devices on site prior to the start up.
18. A geotechnical analysis shall be performed for the wet well and lift station site by a licensed geotechnical engineer. The analysis shall include: soil compaction, testing methodology, recommended suitable backfill material and compaction techniques. A compaction report shall be provided to the City inspector following wet well and valve vault backfill.

19. Check valves shall be Crispin RF Series with rubber flapper valvesewer rated bronze on bronze style seat with an outside lever, ~~and~~ spring ~~and limit switch hardware~~. Valves shall be epoxy coated on both the inside and outside a minimum of 10 mils thick with a coating approved for ~~sewer constant contact with H2S (hydrogen sulfide)~~. Check valves shall be ordered and installed in the vault as one right hand and one left hand model with the outside levers furthest away from each other (outside of piping configuration). The valve vault emergency by-pass pumping connections shall be 6 inch 316 stainless steel male cam lock style fittings. Fittings shall have an stainless female cap installed. Cam lock fittings shall face "UP" as shown on the detail and clearly visible and accessible for connection with 6 inch by-pass hose from above.

~~19-20.~~ Isolation valves in the valve vault shall be full port round 100 percent opening plug valves: Crispin, Pratt or Milliken. Valves shall be epoxy coated on both the inside and outside a minimum of 10 mils thick with a coating approved for sewer. 4 inch valves shall have a hand lever supplied for each valve. 6 inch and larger valves shall have gear reduction operation with hand wheels.

~~20-21.~~ The pump volute and impellers shall be coated with Metalclad Ceramalloy CP+AC manufactured by ENECON Corporation (where required by the City).

~~21-22.~~ The control panel shall be manufactured and tested at the control panel manufacturer's facility. After manufacturer has verified the control panel is fully functional, the inspector shall be notified and a City witnessed control panel factory test shall be scheduled and completed before shipment of the control panel. The control panel shall not be shipped from the control panel manufacturer's facility prior to written verification of testing from the City.

Revised: 03/2014

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### 7C.050 Lift Station Design Criteria

The Lift Station shall be submersible style with non-clog pumps mounted in the wet well, and shall meet all of the criteria outlined in Chapter 7C.

#### Requirements:

Furnish and install submersible non-clog wastewater pumps. Each pump shall be equipped with \_\_\_\_ HP, submersible electric motor, connected for operation on \_\_\_\_ volts, 3-phase, 60 hertz, with 30 feet of submersible cable (SUBCAB) suitable for submersible pump application. The power cable shall be sized according to NEC and ICEA standards and also meet with U.L. and C.S.A. P-MSHA approval. The pump shall be supplied with a mating iron \_\_\_\_ inch discharge connection and be capable of delivering \_\_\_\_ GPM at \_\_\_\_ TDH. Shut off head shall be \_\_\_\_ feet (minimum).

#### Pump Design:

The pumps shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the wet well to the discharge connection. There shall be no need for personnel to enter the wet well.

#### Pump Construction:

Major pump components shall be of gray cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All nuts, washers, bolts and studs shall be AISI Type 316 stainless steel construction with passivation, conforming to ASTM F593H. All metal surfaces coming into contact with the sewage, other than stainless steel shall be protected by a factory applied spray coating of high solids poly-amide epoxy, free of any chips, cracks, voids or imperfections. Any coating imperfection caused by handling or installation shall be field repaired using the same coating material.

Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with nitrile or Viton rubber O-rings. Connections or seals will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross-sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

#### Cable Entry Seal:

The cable entry seal designs shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close

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tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by a terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Hydromatic epoxy barrier style seals may also be acceptable.

Motor:

The pump motor shall be explosion proof, induction type with a squirrel-cage rotor, shell type design, housed in an oil or air-filled, watertight chamber, NEMA B type. The stator windings and stator leads shall be insulated with moisture resistant, Class F, insulation rated for 155°C (311°F). The stator shall be dipped and baked three times in Class F varnish and shall be heat-shrink fitted or mechanically fastened into the stator housing. The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and rated for ten (10) to fifteen (15) evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 140°C (250°F) shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber shall be hermetically sealed from the motor by an elastomer O-ring seal. Connection between the cable conductors and stator leads shall be made with threaded compression type connectors. The motor and pump shall be designed and assembled by the same manufacturer.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10% ( $\pm 10\%$ ). The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C (176°F).

Factory test pump performance curves shall be provided showing data for torque, current, power factor, input/output kW and efficiency. The information shall be gathered from factory testing of the actual pumps to be installed. This information shall also include data on starting and no-load characteristics. [This report shall be sent to the City inspector for review.](#)

The power cable shall be sized according to the NEC and ICEA standards and shall be U.L. and C.S.A. approved and of sufficient length to reach the wet well junction box without the need of any splices. The cable shall be water and oil resistant chloroprene rubber and shall not be cut, stripped or opened in any way prior to entering the decontactor plug assembly. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of sixty-five (65) feet.

The motor horsepower shall be adequate so that the pump operates non-overloading throughout the entire pump performance curve from shut-off

through run-out. The most efficient pump curve for the design criteria shall be utilized as approved by the City.

The power requirements for pumps one horsepower or less shall be 120/240 VAC single phase 60 Hz. Pumps above one horsepower shall operate on no less than 120/208 VAC three phase power. Pumps five horsepower and greater shall be 277/480 VAC three phase.

**Bearings:**

The pump shaft shall rotate on two bearings. Motor bearings shall be permanently oil or grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two-row angular contact bearing to compensate for axial thrust and radial forces. Single-row lower bearings shall not be acceptable.

**Mechanical:**

Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in an oil reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit located between the pump and the oil chamber shall contain one stationary ceramic and one positively driven rotating silicon carbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub shall not be acceptable. For special applications, other seal face materials may be available.

The following seal types shall not be considered acceptable or equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring action between the upper and lower seal faces.

Cartridge type systems shall be acceptable. No system requiring a pressure differential to offset pressure and to affect sealing shall be used. Pumps requiring use of proprietary seals shall not be allowed.

Each pump shall be provided with an oil chamber for the shaft sealing system. The oil chamber shall be designed to prevent overfilling and to provide oil expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The pump shall be able to operate dry without seal or bearing damage.

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Pump Shaft:

Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft material shall be AISI type 416F stainless steel in accordance with ASTM A276.

Impeller:

At the minimum impellers shall be of ductile iron ASTM A-536, dynamically balanced, coated with Metalclad Ceramally CP+AC manufactured by ENECON Corporation, double shrouded non-clogging design having a long throughlet without turns. The impellers shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. Whenever possible, a full vaned or vortex impeller shall be used for maximum hydraulic efficiency. Mass moment of inertia calculations shall be provided by the pump manufacturer upon request. The impellers shall be keyed to the shaft, retained with an Allen head bolt and shall be capable of passing a minimum 3 inch diameter solid. Impeller wear rings shall be replaceable [304410](#) stainless steel. [Pumps with optional cutter or chopper impellers may be required by the City.](#)

Wear Rings:

A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller. Each pump shall be equipped with a replaceable 410 stainless steel wear ring insert fitted to the volute inlet.

Volute:

The minimum pump volute material shall be single-piece gray cast iron, ASTM A-48 Class 30, coated with Metalclad Ceramally CP+AC manufactured by ENECON Corporation, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller.

Protection:

All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 120°C (250°F) the thermal switches shall open, stop the motor and activate the alarm.

A leakage sensor shall be provided to detect water in the stator chamber as per the Approved Electrical Materials List. Either a Float/Seal Leakage Sensor (FLS) small float switch used to detect the presence of water in the stator chamber, or resistance-type shall be acceptable. When activated, the FLS shall send an alarm, to the PLC which will be indicated on the HMI and the SCADA. Use of a trip temperature above 120°C (250°F) shall not be allowed.

The thermal switches and FLS shall be connected to appropriate PLC addresses in the control panel.

Miscellaneous:

The pump guide rails shall be metal to metal M-T-M style with two inch (2") diameter minimum, 316 stainless steel pipe.

All brackets and mounting hardware shall be 316 stainless steel construction with passivation.

Each pump shall be fitted with a 316 stainless lifting bracket large enough to be easily attached to with a crane lifting hook without manned entry into the wet well. Attached lifting chains or guide cables shall not be allowed.

The following ~~spare parts~~ additional items shall be provided:

- ~~1. One set of mechanical seals~~
- ~~2. One set of O rings~~
- ~~3. One set of wear rings~~
2. One set of pump wear rings.
3. One complete re-build kit for each pump and motor.
4. One spare soft start assembly.

Wet Well, Valve Vault, Piping, Fittings and Valves:

The wet well shall be a pre-cast manhole meeting the requirements of ASTM C 478 with a flat top cover and aluminum access hatch designed for H-20 loading, Flygt FLED-13 HD heavy duty aluminum hatch, 36" x 60" unobstructed clear opening, or sized as required by the pump manufacturer, or City of Lacey approved equal. The wet well opening shall be fitted with a City approved Ultra-GuardRail safety rail system, see detail. The wet well shall be a minimum of six feet diameter. A larger diameter wet well may be required upon review by the City. The wet well bottom shall have a manufactured hopper bottom that directs solids toward the pumps, see detail.

The wet well shall be core drilled for all conduit and pipe penetrations. 316 Link-seal shall be used around all pipe and conduit penetrations to the wet well and the valve vault. After Link-seal has been installed the openings shall be sealed on both the inside and outside with non-shrink grout. Inside the wet well the non-shrink grout material shall be covered with an approved ~~the~~ hi grade calcium aluminate (Sewper coat) wet well coating material.

The wet well shall be designed for the soil conditions on the site including soil bearing conditions and ground water levels. Ladder rungs shall not be installed in the wet well extend below the high water level line.

The valve vault shall be a pre-cast utility vault as manufactured by Utility Vault, Inc. (Old Castle) or equal. The depth of the vault shall not exceed 48 inches from the top of the lid to the inside floor as delivered from the manufacturer. Modifications to over depth vaults to achieve the 48' requirement will not be accepted. Vault shall have solid walls without knockouts. Pipe penetrations shall be cast or core drilled through walls and

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## SANITARY SEWER

floor. All pipes shall be link sealed and grouted in place with non-shrink grout. Vault shall have floor with drain sump and drain line back to wet well with an inline check valve and an in line P trap to prevent odors from entering the vault.

The valve vault hatches shall be aluminum as manufactured by LW Products Company or Halliday products or City of Lacey approved equal. The aluminum access hatches shall be hinged, spring-assisted hatches designed for H-20 loading.

The inside of the wet well shall be coated as outlined below to prevent corrosion.

As determined by the City during the civil plan review, the outlet of the last manhole prior to the wet well shall be equipped with a plug valve. . See detail.

### Wet Well Coating:

The wet well coating material shall be 100% VOC-free self-priming structural polyurethane, SprayWall manufactured by SprayRoq, Inc., Birmingham, AL. [In lieu of coating, a Predl lined manhole may be used.](#) The product shall be installed in accordance with the manufacturer's instructions by a factory certified applicator.

The wet well shall be prepared in accordance with the manufacturer's recommendation for the application to remove any dirt, debris or loose material.

The sprayed-on material shall be applied to completely and uniformly cover the wet well, walls and underside of lid a minimum of 250 mils (0.250 inch) in thickness. The sprayed on material shall form a seamless bond between the wet well wall and fiberglass hopper bottom. Some applications may require a greater surface coating; the manufacturer shall determine the proper application thickness. The finished surface shall be smooth and free from defects.

All manhole joints and pipe penetrations shall be watertight to prevent infiltration or ex-filtration prior to application of the product. Any drilling, cutting or fabricating done in the wet well that breaks or disturbs the coating shall be repaired with the same ~~hi grade calcium aluminate~~ coating in accordance with the manufacturer's instructions.

All pipe and fittings in the wet well ~~and valve vault~~ shall be minimum ductile iron class 52 and shall be epoxy coated or polyethylene lined to a minimum of 10 mils thick on the inside and outside with [Induron Protecto 401 or 3M Scotch 134](#) ~~(a minimum of 10 mils thick on the inside and outside with 100% solids epoxy)~~ Coatings shall be applied according to the manufacturers' requirements by a certified applicator of the product. Coatings shall not be applied to pipe, fittings or valves in the field. All bolts, fasteners, brackets and hardware in the wet well shall be 316 stainless steel.

An additional option for piping in the wet well and valve vault shall be welded HDPE meeting ASTM standard D 3350, SDR 11 ~~3408~~4710.

Isolation valves in the valve vault shall be Pratt, Milliken or Crispin round full port, 100% opening sewer rated plug valves. Valves shall be epoxy coated on both the inside and outside a minimum of 10 mils thick with a coating approved for sewer constant contact with H<sub>2</sub>S (hydrogen sulfide). 4 inch ~~and 6 inch~~ valves shall have standard 2 inch hub with 10 position operating lever. Valves sized ~~8-6~~ inch and larger shall have gear reduction operation and hand wheels.

Check valves shall be Crispin RF Series sewer rated, bronze on-bronze style seat with outside lever and spring. Valves shall be epoxy coated on both the inside and outside a minimum of 10 mils thick with a coating approved for sewer constant contact with H<sub>2</sub>S (hydrogen sulfide). Check valves shall be ordered and installed in the vault as one right hand and one left hand model with the outside levers furthest away from each other (outside of piping configuration).

The valve vault emergency by-pass pumping connections shall be 6 inch ~~316 stainless steel~~aluminum male cam lock style fittings. Fittings shall have a female cap installed. Cam lock fittings shall face "UP" as shown on detail and clearly visible and accessible for connection with 6 inch by-pass hose from above.

#### 7C.060 Electrical

##### General:

Definition of all terms, etc., shall be according to AIA and IEEE standard definitions. Shop drawings shall be submitted during design review on all special equipment, and approval obtained before manufacture. Drawings shall be diagrammatic; locations of all outlets will be checked and verified on project site.

The main control~~Electrical~~ cabinets shall be equipped with a metal cabinet roof (see detail). The minimum overhang shall be a minimum of 4 feet on the front face with one foot on all other sides. The design shall be approved by the City.

Where conflict occurs with other equipment, consult City for final decision. The engineer is responsible for obtaining rough-in dimensions from supplier for equipment.

All work shall be done per National Electrical Code as amended by WAC 296-46, City of Lacey electrical code as adopted by LMC 14.13 and City of Lacey Standards. The most stringent standard shall apply. The Developer shall obtain all permits and arrange inspections.

The Developer shall coordinate power service with serving utilities and make arrangements for power service connection.

## SANITARY SEWER

The pump control and electrical equipment shall be factory manufactured and witness tested by the City prior to being field installed. It shall be fabricated and assembled by an approved U.L. or ETL listed manufacturer, and constructed in conformance with U.L. 508A standards.

Pump Station Telemetry & Controls:

The station electrical shall be constructed in accordance with the City of Lacey standard lift station package and shall use Lacey standard control program. Please contact City of Lacey Maintenance department for the lift station electrical package.

~~Multiple pump control function: Each pump shall operate in an alternating configuration providing rest for the last lead pump. Each pump shall be provided with a HAND-OFF-AUTO (HOA) selector switch which shall control the pump as follows:~~

D. Special Note:

All penetrations made to enclosures, panels, breaker boxes, cabinets, etc. shall be made with PVC coated water tight fittings such as Myers Hub type. All penetrations shall be in bottom of the enclosures.

### 7C.070 Standby Power Generator System

General:

Diesel standby power generation equipment designed with capacity and rating to safely carry the entire connected lift station load shall be provided at the lift station site to operate the lift station in the event of a power outage. The Developer shall provide the City of Lacey the design load calculations during the submittal process. All generators equal to or greater than ~~500~~250 kW shall be equipped with a permanent load bank sized for 80 percent of the engine generators rated capacity. This shall be installed within the discharge air duct work for the generator. Please contact the City of Lacey Maintenance department for the current generator package.

~~The auxiliary power unit shall include, but not be limited to, the following:~~

### 7C.080 Odor/Corrosion Control

Odor/corrosion control shall be provided at the lift station and/or at the pressure main discharge manhole as determined and required by the City. Items such as a Little John digester, future conduits or piping may be required.

Refer to chapter 7D.080 for pressure main termination and odor control requirements.

### 7C.081 Lift Station Safety/Security

Prior to acceptance of the lift station along with the lift station signage, the developer shall be invoiced for five (~~5-8~~) Best Lock 11-B772 with cores.

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Additional locks may be required depending on site layout and security requirements.

7C.085 Lift Station ~~Information~~ Checklist ~~Information~~ |

The lift station ~~information~~ ~~construction~~ checklists can be found in Appendix Q shall be filled out by the developer and included on the face of the engineering drawings and in the Operation and Maintenance manual. |

~~7C.090 Lift Station Inspection Checklist~~ |

**7D PRESSURE SEWER (PRESSURE MAIN)**

7D.010 General

Low pressure systems, such as S.T.E.P. or grinder may be considered for situations where conditions make gravity sewer impractical. Lift station pressure mains will also fall under these same design criteria.

7D.020 Design Standards

The design of any sewer extension/connection shall conform to City standards, Department of Ecology's "Criteria of Sewage Works Design", and any applicable standards as set forth herein and in sections 3.010, 3.040, and 7A.010.

The layout of extensions shall provide for the future continuation of the existing system as determined by the City. In addition, main extensions shall be extended to and through the site of the affected property fronting the main.

The system shall be designed as per Section 7B.020.

Privately owned pressure mains shall have a isolation valve installed on the main at the right of way.

Grinder system pressure mains shall not be combined with or connected to S.T.E.P. pressure sewer mains. Grinder and/or S.T.E.P. sewers may be allowed to connect to gravity sewer mains. Grinder mains shall be sized as per Section 7B.020 and reviewed by Environment One. Environment One comments shall be forwarded to the City for approval. If permitted by the Director of Public Works grinder pressure mains may be allowed to connect to lift station pressure mains. S.T.E.P. sewers shall not be allowed to connect to lift station pressure mains.

S.T.E.P. and lift station pressure sewer pipe shall be even sizes only (i.e. 2 inch, 4 inch, 6 inch, etc.) Minimum pressure sewer pipe size for S.T.E.P. shall be 2 inch diameter. Grinder mains of odd sizes shall require the use of HDPE. Minimum pressure sewer (pressure main) pipe size for lift stations shall be 4 inch diameter. HDPE pipe shall be sized by inside pipe diameter (see table). Typically, IPS HDPE pipe is used in Lacey; however, in case where the required inside diameter of the pipe cannot be obtained using IPS HDPE, ductile iron pipe size (DIPS HDPE) pipe may be required.

SANITARY SEWER

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SANITARY SEWER

TYPICAL SIZES AND DIMENSIONS FOR IRON PIPE SIZE (IPS) PE34084710  
HIGH DENSITY POLYETHYLENE (HDPE) PIPE

PRESSURE RATING		DR 11 (160 PSI)		
NOMINAL SIZE	ACTUAL O.D.	MINIMUM WALL THICKNESS	AVERAGE I.D.	WEIGHT LB/LF
2"	2.375"	0.216"	1.917"	0.639
3"	3.500"	0.318"	2.825"	1.387
4"	4.500"	0.409"	3.633"	2.294
5"	5.375"	0.489"	4.339"	3.272
5"	5.563"	0.506"	4.491"	3.505
6"	6.625"	0.602"	5.348"	4.971
7"	7.125"	0.648"	5.752"	5.750
8"	8.625"	0.784"	6.963"	8.425
10"	10.750"	0.977"	8.678"	13.089
12"	12.750"	1.159"	10.239"	18.412
14"	14.000"	1.273"	11.302"	22.199
16"	16.00"	1.455"	12.916"	28.994
18"	18.00"	1.636"	14.531"	36.696
20"	20.00"	1.818"	16.145"	45.304
22"	22.00"	2.000"	17.760"	54.818
24"	24.00"	2.182"	19.375"	65.237
26"	26.00"	2.364"	20.989"	76.563
28"	28.00"	2.545"	22.604"	88.795
30"	30.00"	2.727"	24.218"	101.934

NOTE:

Average inside diameter calculated using nominal OD and minimum wall plus 4% for use in estimating fluid flows. Actual ID will vary.  
The applicable General Notes in section 7B.020 shall be included on any plans dealing with pressure sanitary sewer design.

