

City of Kelso **ENGINEERING DESIGN MANUAL**



Adopted by City of Kelso City Council
February 1, 2011
Amended June 20, 2017

Effective
February 6, 2011
Amended Effective Date June 25, 2017

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Chapter 1

General Design Requirements

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CHAPTER 1 – GENERAL DESIGN REQUIREMENTS

1.00 Requirements for Public Improvements

A. General

The purpose of this document is to set standards for the design and construction of public improvements. These include street, bikeway, drainage, water, and sanitary sewer improvements as required by the development review process, City ordinance, and other City policies adopted by the City. Standards for site grading, drainage, erosion control, parking lot, private street, and driveway construction on private property are also contained in the KEDM. No such work shall commence prior to City approval of the construction plans. Design submitted shall be stamped by a registered professional engineer licensed to practice in the State of Washington, or as otherwise approved by the Director.

All public improvements and private streets, parking lots, sidewalks, and driveways shall be designed and constructed in such a manner as to be readily accessible to and usable by individuals with disabilities as per the requirements of the Americans with Disabilities Act of 1990. This includes providing curb ramps at intersections with pedestrian crosswalks to allow a smooth transition between street and sidewalk elevations.

B. Shortened Designation

This City of Kelso Engineering Design Manual shall be cited routinely in the text as the "KEDM."

C. Applicability

The KEDM shall govern all new construction and upgrading of facilities both in the right-of-way and on-site for: transportation-related facilities; storm drainage facilities and stream channel improvements; sewer and water improvements; and park, recreation, and open-space facilities used by the public.

1.01 Precedence of Documents

If there is a conflict between approval documents, the document highest in precedence shall control. The precedence shall be:

First: Permits from other agencies as may be required by law.

Second: Modifications to the KEDM as approved by the Director.

- Third: Conditions of approval, facilities review, and site development permit.
Fourth: City of Kelso Ordinances.

Fifth: KEDM.

Sixth: The 2012 Stormwater Management Manual for Western Washington, as amended in December 2014 (where applicable).

Seventh: Plans and details prepared by the Design Engineer.

Eighth: WSDOT Standards Specifications for Road, Bridge, and Municipal Construction.

Ninth: Reference specifications.

Supplemental written agreements and approved revisions to plans and specifications by the appropriate jurisdiction will take precedence over documents listed above. Detailed plans shall have precedence over general plans. In any event, the determination of the Director shall be final.

1.02 Abbreviations and Definitions

<i>AASHTO</i>	American Association of State Highway and Transportation Officials.
<i>ADA</i>	Americans with Disabilities Act of 1990.
<i>Applicant</i>	Any person, firm or corporation applying for public services, or responsible party for a development application.
<i>ASTM</i>	American Society for Testing and Materials.
<i>Best Management Practice (BMP)</i>	The schedules of activities, prohibitions of practices, maintenance procedures, and structural and/or managerial practices, that when used singly or in combination, prevent or reduce the release of pollutants and other adverse impacts to waters of Washington State or the stormwater drainage system.
<i>Bicycle Facilities</i>	A general term denoting improvements and provisions which accommodate or encourage bicycling, including parking facilities, maps, signs, pathways, bike lanes, widened sidewalks, bikeways, and shared roadways designated for bicycle use.
<i>Bicycle Lane (Bike Lane)</i>	A portion of a roadway, which has been designated by striping, signing and pavement markings for the preferential or exclusive use of bicyclists.
<i>BMP</i>	Best Management Practice

<i>Bioretention BMP</i>	Engineered facilities that store and treat stormwater by passing it through a specified soil profile, and either retain or detain the treated stormwater for flow attenuation.
<i>City</i>	City of Kelso.
<i>City Engineer</i>	City Engineer for the City of Kelso or their Designee.
<i>Connection</i>	As used in relation to transportation systems, the connection of a private or public street, driveway, or alley at the right-of-way line to a public street. As used in relation to a storm drainage system, the connection of a private storm drainage system to the municipal stormwater drainage system.
<i>Construction Stormwater Pollution Prevention Plan (C-SWPPP)</i>	A document that describes the potential for pollution problems on a construction project and explains and illustrates the measures to be taken on the construction site to control those problems.
<i>Continuous simulation hydrologic model</i>	A computer model used to simulate the physical processes of surface water runoff over an extended period of time using continuous meteorological and streamflow records. Models approved for use in designing flow control facilities (MR 7) and on-site stormwater management BMPs on sites meeting the LID Performance Standard are listed in the SWMMWW, Vol. II, Section 2.1.
<i>Contractor</i>	The agent of the applicant completing the construction activities associated with a given project.
<i>Developer</i>	The owner and/or their agents or contractors responsible for a given project.
<i>Development</i>	Any improvement, public or private, which requires a building or civil engineering permit.
<i>Director</i>	Community Development Director/City Engineer or their designee.
<i>Dispersion</i>	Release of surface and stormwater runoff such that the flow spreads over a wide area and is located so as not to allow flow to concentrate anywhere upstream of a drainage channel with erodible underlying granular soils.
<i>DOH</i>	Washington State Department of Health.
<i>Driveway</i>	Any access to any property that is not defined under a public or private road.
<i>Ecology</i>	Washington State Department of Ecology

<i>Erosion</i>	The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep. Also, detachment and movement of soil or rock fragments by water, wind, ice, or gravity.
<i>Applicant Engineer</i>	A Professional Engineer doing the project design.
<i>fps</i>	Feet per second
<i>Hard Surface</i>	An impervious surface, a permeable pavement, or a vegetated roof.
<i>HMA</i>	Hot Mix Asphalt. Also known as asphaltic concrete.
<i>Impervious surface</i>	A non-vegetated surface area that either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development. A non-vegetated surface area which causes water to run off the surface in greater quantities or at an increased rate of flow from the flow present under natural conditions prior to development. Common impervious surfaces include but are not limited to roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam or other surfaces which similarly impede the natural infiltration of stormwater. Open, uncovered retention/detention facilities shall not be considered as impervious surfaces for purposes of determining whether the thresholds for application of the Minimum Requirements are exceeded. Open, uncovered retention/detention facilities shall be considered impervious surfaces for purposes of runoff modeling.
<i>Intersection</i>	Refers to the area jointed by two (2) or more roads intersecting. For approaches of a continuous street at an acute curve or some other angle point with different street names.
<i>Land-disturbing Activity</i>	Any activity that results in a change in the existing soil cover (both vegetative and nonvegetative) and/or the existing soil topography. Land-disturbing activities include, but are not limited to clearing, grading, filling, and excavation. Compaction that is associated with stabilization of structures and road construction shall also be considered a land-disturbing activity. Vegetation maintenance practices, including landscape maintenance and gardening, are not considered land-disturbing activity. Stormwater facility maintenance is not considered land-disturbing activity if conducted according to established standards and procedures.
<i>LID Manual</i>	Low Impact Development Technical Guidance Manual for Puget Sound, December 2012

<i>Low Impact Development (LID) BMPs</i>	A synonym for on-site stormwater management BMPs.
<i>MR</i>	Ecology's Minimum Requirements
<i>Multi-Use Trail</i>	A pathway designated for pedestrian or bicycle use.
<i>Native vegetation</i>	Vegetation comprised of plant species, other than noxious weeds, that are indigenous to the coastal region of the Pacific Northwest and which reasonably could have been expected to naturally occur on the site. Examples include trees such as Douglas fir, western hemlock, western red cedar, alder, big-leaf maple; shrubs such as willow, elderberry, salmonberry, and salal; and herbaceous plants such as sword fern, foam flower, and fireweed.
<i>NPDES</i>	National Pollutant Discharge Elimination System
<i>On-site Stormwater Management BMP</i>	Distributed stormwater management practices, integrated into a project design, that emphasize pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration. LID BMPs include, but are not limited to: BMP T7.30: Bioretention Cells, Swales, and Planter Boxes, BMP T5.14A: Rain Gardens, BMP T5.14B: Bioretention, BMP T5.15: Permeable Pavements, roof downspout controls, dispersion, BMP T5.13: Post-Construction Soil Quality and Depth, BMP T5.19: Minimal Excavation Foundations, BMP T5.17: Vegetated Roofs, and water re-use.
<i>Parking Lot</i>	Any area intended to accommodate parked vehicles for free or for a fee and not accessory to single-family residences.
<i>Permeable Pavement</i>	Pervious concrete, porous asphalt, permeable pavers or other forms of pervious or porous paving material intended to allow passage of water through the pavement section. It often includes an aggregate base that provides structural support and acts as a stormwater reservoir. Also known as a permeable pavement BMP.
<i>Pollution-generating hard surface (PGHS)</i>	Those hard surfaces considered to be a significant source of pollutants in stormwater runoff. See the listing of surfaces under pollution-generating impervious surface.