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**GENERAL NOTES (PRESSURE SEWER MAIN INSTALLATION)**

1. All sewer mains shall be field staked for grades and alignment in accordance with section 7A.030 of the Development Guidelines.
2. All side sewer locations shall be marked on the face of the curb with an embossed "S" 3" high and 1/4 inch into concrete.
3. Bedding of the pressure sewer main and compaction of the backfill material shall be required. (See detail).
4. A 3 foot square x 8 inch thick concrete pad with #4 rebar shall be installed around all valves that are not in a pavement area.
5. Temporary street patching shall be allowed for as approved by the City Engineer. Temporary street patching shall be provided by placement and compaction of 1 inch maximum asphalt concrete cold mix. Contractor shall be responsible for maintenance as required.
6. Erosion control measures shall be taken by the contractor during construction to prevent infiltration of existing and proposed storm drainage facilities and roadways.
7. All buried power for S.T.E.P/Grinder systems shall be installed with continuous tracer tape installed 12 inches above the buried power. The marker shall be plastic non-biodegradable, metal core backing marked "power". Tape shall be furnished by contractor.
8. Pressure mains less than 4 inches in diameter shall be HDPE SDR 11 or Schedule 80 PVC ASTM D1784 with rubber gasket joints. Pressure mains 4 inches in diameter or greater shall be HDPE SDR 11 or PVC C-900DR 14. Certain-Teed Certa-Lok C-900 R/J pipe is approved for use where restrained joints are required. Welded Poly (HDPE) pipe shall be Hi density ASTM D 3350, SDR 11 ~~34084710~~ socket welded or butt fusion welded. HDPE pipe shall be sized by inside pipe diameter. Fittings and valves shall comply with section 7E.040 of the Development Guidelines. Piping for sewer lines shall be green, white or black. HDPE sewer pipe shall be green or black with a green stripe manufactured on the pipe.
9. S.T.E.P/Grinder service line from main connection to service ball valve shall be 1 ¼ inch or 2 inch diameter schedule 80 PVC. HDPE pipe shall be hi density ASTM D 3350, SDR 11 ~~34084710~~ socket or butt fusion welded.
10. All plastic pipe and services shall be installed with continuous tracer tape installed 12 inches to 18 inches under the proposed finished sub grade. The marker shall be plastic non-biodegradable, metal core or backing marked sewer which can be detected by a standard metal detector. In addition, S.T.E.P systems and pressure mains shall be installed with 12 gauge direct bury, U.S.E. green coated copper wire wrapped around all plastic pipe, brought up and tied off at valve body. Continuity testing of the wire will be done by the City. Tape

shall be Terra Tape "D" or approved equal. The tape and wire shall be furnished by the contractor.

11. Prior to acceptance of the project the pressure mainline and service lines shall be subject to a hydrostatic pressure test of ~~200-175~~ pounds for 15 minutes and any leaks or imperfections developing under said pressure shall be remedied by the contractor. Pressure testing shall not exceed the pressure rating of valves or other components within the system. No air will be allowed in the line. The main shall be tested between valves. Insofar as possible, no hydrostatic pressure shall be placed against the opposite side of the valve being tested. The pressure test shall be maintained while the entire installation is inspected. In addition, all Pressure mains shall be pigged in the presence of the City Inspector prior to placing main in service.

12. Prior to backfill, all mains and appurtenances shall be inspected and approved by the City of Lacey Construction Inspector. Approval shall not relieve the contractor for correction of any deficiencies and/or failures as determined by subsequent testing and inspections. It shall be the contractor's responsibility to notify the City of Lacey for the required inspections.

13. Single and duplex family S.T.E.P. pumping systems installed in Lacey shall be an Orenco certified package and be accompanied by a certificate of origin letter from Orenco. The certificate of origin letter shall be presented to the City of Lacey inspector at time of installation and inspection of the pumping system. Package components and installation requirements shall also comply with Lacey details. A PDF version of the certificate of origin letter and the manufacturer's submittal data of the required components can be found online at the City of Lacey website under the Public Works heading then under Development Guidelines and Public Works Standards.

14. Single and duplex family grinder system shall be manufactured by E-One (Environment One Corporation) only and shall be purchased and installed as a packaged system from E-One. This includes the electrical control panel, wiring from panel to pump chamber, the pump and pumping components and pump chamber. No substitution of parts shall be allowed.

15. All STEP and Grinder systems installed in commercial applications shall meet the applicative electrical requirements for commercial systems.

16. All valves up to 2 inch shall be red handle Cepex Poly True Union FIPT x FIPT ball valves with appropriate couplings. All valves three to 24 inch shall be Pratt, Milliken, or Crispin plug valves or approved equal. Plug valves shall be of a full round port design (100% opening) and epoxy coated on the inside and outside as specified in 7D.030. All plug valves shall have a 2 inch operating nut, gear reduction operation, and be rated for burial. Tapping valves shall be resilient wedge gate valves and be epoxy coated on the inside and outside.

~~13.~~

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7D.030 S.T.E.P./Grinder/Lift Station Pressure Main

- A. Material: Pressure mains less than 4 inches in diameter shall be HDPE SDR 11 or Schedule 80 PVC, ASTM D1784, with rubber gasket joints. Pressure mains 4 inches in diameter or greater shall be HDPE SDR 11 or PVC C-900DR 14. Certain-Teed Certa-Lok C-900 R/J pipe is approved for use where restrained joints are required. Welded Poly (HDPE) pipe shall be Hi density ASTM D 3350, SDR 11 [34084710](#) socket welded or butt fusion welded. HDPE pipe shall be sized by inside pipe diameter. Fittings and valves shall comply with section 7E.040 of the Development Guidelines. Piping for sewer lines shall be green, ~~white or black~~ or white. HDPE sewer pipe shall be green, ~~black~~ or black with a green stripe manufactured on the pipe. For 14 to 24 inch mains, pipe shall be PVC C905 Class 235 or HDPE SDR 11 with ductile iron fittings and gasket joints. A more rigid pipe may be required where unlimited trench widths occur. All ductile iron fittings shall be either epoxy coated or PE lined both inside and outside. The coating material shall be designed for use with corrosive materials. The use of ductile iron pipe will be limited to the lift station site only. Ductile iron pipe will not be used downstream of the lift station check valve vault. Pipe material & fittings for pressure mains larger than 24 inches shall be reviewed by the City of Lacey. Sewer rated C-151 class 50 ductile iron pipe may allowed under special circumstances as deemed necessary by the Director of Public Works. Welded poly pipe shall be hi density ASTM D 3350, SDR 11 [34084710](#) socket welded or butt fusion welded. HDPE sewer pipe shall be green, black with a green stripe manufactured on the pipe. Butt fuse welded pipe shall be de-beaded on the inside of each weld. HDPE pipe that is directionally bored underground or under the road shall have a locating wire installed with the pipe.
- B. Installation. The process for HDD shall follow the standard three step process of (1) drilling the pilot hole (2) enlarging the hole/back reaming (3) pulling through the transmission pipeline. The use of drill fluid such as bentonite or polymer is required. A properly sized hole and ample amount of drill fluid shall be used to prevent damage to the pipe being installed. During the installation of the transmission pipe, a second smaller HDPE DR 14 pipe a minimum of ¾ inch diameter shall be pulled through alongside the transmission pipe the smaller pipe shall have a standard 12 gauge direct bury U.S.E. green coated copper tracer wire pulled through and connected to the tracer wire of the main at each end using the low voltage grease-type splice kits. Soils that have too many cobbles may not be approved by the City for HDD.
- C. Depth: Pressure mains shall have a minimum 68 inches of cover to top of pipe. This minimum assumes 42 inches cover to an 8 inch diameter water pipe and 18 inches separation from the bottom of water pipe to the top of the sewer line. See Chapter 6.130 for sanitary sewer/water main crossing requirements.

- D. Pressure Main Velocity: The minimum velocity allowed is 2 feet per second (fps) at average Dry Weather Flow. 2 fps is required to maintain solids in suspension although 3 fps is desired to scour settled solids. Maximum velocity allowed shall be 8 fps.

7D.035 Connections to Pressure mains.

Connection to an existing PVC or AC pressure main shall be done with an all stainless steel tapping saddle such as Romac SST with a stainless steel flange. Connection to an existing ductile iron pressure main shall be done with a fabricated steel tapping saddle such as Romac FTS style. Fabricated steel saddles shall have optional fusion epoxy coating 8 to 12 mils lined and coated. Tapping saddle gaskets shall be rated for sewer. The tapping valve shall be an epoxy coated resilient wedge gate valve conforming to AWWA C-515 latest revision requirements. Refer to detail 7-12.2 for specific requirements when connecting a new S.T.E.P. or grinder service to an existing pressure main. S.T.E.P. sewers shall not be allowed to connect to lift station pressure mains.

The check valve shall be made accessible for maintenance or replacement. Installation of a manhole with bottom shall be required to facilitate access to the check valve.

7D.040 Lift Station Pressure Main Surge Protection

PVC is subject to fatigue failure due to cyclic surge pressures. The pressure main shall be constructed to minimize rapid changes in velocities. A properly sized surge tank may be required on the pressure main.

7D.045 Valves

All valves up to 2 inch shall be red handle Cepex Poly True Union FIPT x FIPT ball valves with appropriate couplings. All valves ~~four~~ three to 24 inch shall be ~~M&H, Clow, Pratt, DeZurik or Milliken, or Crispin~~ plug valves or approved equal. Plug valves shall be of a full round port design (100% opening) and epoxy coated on the inside and outside as specified in 7D.030. All plug valves shall have a 2 inch operating nut. ~~Plug valves 6 inches & larger shall have gear reduction operation, and be rated for burial.~~ Tapping valves shall be resilient wedge gate valves and be epoxy coated on the inside and outside.

- A. Pressure Main Valve Spacing: Valves shall be installed at all locations where the size of the pipe changes. (See also 7D.065 pig port requirements for pipe line size changes and spacing). Three valves shall be installed at each cross and two valves shall be installed at every tee. In no case shall valve spacing exceed 1000' for mains up to 10 inch. Valve spacing shall not exceed 500' for mains over 10 inches. At every lift station, a pressure main isolation valve is required within ten feet of the station.

## SANITARY SEWER

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- B. Air Release Valves: Air release valves shall be ARI model D-021 for S.T.E.P ~~and grinder~~ mains and ARI D-025 for Lift station ~~and grinder~~ mains. Air release valves and air/vacuum valves shall be located at the high points of the line. Air release valves shall be fitted with an activated carbon canister to absorb compounds with disagreeable odors prior to releasing the air to the surrounding area. Grades shall be designed to minimize the need for air/vacuum valves when practical. Vehicular access to valve is required for maintenance. See detail.
  - C. Pressure Sustaining Valve Assembly: Pressure sustaining valves are sometimes required in the design of S.T.E.P systems to keep the pipeline full during periods of low or no flow or when siphoning conditions exist. Pressure sustaining valve and assembly shall be reviewed by the City of Lacey prior to approval.

### 7D.055 Fittings

- A. All pipe fittings shall have a minimum working pressure rating equal to the pipe with which they are connected. Fittings shall be PVC 1120, rubber joint complying with ASTM D-1784, D-2466, or D-2467.
- B. Fittings for welded poly pipe shall be electro fusion welded. Tee connections shall be electro fusion branch saddles or side wall fusion reducing tees. Connection to existing poly mains shall be by self tapping electro fusion saddles or Romac SST-H.

### 7D.060 Pressure Main Low Point Drain

Provisions to drain a pressure main to facilitate repairs or to temporarily remove pressure main from service shall be provided. This may be accomplished through the use of a valved tee connected to a drain line at the low point of the line. See detail.

### 7D.065 S.T.E.P./Grinder Pressure Main Pigging Ports

A pipeline pig is a projectile that is forced through the inside of a pipe to clean pressure pipelines. A pigging port is used as a point to send or retrieve the pig. Pigging ports shall be required:

1. At every change in pipeline size (or as determined during the plan review).
2. At the end of every dead end line.
3. At the connection point to the main when the main being constructed will be a secondary main.
4. Location and number of pigging ports required are subject to review and approval by the City of Lacey. See detail.

7D.070 Thrust Blocking

Location of thrust blocking shall be shown on plans. Thrust block concrete shall be Class B poured against undisturbed earth. A barrier shall be placed between all thrust blocks and fittings.

Designed and approved restraining joint systems may be allowed in lieu of thrust blocking only by special approval (engineer must submit calculations when requesting approval). Mechanical joints shall utilize a pipe restraint style gland. "Megalug" type joint restraints will not be allowed on PVC pipe. Mechanical restraints shall be split grip ring type. Restraining joint brand, type, and size shall be specified on the plans.

7D.080 Pressure Main Termination

Sewer odors and gases, hydrogen sulfide odors (H<sub>2</sub>S), and the buildup of sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) occur in the operation of a pressure main and/or S.T.E.P/Grinder system.

Odor and corrosion control measures shall be addressed on pressure sewer systems connecting to a gravity sewer system.

A determination of need for odor and corrosion prevention shall be prepared and stamped by a Professional Engineer licensed in the State of Washington. The report, along with said engineer's history of odor control experience and references shall be submitted during design phase for review by the City of Lacey. As a minimum, the odor control system shall be designed and installed according to current method of City of Lacey odor control treatment. If required, an odor control facility shall be installed in order to inject a treatment product into the system so that both odor and corrosion issues generated by the system are addressed. The pressure main shall be sized to provide adequate contact time for treatment to be effective. All manholes with 400 feet downstream of the out fall manhole and including the out fall manhole shall be entirely coated to the top grade ring with ISO 9000 certified hi grade calcium aluminate material, Kerneous-Kerneos Sewper Coat PG 4 minimum of one inch thickness or 100 % VOC-free self-priming structural polyurethane SprayRoq – SprayWall product. The coating shall be applied under direction of the product representative, by a factory trained/certified applicator of the product. If new gravity manholes are to be installed at the terminus, all of the new manholes shall be coated as well. The pressure main discharge shall be made with a smooth transition of flow into the existing flow so as to not cause splashing of the effluent at the discharge.

**7E S.T.E.P. PRESSURE SEWER SYSTEMS:**

7E.010 General

A Septic Tank Effluent Pump (S.T.E.P) system or grinder pump system may be installed to serve single family residential ~~(1 EDU)~~, multi-family residential ~~(duplex, 2 EDU's)~~, (Small Community Systems ~~(3 to 6 EDU's)~~), and commercial applications where approved by the City. A chart (City of Lacey S.T.E.P System Requirement Chart) outlining the general S.T.E.P system design requirements can be found in this section. A S.T.E.P/Grinder application with a proposed site plan is required for each individual on-site system. An example of the S.T.E.P/Grinder application can be found in Appendix D.

Any new single family subdivision designed with S.T.E.P or grinder sewers shall include an easement on the face of the plat for access to all lots as shown in the appendix. Other S.T.E.P or grinder applications shall require easements as outlined in the appendix.

Single family subdivisions designed with individual ~~S.T.E.P. sewers~~ pressure sewer systems shall provide civil drawings including the building envelopes, 10 foot private utility trench, driveway, water meter, service box and the ~~S.T.E.P.~~ tank locations in the front of the lot drawn to scale to assure all improvements can be accommodated on site.

A S.T.E.P system is a facility consisting of a tank or tanks for settling and digesting wastewater solids, and a pressure piping system for conveying the supernatant liquid into the sewer system. Grinder pump systems consist of a single pump basin. The pump(s) grind the waste stream into a slurry and pump it to the City sewer system.

The single family and duplex S.T.E.P. tanks or grinder pump basins shall be located in the front yard of the residence. If the lot size is too small for the S.T.E.P. tanks, a community S.T.E.P. system (3 to 6 EDU's) may be required and sized according to the City of Lacey S.T.E.P. system sizing chart.

The Small Community S.T.E.P. tank pump facility shall be located on an adequately sized lot or open space with an easement granted to the City. An additional 15' easement shall be granted around all sides of the facility for maintenance access. A driveway and/or adequate parking shall be provided at the facility for City of Lacey maintenance vehicular access as determined by the City. Driveway shall be constructed as a permanent all weather surface capable of supporting an 80,000 lb. vehicle.

Multifamily Equivalent Dwelling Unit Sizing Chart

Equivalent Dwelling Units (EDU's)	Number of Bedrooms
1.0	3
0.75	2
0.5	1

The above chart is for design purposes only and cannot be utilized for connection fee calculations.

Operation and maintenance of the tank, pump, and pump controls for the small community systems shall be the responsibility of the City only after the system has been inspected and approved and an easement is granted to the City and the warranty period of one year has expired. The one year warranty period for the onsite S.T.E.P. ~~tanks and/or grinder~~ pump facilities shall begin when the residence or business discharging effluent into the tanks becomes occupied. The one year warranty period for the pressure main will begin when the ~~S.T.E.P. tank / pump facilities~~ onsite systems connected to the main become occupied and begin pumping effluent into the conveyance system. It is required by the City that the easements for a new development be granted on the plat, otherwise, an easement for each lot will have to be granted at the time of connection. The City will be responsible for mapping the single family and duplex on-site system for "as built" purposes. The small community pump station facilities shall be installed/constructed per the approved plans and as-built by the designing engineer.

Power (electricity) for the single family, duplex or commercial system shall be provided by the customer. Power for the small community type pump stations shall be provided by the homeowner's association or property owner.

All sewer pipe, drains and plumbing between the tank and the building for single family, duplex or commercial systems shall be the responsibility of the customer.

Community type pump systems shall use the applicable criteria outlined in Chapter 7B for the design and construction of the gravity sewer.

Commercial ~~S.T.E.P.~~ systems and tanks installed for the purpose of pumping industrial cleaning effluent, truck wash bays or car washes shall require the installation of an oil water separator prior to the S.T.E.P. or grinder pump tank. The entire facility shall be owned and maintained by the customer to the location of the service valve/check valve box located downstream of the facility. Verification of maintenance shall be provided to the City of Lacey yearly.

7E.015 ~~S.T.E.P.~~ Customer Responsibilities

All S.T.E.P. and grinder tank riser lids shall be set to grade for maintenance access. No shrubs, bushes, ~~trees~~ or ground cover vegetation other than grass shall be planted within a ~~3'-5'~~ radius of any tank lid. No trees shall be planted within 10' of any tank lid or valve box. All of the tank lids shall be visible.

The property owner must maintain access to the ~~septic~~ tank and controls at all times for City maintenance purposes. The tank riser lid may not be covered or buried. For S.T.E.P. applications only, although the owner may place a bird bath, potted plant or other yard decoration on the riser lid, as long as it can be readily removed for repair or maintenance. Grinder tank lids are vented and require that all dirt, beauty bark, rock, grass, debris, etc. be kept away from the lid to ensure proper venting of the pump chamber (tank).

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The plumbing from the home to the interceptor tank is the responsibility of the property owner. The City will service and maintain all equipment excepting that which is mentioned above after the warranty period of one year has expired.

The customer shall be responsible for notifying the City when the control panel alarm buzzer is activated. The customer shall be responsible for curtailing water usage until City forces respond to the customer's notification in the event of an alarm, power outage, or other abnormal condition~~problem~~. The City will accept no responsibility for damages resulting from a plumbing backup, such as may occur if water usage is not curtailed during an alarm condition, power outage, or if the customer ~~has disables~~ disabled the alarm.

#### 7E.020 Design Standards

The design of any S.T.E.P or grinder sewer system shall conform to City standards and any applicable standards as set forth herein and in Sections 3.010, 3.040 and 7A.010.

The layout of extensions shall provide for the future continuation of the existing system as determined by the City. In addition, main extension shall be extended to and through the side of the affected property fronting the main. Individual S.T.E.P or grinder service boxes shall be located at the corner of the lot opposite the water meter. ~~S.T.E.P service~~ Service boxes shall not be installed in driveways.

The largest S.T.E.P. tank accepted by City of Lacey shall be 8,000 gallon fiberglass as shown in the City of Lacey S.T.E.P. system requirement chart and the details at the end of this chapter.

Odor control measures shall be addressed on S.T.E.P/Grinder sewer systems as per 7D.080.

The standards outlined in section 7D "Pressure Sewer" of this manual shall be used for the design and construction of S.T.E.P/Grinder pressure mains.

Pump, pipeline, and appurtenant component sizing shall conform to the criteria as set forth in the Lacey "Comprehensive Sanitary Sewer Plan" and this chapter of the Development Guidelines and Public Works Standards.

The applicable General Notes in section 7B.020 shall be included on any plans dealing with pressure sanitary sewer design.

The standards outlined in Section 7D.080, "Pressure Main Termination" shall be used for S.T.E.P and grinder main terminations.

#### 7E.025 ~~S.T.E.P.~~ Components and Testing

All S.T.E.P. pumping equipment shall comply with the City of Lacey/Orencia Certificate of Origin package. No substitutions.

All grinder pump system equipment shall be provided as a packaged system manufactured by Environment One (E-one). No substitutions.

Hydrostatic Leakage test shall begin when the tank is filled with water to two inches above base of tank riser. The test duration shall be two hours {maximum allowable loss is one gallon. One gallon is 232.6 cubic inches or about 0.5 inches of depth in a 24 inch riser.}

Pressure tests between the pump chamber and the service box shall be 150 pounds per square inch for fifteen minutes. No leakage is allowed.

All electrical work shall be to National Electric Code (NEC) standards. The control box shall be located within three feet of the meter base or City approved location.

All underground wiring shall be a minimum #14 stranded wire for the float switches and a minimum #12 wire for the motor, color coded, in schedule 40 conduit, a minimum 18 inches deep, with warning tape in trench above conduit.

#### 7E.030 Service Lateral Pipe and Building Sewer

- A. Service line: See City of Lacey S.T.E.P./Grinder System Requirement Chart for pipe size. Pipe shall be schedule 80 PVC water pipe, solvent weld joint located at 90 degrees to the mainline when possible. Solvent cements and primer for joining PVC pipe and fittings shall comply with ASTM D 2564 and shall be used as recommended by the pipe and fitting manufacturers. Poly pipe shall be green or black with a green stripe, hi density ASTM D 3350, SDR 11 ~~34084710~~ socket or butt fusion welded. Services shall have a minimum 24 inches cover to top of pipe. Pressure services shall cross under any water line. See chapter 6.130 for water & sewer separation requirements.
- B. Building Sewer: The gravity building sewer pipe between the building and the tank for single family, duplex and commercial systems shall be designed and installed in accordance with the Uniform Plumbing Code (UPC) as adopted in LMC 14.06. A clean out shall be installed on the gravity building sewer, located between the structure and the tank, raised to grade and installed per UPC.
- C. All pipe shall be installed with continuous tracer tape installed 12 to 18 inches under the proposed finished grade. The marker tape shall be plastic; non-biodegradable, metal core or backing which can be detected by a standard metal detector. Tape shall be Terra Tape "D" or approved equal. In addition to tracer tape, install 12 gauge green coated copper wire, wrapped around the pipe, brought up and tied off at the valve boxes.

#### 7E.035 Fittings

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Solvent weld fittings for one inch through two inch pipe shall be socket type Schedule 80 and shall comply with ASTM D 1784 and ASTM D 2466. Poly fittings shall be electro fusion welded hi density ASTM D 3350 socket or butt fusion welded and of the same pressure rating and classification as the pipe.

7E.040 Service Lateral Valves

- A. All service valves shall be 1 ¼ or 2 inch Cepex Poly or KBI True Union FIPT x FIPT ball valves. Valves shall be left "off" and have a threaded plug installed in the end until the lot is connected.
- B. Check Valves: Check valves used on service lines shall be Spears True Union ball check Schedule 80 PVC. Valves shall have a working pressure of 200 psi. Valves shall be designed for use with corrosive fluids. A check valve shall be installed at the end of the service stub out at the property line to be installed in a valve box. The check valve shall be mounted horizontally and be visible in the valve box along with the ball valve. Check valve shall not be buried. A Cepex GR 1100-SB, Cepex GR 1000-SB or Schedule 80 PVC assembly as shown in the details may be utilized.
- C. Service Valve Box Lids. Valve box lids shall be specified to be marked "SEWER" so they can quickly be distinguished from valves in the water system.
- D. Service Valve Boxes:

Earth Bury:

- ~~Carson 1419E. For single service.~~

Traffic Areas:

- ~~Midstates Plastics BCF 1419SL. For single family service.~~

7E.060 Concrete S.T.E.P. / Septic Tanks

Approved S.T.E.P tanks and sizes are listed in the City of Lacey S.T.E.P. System Requirement Chart. Tanks shall be rectangular, pre-cast concrete, dual chamber, and shall have been designed by a registered structural engineer. The chambers shall be divided in such a way that 1/3 of the tank capacity is designed as the pumping chamber and 2/3 of the tank capacity is designed as the settling chamber. All tanks shall be manufactured for acceptance of pump assemblies and effluent filters. Tanks shall use Orenco flanged tank adapters cast into the concrete for the 8 inch, 24 inch and 30 inch openings to allow positive attachment of the risers. The manufacturer shall provide the structural design and certification to the City for review. The design or analysis shall be in accordance with accepted engineering practice. Tanks 1.5 to ~~4-3~~ feet in depth shall be designed for the following loading conditions:

- A. Top of tank 400 pounds per square foot.
- B. Lateral load of 62.4 pounds per square foot (62.4 pcf equivalent fluid).
- C. The tank shall be designed to support a 2,500 pound wheel load with minimum allowable earth cover.

- D. The tank shall be designed to withstand hydrostatic loading equal to the maximum depth of bury, in addition to the soil loading. Maximum depth of bury shall be measured from the ground elevation to the invert of the sewer line entering the tank.

~~Deeper installations, if required by local conditions, will require special consideration, as will tanks~~ Tanks located where a vehicle might be driven over them will require special consideration and must be traffic rated. Tanks approved as traffic bearing tanks shall be designed to withstand an H-20 live load with a minimum soil cover of 18 inches. Load rating of tank shall be clearly stamped in lid and side of tank. A specific design done by a Structural Engineer needs to be submitted to verify that the tank specified is designed for the depth and loading to be incurred.

All tanks shall be guaranteed in writing by the tank manufacturer for a period of two years from the date of delivery to the project. Manufacturer's signed guarantee shall accompany delivery.

Systems installed on a site where an existing septic tank exists may not use the existing tank. The existing tank shall be removed or abandoned per DOH and/or county requirements.

Concrete material and construction shall meet the requirements of section 6-02 of the WSDOT/APWA Standard Specifications for Road, Bridge, and Municipal Construction most current edition.

The concrete mix shall not be modified unless the mix design is reviewed and approved by the City.

Walls, bottom and top of reinforced-concrete tanks shall be designed across the shortest dimension using one-way slab analysis. Stresses in each face of monolithically-constructed tanks may be determined by analyzing the tank cross-section as a continuous fixed frame. The walls and bottom slab shall be poured monolithically. Concrete shall achieve a minimum compressive strength of 4000 psi in 28 days. Date of manufacture shall be clearly stamped in lid and side of tank.

Reinforcing steel shall be ASTM A-615, Grade 60,  $f_y = 60,000$  psi. Details and placement shall be in accordance with ACI 315 and ACI 318. Fibrous re-bar substitutions such as Novomesh will not be allowed or approved.

Modification of completed or existing tanks will not be permitted for structural, warranty, and liability reasons. In order to demonstrate water tightness, tanks shall be tested prior to acceptance. Each tank shall be tested at the factory, by filling with water to the base of the riser and letting stand. After 24 hours, the tank shall be refilled to the soffit and the ex-filtration rate shall be determined by measuring the water loss during the next two hours. The two hour water loss shall not exceed one gallon.

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Tanks shall not be moved from the manufacturer's site to the job site until the tank has cured for at least 7 days and has reached two thirds of the design strength.

Tanks shall be bedded on 6 inches 5/8 inch crushed rock or pea gravel. Backfill material shall be sand to within 12 inches of the finished grade Sides

shall be compacted in 2 foot lifts to the same or greater density than the surrounding area.

After the tanks have been set in place and the riser installed, but prior to back filling, each tank shall be tested by filling the tank riser with water to the top or to a level that equals 3 PSI against the tank to riser seal for a 2 hour period. Water loss during the test shall not exceed 1 gallon. Electrical "J" box shall not be submerged during the test.

Tanks installed where groundwater levels are above tank bottom require precautions to prevent flotation. In general, tanks shall immediately be filled with water and shall not be pumped down more than 3 feet below top of tank.

Finish grading, cleanup, and restoration shall be completed prior to final acceptance by the City.

#### 7E.065 Fiberglass Septic Tanks

Fiberglass tanks approved for use in the City of Lacey will be of the sizes called out in the City of Lacey S.T.E.P. System Requirement Chart found prior to the sewer details in this section. 1500 gallon fiberglass tanks shall be Orenco Model #T1500-23-19/19-11 only. 8000 gallon fiberglass tanks for small community systems shall be Xerxes Inc. or Containment Solutions Inc. or approved equal and shall meet the following specification:

Single-wall fiberglass septic tanks approved for use in the City of Lacey shall meet UL 1316 and ASTM D4021 specification.

All tanks shall be guaranteed in writing by the tank manufacturer for a period of two years from the date of delivery to the project. Manufacturer's signed guarantee shall accompany delivery.

Systems installed on a site where a septic tank exists may not use the existing tank. The existing tank shall be removed or abandoned per DOH and/or county requirements.

Connection of the PVC inlet and the outlet pipe shall be made with Epoxy coated Romac 501 flexible coupler or Ford Ultraflex. Fernco type coupler with hose clamp connections shall not be installed.

The tank gallon size used shall be determined by the City of Lacey S.T.E.P. System Requirement Chart and details found in this chapter. Actual diameter and length of the tank shall be determined by site conditions such as gravity

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system depth requirements feeding the primary tank, space available, or groundwater and soil conditions.

Fiberglass tanks shall only be installed by persons who have attended an installation class sponsored by the manufacturer of the tank being installed.

All factory requirements shall be strictly adhered to during the delivery, storage and installation process of the fiberglass tank(s).

In areas of high groundwater concrete dead man anchoring of the fiberglass tank(s) may be required. All factory anchoring installation requirements of the tank(s) shall be met.

All backfill requirements recommended by the manufacturer of the fiberglass tank being installed shall be met.

All fiberglass tanks shall be air tested for leakage at the factory prior to shipment. A second air test shall be done at the job site and witnessed by the City of Lacey Inspector prior to back filling to verify no damage or leakage has occurred during shipment or during storage at the job site. All air tests shall be done according to factory specifications.

A standard hydrostatic test for the riser connection shall be required and witnessed by the City of Lacey inspector immediately after installing and back filling the tank(s) by filling the tank riser with water to the top or to a level that equals 3 PSI against the tank to riser seal (approx. 7 feet ) for a 2 hour period. Water loss during the test shall not exceed 1 gallon.

#### 7E.070 Tank Risers and Lids

Pump chamber risers shall be 8, 24 or 30 inch diameter, fiberglass ribbed or PVC as manufactured by ORENCO SYSTEMS, INC., 2826 Colonial Road, Roseburg, Oregon 97470 or approved equal. Solids compartment risers shall be 24 inch diameter. Clean outs or inspection ports between compartments on 1,500 and 3,000 tanks shall be 8 inch diameter. Pump chamber risers shall be 30 inch diameter. 3,000 and 1,500 gallon tank riser height shall not exceed 48 inch from top of tank to finished grade. All tank riser lids shall be set to grade for maintenance access.

No shrubs, bushes, ground cover or trees shall be planted within a 3' radius of the tank lids. Small community system tank riser height shall not exceed 96 inches from top of tank to finished grade. All tank riser lids shall be set to grade for maintenance access.

Pump chamber risers shall be factory equipped with the following:

- A. Appropriately sized (IPS) neoprene grommets shall be installed no less than eight inches from the top of the riser and no more than twelve inches from the top of the riser around the pump discharge pipe(s) and electrical splice box conduits where they exit the riser and create a seal to prevent the infiltration of ground water into the tank.

- B. S.T.E.P. tank splice boxes shall be Orenco model SBEX 1-4.
- C. A lid shall be furnished with each riser. It shall be latching and constructed of fiberglass with an aggregate finish. Riser and lid combination shall be able to support a 2500 pound wheel load. This does not imply that PVC risers are intended for traffic areas.

Each riser shall be bonded to the flanged tank adapter with a two-part epoxy that shall be supplied with the riser by the manufacturer. The epoxy shall be applied in accordance with the manufacturer's recommendations. The epoxy shall be allowed four hours curing time at 64 degrees Fahrenheit; otherwise a greater time shall be allowed based on the manufacturer's recommendations before backfill is placed over tank. Care shall be exercised during the curing period to avoid dislodging the riser. Fiberglass tanks shall have a portion of the risers manufactured as part of the tank and sized to fit the standard Orenco risers and lids. The two part epoxy mentioned above shall be used to attach the Orenco riser to the fiberglass riser along with the adapter ring. Attachment of Orenco riser to PRTA tank adapters, FRTA tank adapters and fiberglass tank adapters shall be done using OSI ADH100 adhesive or adhesive required by the tank manufacturer.

7E.080 Pumping Tank Equipment

S.T.E.P.- Pumps shall be UL listed for use in effluent. All pumping systems shall be Orenco Systems ~~Model OSI S 4000 Series~~ PF Series 4" High Head Pumping Assemblies ~~or approved equal~~. See City of Lacey S.T.E.P System Requirement Chart and City of Lacey/Orenco certified S.T.E.P. package requirements found in Appendix.

Grinder- ~~Grinder pumps serving 2 or less EDU's shall be E-one model WH231. Systems serving 3-4 EDU's shall be E-one model WH472. Systems serving commercial sites will be sized on a case-by-case basis and may require explosion proof rated pumps.~~

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All pumping systems shall be installed in accordance with the manufacturer's recommendations.

7E.090 Control Panel Power

See details at the end of this chapter for control panel location requirements. ~~Single family and duplex family S.T.E.P. control~~ Control panels for single family and duplex applications shall be mounted within three feet of the meter base on the building and be wired to a properly sized dedicated breaker. This is required to avoid damage or overload to system and appliances. Power to the ~~S.T.E.P~~ control box shall be provided to and maintained by the owner of the building that the system serves.

## SANITARY SEWER

The control cabinet for the small community systems shall be a free standing stainless steel enclosure mounted on a concrete pad at the pump tank site. See detail at the end of this chapter for all applicable requirements.

S.T.E.PWhere systems are to be installed for commercial buildings, a copy of the proposed manufacturer's specifications and load calculations shall be submitted to the City for review and approval prior to installation. The property owner per Thurston County Assessor's records shall be responsible to supply and maintain the dedicated power circuit to the S.T.E.Ppump system control panel.

All buried power shall be installed with continuous tracer tape installed 6 inches above the buried power. The marker tape(s) shall be plastic non-biodegradable and be labeled with the appropriate marking.

S.T.E.P. system Wiring wiring from the pump control panel to the splice box in the wet well riser shall be a minimum #14 stranded wire and colored insulation matching the Orenco/City of Lacey Certificate of Origin package requirements. Connections in the riser junction box shall be installed as per the City of Lacey specification. A good quality heat shrink shall be used on all leads. Splices shall be capable of lifting out of the junction box a minimum of six inches. Grinder pump wiring from the control panel to the grinder tank shall be as provided with the E-one package. All field wiring shall be installed in an electrical conduit, no splices allowed. The motor and control circuits will be megered as part of the inspection procedure and shall be no less than 50 mega-ohms before acceptance by the City.

### 7E.095 Control Panels

- A. S.T.E.P. Control panels shall be Orenco Systems models as called out in the Orenco/City of Lacey Certificate of Origin Package for the size system being installed. Grinder pump control panels shall be E-one Sentry Protect Plus with GFCI receptacle and generator receptacle as noted in the details at the end of this chapter. Control panel boxes shall not be painted. The control panel and riser junction box shall be dry and clean before acceptance.

1. All wiring systems shall be installed in accordance with the National Electrical Code (NEC) and City of Lacey specifications, and the manufacture's specifications. In cases of conflict the most stringent standard shall apply.

- ~~1. When required, the Thurston County A disconnect switch shall be mounted directly below the control panel of the single family and duplex family systems and shall be constructed as follows: Hubbell Pro, Heavy duty 20A, 120-277 VAC Single Pole switch #4902-1 or approved equal. Thomas & Betts red dot Dry Tite device box #IH3-1-LM with Bell weather proof cover, Rayntite #5031-0, Single Gang aluminum pad lockable cover.~~

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SANITARY SEWER

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S.T.E.P.- Disconnect box shall be Eaton DPU222R 60a 120/240 volt non-fused pull-out enclosure.

Grinder- Disconnect box shall be Easton DPU222R 60a 120/240 volt non-fused pull-out enclosure.

2. S.T.E.P. panel Disconnect box shall be Bryant 30100 N 1 enclosure with Bryant 30 amp 600V 3 pole switch #3003 D.

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SANITARY SEWER

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## CHAPTER 8

### 8.000 RECLAIMED WATER

#### 8.010 General

Any extension of the Lacey Class A Reclaimed Water System must be approved by the Department of Public Works (DPW). All extensions and uses must conform to the Water Reclamation and Reuse Standards published by the Department of Health (DOH) and the Department of Ecology (DOE) and City of Lacey ordinance 13.64 on Reclaimed Water Use.

In designing and planning for any development, the developer must show in the proposed plans how reclaimed water will be supplied and, as required by the City, whether adequate water pressure and volume will be available to meet the demand requirements. An analysis of the reclaimed water system may be required.

Anyone who wishes to extend or connect to the City's reclaimed water system shall contact the Department of Public Works for appropriate approvals and a connection fee estimate. This fee estimate is an estimate of the costs due the City for a reclaimed waterline extension or connection. A copy of the estimate form may be found in Appendix 'C'.

All construction plans shall be reviewed and approved by DOH, DOE and the City of Lacey prior to construction.

Prior to the release of any reclaimed water meters, all Public Works improvements must be completed and approved including granting of right-of-way or easements and Special Power of Attorney for Annexation if required, and all applicable fees must be paid.

Class A reclaimed water shall be discharged to the sanitary sewer system in order to remain in compliance with LOTT's State Reclaimed Water Permit. Where sanitary sewers are not accessible, dechlorinated Class A Reclaimed Water may be discharged to the stormwater system with approval from DOE. This includes any reclaimed water from blow-offs, line flushing and/or line breaks.

8.020 Design Standards

The design of any reclaimed water extension/connection shall conform to City Standards and any applicable standards as set forth herein and in Chapters 3.010 and 3.040.

Reclaimed Water mains shall be located in the center of the roadway, private drive or easement.

The layout of reclaimed water main extensions shall provide for the future continuation of the existing system. Reclaimed water mains shall be sized to provide adequate pressures throughout the system. Looping of the reclaimed water system may be required to provide adequate pressures and volume. Specific looping requirements shall be determined during plan review by the City. In addition, main extensions shall be extended as required in Chapter 3.130.

Where a reclaimed water system is installed for future use but supply is not yet available, the reclaimed main may be supplied from the potable water main through an approved Reduced Pressure Back Flow Assembly (RPBA) upon approval of the Director of Public Works. At such time that the reclaimed supply becomes available, it shall be the developer's or customer's responsibility to disconnect from the potable water supply and make the connection to the reclaimed water supply. There shall never be any physical connection between a reclaimed water main and a potable water main at the same time. The connection to reclaimed water and the abandonment of the connection to the potable water main shall be coordinated with and witnessed by the City.