<i>Pollution-generating impervious surface (PGIS)</i>	Those impervious surfaces considered to be a significant source of pollutants in stormwater runoff. Such surfaces include those which are subject to: vehicular use; industrial activities (as further defined in this glossary); or storage of erodible or leachable materials, wastes, or chemicals, and which receive direct rainfall or the run-on or blow-in of rainfall; metal roofs unless they are coated with an inert, non-leachable material (e.g., baked-on enamel coating); or roofs that are subject to venting significant amounts of dusts, mists, or fumes from manufacturing, commercial, or other indoor activities.
<i>Pollution-generating pervious surface (PGPS)</i>	Any non-impervious surface subject to vehicular use, industrial activities (as further defined in this glossary); or storage of erodible or leachable materials, wastes or chemicals, and that receive direct rainfall or run-on or blow-in of rainfall, use of pesticides and fertilizers, or loss of soil. Typical PGPS include permeable pavement subject to vehicular use, lawns and landscaped areas including: golf courses, parks, cemeteries, and sports fields (natural and artificial turf).
<i>Private Street</i>	Any vehicular access way, designed or intended to serve three or more parcels or dwelling units or any commercial business which has not been dedicated and accepted as a public roadway.
<i>Professional Engineer</i>	An engineer licensed in the State of Washington
<i>Rain Garden</i>	A non-engineered shallow, landscaped depression, with compost-amended native soils and adapted plants. The depression is designed to pond and temporarily store stormwater runoff from adjacent areas, and to allow stormwater to pass through the amended soil profile.
<i>Securities</i>	Bonds, retainers, cash deposits, assigned savings, or another type of guarantee used to guarantee the performance of or correct deficient work.
<i>sf</i>	Square feet.
<i>Sidewalk</i>	The portion of a street designed for preferential use by pedestrians.
<i>Standard Drawings</i>	City of Kelso drawings that portray the repetitious details of certain types of construction and are found in appendices to the KEDM.
<i>Stormwater facility</i>	A constructed component of a stormwater drainage system designed or constructed to perform a particular function, or multiple functions. Stormwater facilities include but are not limited to pipes, swales, ditches, culverts, street gutters, detention ponds, retention ponds, constructed wetlands, infiltration devices, catch basins, oil/water separators, and biofiltration swales.

<i>Stormwater Site Plan</i>	The comprehensive report containing all of the technical information and analysis necessary for a regulatory agency to evaluate a proposed new development or redevelopment project for compliance with stormwater requirements.
<i>Street</i>	A public or private way, which affords the principal means of access to abutting property.
<i>SWMMWW</i>	2012 Stormwater Management Manual for Western Washington, as Amended in December 2014, by Department of Ecology.
<i>SWPPP</i>	Stormwater Pollution Prevention Plan.
<i>Trail</i>	“Trail” is synonymous with Bicycle Path (off-street pathway).
<i>Trip Generation</i>	The most recent calculated trip rates (either calculated by average or formula), published by the Institute of Traffic Engineers or other transportation engineering analysis proposed by an applicant and deemed appropriate by the Director.
<i>Traffic Engineer</i>	An individual licensed by the State of Washington to practice professional engineering who has been retained by the City or others to design roadway improvements, including utilities.
<i>Unimproved Surface</i>	Any surface that is not maintained or where natural vegetation is expected to grow taller than 6 inches.
<i>Unsignalized Access Spacing</i>	The distance between intersections that do not have traffic signals.
<i>WAC</i>	Washington Administrative Code.
<i>WSDOT</i>	Washington State Department of Transportation
<i>Wetlands</i>	Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Identification and delineation of jurisdictional wetlands and wetland boundaries shall be done by a qualified biologist using applicable State and Federal guidelines.
<i>WSDOT Standard Specifications</i>	The latest edition of the “Standard Specifications for Road, Bridge, and Municipal Construction” as published by the Washington State Department of Transportation and the American Public Works Association.

1.03 Permits

Permits, approvals, or agreements are required by the City and sometimes by other jurisdictions, prior to initiating any construction or demolition work elements described within the KEDM.

The majority of work covered under the KEDM 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 substantial permit can be issued. Any questions regarding information about permits, approvals, and agreements should be directed to the Director.

Grading permits may be issued at the discretion of the Director between May 1st and October 1st, provided that the Director may extend or shorten this time period on a case by case basis depending on actual weather conditions. If structures are proposed to be installed in the future, the grading permit must be closed prior to issuance of a building permit.

1.04 Submittal Requirements

A. General

1. Submittal requirements consist of Civil Site Development Plan, grading plans (where required), stormwater plans and reports (where required), erosion control plans (where required), drainage calculations, geotechnical reports, and other information as required. Letters of transmittal referencing the project name shall accompany all submittals.
2. The WSDOT Standard Specifications are hereby adopted and incorporated as part of this document by reference except as modified herein.
3. General specifications for design plan sets, plan views, profile views, and details sheets to be used in all classes of submittals are given in Section B, C, D, E, and F of the KEDM.

B. Design Plan Format Specifications

Design Plan Format Specifications shall be the minimum specifications used for all plan sets requiring civil engineering, including the Civil Site Development Plan, the Stormwater Site Plan, and other plans. Some plans may have additional specifications.

1. The plans shall be electronically drafted and submitted on 22" x 34" sheets, landscape format.
2. Each Plan shall have a Cover sheet showing the following:

- a. Project name
 - b. Project number, if a City project
 - c. Date
 - d. Vicinity map showing the location of the project in respect to the nearest major street intersection
 - e. Site information including street address (if applicable), Assessor's taxlot, and/or Abbreviated Legal Description
 - f. Name and mailing address of applicant/owner, engineering firm, survey firm, geotechnical engineer, and landscape architect
 - g. Notice to excavators to call for locates prior to excavation
 - h. Four inch by four-inch space in the lower right corner for the City of Kelso's approval stamp.
 - i. The following statement shall appear on the cover sheet of all plans at a location immediately above or below the Applicant Engineer's professional stamp:

“I hereby certify that these plans, and related design, were prepared in conformance with the City of Kelso's Engineering Design Manual. I acknowledge that City approval of these documents does not transfer liability.”
 - j. Index of sheets (Note: the index of sheets may be shown instead on a Notes and Legends sheet behind the Cover sheet.)
 - k. Legend that provides the name and symbol for all symbols used on the subsequent sheets. (Note: the Legend may be shown instead on a Notes and Legends sheet behind the Cover sheet. Alternatively, a legend may be placed on each sheet showing symbols used on that sheet.)
3. The scale shall be 1-inch = 5 feet vertically, and 1-inch = 20 feet horizontally for all drawings. A scale of 1-inch = 10 feet may be used for more detailed drawings such as intersection drawings. The composite utility plan may be at a smaller scale if needed. Scale shall be shown with north arrow and within a title block. All scales shall be as designated above unless otherwise approved by the Director.
 4. The location and elevation of a National Geodetic Survey, United States Geological Survey, Cowlitz County, or City of Kelso bench mark shall be shown. No other datum shall be used without permission of the City.

Temporary control bench marks and elevations shall also be shown on the plans.

5. A north arrow and scale bar shall be shown on each plan view sheet of the plans and adjacent to any other drawing, which is not oriented the same as other drawings on the sheet.
6. Letter size shall not be smaller than 0.10 of an inch high.
7. A title block shall appear on each sheet of the plan set. The title block shall include the name of the project, the engineering firm, the Owner, the sheet title, and the sheet number.
8. The seal of the registered Washington Professional Engineer responsible for preparation of the plans shall appear on each sheet.
9. The description and date of all revisions to the plans shall be shown on each sheet affected, and shall be approved and dated by the registered Professional Engineer of record as evidenced by an original signature or initial.
10. Through use of standard drafting symbols, indicate the location and direction of view for all sections.
11. Match lines shall have stationing and sheet number references.

C. Civil Site Development Plan Submittal

The Civil Site Development Plan is the master plan set, which can or may incorporate other required plan submittals, such as the site grading plan and the Stormwater Site Plan. At the minimum the Civil Site Development Plan shall include the following:

1. Composite utility plan: include existing public and private utilities, and proposed public improvements.
2. Approved preliminary plat (if it's a subdivision).
3. Landscape plan, if applicable, including sidewalks, bikeways, retaining walls, landscaping, irrigation, and lighting.
4. Signing and striping plan, if applicable.
5. Plan view shall show the following when applicable:
 - a. Right-of-way, property, tract, and easement lines (existing and proposed).

- b. Subdivision name, lot numbers, street names, and other identifying labels. Subdivision and street names are subject to the approval of the City Planning Director, Fire Chief, and Director.
- c. Location and stationing of existing and proposed street center lines and curb faces.
- d. Horizontal alignment and curve data of street center lines and curb returns including bearings along centerline.
- e. Existing underground utilities and trees over 6-inches in diameter within the construction limit.
- f. Location of existing buildings, wells, septic tanks, on-site sewage drain fields, fuel tanks, and any other buried structures.
- g. Location, stationing, and size of all mains and service lines for storm drainage, sanitary sewer, and water; and location of all fire hydrants. Stationing shall be located in relationship to the street stationing at all manholes or other key locations.
- h. Provisions for cross-connection control must be clearly shown on the plans, including any retro-fitting of existing water service connections and existing auxiliary water supplies, conversions to City of Kelso water service that are required as a condition of development approval, upgrading of existing service connections by replacement of same, and any other cross connection control required by state and local rules and codes.
- i. Street stationing to be noted at a minimum of 100-foot stations.
- j. Top of curb elevations along curb returns at quarter-delta's and 100-foot stations.
- k. Location of the low points of street grades and curb returns.
- l. Sidewalk locations. This shall include ramps, transitions in location or width, and relationship with driveways. It shall be shown with hatching what sidewalk is proposed to be constructed with the street and what sidewalk is proposed to be constructed with the buildings.
- m. Crown lines along portions of streets transitioned from one typical section to another.
- n. Centerline stationing of all intersecting streets.
- o. Location and description of existing survey monuments, including but not limited to: section corners, quarter corners, donation land claim corners, and City bench marks.
- p. Location of proposed street intersection monument boxes.
- q. FEMA designated 100-year flood plains and flood ways, or areas of flooding during a 100-year storm event.