All new reclaimed water piping and appurtenances shall be purple (Pantone 512) in color and have the words "RECLAIMED WATER-DO NOT DRINK" printed in black lettering at intervals no greater than 3 feet. Lettering shall be a minimum of 1.5 inches high. Spacing between the individual words of the message shall not exceed 3 inches.

Backflow shall be required on potable water service connections for all customers with reclaimed water service. The assembly type shall be a Reduced Pressure Backflow Assembly (RPBA). Reclaimed water irrigation systems using reclaimed water shall have a Double Check Valve Assembly (DCVA). See [Chapter 6.110- Appendix K , Cross Connection Program](#) for specific requirements.

The General Notes on the following page shall be included on any plans dealing with reclaimed water system design.

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**GENERAL NOTES (RECLAIMED WATER MAIN INSTALLATION)**

1. Reclaimed water mains up to 12 inch shall be Pantone 512/522 AWWA C900 DR 14. Reclaimed water mains larger than 12 inches shall be Pantone 512/522 AWWA C905 DR 18. See Chapter 8.030B for more detailed pipe specifications.
2. Gate valves shall be resilient wedge, NRS (Non Rising Stem) with O-ring seals. Valve ends shall be mechanical joint or ANSI flanges. Valves shall conform to AWWA C-515 latest revision. Valves shall be Mueller, M & H, Kennedy, Clow R/W, Waterous Series 2500, EJ Flowmaster or American AVK. All valves shall be Pantone 512/522 in color.
3. All valves shall have a standard EJ or Olympic Foundry VB 950 water valve box set to grade with a 6 inch ASTM 3034 SDR 35 PVC riser from the valve to within six inches of the valve box top. The valve box and lid shall be per the detail at the end of this chapter.
4. **Existing valves shall be operated by City employees only.**
5. All lines shall be chlorinated and tested in conformance with the above referenced specification (Note 1) and Water Chapter 6.190 of *the Development Guidelines and Public Works Standards*.
6. The sterilization and flushing process for the reclaimed water main shall be the same as the potable water main. See chapter 6.200 for specific requirements. Bacteriological samples will ~~not~~ be required for reclaimed water mains. Mains will be flushed and tested for hydrostatic pressure while connected to the potable system.
7. All pipe and services shall be installed with continuous tracer tape installed 12" to 18" under the final ground surface. The marker shall be purple plastic non-biodegradable, metal core backing three inch wide marked "CAUTION RECLAIMED WATER LINE" which can be detected by a standard metal detector. In addition to tracer tape, install direct bury, U.S.E.12 gauge purple coated copper wire, wrapped around or taped to the pipe, as shown on the detail. Low voltage grease-type splice kits shall be used on tracer wire. Continuity testing of the wire will be done by the City.
8. All service line locations shall be marked on the top or face of the curb with an embossed "R" 3 inches high and 1/4 inch into concrete.
9. Separation between reclaimed water, sewer and the potable water mains shall be maintained per DOE, DOH and City of Lacey standards. See Development Guideline reclaimed water details for more specific requirements.
10. Commercial grade concrete shall be installed one foot around all valve boxes eight inches thick. A concrete pad per the reclaimed water detail shall be installed around all valve boxes and blow-offs that are not in a pavement area.
11. At any connection to an existing line where a new valve is not installed, the existing

## RECLAIMED WATER

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valve must be pressure tested to City standards prior to connection. If an existing valve fails to pass the test, the contractor shall make the necessary provisions to test the new line prior to connection to the existing system or install a new valve.

12. The minimum burial depth of all reclaimed water lines shall be 72 inches.
13. It shall be the contractor's responsibility to field verify the location and depth of the existing main and provide the fittings required to make the connection to the existing main.
14. When an existing City reclaimed water main is to be abandoned it shall be the developer's responsibility to coordinate and abandon the existing main. It shall also be the developer's responsibility to install and transfer existing reclaimed water services to the new main.
15. Sand or pea gravel shall be placed around and under service lines by hand to a height of 6 inches above and below the line (s). There shall be a minimum of 1 foot of sand placed around the entire meter box.
16. Meters 2 inches or larger in size must be ordered by the contractor/developer a minimum of 10 weeks in advance of install. Meters 3 inches or larger shall be installed by the contractor.
17. The reclaimed water main and appurtenances and service connections to the meter setter shall be tested in sections of convenient lengths under a hydrostatic pressure equal to 150 psi in excess of that under which it will operate. In no case shall the test pressure be less than 225 psi.
18. All new reclaimed water piping and appurtenances shall be purple (Pantone 512) in color and have the words "RECLAIMED WATER-DO NOT DRINK" printed in black lettering at intervals no greater than 3 feet. Lettering shall be a minimum of 1.5 inches high. Spacing between the individual words of the message shall not exceed 3 inches.
19. Class A reclaimed water shall be discharged to the sanitary sewer system in order to remain in compliance with LOTT's State Reclaimed Water Permit. This includes any reclaimed water from blow-offs, line flushing and/or line breaks.
20. To lower the risk of contamination, standard tapping practices used for potable water mains shall be followed when connecting to a reclaimed water main. See Water Chapter 6.040 Connection to Existing Water Main for specific requirements.

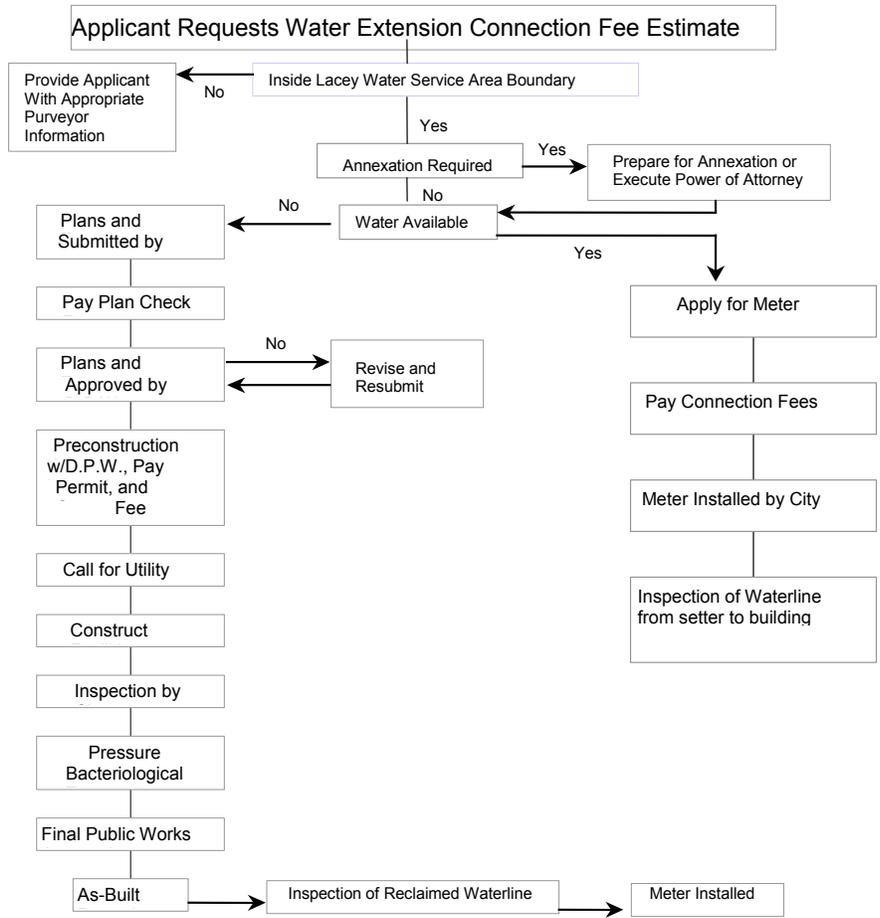
~~20-21.~~The City requires constructing, testing and tapping reclaimed water mains using equipment dedicated for reclaimed water use only. Equipment used on sewer systems are prohibited for use on reclaimed water lines. Equipment previously used for potable water systems may be used for reclaimed water, but afterwards shall not be used on the potable water system.

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**PROCESS TO OBTAIN RECLAIMED WATER SERVICE**



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8.030 Main Line

- A. Reclaimed water mains shall be sized to provide adequate flow at the required residual pressure. The minimum main size shall be 6 inches diameter. Nothing shall preclude the City from requiring the installation of a larger sized main.
- B. All pipe for reclaimed water mains shall comply with one of the following types:

All pipes joined using non-restrained joints shall be rubber gaskets, push on type or mechanical joint, conforming to AWWA C 111. When pipe joint restraints are required, the pipe shall be Certain Teed Certa-lok C900/RJ DR 14.

PVC Pipe: All piping shall be PVC with a minimum cover of 72 inches. The PVC pipe shall be purple (Pantone 512/522) in color and conform to the latest revision of AWWA C900 DR 14 standards.
- C. All fittings shall be compact ductile iron fittings conforming to AWWA C 153. All shall be cement mortar lined conforming to AWWA C 104. Plain end fittings shall be ductile iron if mechanical joint retainer glands are installed on the plain ends. All fittings shall be connected by flanges or mechanical joints. All retaining follower glands shall be ductile iron.
- D. All pipe and services shall be installed with continuous tracer tape installed 12 to 18 inches under the final ground surface. The marker shall be purple plastic non-biodegradable, metal core or backing which can be detected by a standard metal detector. In addition to tracer tape, install 12 gauge, solid, direct bury, U.S.E. purple coated copper wire, wrapped around or taped to the top of pipe, brought up and tied off at valve body as shown on the reclaimed water detail.
- E. The minimum cover for all reclaimed water mains from top of pipe to finish grade shall be 72 inches unless otherwise approved. If the pipe is offset to the edge of the road, the actual roadway cross grade shall be projected out and used to measure cover to top of pipe. This will require more fill over the pipe in a fill section but allows the pipe adequate cover in the event of future roadway cuts or widening. If the pipe is located under a ditch, or on the "downhill" slope of the roadway cross section, the minimum cover over the pipe shall be 72 inches regardless of projected grades.
- F. When minimum cover of the reclaimed water main is in conflict with other utilities, the engineer shall be required to provide the top and bottom elevations of the pipes in conflict. The adjustment of elevation when the minimum cover cannot be met shall be as directed by the city.

## RECLAIMED WATER

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- G. When designing a reclaimed water main through an unimproved area the engineer shall provide a future design of the area to prevent design/construction of shallow mains. The design shall include elevations of the top of pipe at 25-foot intervals.

### 8.040 Connection To Existing Reclaimed Water Main

The developer's engineer shall be responsible for determining the scope of work for connection to existing reclaimed water mains. See reclaimed water details.

At the City's request the contractor shall install a temporary 2-inch brass blow off for flushing. The blow off shall be constructed with a standard 2-inch tapping saddle and Ford brass corporation stop with 2-inch brass pipe extended up to finished grade. When flushing is completed the 2-inch pipe shall be removed. The corporation stop shall be shut off and capped tight with threaded brass plug.

It shall be the Contractor's responsibility to field verify the location and depth of the existing main and the fittings required to make the connections to the existing mains.

No connection shall be made to an existing main on a Friday without Public Works approval.

**A City representative shall be present throughout the entire connection or tapping procedure.**

### 8.050 Service Interruption

The contractor shall give the City a minimum of 72 hours notice of any planned connection to an existing pipeline. This includes all cut-ins, live taps and extensions. Notice is required so any disruptions to existing services can be scheduled. The City will notify customers involved or affected by the service interruption. The contractor shall make every effort to schedule main construction with a minimum interruption of reclaimed water service. In certain situations, the City may dictate scheduling of reclaimed water main shutdowns so as not to impose service interruptions during specific periods to existing customers. Interruptions to service of the reclaimed water system shall be treated as if it were potable water.

### 8.060 Valves

All valves and fittings shall be ductile iron with ANSI flanges or mechanical joint ends. **All existing valves shall be operated by City employees only.**

Valves shall be installed in the distribution system at sufficient intervals to facilitate system repair and maintenance, but in no case

## RECLAIMED WATER

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shall there be less than one valve every 1000 feet. Generally, there shall be three valves on each tee and four valves on each cross. Valves installed with tees and crosses shall be flanged together. All valves shall open counter-clockwise. Specific requirements for valve spacing will be made at the plan review stage.

- A. Gate Valves see page 8-3 for requirements.
- B. Reclaimed water valves shall be affixed with warning tags. Tags shall be securely fastened with a zip tie to the tracer wire at the top of the valve box in a manner that ensures visibility. Reclaimed water valve tags shall be inert polyethylene plastic that is impervious to all known alkalis, acids, chemical reagents and solvents likely to be encountered in the soil. The tags shall be 3" x 5 3/4" minimum size. Tags shall be purple and shall have the words, "CAUTION: RECLAIMED WATER-DO NOT DRINK" printed in black lettering. The lettering shall be a minimum of 1/2 inch high.
- C. Valve Box: All valves shall have a standard EJ or Olympic Foundry VB-950 water valve box set to grade with a 6 inch ASTM 3034 SDR 35 PVC riser from valve to within 4 to 6 inches of valve box top. Commercial grade concrete shall be installed one foot around all valve boxes eight inches thick. If valves are not set in paved area, a concrete pad shall be set around each valve box at finished grade. In areas where valve box falls in road shoulder, the ditch and shoulder shall be graded before placing asphalt or concrete pad. See reclaimed water detail.
- D. Valve marker post: Valve marker posts shall be 4 inch x 4 inch reinforced concrete or schedule 40 steel posts 5 feet long stamped with "R" and distance to valve in white. Posts shall be painted with 1 base coat and 2 coats purple oil base enamel. The need for valve marker posts will be determined during plan review. See reclaimed water detail.

### 8.070 Bend Markers

Bend markers are required when water lines are located outside the right-of-way. When the direction of a main changes due to a bend, a bend marker is required. See reclaimed water details.

### 8.080 Casing

The casing shall be as follows: one quarter inch wall seamless steel casing pipe or ductile iron class 52. Casing spacers are required. A minimum of three sets of spacers are required per 20 feet of pipe. Spacers shall be as manufactured by UniFlange, Calpico Inc. or approved equal. No more than one inch of clearance is allowed

## RECLAIMED WATER

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between the top of the spacers and the inside top of the casing pipe. Approval of products requires research and therefore may be time consuming.

The joints of the transmission pipe within the casing pipe shall be restrained with a restraint system approved by the City of Lacey. Restrained joints shall be required on the transmission line one pipe length past either end of the casing pipe. Additional restraints may be required by the City.

### 8.090 Air and Vacuum Release Valve

Air and vacuum release valves (ARV) shall be installed behind the sidewalk on the property line. For mains up to 12 inches diameter ARV's shall be as shown on reclaimed water detail. The engineer shall size the ARV for mains 14 inches diameter and larger.

ARV's must be installed in a manner that will not create a cross connection condition. Measures to prevent backflow, cross connections, and contamination of the City system.

The installation shall be set at the high point of the line when required. ARV's shall not be installed in areas subject to high ground water or flooding. Where possible, pipes are to be graded to prevent the need for an air release valve.

### 8.100 Blowoff Assembly

A blow off shall be required at the end of all dead end mains. The blowoff assembly shall be as shown on the details. The working pressure rating for blowoff assemblies shall be 200 psi.

### 8.110 Sample Stations

A. A sample station ~~shall~~ may be required on any reclaimed water main extension for testing. The requirement for the location of the sample station will be determined by the City during the plan review. Sample stations shall be located behind the walk, in an open space, or in a utility easement whenever possible and shall generally be centrally located in the project at a low point if possible. The Type 93-WM sample station shall be installed in a single domestic meter setter per the reclaimed water detail.

### 8.120 Service Connection

A. Service connections on reclaimed water for new developments shall be installed as part of the mainline construction. After the system has been accepted by the City and public works approval has been given the owner may apply for a reclaimed water meter.

## RECLAIMED WATER

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The City will install a reclaimed water meter after the application has been made, the work completed (including the backflow assembly installation), accepted and all applicable fees have been paid.

- B. When reclaimed water is desired to serve a parcel fronting an existing main but not served by an existing setter, an application must be made to the City. Upon approval of the application and payment of all applicable fees, the applicant shall hire a contractor to tap the main and install the service in accordance with Chapter 8.040.

Domestic or reclaimed water irrigation meters 2 inch or larger in size must be ordered through the City by the contractor/developer 10 weeks in advance of the installation date.

When applicable, conduit or casing is required by Thurston County for services crossing perpendicular to the roadway centerline outside the City limits but within the City of Lacey reclaimed water service area. The applicant is responsible for this work. Contact Thurston County for the required right-of-way permit(s) and restoration requirements, if any. If Thurston County allows trenching, conduit shall still be required.

- C. Service lines shall be as specified herein. Service lines shall be a one piece purple (Pantone 512) polyethylene plastic pipe from the reclaimed water main to the setter. Service lines shall be as specified herein. No glued joints will be accepted. Service lines shall be installed perpendicular to and 22½° above horizontal of the main. Purple warning tracer tape and wire wrapped around the pipe shall be installed on all service lines. When connecting to an existing system where the roadway cannot be cut, a casing shall be required.

One and one-half to two inch diameter service lines shall be NSF Approved, PE3408 purple polyethylene pipe manufactured from virgin materials. Pipe shall meet the following specifications:

- ANSI/AWWA C901
- ASTM D1248, ASTM D 3350, ASTM D 2239, ASTM D 3035 and ASTM D 2737,
- Pressure Class 200, SIDR – 7 (Standard Inside Dimension Ration-Pressure Rated),
- Cell classification 345464C,

Pipe shall be manufactured by Interstate Plastics, Philips Driscopipe, Eagle Pacific, Superlon Plastics, U.S. Poly or approved equal.

Service saddles with stainless steel straps shall be as shown on the details or approved equal. All clamps shall have rubber gasket and iron pipe

threaded outlets.

Corporation stops shall be as shown on the appropriate detail or approved equal with iron pipe threads conforming to AWWA C 800. Stainless steel inserts shall be used with pack joints and polyethylene pipe.

#### 8.130 Marking Service Lines

The location of all service lines shall be marked on the face or top of the cement concrete curb with a "R" 3 inches in height and 1/4 inch into the concrete. When asphalt rolled curb is allowed, the water shall be marked with a tag secured with a "PK" nail one foot toward centerline from the gutter. The tag shall be a minimum 1-1/4 inch diameter, 0.050 inch thick aluminum disk stamped "R" or an unstamped purple plastic equivalent.

#### 8.140 Water Main/Sanitary Sewer and Reclaimed Water Crossings

The Contractor shall maintain a minimum of 18 inches of vertical separation between sanitary sewers/reclaimed water and water mains. To accommodate crossings, the minimum cover for reclaimed water main of 72 inches may be reduced upon approval by the City to provide for as much vertical separation as possible. When a reduced depth is allowed, approved alternate backfill material may be required by the City. See 8.080 for casing specifications.

Reclaimed water shall only be installed under water lines and shall be above sewer lines. The vertical separation of 18 inches shall be at a minimum of 10 feet on either side of the crossing. The longest standard length of pipe shall be installed so that the joints will fall equidistant from any sewer or water crossing. In some cases where minimum separation cannot be maintained, it may be necessary to encase the reclaimed water pipe and/or the sewer or water service per City of Lacey standards.

#### 8.200 Hydrostatic Tests

The reclaimed water main and appurtenances and service connections to the meter setter shall be tested in sections of convenient lengths under a hydrostatic pressure equal to 150 psi in excess of that under which it will operate. Prior to sterilization and flushing, the installation shall be subjected to a hydrostatic pressure of 225 psi for 15 minutes, and any leaks or imperfections developing under said pressure shall be remedied by the contractor. The main shall be tested between valves. Insofar as possible, no hydrostatic pressure shall be placed against the opposite side of the valve being tested. Test pressure shall be maintained while the entire installation is inspected.

The contractor shall provide all necessary equipment and shall

perform all work connected with the tests. The test pump shall be clean and disinfected. Tests shall be made after all connections have been made and the roadway section is constructed to subgrade. This is to include any and all connections as shown on the plan. The contractor shall perform the test to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the line has been released before requesting the City to witness the test.

#### 8.205 Sterilization and Flushing

The sterilization and flushing process for the reclaimed water main shall be the same as the potable water main. See chapter 6.200 for specific requirements. When potable water is used ~~to supplement the reclaimed water system for flushing and conducting hydrostatic tests on the new main,~~ a bacteriological test shall be taken on the new main.

#### 8.210 Reclaimed Water Irrigation

All reclaimed water irrigation systems located within the public right-of-way shall be designed by a State of Washington registered landscape architect or City approved design firm. Parts lists shall be submitted with each project.

Prior to submitting the design, the contractor/engineer/landscape architect shall hire an independent Certified Landscape Irrigation Auditor, as certified by The Irrigation Association, to review and approve the proposed design.

After the reclaimed water irrigation system is installed, the contractor shall provide an irrigation audit to be performed on the new system by an independent Certified Landscape Irrigation Auditor (CLIA), as certified by the Irrigation Association, prior to final field observation by the Engineer. The CLIA shall test for proper coverage as determined by the Landscape Irrigation Auditor Handbook, most recent edition. The CLIA shall provide written certification that the reclaimed water irrigation system installed provides proper coverage as provided in the handbook.

The General Notes on the following pages are required on all plans for City operated or maintained reclaimed water irrigation systems or on any owner association operated or maintained reclaimed water irrigation systems located within the public right-of-way.

At sewer lift stations, reclaimed water irrigation systems shall be installed with an approved backflow prevention assembly in accordance with Chapter 6.110 of this manual. See reclaimed water detail.

A separate reclaimed water irrigation meter shall be provided for reclaimed water irrigation systems. Medians shall require a separate meter. The reclaimed water irrigation system shall be installed after the

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area has been properly prepared. See Chapter 4B.125 for soil preparation requirements. The pipe trenches shall be no wider than is necessary to lay the pipe or install equipment.

The median system shall be a completely separate system with its own separate appurtenances.

Reclaimed water irrigation sprinklers shall be situated so as to not wet any public street or sidewalk. Spray heads shall not be used in planters less than 3 feet wide. Drip reclaimed water irrigation methods shall be employed in areas less than 3 feet wide to prevent overspray. Turf heads shall be placed at finished grade as measured from the top of the sprinkler. Shrub heads shall be 12 inch pop up type placed at finished grade unless otherwise specified. Drip reclaimed water irrigation emitters shall be installed in accordance with the manufacturer's recommendations.

Installation and maintenance of reclaimed water irrigation systems in roadway planter strips shall be as shown in the table below. The system owner shall be responsible for the on-going utility expenses incurred.

	<b>Single Family Residential Zones</b>	<b>Multi-Family &amp; All Other Zones</b>
<b>Arterial Boulevard</b>	Developer installs, Homeowners Association maintains or a Community Facilities District may be established per LMC 3.46	Developer installs. Owner or Owners Association maintains or a Community Facilities District may be established per LMC 3.46
<b>Arterials</b>	Developer installs, Homeowners Assn. maintains. If the association doesn't maintain, a Community Facilities District may be established at the City's discretion per LMC 3.46.	Developer installs. Owner or Owners Association maintains (the City will maintain where existing covenants don't address this issue)
<b>Collectors</b>	Developer installs, Homeowners Assn. maintains	Developer installs, Owners Association maintains
<b>Residential</b>	Developer installs & Homeowners Assn. maintains	Owner installs, owner maintains

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**GENERAL NOTES (RECLAIMED WATER IRRIGATION SYSTEMS)**

1. It shall be the responsibility of the contractor to have a copy of an approved set of the landscaping plans signed by the Director of Public Works on the construction site at all times.
2. Electrical permits and inspections are required for all reclaimed water irrigation services within the City of Lacey. The contractor is responsible for obtaining permits prior to any type of actual construction. Prior to installation of any materials, the irrigation contractor shall submit for approval by the City, five copies of material catalog cuts, specifications, shop drawings and/or wiring diagrams. Any materials purchased or labor performed prior to such approval shall be at the contractor's own risk.
3. A clearly marked service disconnect shall be provided for every automatic reclaimed water irrigation installation unless otherwise stated on a City approved set of plans. The location and installation of the disconnect shall conform to the National Electrical Code (NEC) and City of Lacey standards. The service disconnect shall be City approved.
4. All low voltage wire shall be a minimum size of #14 UF from each control valve to the terminal interface.
5. All low voltage splices shall be Spears DS 400 or a City approved equal. All splices shall be done in valve control boxes. Direct burial splicing will not be allowed.
6. The automatic controller components shall be as specified in Chapter 8.210G of the Development Guidelines.
7. All materials specifications from Section G Material Specifications of this paragraph shall be shown on the plans.
8. A separate reclaimed water irrigation meter shall be provided for reclaimed water irrigation systems. Medians shall require a separate meter. The reclaimed water irrigation system shall be installed after the area has been properly prepared. See Chapter 4B.125 for soil preparation requirements. Pipe trenches shall be no wider than is necessary to lay the pipe or install equipment. The top 6 inches of topsoil shall be kept separate from the subsoil and shall be replaced as the top layer when backfill is made.
9. The median system shall be a completely separate system with its own separate appurtenances for City owned medians.
10. All reclaimed water irrigation lines to be installed under existing pavement or areas to be paved shall be installed within a casing. The casing shall be a minimum 4 inch diameter or twice the diameter of the encased pipe. The casing shall be AWWA C900 DR 14 PVC pipe. The reclaimed water irrigation casing shall extend a minimum of 1 foot beyond the structure under which casing is being jacked or bored.

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11. Upon final acceptance of the work, the contractor shall submit two as-builts per Chapter 3.065.
12. Privately owned sprinkler heads built along slopes in excess of 2 percent shall contain check valves.

Revised: 03/2014

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8.210 Reclaimed Water Irrigation (cont.)

A. Layout of Reclaimed water irrigation System

The contractor shall stake all reclaimed water irrigation heads and mark all proposed trenches within the reclaimed water irrigation system per the approved plans prior to installing the system. Alterations in layout may be expected, i.e., to conform to ground conditions and to obtain full and adequate coverage to the landscaping. However, no alterations shall be made without prior authorization by the City.

B. Excavation

All soil shall be prepared as specified in 4B.125 prior to trenching. Trenches shall be no wider at any point than is necessary to lay pipe or install equipment. Trench bottoms shall be of relatively smooth sand 4 inches below and 6 inches above the pipe.

Detectable marking tape shall be placed in the trench 6 inches directly above, parallel to, and along the entire length of all nonmetallic water line and nonmetallic conduit. The width and depth of the tape shall be as recommended by the manufacturer or the City.

C. Piping

The reclaimed water irrigation main line is the line containing the supply usually situated between the reclaimed water irrigation meter and the reclaimed water irrigation control valves. The reclaimed water irrigation lateral lines are the lines between the reclaimed water irrigation control valves and the connections to the reclaimed water irrigation heads. Swing joints, thick walled poly pipe, flexible risers, rigid pipe risers, and associated fittings are not considered part of the lateral line but incidental components of the reclaimed water irrigation heads.

All reclaimed water lines shall be purple PVC and be a minimum of 18 inches below finished grade as measured from the top of the pipe. Where possible, mains and laterals or section piping shall be placed in the same trench.

All reclaimed water irrigation lines to be installed under existing pavement or areas to be paved, shall be installed within a minimum 4 inch diameter or twice the diameter of the encased pipe. The casing shall be AWWA C900 DR 14 PVC pipe. The reclaimed water irrigation casing shall extend a minimum of 1 foot beyond the structure under which casing is being jacked or bored.

D. Valve boxes

Valve boxes shall be installed flush to grade outside of play and high vehicular and pedestrian traffic areas.

Valve boxes shall have filter fabric underlayment installed at the bottom to

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prevent rodent intrusion and sediment builds up.

Valve boxes shall be supported with bricks or concrete blocks as approved by the City to prevent settlement.

Reclaimed water valve boxes shall be purple in color and have purple lids with permanent lettering stating: "reclaimed water do not drink".

### E. Pipe Connections

During construction, pipe ends shall be plugged or capped to prevent entry of dirt, rocks, or other debris.

PVC pipe, couplings and fittings shall be handled and installed with care and in accordance with the manufacturer's recommendation. For gasketed connections, the outside of the PVC pipe shall be chamfered to a minimum of 1/16 inch at approximately 22 degrees. For all other connections, pipe and fittings shall be joined by solvent welding. Solvents used must penetrate the surface of both pipe and fittings which will result in complete fusion at the joint. The solvent and cement shall be of a type recommended by the pipe manufacturer.

Threaded PVC joints shall be assembled using Teflon tape as recommended by the pipe manufacturer.

On plastic to metal connections, work the metal connection first. Use a non-hardening compound on threaded connections. Connections between metal and plastic are to be threaded utilizing female threaded PVC adapters with a threaded schedule 80 PVC nipple only.

### F. Electrical Wire Installation

The electrical controller shall be located in an open space or in a utility easement whenever possible.

All control wires shall be labeled at the controller, splice boxes and at the valves in the field.

Wiring between the automatic controller and the automatic valves shall be direct burial, #14 and may share a common neutral. A minimum of two spare # 14 UF yellow wires shall be installed from the controller to the furthest valve in each direction, looping through each control valve box. There shall be a 2 foot loop left in each control valve box. Separate control conductors shall be run from the automatic controller to each valve. When more than one automatic controller is required, a separate common neutral shall be provided for each controller and the automatic valve which it controls. Wire shall be installed adjacent to or beneath the reclaimed water irrigation pipe. Plastic tape or nylon ty-wraps shall be used to bundle wires together at 10 foot intervals, and the wire shall be "snaked" from side to side in the trench. When necessary to run wire separate from the reclaimed water irrigation pipe, the wire shall be bundled and placed under detectable marking tape. When lateral pipe lines have less than 18

## RECLAIMED WATER

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inches of cover, direct burial wire shall be installed below the pipe at a minimum depth of 18 inches from finished grade.

Wiring placed under pavement and walls or through walls, shall be placed in reclaimed water irrigation casing. See 8.210 Section C.

Splices will be permitted only at junction boxes, valve boxes, or at control equipment. A minimum of 2 feet of excess conductor wire shall be left at all splices and terminal and control valves to facilitate inspection and future splicing.

### G. Material Specifications

As a means of keeping the City's parts inventory to a minimum and maintenance personnel familiarized and knowledgeable about product operation, the following is a list of approved products to be used on all jobs in which the City will be responsible for maintenance and operations. Requests for approved equals need to be submitted to the City of Lacey Public Works Department, Development Review section.

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Description	Approved Device
Pop Up Spray Heads	Rainbird 1800 PRS SAM <ul style="list-style-type: none"> <li>• minimum of 6" pop up</li> <li>• installed on Toro Funny Pipe</li> <li>• must have a purple top</li> </ul>
Gear Driven Rotary Heads	Hunter I-20 and I-40 Series <ul style="list-style-type: none"> <li>• installed on prefabricated O-Ring PVC Swing Joints</li> <li>• check valves on all heads</li> <li>• must have a purple top</li> </ul>
Remote Control Valve and Master Valve	Weathermatic 21000DW series installed with isolation ball valve and double union. A master valve shall be installed directly after the DCVA. The valves must be tagged "reclaimed water do not drink"
Quick Coupling Valves	West Ag 4V100-R-Y or Rainbird 44RC <ul style="list-style-type: none"> <li>• installed at point of connection and at the furthest valve at the far end of the main line</li> <li>• installed on prefabricated O-Ring PVC Swing Joints</li> <li>• must have a purple lid</li> </ul>
Double Check Backflow Preventer	Febco 850U or approved DOH equal with schedule 80 PVC unions. The double check backflow preventer shall be installed in a purple box.

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Flow Sensing Device	<p>Data Industrial IR series</p> <ul style="list-style-type: none"> <li>• installed with master control valve</li> <li>• wiring between flow sensor and reclaimed water irrigation controller shall be a twisted pair direct burial 2-conductor shielded 18 AWG or larger stranded copper wire with appropriate ratings for distance of run. Wire shall be a single run with no splices.</li> <li>• master control valve shall be the same valve as the remote control valve</li> </ul>
Automatic Controller (for City owned and maintained systems)	<p>Toro Sentinel with stainless steel cabinet and full surge protection</p> <ul style="list-style-type: none"> <li>• shall be grounded conforming to NEC specifications</li> </ul>
Valve Boxes	<ul style="list-style-type: none"> <li>• Carson 910-12B for Quick Coupler</li> <li>• Carson 1419B for remote control valve or larger</li> <li>• Other boxes shall be sized accordingly</li> <li>• 6 inch pit boxes will not be permitted</li> <li>• Valve boxes shall be purple in color</li> </ul>
Shut-Off Valves	<p>Schedule 80 PVC True Union ball valve</p>
Drip Irrigation	<ul style="list-style-type: none"> <li>• All drip lines shall be Netafim CV with all Netafim connectors</li> <li>• Use Netafim disk filter at each control valve</li> <li>• Note: no flush/vacuum valve are required</li> </ul>

H. Flushing

All main supply lines shall receive two fully open flushings to remove debris that may have entered the line during construction. The first flushing shall be completed prior to installing valves or testing.

## RECLAIMED WATER

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All lateral lines shall receive one full-open flushing prior to placement of sprinkler heads, emitters, and drain valves. Note, drain valves on main lines are not recommended. Quick couplers shall be installed on the down stream side at the cross connection device and at each terminus of the main line from the cross connection device. The flushing shall be of sufficient duration to remove any dirt and debris that have entered the lateral lines during construction.

### I. Testing

All gauges used for testing water pressure shall be certified correct by an independent testing laboratory immediately prior to use on the project. Gauges shall be retested when ordered by the inspector.

Automatic controllers shall be tested by actual operation for a period of two weeks under normal operating conditions. Should adjustments be required, the Contractor shall do so according to the manufacturer's recommendation or under the City's direction until the operation is satisfactory to the City.

All main lines shall be purged of air and tested with a minimum static water pressure of 150 psi for 60 minutes without introduction of additional service or pumping pressure. Testing shall be done with one pressure gauge installed on the line in a location determined by the City inspector. Lines which show loss of pressure exceeding 5 psi after 60 minutes will be rejected.

All lateral lines shall be purged of air and tested in place at operating line pressure with a pressure gauge and with all fittings capped or plugged. The operating line pressure shall be maintained for 30 minutes with valves closed and without introduction of additional pressure. Lines which show leaks or loss of pressure exceeding 5 psi at the end of specified test period will be rejected.

The contractor shall correct rejected installations and retest for leaks as specified herein.

### J. Backfill

Backfill shall not be started until all piping has been inspected, tested and approved by the City inspector, after which, backfilling shall be completed as soon as possible. All backfill material placed within 6 inches of the pipe shall be free of rocks, roots, or other objectionable material which might cut or otherwise damage the pipe.

Backfill from the bottom of the trench to approximately 6 inches above the pipe shall be by continuous compacting in a manner that will not damage pipe or wiring and shall proceed evenly on both sides of the pipe. The remainder of the backfill shall be thoroughly compacted, except that heavy equipment shall not be used within 18 inches of any pipe. The top 6 inches of the backfill shall be of topsoil material.

K. Adjusting System

Before final inspection, the contractor shall adjust and balance all sprinklers to provide adequate and uniform coverage. Spray patterns shall be balanced by adjusting individual sprinkler heads with the adjustment screws or replacing nozzles to produce a uniform pattern.

L. System Operation

The reclaimed water irrigation system shall be completely installed, tested and operable prior to planting unless otherwise specified in the plans or as approved by the City. The contractor shall be responsible for all maintenance, repair, and testing, inspecting and automatic operation of the system until all work is considered complete as determined by the final inspection.

M. As-Built Plans

Upon final acceptance of the work, the contractor shall submit two as-builts per Chapter 3.065.

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EXHIBIT B  
ORDINANCE NO. 1514



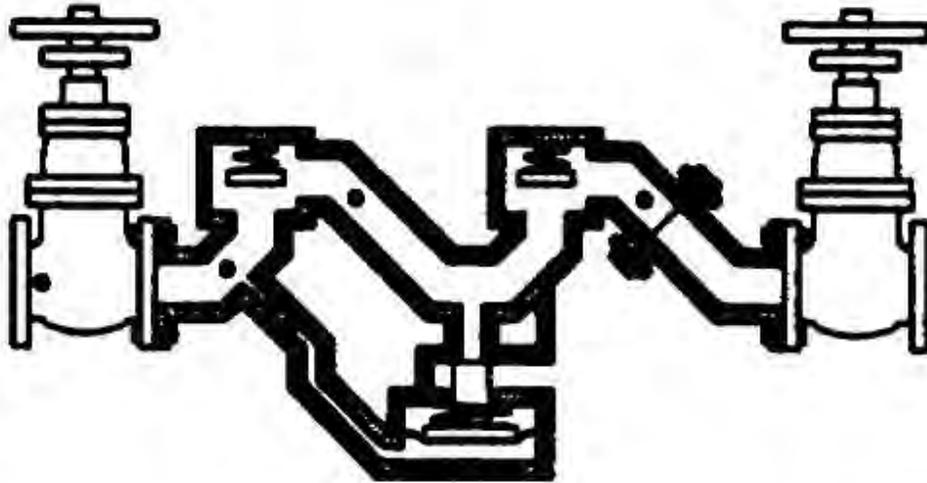
420 COLLEGE STREET SE  
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(360) 413-4341 Fax (360) 456-7799

*Shaping  
our community  
together*

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# **Cross-Connection Control Program**

## **Department of Public Works**



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## **1. Introduction**

### 1.1. Purpose and Scope

This Policy establishes the Cross Connection Control Plan for the City of Lacey. The purpose of this plan is to provide a clear definition of regulated existing and potential connections, provide procedures and design criteria for backflow prevention, outline duties of parties pertaining to the Public Drinking Water System, and summarize current city, state, and federal policies and regulations regarding cross connections. This revision supersedes any previous editions.

The City of Lacey relies on 'Premise Isolation' to administer the cross-connection program. The customer is responsible to install backflow assemblies at fixtures within their establishment, per the 'Uniform Plumbing Code', to protect the potable water from contaminating other areas of the establishment. All pertinent departments within the City of Lacey shall coordinate efforts in administering this policy.

The City of Lacey Public Works Department will carry out the functions of the Cross Connection Control Program. The Public Works Director will oversee and manage the program administration and designate employees to carry out daily procedures. These designees will meet the requirements outlined for certification. This joint effort will include communication between the CCS and other water operations staff, water system designers, engineers, financial, and administrative staff.

The City of Lacey will educate the public regarding cross-connection hazards by various means including but not limited to: brochure distribution, City website information, Consumer Confidence Reports, displays at public functions, site inspections, questionnaires, predevelopment meetings, pre-construction meetings and over-the-counter dialogue.

## 1.2. Importance of Backflow Prevention

Contaminants may be introduced into the potable water system during backflow conditions or through an unprotected cross connection. These may be microbiological contaminants (e.g. Giardiasis, Legionella, Hepatitis, Typhoid, *E. coli*), chemical contaminants (e.g. boiler chemicals, herbicides, pesticides, industrial chemicals), or physical contaminants (e.g. hot water, compressed air, gasoline).

When you go to your tap, you can have confidence in the fact that the City of Lacey operates a reliable, first-class water system. It is important to us that our drinking water customers, their families and businesses receive drinking water that is safe all day, every day.

## 2. Definitions

### 2.1. Key Definitions

The following are definitions for words which are widely used throughout this document. Therefore, it is important to understand these key terms.

**Backflow**

The undesirable reversal of the flow of water from its intended direction. It occurs when a differential pressure exists between two different points in a continuous fluid system. Backflow is caused by either backpressure or backsiphonage.