- r. Existing drainage and stormwater facilities, including off-site facilities, upstream and downstream that affect the design (e.g. downstream restrictions that back water onto project site). Locations of catch basins, pipes, channels, ditches, swales, culverts.
 - s. Streams, springs, wetland areas, wetland buffers and other waters of the State.
 - t. Any additional information that the City deems necessary.
6. Profile views shall show the following:
- a. Stationing, elevations, vertical curve data (including curve k factors), and slopes for center of streets or top of curbs. For off-set or super elevation cross-sections, both curbs shall be profiled. Where curbs are not to be constructed, center line of street and ditch inverts shall be shown.
 - b. Original ground along the center line, and if necessary at the edges of the right-of-way if grade differences are significant.
 - c. Center line, top of curb, and gutter flow lines of existing streets for a distance of at least 300 feet each way at intersections with proposed streets. For stub streets that may be extended in the future, the vertical alignment shall be designed for at least 300 feet beyond the scope of the proposed construction, unless otherwise approved by the Director. At the discretion of the Director, additional design information concerning the vertical and horizontal alignment of future street extensions may be required.
 - d. Vertical alignment of streets, including existing center line monumentation.
 - e. The top of curb for all cul-de-sacs, eyebrows, and curb returns.
 - f. Profiles of existing drainage and stormwater facilities, including off-site facilities, upstream and downstream that affect the design (e.g. downstream restrictions that back water onto project site). In addition, base flood elevations shall be shown on the profile.
 - g. All proposed drainage and stormwater facilities; all invert and top elevations, slopes, direction of flow, materials, bedding, and backfill.
 - h. Profiles for ditch and creek flowlines shall extend a minimum of 200 feet beyond the project, both upstream and downstream with typical cross sections at 50-foot intervals, unless otherwise approved by the Director.
 - i. Designate structures using alpha or numeric labels on profiles to correspond to plan view notation.
 - j. Profile for existing and proposed storm, sanitary, and water mains.
 - k. All existing and proposed sanitary, water, storm lines, and other utilities crossing the profile.

7. Detail sheets

Detail sheets shall be provided as part of the Site Development Plans and other required plans. The detail sheet(s) shall show all City Standard Details and special details necessary for the project. The detail sheet(s) shall show all City Standard Notes applicable to the project.

All Details shall be full size.

D. Site Grading Plan Submittal

The City of Kelso requires a site grading plan as part of the application for any development that involves the excavation or fill of greater than 50 cubic yards of material or the disturbance of 7,000 square feet or more of land (land-disturbing activity). Grading contours (existing & proposed) shall be at no more than 2-foot intervals. Existing contours shall extend beyond the project site a minimum of 50 feet. Existing contours and elevations on the grading plan shall be prepared, stamped and sealed by a surveyor licensed in the State of Washington.

All land-disturbing activity must adhere to the requirements of Chapter 2 for erosion and sedimentation control.

E. Structural Submittal

Structural construction plans and the necessary calculations stamped by a structural engineer shall be submitted for proposed structures, as determined by the Director (i.e. walls, box culverts, bridges). A letter from the structural engineer approving installation of the structure shall be submitted prior to as-built approval.

F. Other Requirements

Other information to be shown on the construction drawings or other submittals includes:

1. The design elements such as:
 - a. Street classification;
 - b. Design speed;
 - c. Super elevation;
2. For construction sites that disturb one or more acres of land, or are part of a larger common plan of development or sale that eventually will disturb one or more acres of land, submit a copy of the Notice of Intent for the Construction Stormwater General Permit the applicant or Applicant Engineer submitted to

Ecology. If the site was granted a waiver by Ecology, submit a copy of the waiver instead.

3. Any additional information that the Director deems necessary to review the plans and assure compliance with design standards.

G. Stormwater Submittals Guide

Development projects and land-disturbing activities that exceed the thresholds in Chapter 2 of the KEDM are required to prepare and submit a Stormwater Site Plan. The Stormwater Site Plan encompasses the entire submittal for stormwater and drainage review.

Depending on the size and complexity of the development or activity, applicants must prepare either an Abbreviated Stormwater Site Plan or a Full Stormwater Site Plan. The size and complexity are evaluated using the applicability criteria found in Chapter 2 of the KEDM.

1. Abbreviated Stormwater Site Plan

Sites that trigger MRs 1-5 in accordance with Chapter 2 of the KEDM shall prepare an Abbreviated Stormwater Site Plan. The Abbreviated Stormwater Site Plan meets the requirements of MR 1.

To fulfill this requirement, applicants shall complete the Abbreviated Stormwater Site Plan form available from the City and shall provide the required attachments.

2. Full Stormwater Site Plan

Sites that trigger MRs 1-9 in accordance with Chapter 2 of the KEDM shall prepare a Full Stormwater Site Plan. The Full Stormwater Site Plan fulfills MR 1.

To prepare the elements of a Full Stormwater Site Plan, applicants shall follow the instructions for Preparation of Stormwater Site Plans in Section 2.05 of the KEDM.

Individual elements produced by following the instructions in Section 2.05 shall be organized into the following four separate documents, which comprise the Full Stormwater Site Plan:

- a. Site Development Drawings (see specifications in Section H, below)
- b. Drainage Design Report (see specifications in Section I, below)

- c. Long-Term Stormwater Site Management Plan (see specifications in Section J, below)
- d. Construction Stormwater Pollution Prevention Plan (see specifications in Section K, below)

Specifications for each of these documents are given in Sections H through K below.

H. Specifications for Site Development Drawings

The Site Development Drawings must meet the specifications of the Civil Site Development Plan in accordance with Section 1.04.C of the KEDM. The Site Development Drawings are engineering drawings that provide sufficient detail to construct the project's stormwater facilities and conveyances. These plans shall be stamped, signed, and dated by the engineer(s), registered in the State of Washington, responsible for the civil engineering design of the project.

1. The following specifications apply in addition to the Civil Site Development Plan Specifications:
 - a. Include a survey meeting the requirements of the SWMMWW Vol. I Section 3.1.1.1 on page 3-4 for projects required to meet MRs 1-9.
 - b. Threshold discharge areas in accordance with Chapter 2 of the KEDM. TDAs shall be identified and labeled consistently in all submittals – plans, reports, and maps.
 - c. Location of the point of stormwater and surface water discharge from each TDA, which preserves natural drainage patterns.
 - d. Location and overflow route for the 100-year storm.
 - e. Location of soil logs, test pits, and extents of soils as documented in the Drainage Design Report.
 - f. Location of slope instability and steep slopes.
 - g. Areas of the site predominantly covered by native vegetation and areas of native vegetation to be preserved.
 - h. Existing and proposed stormwater drainage; offsite areas contributing runoff to the site; location and number of stormwater facilities and on-site stormwater BMPs; designated flow paths and dispersion areas; direction of flow; size, type and kind of drainage channels and pipes.
 - i. Existing and proposed pollution-generating pervious surfaces (PGPS) and pollution-generating hard surfaces (PGHS).
 - j. Location of on-site stormwater BMPs (MR 5).

- k. Include locations of on-site BMPs on individual lots if they are used to meet MRs 6 or 7.
 - l. Show areas of disturbed soils to be amended (BMP T5.13)
 - m. Location of all runoff treatment facilities (MR 6)
 - n. Location of all flow control facilities (MR 7)
 - o. Location of structural source control BMPs used to meet MR 3.
 - p. Dimension of permeable pavements. Drawings shall use different hatches for permeable pavement and traditional pavement.
 - q. Dimensions of setbacks of stormwater facilities and on-site stormwater BMPs from property lines, structures, wells, on-site sewer systems, landfills, slopes, and other natural features as applicable to the facility.
 - r. Locations and species of retained trees and newly planted trees for which impervious surface reductions are claimed. Show distance from associated impervious surface.
 - s. Show all tracts or easements used to enclose drainage features or stormwater facilities.
 - t. If individual lots will connect to the public stormwater drainage system, locations of approved connections.
 - u. Approved location for storm runoff from building lots (if applicable)
 - v. The Director may require additional site or vicinity information if needed.
 - w. Include in the landscape plan:
 - x. Locations and dimensions of vegetated stormwater facilities and vegetated on-site stormwater management BMPs
 - y. Locations and dimensions of areas of preserved native vegetation
 - z. Locations and species of retained trees Locations and dimensions of any required flow lengths and vegetated flow paths, (e.g. for dispersion BMPs)
 - aa. Detailed planting plan and specifications for trees, vegetated stormwater facilities, and vegetated on-site stormwater management BMPs
2. The following additional Profile specifications apply:
- a. Original surface grade profile
 - b. Final surface and storm drain profile
3. The following additional Detail specifications apply:
- a. Details of each bioretention BMP showing the following:

- i. Width, length, side slopes, and maximum design pond depth. If bioretention is used to meet MR 6 or MR 7, show sufficient details to confirm accurate representation of the facility in the continuous simulation hydrologic model.
 - ii. Descriptions of all materials such as underdrain, drain rock, pipe, filter fabric, outlet structure, irrigation, bioretention soil mix, and mulch
 - iii. Locations, elevations, and slopes of any catch basins and pipes
 - iv. Designs for any retaining walls proposed. Structural walls shall meet City building permit requirements.
 - v. A minimum of two cross-sections showing original property lines, slope catch points and other information to construct the facility
- b. Details of each permeable pavement installation showing the following:
 - i. Dimensions of permeable pavement
 - ii. Dimensions of underground storage layer. If permeable pavement is used to meet MR 6 or MR 7, show sufficient details to confirm accurate representation of the facility in the continuous simulation hydrologic model.
 - iii. Pavement section
 - iv. Descriptions of all materials such as geotextile; underdrain; base material; storage layer; asphalt, concrete, or pavers
 - v. Direction and percentage of slope
- c. Details of each treatment facility showing the following:
 - i. Overall measurements and dimensions
 - ii. Flow direction
 - iii. Location and elevations of inverts, inflow, bypass, and discharge
 - iv. Slope (if applicable)
- d. Details of each flow control facility showing the following:
 - i. Overall measurements and dimensions
 - ii. Measurements necessary to calculate storage volumes
 - iii. Control structure/restrictor placement
 - iv. Details of flow control structures showing size, dimensions, elevations, and orientations of all orifices, weirs, risers, tee-sections, etc.