<b>Cross Connection</b>	Any actual or potential connection between a potable water line and any source of non-potable liquid, solid, or gas that could contaminate the potable water supply by backflow.
<b>Potable Water</b>	Water suitable for human ingestion, free from harmful or objectionable materials.
<b>Non-Potable Water</b>	Water that has not been examined, properly treated, and not approved by appropriate authorities as being safe for consumption.

2.2. Definitions Pertaining to the Cross-Connection Control Program

<b>Actual Cross Connection</b>	A cross connection that currently exists.
<b>Acute Hazard</b>	Posing an immediate risk to human health.
<b>Auxiliary Water Supply</b>	Any water supply on or available to the premises other than the City of Lacey water supply. These auxiliary waters may include water from another purveyor’s public potable water supply or any natural source(s) such as a well, spring, river, stream, etc., or “used waters.”
<b>Backflow Assembly Tester (BAT)</b>	An individual certified by Washington State Department of Health who inspects, tests, maintains and repairs backflow assemblies and air gaps that protect the public water system.
<b>Backflow Prevention Assembly</b>	An assembly that has passed laboratory and field evaluation tests performed by a certified organization and is listed on the State of Washington DOH list of approved backflow prevention assemblies.
<b>Backpressure</b>	Results when pressure on the user’s side of the service connection is greater than the pressure provided by the Public Water System. Some common causes are: <ol style="list-style-type: none"><li>1. Pump</li><li>2. Boiler</li><li>3. Elevated tank or tall building</li></ol>

<b>Backsiphonage</b>	Results from a negative pressure within the piping system (partial vacuum). Some common causes are: <ol style="list-style-type: none"><li>1. High velocities in pipe lines</li><li>2. Line repair or break</li><li>3. Lowered main pressure due to high water withdrawal rate (e.g. firefighting or main flushing)</li><li>4. Reduced pressure on the suction side of a booster pump</li></ol>
<b>Contamination</b>	Degradation of the quality of the potable water by any foreign substance which creates a hazard to public health or which may impair quality of the water.
<b>CrossConnection Control Specialist (CCS)</b>	An individual certified by Washington State Department of Health that develops and implements a cross-connection control program, including investigation and enforcing compliance.
<b>Local Administrative Authority</b>	The local building official, board, department or agency authorized to administer and enforce the provisions of the Universal Plumbing Code as adopted under Chapter 19.27 of the Revised Code of Washington
<b>Local Health Agency</b>	Refers to Thurston County Department of Health (DOH), Office of Drinking Water.
<b>Potential Cross Connection</b>	A cross connection that may occur at any time. Examples include: bypass arrangements, jumper connections, unattached hose connections, intricate piping, existing wells onsite, etc.
<b>Premise Isolation</b>	A means of protecting the City owned and controlled water system through the installation of approved air gaps or backflow prevention assemblies at or near the service connection (or an alternate location acceptable to the City) to isolate the user's water system from the City's distribution system. This type of protection does not provide protection to personnel on the premises.
<b>Premises</b>	Any and all areas on a customer's property which are served or have the potential to be served by the City of Lacey Water System.
<b>Public Water System</b>	Refers to the City of Lacey water distribution system, providing water for human consumption.

**Purveyor** An agency, subdivision of the state, municipal corporation, firm, company, mutual or cooperative association, institution, partnership, person, or other entity owning or operating a public water system. This includes the authorized agents of such entities.

**Reclaimed Water** Wastewater which is suitable for uses other than potable water as a result of treatment. Class A reclaimed water is clean enough for public contact and almost any use except drinking.

**Service Connection** The point of connection between a user's piping and the water supplier. The water meter serves as this point.

**Water Supplier** The person or organization that owns or operates the approved water supply system.

**Water User** Any person obtaining water from the City of Lacey.

2.3. Backflow Prevention Assemblies

**RBPA** Reduced Pressure Backflow Assembly; incorporates the use of two independently-acting spring-loaded check valves separated by a spring-loaded differential pressure relief valve, two resilient seated shutoff valves and four properly located test cocks.

**DCVA** Double Check Valve Assembly; two single check valves assembled within one body and furnished with four test cocks and two shut-off valves.

**AG** Air Gap<sup>1</sup>. Non mechanical devices referring to the unobstructed vertical space between the water outlet and the flood level of a fixture.

**DCDA** Double Check Detector Assembly; an outgrowth of the double check valve and is primarily utilized in fire line installations.

**RPDA** Reduced Pressure Detector Assembly; an outgrowth of the Double Check Detector Assembly and is typically only used on fire line applications.

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<sup>1</sup> Air Gaps are not considered assemblies, but these configurations are acceptable for the protection of the water supply. As their approval is limited to certain situations, please check with Community Development prior to installation to determine if your site is acceptable for this configuration.

<b>PVBA</b>	Pressure Vacuum Breaker Assembly; an outgrowth of the SRVB used to prevent backsiphonage in constant pressure applications.
<b>SRVB</b>	Spill-Resistant Vacuum Breakers; prevent backsiphonage on indoor point-of-use applications.
<b>Hose Bibb VB</b>	Hose Bibb Vacuum Breaker; consists of a springloaded check valve that seals against an atmospheric outlet when the water supply is turned on. Required use for Lacey water customers. (See Fig. 4)

### 3. Statutory Requirements

#### 3.1. Introduction

The program in this manual contains each of the elements required by Federal and State regulations pertaining to cross connection control; this includes enforcement authority, administration, personnel, certification, facility surveys, assembly testing, and public education.

#### 3.2. References

1. Environmental Protection Agency Safe Drinking Water Act
  - a. 40 CFR 141. National Primary Drinking Water Regulations
2. Revised Code of Washington (RCW) Title 43
3. Washington Administrative Code (WAC) 246-290. Group A Public Water Suppliers
  - a. WAC 246-290-415. Operations and Maintenance
  - b. WAC 246-290-490. Cross Connection Control
4. WAC 246-292. Waterworks Operator Certification
5. Washington State Department of Health (DOH)
  - a. Publication #331-234 - *Guidance Document: Cross-Connection Control for Small Water Systems.*
6. American Water Works Association (AWWA) Standards
  - a. *Cross-Connection Control Manual, Accepted Procedure and Practice*
7. USC Foundation for Cross-Connection Control and Hydraulic Research
  - a. *Manual of Cross Connection Control*
8. Uniform Plumbing Code (UPC) Chapter 10
9. Uniform Fire Code (UFC)
10. City of Lacey Development Guidelines and Public Works Standards
  - a. Chapter 6. Water
11. Lacey Municipal Code (LMC)
  - a. LMC 13.48.070. Cross-connections and backflow protection. (Ord. 195 §7, 1971; Ord. 946 §2, 1992; Ord. 104 §7, 1968).

### 3.3. Responsibility

Implementing an effective cross connection control program requires full cooperation of the water users, suppliers, and local health agency. If the drinking water system on a premise is found to be contaminated, the health agency and water supplier should be promptly notified and appropriate measures taken to eliminate contamination. The responsibilities of the various entities involved are outlined below.

#### 3.3.1. Cross Connection Control Specialist (CCS)

3.3.1.1. A designated CCS shall develop, implement, and maintain a crossconnection control program that meets WAC requirements. This person will serve as Cross-Connection Program Manager\*, with support as needed from additional certified Cross-Connection Control Specialists to ensure at least one certified operator is on staff at all times. These personnel include:

- a. Ashley Smith, Water Resources Division CCS\*
- b. Terry Cargil, Water/Wastewater Supervisor
- c. Lance Sponberg, Senior Utilities Control Tech
- d. Ed Andrews, Senior Water Distribution Tech
- e. Jason Bourgault, Controls Specialist
- f. Andrew Smith, Controls Specialist
- g. Chris Nickell, Water Treatment Plant Operator
- h. Tracy Anderson, Senior Wastewater Control Tech
- i. Jim Baker, Controls Specialist

3.3.1.2. A CCS shall perform the following duties:

- a. Assess the degree of hazard to the public water system
- b. Determine appropriate backflow protection
- c. Inspect backflow prevention assemblies (BPAs) to verify adequate protection for the degree of hazard
- d. Investigate and respond to backflow incidents
- e. Develop and maintain cross-connection control records
- f. Complete and sign cross-connection related reports
- g. Take corrective action when a consumer fails to comply with requirements regarding installation, inspection, field testing, maintenance, or repair of a backflow preventer
- h. Review inspection and test reports for backflow preventers

3.3.1.3. If the purveyor grants exceptions to mandatory premises isolation as required by WAC, the CCS shall:

- a. Determine on a case by case basis whether such an exception is appropriate;
- b. Complete and sign an exception form;

- c. Include the completed form in DOH Annual Summary Report and Department records.

#### 3.3.2. Backflow Assembly Tester (BAT)

A BAT shall inspect, test, maintain, and repair backflow prevention devices and air gaps that protect the public water system and report the results to the Public Works Department CCS and the owner of the backflow preventer. This will be accomplished by conforming to the following:

- Inspected backflow assemblies must have a tag attached indicating the test date and passing status.
- Record inspection and test results completely, accurately, and legibly.
- Submit instrument calibration records and current BAT certification card to the City of Lacey CCS.
- Any suspected fraudulent test reports will be rejected.

#### 3.3.3. Water User

A water user refers to the customer. The water user has the primary responsibility to keep contaminants out of the potable water system. This responsibility begins at the user connection and includes all water distribution piping on the premises. The water user has the responsibility of notifying the water supplier when a cross-connection exists.

#### 3.3.4. Property Owner

If an actual or potential cross-connection exists, the property owner shall have a backflow prevention assembly installed, tested, and maintained at their expense as directed by the water supplier.

#### 3.3.5. Water Supplier

The City of Lacey Water System is operated and maintained to ensure a safe and reliable drinking water supply, as required under the Federal Safe Drinking Water Act. This includes implementing a cross connection control program to prevent contamination of the Lacey Water System by backflow. This responsibility begins at the source and ends at the user connection; it includes the entire distribution system.

#### 3.3.6. Health Agency

The WA DOH oversees and regulates all planning, capital construction, maintenance, and monitoring of the Lacey Water system as an approved drinking water supply. This includes ensuring that drinking water systems have and implement cross connection control programs to protect the health of consumers using public drinking water supplies.

### 3.4. Record Keeping and Reporting

All original records (correspondence, plans, etc.) will be kept in the water system's files.

3.4.1. Record of Risk Assessment

For each customer, the City shall maintain a record of the initial risk assessment and subsequent re-assessments, in the form of a completed: • Water Use Questionnaire (i.e., for residential customers); and/or • Cross-Connection Survey Report.

3.4.2. Inventory of Backflow Preventers

The designated CCS shall maintain via a digital database an inventory of all backflow preventers or air gaps required to protect the distribution system to include:

- Information on the exact location of the backflow preventer or AG (adequate details to find the backflow preventers), as well as GIS location information;
- Description of hazard isolated (either the category of premises such as a medical clinic or the fixture such as a boiler);
- Type, size, make, model, serial number and installation date of backflow assembly, or AG details including installation date; and
- Size, make, model and installation date of AVBs used on irrigation systems.

3.4.3. Inventory of Backflow Preventers Test/Inspection Reports

For each assembly field test or AG inspection, the test report inventory information should include at a minimum:

- The name and certification number of the BAT performing each test or inspection;
- Test results (pass/fail and actual readings) or inspection results; and
- Repair/re-plumbing history.

3.4.4. Correspondence

The City will maintain copies of all correspondence with customers, DOH, and the Local Administrative Authority for a period of at least five years.

The City will also maintain, *as a permanent record*:

- Current service agreements
- Notification to the customer to install a backflow preventer(s) to protect the public water system from contamination.

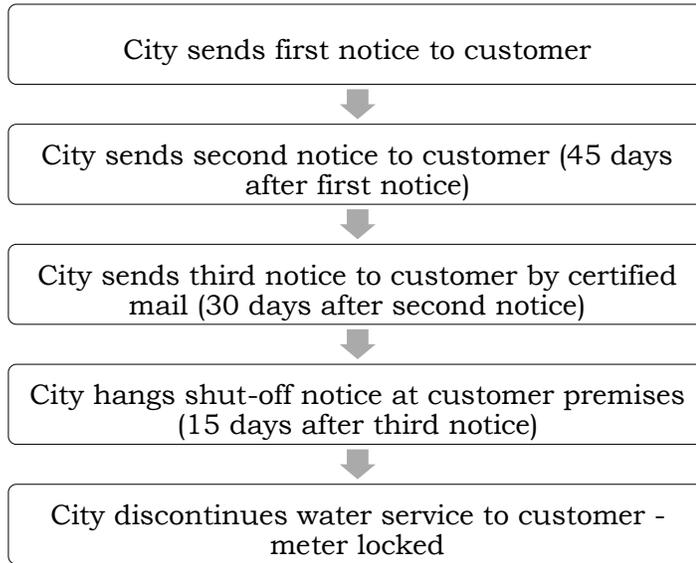
## 4. Enforcement

It is unlawful for any person to allow contaminants to backflow from their facility and/or property into the City distribution system. Any person who willfully violates any of the provisions or requirements of this Policy is guilty of a gross misdemeanor (LMC 13.48.080) and upon said conviction of offense shall be subject to a fine not exceeding the sum of \$5000.00 and/or one (1) year in jail. Each day that each violation of this chapter continues shall be punishable as a separate offense.

Any services existing now or hereafter that create an actual or potential crossconnection shall be disconnected and/or eliminated. Connections which cannot

be disconnected and/or eliminated shall require the installation of a backflow prevention assembly.

Service of the city water supply system to any premises upon which the potential for backflow exists, and/or a user has failed to complete backflow testing requirements, may be discontinued or refused unless such corrective action is taken. If at any time a serious threat to public health exists, water service will be terminated immediately. (LMC 13.48.070)



## 5. Backflow Incident Procedures

The City will immediately begin a backflow incident investigation whenever the initial evaluation of a water quality complaint indicates that:

- A backflow incident has occurred (i.e., drinking water supply has been contaminated) or may have occurred; or
- The complaint can't be explained as a "normal" aesthetic problem.

Also, whenever a water main break (or power outage for pumped systems) causes a widespread loss of water pressure in the system (creating backsiphonage conditions), City staff will initiate a check of distribution system water quality as a precursor to the need for a backflow incident investigation.

### 5.1. Agency Notification

The City will notify DOH, the Local Administrative Authority, and local health jurisdiction as soon as possible, but no later than the end of the next business day when a backflow incident contaminates the potable water supply. An emergency contact telephone list will be maintained in the water system's O&M Manual.

### 5.2. Customer Notification

As soon as possible, the City will notify customers not to consume or use water. This could remain in effect for several days while the source and type of contamination is identified, and the distribution system is cleaned and/or disinfected.

The City will begin notification procedures with the customers nearest in location to the assumed source of contamination (usually the customer(s) making the water quality complaint).

The City will inform the customer of the reasoning behind the backflow incident investigation and efforts to restore water quality. Customers will be informed when they may use water, and of the need to boil water for consumption until the incident is resolved (e.g. bacteriological test results received from lab).

When a customer cannot be notified immediately, the City will place a written notice on the front door handle, and a follow-up visit will be made to confirm they received notice.

### 5.3. Identification of Source of Contamination

Consideration will be given to the distribution system as a potential source of contamination (e.g. air valve below ground, water source).

The City will not start flushing the distribution system until the source of contamination is identified (flushing may aggravate the backflow situation, and will likely remove the contaminant before a water sample can be collected to fully identify the contaminant).

The City will conduct a site to site survey to search for the source of contamination and the extent that the contaminant has spread through the distribution system. Note: a check of water meters may show a return of water (meter running backward) to the distribution system.

When the cross connection responsible for the system contamination is located, water service will be discontinued to that customer, until the customer completes corrective action ordered by the City.

### 5.4. Isolation

Portions of the system that are suspected of being contaminated will be isolated by closing isolating valves; leave one valve open in a one-way flow configuration to ensure that positive water pressure is maintained throughout the isolated system.

City staff will notify all affected customers in the isolated area first followed by other customers served by the system.

### 5.5. Public Health Impacts

The City will seek immediate input from and work with state and local agencies to accurately communicate and properly mitigate potential health effects resulting from the backflow incident. If appropriate, the City will refer customers that may have consumed the contaminant or had their household (or commercial) plumbing systems contaminated to public health personnel and Local Administrative Authorities (plumbing inspectors).

#### 5.6. Cleaning/Disinfecting the Distribution System

A plan of action will be developed and implemented for cleaning the contaminated distribution consistent with the contaminant(s) identified. Where both chemical and bacteriological contamination has occurred, disinfection will occur after the removal of the chemical contaminant.

#### 5.7. Backflow Incident Report Form

The Department of Health “Backflow Incident Report Form,” DOH 331-457-F will be completed and filed following the incident.

## **6. Survey and Evaluation of Hazards**

### 6.1. Introduction

A cross connection control survey is the first step in abating cross-connection hazards. This includes a review of a customer’s water use practices, with the purpose of identifying where the water system may be interconnected with a potential source of contamination.

### 6.2. Notification Procedures

It shall be standard operational procedure for the City of Lacey staff to provide the customer advanced notice and coordinate a mutually convenient time before conducting a survey of the premises. Unannounced inspections shall be used in the case of customers who have failed to provide necessary information to continue water service or if actual cross-connections are observed.

Following the survey, the customer will receive a letter informing them of the findings and what (if any) remedial actions are necessary. Typically, sixty days will be granted; however, this may be shortened depending on the degree of hazard involved and the history of the device(s) in question.

### 6.3. Priority

The following sequence will be used to determine the priority in which surveys will be initiated according to the probable severity of health impacts, should a backflow

incident occur, and the likelihood of existing cross-connections. The Water Resources division shall maintain a list of pending surveys to be conducted within a given year.

1. Premises that have been identified as having an actual cross-connection.
2. Customers that meet the use definitions of WAC 246-290-490 table 9: Severe and High Health Cross-connection Hazard Premises Requiring Premises Isolation by AG or RPBA.
3. Customers that have an active permit for construction or tenant improvement.
4. Premises that are suspected of having a potential cross-connection.
5. Commercial customers shall be surveyed before residential customers.

#### 6.4. Building Development

In the case of new development, the City of Lacey will review applicable plans and determine backflow prevention assemblies required, if any. In any case, a minimum of premise isolation RPBA will be required on any new commercial construction. A residential development (e.g. apartment complex, condominium, mobile home park) having one or more metered connections serving more than two living units per meter will be treated as a commercial service and will require premise isolation. This assembly shall be installed prior to the City Of Lacey releasing water meter.

If customer requires a building permit, the status of their current backflow protection will be reviewed. If a significant change of use or tenant improvement occurs that changes the facilities' risk, or involves >50% of the square footage of the building, a premises isolation will be required. The tenant will require service isolation, regardless of this threshold, if they meet the requirements on Table 1 (Premises Requiring Mandatory Service Protection) and are non-conforming.

Following permit issuance, the device will be inspected by Public Works staff to insure it is appropriate for the applicable hazard and that installation is in accordance with Development Guidelines.

#### 6.5. Facilities Requiring Backflow Protection

Installation of requested backflow protection assemblies shall be a condition of continued water service from the City and shall also be a condition of receiving a business license from the City.

Customers may request an exemption from mandatory premises isolation if they meet the criteria outlined on "Premises Isolation Exemption," DOH 331-156-F.

##### 6.5.1. Severe Health Cross-Connection Hazards

Properties identified as a "Severe Health Cross-Connection Hazard" (as identified in WAC 246-290-490 table 9) must install an RPBA in combination with an approved air gap as a premise isolation. This includes radioactive material processing facilities and wastewater treatment plants.

6.5.2. Mandatory Isolation

Properties identified in Table 1 require mandatory RBPA isolation, at a minimum.

<p><b>Table 1: Premises Requiring Mandatory Service Protection</b></p> <p>This includes, but is not limited to, the following facilities and/or equipment:</p>	
<input type="checkbox"/> Auto body/repair shops	<input type="checkbox"/> Irrigation with chemical addition
<input type="checkbox"/> Car washes	<input type="checkbox"/> Swimming pools
<input type="checkbox"/> Bakeries	<input type="checkbox"/> Piers and docks
<input type="checkbox"/> Commercial kitchens/restaurants/ premises where food is being prepared	<input type="checkbox"/> Greenhouses/Agricultural use
<input type="checkbox"/> Food processing facility	<input type="checkbox"/> Tall buildings (≥ 3 stories)
<input type="checkbox"/> Butchers (includes fish markets and livestock)	<input type="checkbox"/> Water storage tanks or pressure tanks
<input type="checkbox"/> Distilled breweries/wineries/beverage bottling plants	<input type="checkbox"/> Wells (groundwater or aux. supply)
<input type="checkbox"/> Beauty salons or barber shops	<input type="checkbox"/> Multiple water services
<input type="checkbox"/> Nail salons	<input type="checkbox"/> Water reuse/recycling
<input type="checkbox"/> Commercial laundry facilities	<input type="checkbox"/> Booster pumps
<input type="checkbox"/> Dry-cleaning establishments	<input type="checkbox"/> Chemically treated boilers
<input type="checkbox"/> Dental office/Laboratory	<input type="checkbox"/> Large boilers (more than 350000 BTU)
<input type="checkbox"/> Medical offices/Laboratories (Includes offices that administer medication)	<input type="checkbox"/> Heat exchangers (single wall) or cooling towers
<input type="checkbox"/> Pharmacies	<input type="checkbox"/> Water cooled equipment or chillers
<input type="checkbox"/> Veterinary offices/Laboratories	<input type="checkbox"/> Manufacturing, cleaning, processing, or fabricating plants
<input type="checkbox"/> Funeral Parlors/Mortuaries	<input type="checkbox"/> Chemicals used in processing (e.g. photo laboratories, dye plants)

<input type="checkbox"/> Apartment complexes	<input type="checkbox"/> Warehouses with toxic chemical storage
<input type="checkbox"/> Hotels and/or motels	<input type="checkbox"/> Sewage treatment or handling
<input type="checkbox"/> Mobile home parks or acquired systems supplied with a master meter <sup>3</sup>	<input type="checkbox"/> Petroleum processing or storage
<input type="checkbox"/> Nursing homes	<input type="checkbox"/> Complex plumbing
<input type="checkbox"/> Marijuana growing/processing facilities	<input type="checkbox"/> Survey access denied or restricted

**If you believe that your premise does not require a Backflow Prevention device, you may have a Professional Engineer, Registered Architect, or Licensed Master Plumber submit a request for exemption to the Public Works Department for consideration.**

6.5.3. Fixture Isolation

In addition to mandatory premises protection, there are numerous fixtures, equipment areas, or other common use areas which could have crossconnection potential. Table 2 lists some examples of these hazards which must be inspected and analyzed to determine potential risk. These require additional backflow protection.

<p><b>Table 2: Fixtures, Equipment and Areas with Backflow Potential</b></p> <p>This includes, but is not limited to, the following facilities and/or equipment:</p>	
<input type="checkbox"/> Carbonated beverage dispensers	<input type="checkbox"/> In ground irrigation systems <sup>2</sup>
<input type="checkbox"/> Tapped coffee lines	<input type="checkbox"/> Aquariums <sup>3</sup>
<input type="checkbox"/> Detergent dispensers	<input type="checkbox"/> Decorating ponds <sup>4</sup>
<input type="checkbox"/> Kitchen equipment	<input type="checkbox"/> Hoses and hose bibs - VB
<input type="checkbox"/> Commercial dishwashers	<input type="checkbox"/> Hot tubs/swimming pools <sup>4</sup>
<input type="checkbox"/> Ice makers <sup>4</sup>	<input type="checkbox"/> Medical equipment
<input type="checkbox"/> Janitor sinks <sup>4</sup>	<input type="checkbox"/> Laboratory equipment
<input type="checkbox"/> Lavatories <sup>4</sup>	<input type="checkbox"/> Agricultural equipment

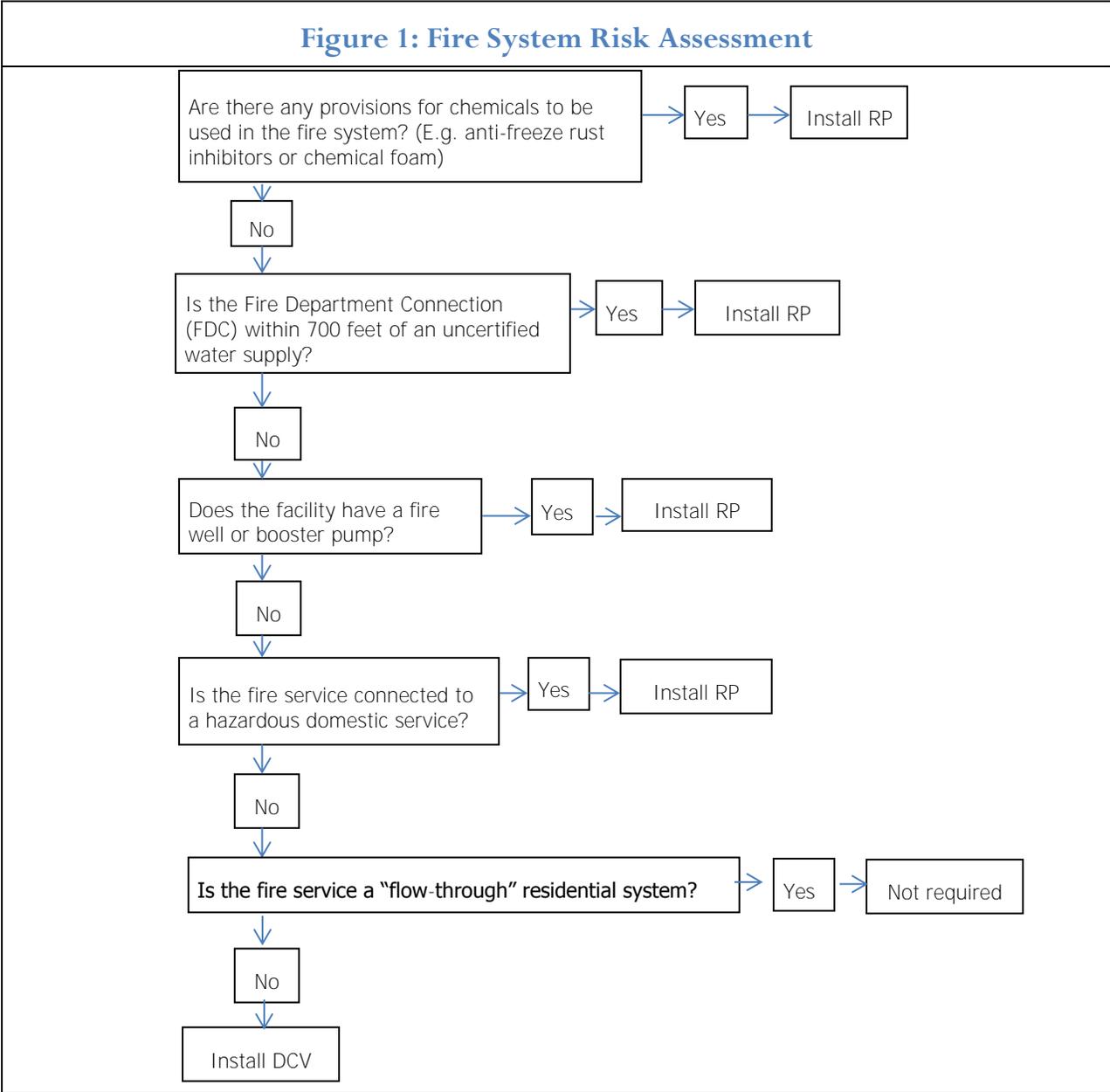
<sup>2</sup> DCVA/PVBA protection may be used with Public Works approval

<sup>3</sup> AG protection may be used with Public Works approval

□ RV dump stations	□ Water trucks or temporary water connections <sup>4</sup>
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6.5.4. Fire Sprinkler Systems

Under normal conditions fire sprinkler systems shall be isolated by a DCVA, at a minimum. The following risk assessment will be used to determine if a higher degree of protection is required.



6.5.5. Auxiliary Water Supply

Lacey addresses the use of permit-exempt wells for auxiliary water supply in the LMC, the Development Guidelines and Public Works Standards, and in water service policies of the Water System Comprehensive Plan. Existing permit-exempt wells are required to be decommissioned as a condition of receiving a new water service connection from the Lacey water system, and existing Lacey water customers are prohibited from drilling new permit-exempt wells. If a current customer has an auxiliary water supply on their premises, they will be required to comply with one of the following options:

- 1) Install an RPBA at each service connection immediately downstream (user side) of their meter.
- 2) Eliminate the auxiliary water supply to City specifications. State law prohibits keeping an unused well onsite; therefore, wells must be decommissioned according to Washington State Department of Ecology specifications. Permanently disconnect all apparatus required to draw water from the supply such as a lake, stream, or spring.
- 3) Discontinuing City of Lacey water service.

The customer will be required to pass an inspection with the Public Works Department confirming successful elimination of the potential crossconnection.

6.6. Hazard Re-Assessment

Customers will be re-assessed to determine risk based on the following table:

<b>Table 3: Hazard Re-Assessment</b>	
Hazard Re-Assessment Task	Schedule
Customers assessed as a high health hazard (Table 9 of WAC 246-290-490 facilities) and protected by a premises isolation AG or RPBA	Not required as long as annual test results are satisfactory
Customers assessed as requiring premises isolation (supplemental to Table 9 of WAC 246-290-490 facilities)	Within 3 years if DCVA Installed
Customers where in-premises backflow assemblies are relied upon by purveyor	Within 3 years
All residential customers where purveyor relies upon compliance with Uniform Plumbing Code	Within 5 years (questionnaire)

## 7. Installation

### 7.1. Process

7.1.1. Permits and Plan Review Applications may be obtained from the Public Works Department. A plan review is required for any:

- 1) 2" or larger backflow prevention assembly
- 2) PVBA or SRVB

7.1.2. Devices must be installed by a Lacey Licensed Plumber inside of a building, or a Licensed Contractor, in full compliance with all relevant aspects of the Uniform Plumbing Code, and approved for use in Washington State.

7.1.3. BPA installation shall be inspected and approved by a City of Lacey CCS prior to testing.

### 7.2. General Considerations

7.2.1. Field modifications that affect the functionality or ability to test and maintain BPAs are not allowed. If the assembly is to be vertically oriented, the type and model specified shall be approved by DOH for vertical installation.

7.2.2. All BPAs shall be suitably supported and braced to prevent movement or strain.

7.2.3. Assemblies may not be installed above or next to electrical panels or motors.

7.2.4. Assemblies installed more than 5 feet above floor or ground level shall have a permanent, solidly constructed platform under it to provide safe access for testing and maintenance. The platform must comply with all applicable safety standards and policies; a ladder is not acceptable.

7.2.5. For installations where uninterrupted water service is necessary, a parallel assembly should be installed to facilitate testing and maintenance. The bypass or parallel assembly shall be of the same type (DCVA/RPBA).

7.2.6. The piping and fittings on the inlet side of the BPA shall be rigid brass, copper, or schedule 80 PVC. Galvanized piping or fittings are not allowed.

7.2.7. Assemblies used in domestic services lines shall be lead free.

### 7.3. Thermal Expansion

The installation of a backflow assembly may alter system-operating pressure, flow, and/or influence other hydraulic functions. Additionally, thermal expansion may result from the installation of a backflow assembly. It is the

property owner's responsibility to ensure system-operating requirements are adequate.

#### 7.4. Location

All backflow protection assemblies shall be installed in a location that is easily accessible for inspection and testing, with protection from freezing and adequate clearances for their proper operation. They shall never be submerged in water, or installed in an area subject to flooding. Drawings of installation specifications are located in City Development Guidelines, Chapter 6. Devices that do not meet these criteria shall be relocated as required by the City.

The City of Lacey has the authority to perform regular inspections on all backflow assemblies used to protect the Lacey water system and shall be provided reasonable access to the premises for inspection purposes. If reasonable access cannot be provided, a reduced pressure backflow assembly must be installed at the owner/user's expense, at the service connection to that premises.

##### 7.4.1. Clearances

7.4.1.1. All BPA's shall be installed in a manner that facilitates testing and operation. Both shut-off valves and all test cocks shall be operable and accessible. There shall be no obstacles or structures that may prevent access to the assembly.

7.4.1.2. Assemblies 2" and smaller shall have at least 6" clearance on all sides of the assembly. Alternatively, if the assembly is to be installed near a wall indoors, there shall be a minimum of 3" between the assembly and wall, and a minimum of 18" on the test cock side.

7.4.1.3. Assemblies larger than 2" shall have a minimum of 12" clearance on all sides of the assembly. In addition, they shall have a minimum of 24" clearance on the test cock side.

7.4.1.4. RPBA's must have a minimum of 12" clearance below the assembly drain opening for proper relief operation.

##### 7.4.2. Indoor

An RPBA installed inside a building shall be in a location where occasional spitting from the relief valve and possible constant discharge in the event of a fouled check valve will not be objectionable. An approved air gap assembly, provided by the manufacturer or fabricated for the specific installation, may be installed.

A line from the funnel may be run to an adequately sized floor drain of equal or greater size. Drains shall be sized to carry the full-rated flow of the

assembly. Check with the manufacturer for the relief valve discharge rates to determine the size of drain required.

#### 7.4.3. Outdoor

Assemblies must be protected from freezing and other severe weather conditions. This is accomplished with the use of an approved insulated box and concrete pad.

#### 7.4.4. Vaults

7.4.4.1. Vaults shall have adequate drainage. This is accomplished by complying with minimum clearances as specified in Development Guidelines, and utilizing a minimum of 12" of drainage rock below the vault or irrigation box.

7.4.4.2. Vaults containing 3" or greater BPAs must be equipped with a drain or float activated electric pump. Alternatively, the vault may have a boresighted drain to daylight.

7.4.4.3. RPBA's may not be installed below ground.

#### 7.5. Air Gap

If an air gap is to be utilized, it must be approved by the CCS and meet the following criteria:

- 1) Greater than 2 times the diameter of the supply pipe opening, but never less than 1" from the supply pipe opening and flood-level rim of the receiving vessel.
- 2) Side walls, ribs, or similar obstructions may affect the air gap if within a distance of three times the diameter of the opening for a single wall, or four times the diameter of the opening for intersecting walls. In this case, a minimum of 3 times the diameter of the supply pipe opening shall be used.

#### 7.6. Existing Devices

Any existing backflow protection assembly may be used provided:

- 1) The devices are functioning properly based on a current passing test report. 2) The degree of protection is appropriate for the degree of hazard.

Backflow assemblies that do not meet these criteria shall be removed and replaced with approved devices.

## 8. Testing

It is the responsibility of the water user to ensure their backflow prevention assemblies are tested in accordance with their required schedule and to have any failed assemblies repaired or replaced immediately. Failure to test will result in enforcement action as described in Section 4.

### 8.1. Periodicity

8.1.1. Backflow prevention assemblies shall be tested immediately and after they are installed, relocated or repaired. They shall not be placed in service unless they are functioning as required.

8.1.2. Assemblies shall be tested at least annually thereafter.

8.1.3. Assemblies in extremely hazardous connections may require more frequent testing as required by the CCS.

### 8.2. Reporting

8.2.1. Test reports for new installation or repairs must be submitted to the City Public Works Department within 30 days.

8.2.2. Test reports for annual verification must be submitted within the month that the assembly is due for testing.

8.2.3. A BAT may use their own test report forms, provided they contain all of the information required by the local health agency, or they may use the City of Lacey BPA Test Report found in the drawing section of this document.

8.2.4. A verification tag, indicating the device's passing status and test date must be clearly displayed on the assembly.

### 8.3. Customer Notification

As a courtesy, the City will notify the water user that a test is due approximately one month in advance. The notice will contain:

- 1) The service location
- 2) Assembly information, such as serial number, size, and type
- 3) The date by which the assembly must be tested or repaired
- 4) A contact person, usually designated CCS
- 5) A list of certified backflow assembly testers

8.4. Certified Backflow Assembly Testers (BAT)

The City of Lacey will maintain an annual list of certified BATs for distribution.

8.4.1. Any DOH certified tester may apply for inclusion on this list by submitting a copy of their current certification card, instrument calibration, and Lacey business license.

8.4.2. A BAT may be removed from the list at any time if they are suspected of fraudulent testing, or if valid customer complaints are received.

**9. Discontinued Use of Hazard**

If at any time a customer believes there is no longer an actual or potential crossconnection on their premises, they may request an inspection to verify elimination of the hazard and discontinued use of their backflow assembly/ies.

9.1. In-ground Irrigation system

9.1.1. If the use of a customer’s in-ground irrigation system is no longer desired, the system may be decommissioned by completing the following:

- 1) Remove the existing backflow assembly and cap the water supply line.
- 2) Remove zone control valves and sprinkler heads that are easily visible.
- 3) Remove plastic or concrete boxes and backfill.

9.1.2. Upon completion, the customer must call for an inspection to verify elimination of the potential cross-connection. A certified BAT may submit a test report on behalf of the customer indicating successful completion in lieu of an inspection.

**10. Reclaimed Water**

**All classes of reclaimed water shall be considered a high health hazard.** This is because the degree of treatment of reclaimed water is far less than the minimum requirements for the production of potable water. Even the Class A reclaimed water criteria allow water that could contain pathogens (disease-causing organisms). If reclaimed water is to be used on premises, the levels of protection shown on Table 4 must be used, at a minimum:

<b>Table 4: Backflow Protection with Reclaimed Water Use</b>	
1) Premises where the public water system is used to supplement the reclaimed water supply	AG

2) Piping systems where the public drinking water system is used to supplement new irrigation water mains, until which point reclaimed water becomes available	RPBA
3) Premises where reclaimed water is used other than in paragraph 1, and there is no interconnection with the potable water system	RPBA
4) Residences using reclaimed water for landscape irrigation where there is no interconnection with the potable water system	RPBA
5) Landscape irrigation where reclaimed water is used and there is no interconnection with the potable water system	DCVA

**All greywater systems shall be considered a high health hazard.** A greywater system uses the effluent from untreated household wastewater that hasn't come into contact with toilet waste or food processing waste. Greywater includes wastewater from bathtubs, showers, bathroom sinks, clothes washing machines and laundry tubs. Greywater excludes wastewater from kitchen sinks and dishwashers. A greywater system is sometimes used to supply water for underground landscape irrigation. The system typically contains one or more holding tanks, an underground distribution system connected to perforated irrigation pipe, an overflow gravity drain to the sewer or septic system, and a pump. If grey water is to be used on premises, the levels of protection shown on Table 5 must be used, at a minimum:

<b>Table 5: Backflow Protection with Grey Water Use</b>	
1) Premises where a grey water system is used	RPBA

## 11. Mobile Vessel and Hydrant Use

See Figure 5: Mobile Vessel and Hydrant Use

### 11.1. Fire Hydrant Use

11.1.1. A permit in the form of a meter rental agreement is required to use or operate fire hydrants or valves intended for fire-suppression purposes which are installed on water systems. A hydrant meter must be obtained from the City of Lacey Shop. If a hydrant is used without permission, the Lacey Police Department and Lacey Public Works Department should be notified immediately.

11.1.2. Water distributed through a hydrant meter for uses other than tank filling shall be protected from backflow and isolated from the potable water system with an approved Reduced Pressure Backflow Assembly (RPBA) In circumstances where a Double Check Valve Assembly (DCVA) is desired for use, it must be approved prior to meter rental by the City Cross-Connection Control Program Manager.

11.1.3. Whenever a mechanical means of backflow protection is required (RPBA or DCVA), the contractor shall insure that the assembly is tested by a certified BAT immediately upon installation. Along with the testing, a test report must be submitted to the City of Lacey Public Works Department. A Backflow Prevention Assembly certification tag must be affixed to the hydrant meter while in use.