- v. A minimum of two cross-sections of each infiltration or detention pond showing original property lines, slope catch points, and other information to construct the facility.
- e. Details of each on-site stormwater BMP used to meet MR 5 sufficient to construct the BMP.
- f. For infiltration facilities and on-site stormwater BMPs used to infiltrate runoff from a pollution-generating hard surface, provide details to confirm accurate representation in the continuous simulation hydrologic model (see Drainage Design Report).

I. Specifications for Drainage Design Report

The Drainage Design Report contains the technical information to support the site's drainage and stormwater plan. The report shall contain the following sections and components and shall address MRs 1-9.

All sections listed below shall be included in each Drainage Design Report. If a section is not applicable, write "N/A" in the section contents and describe why the section is not applicable.

All page numbers of the report shall be numbered. Appendices shall have page numbers.

1. Cover Page

The Cover Page shall contain the following items:

- a. Name of Report
- b. Project Name
- c. Project Number, if a City project
- d. Situs Address
- e. Applicant's Name and Contact Information
- f. Applicant Engineer's Name and Contact Information
- g. Date of Submittal

2. Applicant Engineer's Certification

The Applicant Engineer shall include a statement that all the required information is included in the Drainage Design Report, the report was prepared by the Applicant Engineer or under his/her supervision, and that the proposed stormwater facilities are feasible.

3. Table of Contents

The Table of Contents shall contain the following items:

- a. List of section headings and their respective page numbers
- b. List of tables with page numbers
- c. List of figures with page numbers
- d. List of attachments and/or appendices, numbered
- e. List of references

4. Maps

All maps shall contain a scale and north arrow. The following maps shall be included:

- a. **Vicinity Map:** All vicinity maps shall clearly show the project site.
- b. **Basin Maps:** Show project boundaries, sub-basin boundaries, TDAs, and off-site contributing areas for both the pre-development and the post-development scenarios. TDAs shall be identified and labeled consistently in all submittals – plans, reports, and maps. Show drainage features, the flow path to and from the project site, and stormwater treatment and flow control facilities. Identify the point of compliance of each TDA for modeling site hydrology using an approved continuous simulation hydrologic model.
- c. **Soils Map:** The soils map shall show soils on the site and within the contributing area that drains to the site itself. Information should be consistent with the Soils Report.
- d. **Other Maps:** The following additional maps shall be required in the situations noted:
 - i. **Wellhead Protection.** If the site lies within the 10-year time-of-travel zone of a public water supply well or within a Category I or II critical aquifer recharge area (CARA), maps showing all of the zones of contribution that overlap the site are required.
 - ii. **Floodplains.** If a floodplain mapped by the Federal Emergency Management Agency (FEMA) exists on or adjacent to the site, a map showing the floodplain is required.
 - iii. **Shoreline Management Area.** If the site requires a shoreline permit, a map showing the boundary of the shoreline management area in relation to the site is required.

5. Section A – Project Overview

The Project Overview is a brief narrative describing and summarizing the site and the proposed project. Most of the information in the Project Overview is discussed or shown in detail in other sections of the Stormwater Site Plan.

- a. Describe the site location, including legal description, address, parcel number, zoning, etc.
- b. List the primary type of permit required for the work and briefly summarize the type of development project.
- c. Summarize the existing conditions including topography, natural drainage patterns, vegetative ground cover, presence of agricultural drain tiles, and presence of critical areas.
- d. List existing onsite stormwater systems and describe their functions.
- e. Summarize site parameters that influence stormwater system design.
- f. List adjacent areas, including streams, lakes, rivers, wetland and buffer areas, residential areas, and roads that might be affected by the construction project.
- g. Generally describe proposed site construction, size of improvements, and proposed methods of mitigating stormwater runoff quantity and quality impacts.
- h. Describe how the proposed project considers the six listed site layout considerations described in SWMMWW, Vol. I., Section 3.1.2, Step 2 – Prepare Preliminary Development Layout.
- i. Describe other permits from City of Kelso and/or other agencies that may affect the design of the stormwater system. Describe how any conflicts will be managed .

6. Section B – Existing Conditions and Soils

Provide a detailed narrative of the site's survey, using the information gathered in Step 1 – Site Analysis: Collect and Analyze Information on Existing Conditions in SWMMWW, Vol. I, Section 3.1.1.

Provide a detailed narrative of the soils and subsurface investigations also required in SWMMWW, Vol. I, Section 3.1.1. Describe the soils on the site.

Attach the required Soils Report as an appendix to the Drainage Design Report.

At a minimum, include the following:

- a. Existing ground cover, including pervious and developed areas

- b. Drainage through the site and to and from adjacent properties
- c. Locate and describe point of discharge from the site
- d. State whether the site is located in a drainage district
- e. Describe streams, rivers, ponds, ravines, gullies, steep slopes, springs, and erosion hazards on or downgradient of the site
- f. Describe critical areas on the site and those that receive runoff from the site to a minimum of $\frac{1}{4}$ mile away from the site boundary
- g. For agricultural sites with drain tiles, discuss the impact on site drainage
- h. Location of or proximity to high groundwater
- i. Location of or proximity to aquifer recharge areas or wellhead protection areas
- j. Describe known drainage problems such as flooding, erosion
- k. Describe location and proximity to structures, basements, property lines, sewers, septic tanks and drain fields, closed or active landfills, and storage tanks, both aboveground and underground
- l. Reference and describe any relevant reports or studies such as geotechnical reports on the site or adjacent to it, environmental impact statements, critical areas reports, flood studies, or basin plans. Describe any conditions imposed on the site or development activity by such reports or studies.
- m. Describe the soils on the site, using information included in the required Soils Report.
- n. Describe the infiltration testing done to assess the feasibility of bioretention and permeable pavement.
- o. State the results of the results of testing for saturated hydraulic conductivity, the results of testing for a hydraulic restriction layer, water table elevations, and results of analysis of shallow lateral flow (if needed).
- p. If full dispersion is proposed for the site, provide a narrative of the native vegetation survey required in SWMMWW, Vol. I, Section 3.1.1.
 - Attach the survey as an appendix to the Drainage Design Report.

7. Section C – Minimum Requirements Analysis

Following instructions in SWMMWW, Vol. I, Section 3.1.4 to determine and read the MRs, describe the land-disturbing activity and document the applicable MRs for the project site. See Chapter 2 of the KEDM for requirements.

- a. Provide a table to document the totals of land-disturbing activities and surfaces on the post-development site in the following categories:
 - i. The amount of existing hard surface.
 - ii. The amount of new hard surface.
 - iii. The amount of replaced hard surface.
 - iv. The amount of vegetation converted to lawn or landscaping.
 - v. The amount of native vegetation converted to pasture.
 - vi. The total amount of land-disturbing activity.
 - vii. The total amount of PGHS
 - viii. The total amount of PGPS, not including permeable pavements
 - ix. The total amount of effective impervious surface

If the site includes multiple TDAs, provide the same information for each TDA and aggregated for the entire site.

- b. Document through an approved continuous simulation hydrologic model the increase in the 100-year flood frequency from pre-developed to developed conditions for each TDA.
- c. List the proposed commercial or industrial uses of the site, if any.
- d. Based on the information above and on an understanding of the MRs:
 - i. List the TDAs that must meet the on-site stormwater management requirements listed in MR 5.
 - ii. List the TDAs that must meet the water quality requirements listed in MR 6.
 - iii. List the TDAs that must meet the flow control requirements listed in MR 7. List which, if any, are also Flow Control Exempt.
 - iv. List the TDAs that must meet the wetlands protection requirements listed in MR 8.
 - v. List the TDAs that must meet the pollutant source control requirements listed in MR 3.

8. Section D – On-Site Stormwater Management Selection and Sizing (MR 5)

Describe how the site meets the requirements of on-site stormwater management listed in MR 5.

Information and calculations in the Drainage Design Report shall support and be consistent with the Site Development Drawings. All on-site stormwater management BMPs shall be shown on the Site Development Drawings (1.02.H).

At a minimum, include the following in the Drainage Design Report:

- a. Describe the site's suitability for on-site stormwater management.
- b. For each TDA, state whether MR 5 is being met using List #2 or the LID Performance Standard.
- c. Provide a narrative describing how the project will fulfill the requirement for on-site stormwater management (MR 5) to the extent feasible.
- d. List total area of native vegetation retained.
- e. List the on-site stormwater management BMPs selected.
- f. Show an illustrative sketch of the on-site stormwater plan.
- g. Describe site suitability, including soils, slopes, infiltration rate, and native vegetation, as applicable, for each on-site stormwater management BMP.
- h. Describe how design criteria will be met for each on-site stormwater management BMP.
- i. Describe specifications for amending disturbed soils in accordance with BMP T5.13.
- j. Summarize proposed ownership of on-site stormwater management BMPs. [Additional details to be provided in the Long-Term Stormwater Site Management Plan.]

If Using List #2

- k. Provide justification and documentation, if needed, for any determination that an on-site stormwater management BMP is infeasible. The only acceptable infeasibility criteria are found in the SWMMWW. Site-specific information is required.

If Using the LID Performance Standard

- l. Show calculations for impervious surface reduction credits for retained or newly planted trees, if any.
- m. If full dispersion or full downspout infiltration are proposed, describe how BMP designs meet requirements allowing removal of the associated drainage areas from computer model input.
- n. Complete a detailed hydrologic analysis for existing and developed site conditions, in accordance with the requirements of SWMMWW, Vol. III, Section 2, using an approved continuous simulation hydrologic model. Compute pre-developed and developed flow durations for all TDAs. Provide an output table from the continuous flow model, including the following:

- i. Flow rates for the 2, 10, and 100-year return periods for pre-developed and developed conditions.
 - ii. A table listing the pass/fail rates for each flow level where duration statistics were calculated.
 - iii. A graph showing the flow rate on the y axis and percent time exceeding on the x axis for pre-developed conditions and post-developed mitigated conditions, from 8% of the 2-year through the 50% of the 2-year flow rate.
- o. Provide the electronic computer model input and output files on a CD or a USB flash drive. [Note: the media will not be returned.]

If Using Bioretention

- p. Describe the bioretention soil mix specifications.

If Using Permeable Pavement

- q. Show supporting design calculations showing adequate infiltration rates to accommodate flows from all surfaces directed to the permeable pavement.
- r. Base material gradation.
- s. Asphalt or concrete mix design and void calculations.
- t. Acceptance test procedures.

9. Section E – Runoff Treatment Analysis and Design

Describe how the site meets the requirements for runoff treatment listed in MR 6. Provide a separate analysis for each TDA required to meet MR 6.

Information and calculations in the Drainage Design Report shall support and be consistent with the Site Development Drawings. All runoff treatment facilities shall be shown on the Site Development Drawings (1.02.H). A detail drawing shall be provided in the Site Development Drawings for each runoff treatment facility.

At a minimum, include the following in the Drainage Design Report:

- a. Document the level of treatment required; list the water quality menus used.
- b. Document assumptions about roofs, driveways, and other hard surfaces to be constructed after site development (e.g. in a subdivision)
- c. Provide background and description to support the selection of the treatment BMPs being proposed
- d. List the BMPs used in the design

- e. Show an illustrative sketch of the runoff treatment plan
- f. Complete a detailed analysis and design of all proposed runoff treatment system elements, in accordance with SWMMWW, Vol. V. Reference runoff treatment system elements to labeled points shown on the Site Development Drawings.
- g. Show model printouts, calculations, equations, references, and graphs as necessary to show facilities are designed consistent with the SWMMWW, Vol. V and the minimum volume criteria of MR 6.
- h. Summarize the results of the runoff treatment design and describe how the proposed design meets the requirements of the SWMMWW.
- i. If bioretention or infiltration below PGHS are used to meet the treatment requirement the runoff model output file must include the volume of water that has been treated through those BMPs.
- j. If infiltration is used to meet runoff treatment requirements, document how the facility design and the site's soils meet the Site Suitability Criteria as described in the SWMMWW, Vol. III, Section 3.3.7.
- k. Include and reference in the Appendices all computations, equations, charts, nomographs, detail drawings, and other tabular or graphic aids used to design water quality system elements.
- l. Provide the electronic computer model input and output files on a CD or a USB flash drive. [Note: the media will not be returned.]

10. Section F – Flow Control Analysis and Design

Describe how the site meets the requirements for flow control listed in MR 7 and protection of wetland hydrology from MR 8, if applicable. Provide a separate analysis for each TDA required to meet MR 7 and/or MR 8.

Information and calculations in the Drainage Design Report shall support and be consistent with the Site Development Drawings. All flow control facilities shall be shown on the Site Development Drawings (1.02.H). A detail drawing shall be provided in the Site Development Drawings for each flow control facility.

At a minimum, include the following in the Drainage Design Report:

- a. Describe the assumptions and site parameters used in determining the pre-development site hydrology, including acreage, soil types, and land covers. Include any maps, exhibits, graphics, and references contributing to the analysis.
- b. Identify initial conditions, including stream base flows, beginning water surface elevations, hydraulic or energy grade lines, initial groundwater elevations, beginning storage volumes, and other data or assumptions

- used to complete the analyses of initial conditions. Reference the sources of information.
- c. Document assumptions about roofs, driveways, and other hard surfaces to be constructed after site development (e.g. in a subdivision)
 - d. Describe use of flow control credits from on-site stormwater management BMPs
 - e. Reflect the site's suitability for stormwater infiltration for flow control, as described in the Soils Report.
 - f. Identify and describe geotechnical or other studies and critical areas reports used to complete the analysis and design
 - g. List the flow control facilities used in the design
 - h. Show an illustrative sketch of the flow control facilities and their appurtenances and state their storage volumes
 - i. Describe the approximate location and sizing of each flow control facility
 - j. Include any bioretention and permeable pavement BMPs to be installed on individual lots by subsequent contractors, if those BMPs contribute to meeting the Flow Control Standard
 - k. Complete a detailed hydrologic analysis for existing and developed site conditions, in accordance with the requirements of SWMMWW, Vol. III, Section 2, using an approved continuous simulation hydrologic model. Compute pre-developed and developed flow durations for all TDAs. Provide an output table from the continuous flow model, including the following:
 - i. Flow rates for the 2, 10, and 100-year return periods for pre-developed and developed conditions.
 - ii. A table listing the pass/fail rates for each flow level where duration statistics were calculated.
 - iii. A graph showing the flow rate on the y axis and percent time exceeding on the x axis for pre-developed conditions and post-developed mitigated conditions, from 50% of the 2-year through the 50-year flow rate.
 - iv. Include models and calculations demonstrating protection of wetland hydrology in accordance with MR 8, if applicable.
 - l. Provide a hydraulic analysis of pipes and/or channels that lead to and/or from the outlet structure. The analysis should confirm the capacity of pipes and channels to convey the peak flow rates for the 2, 10, 50, and 100-year return period flow rate with the water surface elevation of the pond at the elevation for those return period flow rates.

- m. Include and reference all hydrologic and hydraulic computations, equations, rating curves, stage/storage/discharge tables, graphs, and any other aids necessary to clearly show the methodology and results.
- n. Include all maps, exhibits, graphics, and references used to determine existing and developed site hydrology.
- o. Summarize the results of the flow control design and describe how the proposed design meets the requirements of the SWMMWW, including MR 7 and, if applicable, MR 8.
- p. Identify locations and species of newly planted or retained trees for which impervious surface reduction credits are claimed. Show calculations for impervious surface reduction credits.
- q. If full dispersion or full downspout infiltration are used, describe how BMP designs meet requirements allowing removal of the associated drainage areas from computer model input.
- r. Attach computer model printouts, calculations, equations, references, and graphs as necessary to show facilities are designed consistent with the SWMMWW, Vol. III and the Flow Control Performance Standard of MR 7.
- s. Provide the electronic computer model input and output files on a CD or a USB flash drive. [Note: the media will not be returned.]

11. Section G – Conveyance System Analysis and Design

Describe how the site meets the requirements for conveyance from KEDM Sections 2.08, 2.09, and 2.10.

Information and calculations in the Drainage Design Report shall support and be consistent with the Site Development Drawings. All conveyances shall be shown on the Site Development Drawings (1.02.H). A profile drawing of each proposed conveyance shall be provided with the Site Development Drawings. A detail drawing of each catch basin, manhole and/or other structures required to construct the project's conveyance, as shown in the City Standard Details, shall be provided with the Site Development Drawings.

At a minimum, include the following in the Drainage Design Report:

- a. An analysis of on-site hydrologic connectivity of surface conveyance channels and pipes and points of concentration
- b. Results of the off-site analysis (see SWMMWW, Vol. I, Section 2.6.2)
- c. Describe the upstream contributing basin and any assumptions used to determine the full build-out conditions

- d. Identify and discuss initial conditions, including stream base flows, beginning water surface elevations, hydraulic or energy grade lines, beginning storage elevations, and other data or assumptions used to complete the analyses of initial conditions. Reference the sources of information.
 - e. Describe locations and dimensions of conveyance features
 - f. Complete a detailed hydraulic analysis of all proposed collection and conveyance system elements and existing collection and conveyance elements, including outfall structures and outlet protection that influence the design or are affected by the proposal, in accordance with KEDM Section 2.08 through 2.10. Identify, compute, reference, verify, summarize, and tabulate the following:
 - i. Design flows and velocities and conveyance element capacities for all conveyance elements within the development.
 - ii. The 10-year recurrence interval stage for detention facility outfalls. Provide stage-frequency documentation from the approved continuous simulation hydrologic model.
 - iii. The existing 100-year floodplain elevations and lateral limits for all channels, and no net loss of conveyance or storage capacity from development.
 - iv. The conveyance system elements to labeled points shown on the Site Development Drawings.
 - v. The capacity of each conveyance system element to convey design flow and discharge at non-erosive velocities and the capacity of the onsite conveyance system to convey design flows that result from ultimate build-out of upstream areas.
 - vi. All hydraulic computations, equations, pipe flow tables, flow profile computations, charts, nomographs, detail drawings, and other tabular or graphic aids used to design and confirm the performance of conveyance systems.
 - vii. The results of system analyses, and how the proposed design meets the requirements of the KEDM.
 - g. Document approval of the diking district to discharge to its facilities, if applicable.
12. Section H – Source Control

If the development activity requires source control (MR 3), identify the source control BMPs to be used.

Show any structural source control BMPs on the Site Development Drawings, and include all details needed to construct the facility.

13. Section I – Ongoing Operation and Maintenance

Summarize legal instruments needed to guarantee preservation of the drainage system and access for maintenance. List intended ownership and responsibility for operating and maintaining stormwater treatment and flow control facilities and on-site stormwater management BMPs. Describe dedications, tracts, easements, and agreements.

Additional details and attachments shall be included with the Long-Term Stormwater Site Management Plan.

14. Section J – Groundwater Monitoring Program

Where required by the City, a groundwater monitoring program shall be included in the Drainage Design Report. The groundwater monitoring program shall be prepared by a person with expertise in groundwater contamination investigation, prevention, and monitoring and shall clearly describe a comprehensive groundwater testing and evaluation program designed to ensure compliance with federal and state of Washington laws and the KEDM. The Director will review proposed groundwater monitoring programs on a site-specific basis.