11.1.4. Plumbing of pipe onto a hydrant for irrigation or dust control on a project is not permitted.

11.2. Mobile Vessel Use

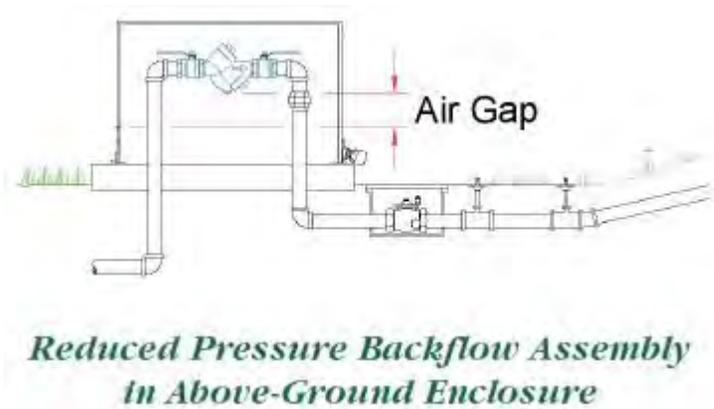
11.2.1. When using a hydrant meter to fill a tanker truck or portable tank of any kind, an approved permanently installed air gap of at least two times the inside diameter of the fill pipe is required.

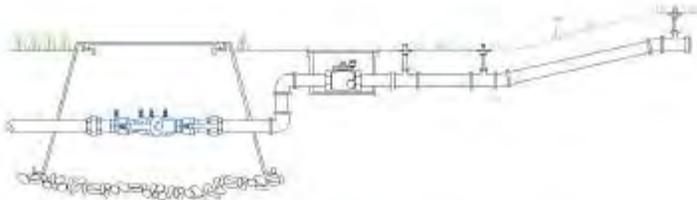
11.2.2. The air gap must have a current passing annual inspection by a certified CCS or BAT, and the inspection tag affixed to the vehicle.

**12. List of Drawings**

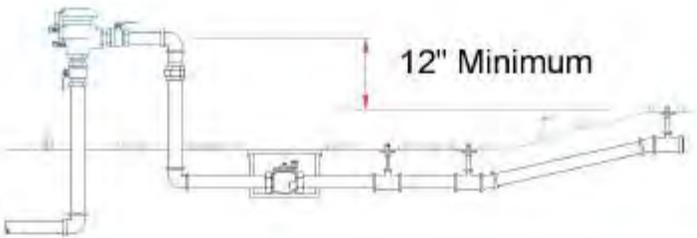
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**Figure 2: Examples of Installation**





*Double Check Valve Assembly  
in Below-Ground Box*



*Pressure Vacuum Breaker Assembly*

Figure 3: Air Gap

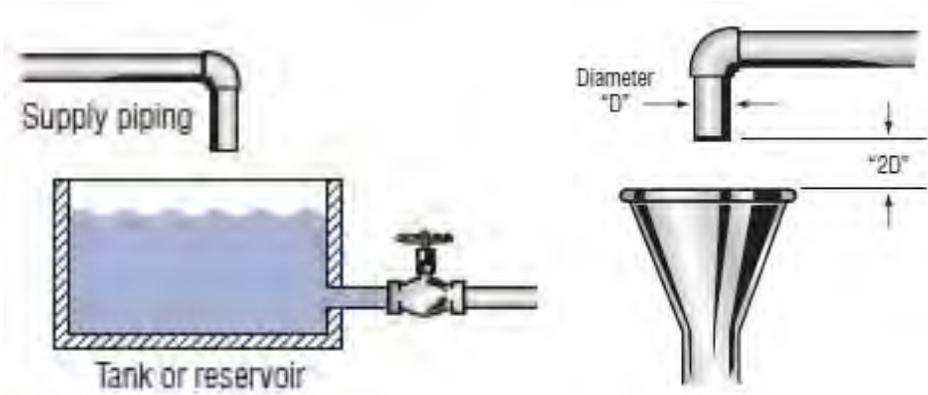


Figure 4: Hose Bibb Vacuum Breaker

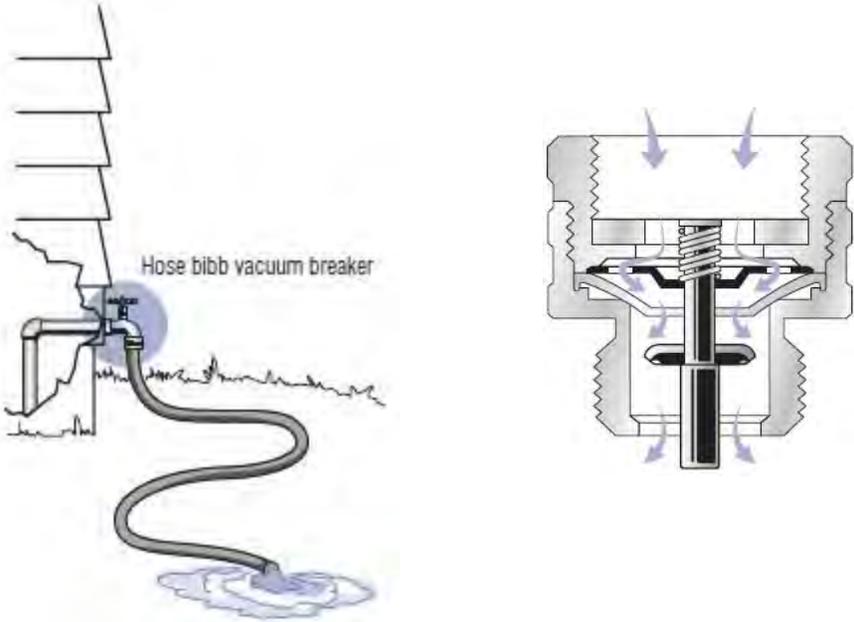
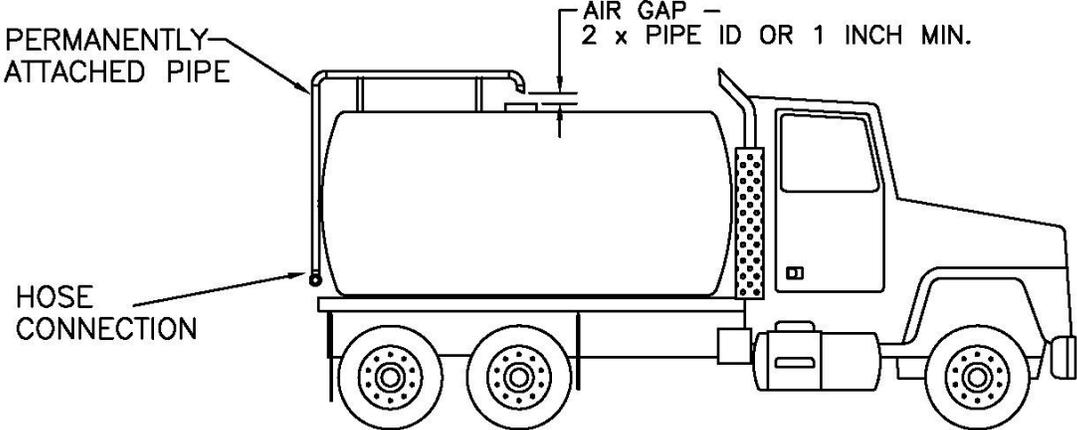
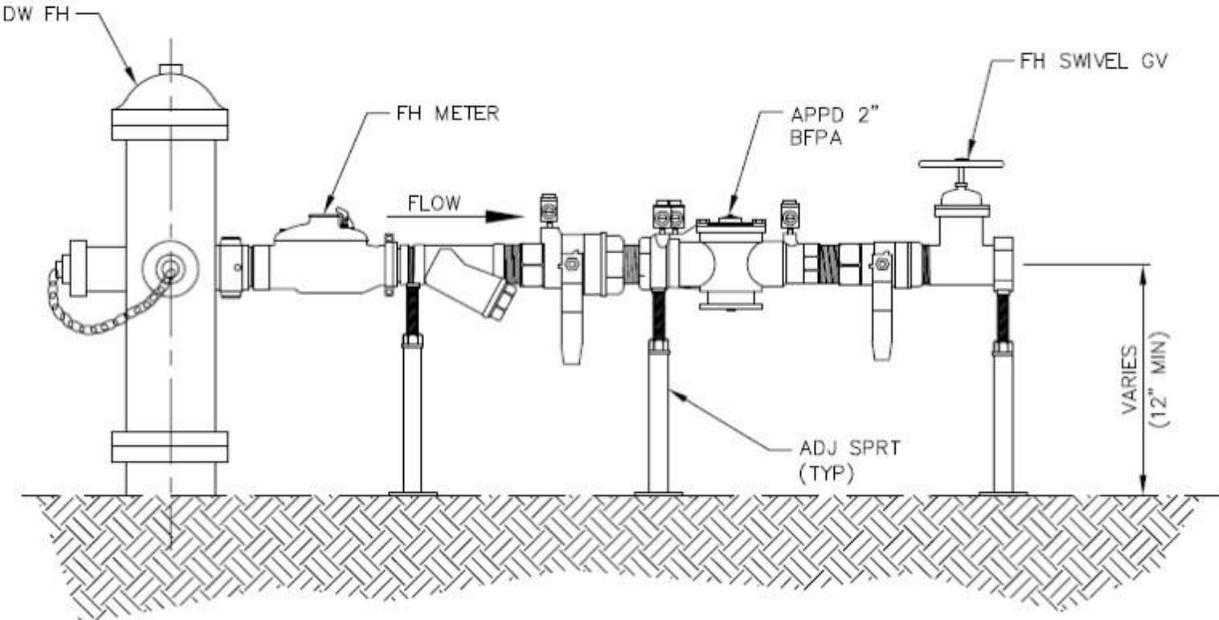


Figure 5: Mobile Vessel and Hydrant Use



WITH AIR GAP



HYDRANT METER WITH BACKFLOW ASSEMBLY



# BACKFLOW PREVENTION ASSEMBLY TEST REPORT

CITY OF LACEY Public Works  
 420 College St. SE Lacey, WA 98503  
 (360) 413-4341 FAX (360) 456-7799 backflow@ci.lacey.wa.us

PWS ID	Water System Name	File #
Facility Name	<input type="checkbox"/> Non-Residential <input type="checkbox"/> Residential	
Service Address	City	Zip
Contact Person	Phone	Email
Hazard Type (if known)	<input type="checkbox"/> DCVA <input type="checkbox"/> RPBA <input type="checkbox"/> PVBA <input type="checkbox"/> AG <input type="checkbox"/> Other	
Preventer Physical Location		
<input type="checkbox"/> New <input type="checkbox"/> Existing <input type="checkbox"/> Replacement: Old Ser. #		Confined Space Yes <input type="checkbox"/> No <input type="checkbox"/>
Assembly Make	Model	Serial # Size "
USC-Approved Yes <input type="checkbox"/> No <input type="checkbox"/>	Proper Install Yes <input type="checkbox"/> No <input type="checkbox"/>	Proper Orientation Yes <input type="checkbox"/> No <input type="checkbox"/>

Initial Test	DCVA	RPBA	PVBA/SVBA
Passed <input type="checkbox"/>	<u>Check Valve 1</u> Leaked <input type="checkbox"/> ___ psid	<u>Relief Valve</u> Opened ___ psid/ Not Open <input type="checkbox"/>	<u>Air Inlet Valve</u> Opened at ___ psid Did Not Open <input type="checkbox"/>
Failed <input type="checkbox"/>	<u>Check Valve 2</u> Leaked <input type="checkbox"/> ___ psid	<u>Check Valve 2</u> Closed Tight <input type="checkbox"/> Leaked <input type="checkbox"/>	Opened Fully Yes <input type="checkbox"/> No <input type="checkbox"/>
		<u>Check Valve 1</u> ___ psid	<u>Check Valve</u> ___ psid
		<u>Approved Air Gap</u> Yes <input type="checkbox"/> No <input type="checkbox"/>	Leaked <input type="checkbox"/>
Cleaning, Repairs, & Parts	Cleaned <input type="checkbox"/> Repaired <input type="checkbox"/>	Cleaned <input type="checkbox"/> Repaired <input type="checkbox"/>	Cleaned <input type="checkbox"/> Repaired <input type="checkbox"/>
	<input type="checkbox"/> Disc <input type="checkbox"/> O-Ring(s)	<input type="checkbox"/> Disc <input type="checkbox"/> O-Ring(s)	<input type="checkbox"/> Air Inlet Disc <input type="checkbox"/> Float
	<input type="checkbox"/> Spring <input type="checkbox"/> Module	<input type="checkbox"/> Spring <input type="checkbox"/> Module	<input type="checkbox"/> Air Inlet Spring <input type="checkbox"/> Diaphragm
	<input type="checkbox"/> Guide <input type="checkbox"/> Rubber Kit	<input type="checkbox"/> Diaphragm <input type="checkbox"/> Rubber Kit/Guide	<input type="checkbox"/> Check Disc <input type="checkbox"/> Rubber Kit
	<input type="checkbox"/> Seat <input type="checkbox"/>	<input type="checkbox"/> Seat <input type="checkbox"/>	<input type="checkbox"/> Check Spring <input type="checkbox"/>
Final Test	<u>Check Valve 1</u> Leaked <input type="checkbox"/> ___ psid	<u>Relief Valve</u> Opened at ___ psid	<u>Air Inlet Valve</u> Opened at ___ psid
Passed <input type="checkbox"/>	<u>Check Valve 2</u> Leaked <input type="checkbox"/> ___ psid	<u>Check Valve 2</u> Closed Tight <input type="checkbox"/>	Opened Fully Yes <input type="checkbox"/> No <input type="checkbox"/>
Failed <input type="checkbox"/>		<u>Check Valve 1</u> ___ psid	<u>Check Valve</u> ___ psid

Air Gap Inspection Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Supply Pipe Diameter "	Air Gap Separation "
Line Pressure psi	Detector Meter Gals <input type="checkbox"/> CuFt <input type="checkbox"/>	Service Restored Yes <input type="checkbox"/> No <input type="checkbox"/>

Remarks\*

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Test Kit Make & Model	Serial #	Ver./Cal Date**
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By this signature, I certify:

- I personally inspected and field-tested the backflow assembly using field test procedures meeting WAC 246-290-490 and test equipment meeting WAC 246-292-034; or I personally inspected the air gap or AVB.
- The information in this report is true, complete, and accurate.

BAT Signature (initial test)	Cert. #	Date/Time
BAT Name (print)	BAT Phone #	
Repaired By	Date/Time	
BAT Signature (after repair)	Cert. #	Date/Time
BAT Name (print)	BAT Phone #	
BAT Company Name	Address	



420 COLLEGE STREET SE  
 LACEY, WA 98503-1238  
 (360) 413-4341 Fax (360) 456-7799  
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 together*

**Preliminary Cross-Connection  
 Control Hazard Assessment Form *Non-Residential Customers***

**Name of Customer or Business:** \_\_\_\_\_  
**Address:** \_\_\_\_\_  
**Phone Number:** \_\_\_\_\_  
**Description of Business:** \_\_\_\_\_

Is your business or premises of a type included in the table below (check all that apply)?

Agricultural (farm or dairy)		Metal plating industry	
Beverage bottling plant		Mortuary	
Car wash		Petroleum processing or storage plant	
Chemical plant		Pier or dock	
Commercial laundry or dry-cleaners		Radioactive material processing	
Having both reclaimed water and potable water provided		Survey access denied or restricted	
Film processing plant		Wastewater lift station or pumping station	
Hospital, medical center, nursing home, veterinary, medical, or dental clinic, or blood plasma center		Having an unapproved auxiliary water supply interconnected with the potable water supply	
Having separate irrigation system using City water and adding chemicals*		Marijuana growing or processing	
Laboratory		Other	

\*e.g., parks, playgrounds, golf courses, cemeteries, estates, etc.

Other potential cross-connection concerns:

- Irrigation system
- Fire sprinkler system,  using chemicals or anti-freeze
- Swimming pool
- Other (describe): \_\_\_\_\_

**Note to customer:** This form is used for preliminary assessment only. The City may require a more thorough assessment at a later date.



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 (360) 413-4341 Fax (360) 456-7799

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**This form was completed by (print name):**

**Date:** \_\_\_\_\_

**Water Use Questionnaire**  
*Residential Customers*

Customer Account Number (optional)

Customer Name

Address Line 1

Address Line 2

Please indicate whether the special plumbing or activities listed below apply to your premises:

Yes	No	Plumbing or Activity Present on Customer's Premises
		Underground sprinkler system
		Water treatment system (e.g. water softener)
		Solar heating system
		Residential fire sprinkler system
		Sewage pumping facilities or grey water system
		Boat moorage with water supply
		Hobby farm (5-10 acres)
		Animal watering troughs
		Swimming pool or spa
		Greenhouse
		Decorative pond
		Photo lab or dark room
		Other water supply (whether connected to plumbing system or not). This includes but is not limited to private wells, and ability to draw water from lakes, streams or springs.
		Home-based business. If Yes, list type/describe (e.g., beauty salon, machine shop, etc.): _____ _____

Completed by (print name): \_\_\_\_\_ Date: \_\_\_\_\_



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LACEY, WA 98503-1238  
(360) 413-4341 Fax (360) 456-7799

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Resident's Signature: \_\_\_\_\_

**Cross-Connection Control Hazard Survey Report**  
*Non-Residential Customers*

Survey date: \_\_\_\_\_

**Customer Information:**

Premises name: \_\_\_\_\_ Telephone: \_\_\_\_\_

Address: \_\_\_\_\_

Contact person: \_\_\_\_\_ Title: \_\_\_\_\_

Description of premises: \_\_\_\_\_

Description of water use: \_\_\_\_\_

**Water Service and Backflow Prevention Assembly (BPA):**

Service Type	Size	Meter #	BPA Size	BPA Type
Domestic				
Irrigation				
Fire				
Other				

**Cross-Connection Control Specialist (CCS) Information:**

Name: \_\_\_\_\_ Telephone: \_\_\_\_\_

Company name: \_\_\_\_\_

Address: \_\_\_\_\_ ZIP: \_\_\_\_\_

DOH CCS Certification #: \_\_\_\_\_ Year certified: \_\_\_\_\_



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Cross-Connection Control Survey Report (Continued)

Page 3 of 3

**Surveyor's Recommendations:**

I certify that this cross-connection hazard survey accurately reflects the overall risk posed by the customer's plumbing system to the City's distribution system. Based on the above survey, I certify that:

- 1. I found the following type(s) of premises isolation backflow preventer(s): Air Gap  
 RPBA/RPDA  DCVA/DCDA  None
- 2. The existing backflow preventer(s) is/are properly installed. Yes  No  N/A
- 3. The existing backflow preventer(s) is/are commensurate with the degree of hazard: Yes   
 No  N/A
- 4. Since no backflow preventer was installed for premises isolation, the premises owner should install a premises isolation backflow preventer of the following type: Air Gap   
 RPBA/RPDA  DCVA/DCDA  N/A
- 5. The premises owner should replace the existing premises isolation backflow preventer(s) with the following:  
 Air Gap  RPBA/RPDA  DCVA/DCDA  N/A

*The completed survey report shall be first signed by the CCS conducting the survey, and then countersigned by the owner of the premises or the owner's authorized agent.*

**CCS Signature:** \_\_\_\_\_  
**Date:** \_\_\_\_\_

As the Owner of the Premises (or Owner's authorized agent), I certify that I have received a copy of this completed Cross-Connection Control Hazard Survey Report.

**Signature:** \_\_\_\_\_  
**Date:** \_\_\_\_\_

Note: Customers and regulatory agencies should be aware that the Purveyor's requirement for this cross-connection hazard survey and/or for the installation of a specific backflow prevention assembly on a service pipe *do not* constitute an approval of the customer's plumbing system, compliance of the customer's plumbing system with the Uniform Plumbing Code or an assurance of the absence of cross connections in the customer's plumbing system.