15. Section K – Appendices

Provide a technical appendix that includes all computations completed in the preparation of the Drainage Design Report, together with copies of referenced data, charts, graphs, nomographs, hydrographs, stage-storage discharge tables, maps, exhibits, and all other information required to clearly describe the on-site stormwater management, flow control, and runoff treatment design for the proposed development activity. The format of the technical appendix shall follow as closely as possible the section format of the Drainage Design Report and shall be adequately cross-referenced to ensure that the design may be easily followed, checked, and verified. The technical appendix shall also contain all special reports and studies. Additional required subjects of special reports may include, but are not limited to:

- a. Geotechnical
- b. Wetlands
- c. Floodplains and floodways
- d. Groundwater
- e. Structural design
- f. Fluvial geomorphology (erosion and deposition)

J. Specifications for Long-Term Stormwater Site Management Plan

The Long-Term Stormwater Site Management Plan assures continued operation and maintenance of the site's stormwater management facilities to maintain intended function. The plan size must be 8.5" x 11" and the plan must comply with the recording standards of the Cowlitz County Auditor.

The Long-Term Stormwater Site Management Plan is a standalone plan that must be understandable by a typical property owner and site operator. It includes illustrative and narrative guidance for locating, operating, and maintaining all elements of the site's stormwater management and drainage strategy.

All sections listed below shall be included in each Long-Term Stormwater Site Management Plan. All page numbers of the plan shall be numbered. Attachments shall have page numbers.

1. Cover Sheet

The Cover Sheet shall contain the following items:

- a. Name of Plan
- b. Project Name
- c. Project Number, if a City project
- d. Situs Address
- e. Applicant's Name and Contact Information
- f. Applicant Engineer's Name and Contact Information
- g. Date of Submittal

2. Operations and Maintenance Summary

Generally describe the drainage and stormwater management facilities on the site.

Summarize the ownership and operational and maintenance responsibility of the site's drainage and stormwater control features. Describe drainage easements and stormwater tracts, if any. Include all types of on-site stormwater management BMPs used on the site, including retained and newly planted trees, and areas of native vegetation retained for full dispersion. Include treatment and flow control facilities. If MR 3 is applicable, include a summary of pollutant source control measures.

If the site is a subdivision, and if on-site stormwater management BMPs to be located on individual lots contribute to meeting MR 6 or MR 7, then include those BMPs in the summary.

The summary shall be consistent with the attachments that describe ownership and operation and maintenance in detail.

3. Stormwater Improvement Restrictive Covenants

Attach a copy of the Stormwater Improvement Restrictive Covenant required by KEDM Section 2.21.C.

4. Site Stormwater System Manual

Attach the Site Stormwater System Manual, which describes ongoing operation and maintenance of the storm drainage system, required by KEDM Section 2.21.D(1).

5. Individual Lot Operation and Maintenance Instructions

If the site is a subdivision or short subdivision, prepare, but do not attach, simplified maintenance instructions for on-site stormwater management BMPs on individual residential lots as required by KEDM Section 2.21.D(2) for each lot. These documents shall be recorded with the Stormwater Improvement Restrictive Covenant for each lot.

Write “See recorded Stormwater Improvement Restrictive Covenant for each lot” in this section of the plan.

If the site is not a subdivision, write “N/A” in this section of the plan.

6. Pollution Source Control Plan

If MR 3 is applicable to the site, describe the applicable (mandatory) operational source control BMPs as described in the SWMMWW, Vol. IV Section 2.1.

K. Specifications for Construction Stormwater Pollution Prevention Plan

The Construction Stormwater Pollution Prevention Plan (C-SWPPP) describes the operational practices and structural BMPs that prevent erosion on construction sites and prevent sediment from leaving sites and entering into the drainage system.

Submit a C-SWPPP prepared in accordance with the SWMMWW, Vol. II, Chapter 3. BMPs shall be selected from the SWMMWW, Vol. II, Chapter 4.

At the minimum include the following:

1. Narrative meeting the requirements of SWMMWW, Vol. II, Section 3.2.1
2. Drawings meeting the requirements of SWMMWW, Vol. II, Section 3.2.2

L. Transportation Impact Study

1. Purpose. The transportation impact study is an analysis prepared to determine the transportation impacts of a given development.
2. Timing. A transportation impact study shall be submitted with the land use application as required in KEDM Section 1.04.K.
3. Contents. The transportation impact study will typically include the following. The Director may require more or less depending on the size and/or anticipated impacts of the development as required in KEDM, Section 3.01.
 - a. Analysis approach and methods - The traffic study approach and methods should be guided by the following criteria:
 - (i) Study Area – As a rule, the analysis must include any intersection or roadway segment, regardless of jurisdictional boundaries, to which at least 10 project trips would be added during the peak hour of trip generation (or 100 daily trips). Projects just meeting the minimum threshold for traffic impact analysis will normally require analysis of only the intersection(s) or roadway segment(s) adjacent to the site. Larger developments will require the analysis of more intersections. Some larger developments will require application of the urban area traffic model which is developed and maintained by the Cowlitz-Wahkiakum Council of Governments. In addition to off-site intersections, it is important that the TIA address the intersections/driveways proposed to provide access to the site. The Director must approve the study intersections and roadways.
 - (ii) Study Horizon Years – The study horizon year shall be the year the project is to be completed and operational. If the project requires a zone change, the horizon year shall be ten (10) years from the date of the study, and include a “no-build” analysis for comparative purposes.
 - (iii) Analysis Time Period – Both the morning and evening weekday peak hours, 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m., shall be analyzed, unless the proposed project is expected to generate no trips, or a very low number of trips, during either the morning or evening peak periods. If this is the case, the requirement to analyze one or both of these periods may be waived by the Director. Where the peak traffic hour in the study area occurs during a different time period than the normal morning or afternoon peak travel periods (for example mid-day), or occurs on a weekend, or if the proposed project has unusual peaking characteristics, it is up to the

discretion of the Director if those time periods should be included for analysis.

- (iv) Geometrics and Traffic Control – Roadway geometric conditions within the study area should include, but not be limited to, intersection and driveway spacing, roadway width, traffic lanes, turn lanes, medians, curb and gutter, speed limits, horizontal and vertical curvature, traffic control devices, and traffic signal phasing (if traffic signals are present). The discussion on geometric conditions should include locations of driveways and intersections across the street from the development, and how this may impact traffic operations.
- (v) Sight Distance – To identify potential safety issues associated with site access and egress, sight distance at intersections (stopping sight distance and corner sight distance) measurements shall be conducted at the proposed site driveway(s). The measured sight distance shall be compared to minimum requirements, as established by the American Association of State Highway and Transportation Officials (AASHTO). A summary of sight distance analysis should be presented in tabular form and included in the TIA.
- (vi) Traffic Volumes – When directed by the City’s representative, the traffic volumes for the analysis hours should be adjusted for the peak season, in cases where seasonal traffic data is available.
 - (A) Data Collection Requirements – All data should be collected in accordance with the latest edition of the ITE Manual of Traffic Engineering Studies.
 - (B) Turning Movement Counts – Manual turn movement counts shall be collected at all study area intersections to determine the base traffic conditions. These turning movement counts should typically be conducted during the weekday (Tuesday through Thursday) between 7:00 a.m. – 9:00 a.m. and 4:00 p.m. – 6:00 p.m. and for other periods depending upon the proposed and/or surrounding land uses. Historical turning movement counts may be used if the data is not more than 12 months old at the time of the TIA. In high traffic locations where congestion is present or traffic peaks early or late, extended or altered count periods may be required. Turn movement counts may be required during other periods as directed by the City’s representative.

- (C) Daily Traffic Volumes – Daily traffic volumes should be provided as 24-hour volumes (one hour increments), and peak period volumes (15 minute increments) at intersections and driveways should be provided as turning movements. The analysis shall be based on traffic counts that are no more than 12 months old (or less if there are significant changes in traffic patterns). If current traffic volume data is not available from the City, the consultant shall be responsible to collect all necessary data. The estimation of existing peak hour turn movements based on automatic machine counts is not acceptable.
- (D) Pedestrian and Bicycle Volumes – Pedestrian and bicycle data will be included with all peak period intersection turn movement counts. Pedestrian data will be collected for each crossing movement of each leg of the intersection, while bicycle data will be collected by approach leg of the intersection.
- (vii) Crash Data – Within the study area for each TIA, a crash history evaluation shall be conducted for the most recent three-year period. The intent of the evaluation is to identify any apparent trends in the data that reflect a safety issue that may be exacerbated by the proposed development and to identify mitigation(s) to resolve the issue(s). At a minimum, the analysis shall summarize the number of crashes per year, location of crash (intersection), direction of the vehicles, type of crash, severity and fatalities. Any pedestrian and/or bicycle collisions within the corresponding analysis period should be identified separately. Intersection crash rates shall be calculated and evaluated based on estimated million entering vehicle at the intersection. The Traffic Engineer shall assess the overall results of the safety analysis. The Director may request a crash diagram be drawn.
- (viii) Traffic Volume Forecasts – Future traffic volumes should be estimated using information from transportation models, or applying an annual growth rate to the base-line traffic volumes. The future traffic volumes should be representative of the horizon year for project development. If the annual growth rate method is used, the Director must give prior approval to the growth rate. In addition, any nearby proposed approved development projects should be taken into consideration when forecasting future traffic volumes. The increase in traffic from proposed approved projects should be compared to the increase in traffic by applying an annual growth rate. This information should be provided by the Director.

If modeling information is unavailable, the greatest traffic increase from either the approved developments, the application of an annual growth rate, or a combination of an annual growth rate and approved developments, should be used to forecast the future traffic volumes. It is up to the discretion of the Director to select the appropriate methodology from information provided for all methods from the applicant.

- (ix) Analysis Scenarios – To determine the potential traffic impacts of a proposed development the following scenarios shall be analyzed in the TIA when appropriate:
 - (A) *Existing Conditions* - Existing traffic operations based on recent traffic count data.
 - (B) *Existing + Approved Conditions* - Projected traffic operations reflecting changes to existing traffic volumes due to relevant approved developments. Approved development traffic is defined as traffic generated by all developments approved by local jurisdictions or submitted to local jurisdictions for approval within the development vicinity at the time of the TIA submittal.
 - (C) *Existing + Approved Conditions + Project* - This scenario is similar to scenario B with the addition of the proposed project traffic at study area intersections. If the development is expected to be completed beyond 12 months after the TIA is submitted, the Director may require an additional scenario of analysis, which would include regional growth on traffic beyond existing levels. This scenario would have an appropriate growth applied to existing traffic volumes to forecast the planning horizon (build-out) year.
- (x) Trip Generation – To determine the impacts of a proposed development on the surrounding transportation network, the trip generation characteristics of that development must be estimated. Trip generation characteristics should be obtained from one of the following acceptable sources:
 - (A) Institute of Transportation Engineers (ITE) *Trip Generation* manual (latest edition).
 - (B) Specific trip generation studies that have been conducted for the particular land use for the purposes of estimating peak hour trip generating characteristics, subject to approval by the

Director prior to their inclusion in the transportation impact analysis.

In addition to new site generated trips, several land uses typically generate additional trips that are not added to the adjacent traffic network. These trips include pass-by, diverted and internal trips, and are considered to be separate from the total number of net new trips generated by the proposed development. The procedures listed in the (ITE) *Trip Generation Handbook* should be used where appropriate to account for pass-by, diverted and internal trips. The Traffic Engineer shall not use any pass-by, diverted or internal trip reductions without prior approval of the method or data sources by the Director.

- (xi) Trip Distribution and Assignment – Projected trips should be distributed and added to the projected non-site traffic on the roadways and intersections under study. The specific assumptions and data sources used in deriving trip distribution and assignment should be documented in the TIA and approved by the Director prior to submittal of the TIA. The site-generated traffic should be assigned to the street network in the study area based on the approved trip distribution percentages. Trip assignments should be rounded to the nearest five percent (5%). Graphic presentations, as well as discussions in text, of the trip assignment shall be documented in the TIA.
- (xii) Capacity Analysis – An intersection capacity analysis is required as part of the TIA submittal. The software used for this analysis shall be the latest edition of the Highway Capacity Software (HCS), or a comparable software analysis program that is based on the *Highway Capacity Manual* methodology.

Peak hour Level-of-Service (LOS) must be calculated for each study intersection (existing and proposed). In most cases, the weekday morning (AM) and weekday evening (PM) peak hours must be included in the analysis. For certain types of development (e.g., recreation facilities, churches, some retail uses) some peak hours may be added (e.g., midday or weekends) or eliminated (e.g., AM peak hour for low traffic generators) from the analysis, if approved by the Director. Unless determined otherwise by the Director, compliance with the LOS standards will be based solely on weekday AM and PM peak hour traffic analysis results. For unsignalized intersections, appropriate MUTCD (*Manual on Uniform Traffic Control Devices*, FHWA) peak hour signal warrants must also be checked for each scenario.

The results of the above analysis shall be summarized in tabular form identifying the average delay, Level-of-Service (LOS), and volume-to-capacity (V/C) ratios for the study intersection. All intersections and specific turning movements with a LOS D or worst shall be clearly identified.

- (xiii) Queue Analysis – Queue lengths shall be calculated for each lane of all approaches to signalized intersections for the 95th percentile queue during the peak hour of analysis. Queue lengths shall also be calculated for unsignalized locations, such as site driveways, where standing queues can interfere with other movements, especially if such interference can contribute to safety deficiencies. Appropriate analysis methods should be used that account for the actual arrivals of vehicles at an intersection. The methodology for queuing at unsignalized intersections or driveways must be approved by the Director prior of the TIA.
- (xiv) Left/Right Turn Storage Analysis – Left-turn and right-turn storage bay analyses must be performed at all study intersections and project driveways identified in the traffic study scope. Storage at signalized intersections is to be calculated utilizing the Poisson method with 95% confidence and a 150 second wait. Storage at unsignalized intersections and driveways with either a dedicated left turn lane or a two-way-left-turn-lane is to be calculated utilizing the graphs found in the Washington State Department of Transportation's Design Manual.

For signalized intersections, queue lengths shall be based on average vehicle length of twenty-five (25) feet, or longer where appropriate.
- (xv) Traffic Simulation – For a major development, a simulation using SimTraffic or other approved software should be done to show existing traffic flows and future traffic flows if directed by the Director.
- (xvi) Access and Site Circulation Analysis – Describe the proposed access to the site for all travel modes. This includes identifying the existing and/or proposed access locations from the public street system and the expected use of each access (pedestrian/bicycle entrance, truck delivery access, etc.). Also describe any proposed roadways within the site and the internal street system configuration.

Summarize the sight distance evaluation conducted at the site accesses. Include the sight distance standards that need to be met and the measured available sight distance in both directions at each site driveway. The sight distance standard should be based on recent 85th percentile speed data conducted along the project frontage. Demonstrate that an adequate vision clearance triangle can be provided at each driveway. Provide the findings of the site access sight distance evaluation and any recommended improvements that may be needed.

Summarize the access spacing evaluation of the proposed site driveways. Provide the applicable City standards for each frontage roadway and site driveways. This analysis should be conducted for both existing and proposed site access locations.

Provide a detailed evaluation of the proposed site plan associated with on-site circulation needs for all modes of travel. This should include the following elements.

- Determine if the number of driveways can adequately and safely accommodate the peak hour vehicle demand.
- Evaluate driveway and cross street alignment and possible conflicts of movement.
- Evaluate the need for separate turn lanes to accommodate vehicles exiting the site and the potential for on-site vehicle queues to impact internal circulation.
- Review the internal roadway system to verify that emergency vehicles and trucks (potential demand based on land use) can be accommodated. Developments with a potential for generating large trucks should provide a turn template analysis of the site plan. The turn template analysis should be provided in the technical appendix.
- Identify how pedestrian and bicycle trips are accommodated between building entrances and parking lot areas. Internal pedestrian and bicycle circulation should be clearly demonstrated on the site plan. Discuss potential conflicts between pedestrians, bicycles and motor vehicles. Identify any land uses (if within one-half mile of site) that would likely generate pedestrian and bicycle trips in association with the proposed project. For example, a proposed subdivision located near a park. Pedestrian and bicycle

connections to off-site destinations should be clearly demonstrated on the site plan. Discuss potential conflicts between pedestrians, bicycles and motor vehicles.

- (xvii) Mitigation Requirements – For every significant impact, the TIA must identify and discuss mitigation measures at conceptual level that will be implemented by the proposed development. The TIA may identify a mitigation measure or develop a range of mitigation measures for each impact to improve the performance of the transportation system. Mitigation measures shall be specific and feasible actions that will actually improve adverse transportation conditions, and shall comply with the City’s design standards. The mitigation measures shall improve conditions or correct capacity deficiencies to acceptable levels of service. The TIA should discuss whether the measure reduces the impact to a less-than-significant level, and should report the conditions after the implementation of the mitigation measure.

An effective measure shall adequately avoid, minimize, rectify, or compensate an impact. It shall be consistent with local plans and policies.

Mitigation measures may include traffic control devices and roadway design features. The Consultant shall determine the need for new traffic control devices, and roadway design features based on the City’s traffic engineering policies and procedures. The installation of traffic control devices and construction of roadway design features shall conform to the City of Longview’s standards and traffic engineering rules and regulations.

In addition, mitigation measures shall address vehicular queues, progression quality, and other factors that affect traffic conditions that are not part of the LOS analyses. They shall consider traffic operations at intersections and driveways.

- b. Report Format –For consistency, the TIA report shall follow the outline described below. The Public Works Department and Community Development Department staff will review and comment on the TIA report.
- (i) The consultant shall also provide a CD which contains the following:
 - (A) A PDF version of the TIA
 - (B) A separate folder containing graphic files (i.e. JPG, BMP, TIFF format) of all graphics included in the TIA

- (C) A separate folder containing the electronic files (i.e. SYNCHRO, HCS) for all analysis.
 - (D) A separate folder containing the electronic files for new traffic counts. The file format shall be .CSV. The count interval for both daily and peak counts shall be 15 minutes.
- (ii) The consultant shall furnish three (3) copies of the TIA report stamped by the Traffic Engineer to the City. The following is the order and format for the TIA report.

1. EXECUTIVE SUMMARY

- a. Purpose of Report and Study Objectives
- b. Site Location and Study Area
- c. Development Description
- d. Principal Findings
- e. Conclusions including mitigations

2. TABLE OF CONTENTS

3. LIST OF FIGURES

4. INTRODUCTION

- a. Explanation of the project
- b. Area map showing development site location
- c. Complete project site plan, with buildings identified as to proposed use. Driveways located on adjacent property and across the street from the proposed project shall be shown on the site plan.
- d. Project schedule, and stages or phase, if applicable

5. EXISTING CONDITIONS

- a. Study Area
- b. Existing Land Use Map. As a minimum, general land uses identified shall include residential, office/business, industrial, and retail.
- c. Roadway System
- d. Pedestrian/Bicycle Facilities
- e. Transit
- f. Sight Distance
- g. Existing Land Use

6. EXISTING TRAFFIC DATA

- a. Traffic Counts
- b. Pedestrian Counts (if necessary)
- c. Bicycle Counts (if necessary)
- d. Times Collected
- e. Locations

- f. Types - Daily, Morning, and Afternoon Peak Periods (two hours minimum, and others as required)
- g. Crash analysis
 - 1. Analysis Years
 - 2. Tabular Crash Report containing the following information:
 - a. Types of Crashes
 - b. Severity (Fatal, Injury, Property Damage Only)
 - c. Vehicular direction of travel
 - d. Time of Day
 - e. Day of Week
 - 3. Crash diagrams

7. EXISTING TRAFFIC OPERATIONS

- a. Level of Service -.Morning Peak Hour, Evening Peak Hour (and other as required)
- b. Traffic Signal Warrant Analysis
- c. Queue Analysis

8. EXISTING TRAFFIC OPERATIONS + APPROVED CONDITIONS

- a. Level of Service -.Morning Peak Hour, Evening Peak Hour (and other as required)
- b. Traffic Signal Warrant Analysis
- c. Queue Analysis

9 TRIP GENERATION

- a. Trip Generation
- b. Pass-by Traffic (if applicable)

10. TRIP DISTRIBUTION AND ASSIGNMENT

- a. Trip Distribution
- b. Trip Assignment

11. EXISTING TRAFFIC OPERATIONS + APPROVED CONDITIONS + PROPOSED PROJECT

- a. Level of Service – Morning Peak Hour, Evening Peak Hour (and other as required)
- b. Traffic Signal Warrant Analysis
- c. Queue Analysis
- d. Left/Right Turn Storage Analysis
- e. Traffic Simulation

12. ACCESS AND SITE CIRCULATION ANALYSIS

- a. Site access
- b. Site access sight distance
- c. Access spacing
- d. Internal site circulation

13. SUGGESTED TRAFFIC MITIGATIONS

- a. Traffic Control Needs
- b. Intersection Channelization Mitigation
- c. Pedestrian/Bicycle Considerations
- d. Neighborhood Traffic Mitigation

14. CONCLUSION AND RECOMMENDATIONS

15. TECHNICAL APPENDIX

- a. Traffic Volume Counts
 - 1. Average Daily 24 Hour Traffic Volumes
 - 2. Peak Hour Turning Movement Volumes (AM, PM and other as required)
- b. Capacity Analyses Worksheets
 - 1. Existing Condition
 - 2. Existing + Approved Conditions
 - 3. Future +Existing + Approved Conditions
 - 4. Future +Existing + Approved Conditions + Proposed Project
- c. Traffic Signal Warrant Analysis
- d. Accident Data and Summaries
- e. Miscellaneous Addendum

M. Street Access Connection Permit

If the new development, or change in use, will generate or create an increase of more than 10 Peak Hour Trips (as defined within the Institute of Transportation Engineers Trip Generation Manual¹), each application for a street access connection permit, whether accompanying an underlying land use application or not, shall include the following unless the Director has waived the requirement:

- 1. Transportation Impact Study — Per KEDM Section 1.04.J
- 2. Existing Conditions Plan – The applicant shall provide a map or plan illustrating the following conditions on both sides of all streets:
 - a. Existing driveways
 - b. Existing sidewalks
 - c. Surrounding off-site conditions
 - d. Street depictions with names of streets for identification
 - e. Existing roadway classifications
 - f. Three Year accident history

¹ Institute of Transportation Engineers Trip Generation Manual, 7th Edition, 2003.

If none of these cases apply, a TIA may still be necessary if the Director deems that special circumstances require analysis (e.g., existing traffic congestion, safety concerns, public controversy, etc.). Conversely if any of these cases apply, the Director may waive the requirement of a TIA, or require less analysis than would be required for a full TIA, depending on the situation.

N. Project Acceptance and Closeout

Prior to acceptance of any and/all public improvements, the following shall be submitted to the Director for review and approval:

1. Final plat showing:
 - a. Plat layout
 - b. Right-of-way dimensions including all curves
 - c. Public easements
 - d. Public tracts
 - e. Required notes
2. As-built drawings: The drawings shall be mylars and be identical to the approved construction drawings with all inverts, rims, and any other necessary changes noted to their as-built status. The words “As-Built Drawing” shall appear as the last entry in the revision block along with the month, day and year the as-built drawing was prepared.
3. CD copy containing:
 - a. PDF version of the as-built drawings
 - b. DWG version of the as-built drawings.
4. Copy of a receipt from the finance department showing that all required engineering fees have been paid.

1.05 Professional Qualifications

Professionals in the technical fields of Civil Engineering, Electrical Engineering, Geotechnical Engineering, Landscape Architecture, Soils Engineering, Structural Engineering, and Surveying who prepare or are responsible for the process of obtaining required permits/approvals shall be currently licensed or registered in the State of Washington and qualified by both experience and educational background in the specific technical areas as warranted by the specific needs of the proposed development project.

1.06 Changes to these Engineering Standards

From time to time changes may be needed to add, delete, or modify the provisions of the KEDM. The Director may propose changes to the KEDM and upon approval of the City Council; they shall become effective and shall be incorporated into the existing provisions.

1.07 Design Modification Process

A. Submittal

Requests to modify City Standards shall be submitted in writing by the Applicant Engineer to the Director. This written request shall state the desired modifications(s), the reason(s) for the request(s) and a comparison between the specification(s), standard(s), and the modification(s).

Any request for modification or variance of City Standards should be documented with reference to nationally accepted specifications/standards.

B. Review

The request to modify shall be reviewed by the Director, who shall consult the appropriate review authorities and make one of the following decisions:

1. Approve as is,
2. Approve with changes, or
3. Deny with an explanation.

The modification, if approved, is for project specific use. Approval of a request shall not constitute a precedent.

C. Appeal

The applicant may appeal the Director's decision to the Hearing Examiner.

D. Criteria for Modification of Specification Standards

1. The Director may grant a modification to the adopted specifications or standards when any one of the following conditions are met:
 - a. The specification or standard does not apply in the particular application.
 - b. Topography, right-of-way, or other geographic conditions impose an unusual or unique hardship on the applicant and an equivalent alternative

which can accomplish the same design is available that does not compromise public safety or accessibility for the disabled.

- c. A change to a specification or standard is required to address a specific design or construction problem which if not enacted will result in an undue hardship or would jeopardize public safety.

1.08 Errors and Omissions

At the discretion of the City, any significant errors or omissions in the approved plans or information used as a basis for such approvals may constitute grounds for withdrawal of any approvals and/or stoppage of any or all of the permitted work. It shall be the responsibility of the applicant to show cause why such work should continue, and make such changes in plans that may be required by the City before the plans are re-approved.

1.09 Inspection

A. General Requirements

1. Work performed within the public right-of-way, or as described in the KEDM, whether by or for private applicant, by City forces, or by a City Contractor, shall be done to the satisfaction of the City and in accordance with the WSDOT Standard Specifications, any approved plans, and the KEDM. Unless otherwise approved, any revision to construction plans must be approved by the City before being implemented.
2. The City shall have authority to enforce the 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 Director may delegate.
3. It is the responsibility of the applicant, Contractor, or their agents to have an approved set of plans, and/or permits on the job site wherever work is being accomplished.
4. It is the responsibility of the applicant, Contractor, or their agents to notify the City in advance of the commencement of any authorized work. A preconstruction conference and/or field review shall be required before the commencement of any work.
5. Failure to comply with the provisions of the KEDM may result in stop work orders, removal of work accomplished, or other penalties as established by ordinance.

B. Substitution of Materials

It is not the intent of the KEDM to exclude other equipment or materials of equal value, quality, or merit. Whenever a product is designated, or manufacturer's name, brand, or item designation is given or described, it shall be understood that the words "or approved equal" follows such name, designation, or description, whether in fact they do so or not. Determination of quality in reference to the project design requirement will be made by the Director. A Contractor shall not use an "equal" product without prior written approval of the Director.

C. City Inspector's Activities

Inspecting services provided by the City shall include:

1. Monitoring both work progress and performance testing results.
2. The performance of administrative and coordination activities, as required, to support the processing and completion of the project.
3. The issuance of a corrective notice to the Contractor to make corrections to the work. The City's project inspector, at the discretion of the Director, may post a stop work order.
4. Maintaining a completion file containing the following:
 - a. The original of the project completion certification;
 - b. A complete copy of the report file initialed by the City's project inspector;
 - c. The results of material tests, compaction tests, and soil analysis as detailed in the construction file.
5. Inform the Director of all proposed plan changes, material changes, corrective notices, stop work orders, or errors or omissions in the approved plans or specifications as soon as practical. Any revision to approved plans must be under the direction of the Applicant Engineer. It shall be at the discretion of the City's project inspector as to whether the revision is significant enough to warrant review by the Director. If so, the Applicant Engineer shall submit five (5) copies. No work affected by the revision shall be done until approved by the Director.

1.10 Contractor's Responsibility for Scheduling

A. Sequence of Operations

1. The Contractor shall plan construction work and execute operations with a minimum of interference to the operation of the existing public facilities, including but not limited to, water, sewer, and roads. It may be necessary to do certain parts of the construction work outside normal working hours in order to avoid undesirable conditions, and it shall be the obligation of the Contractor to do this work at such times. This scheduling, however, is subject to the City's approval and does not relieve the Contractor from making work available for inspection.
2. The Contractor shall notify the City at least 48 hours (two full working days) prior to any City inspection. Connections between existing work and new work shall not be made until necessary inspection and tests have been completed on the new work and it is found to conform in all respects to the requirements of the plans and specifications.
3. Construction hours shall be seven (7) am to six (6) pm for all construction of all public improvements and within public right-of-way and seven (7) am to ten (10) pm for construction of private improvements outside of right-of-way, unless otherwise approved by the Director.

B. Step Inspections

1. The following items of work shall be inspected by City forces:
 - a. For street or sidewalk work, subgrade shall be inspected by the City (and tested by the Contractor) prior to placement of crushed surfacing.
 - b. Crushed surfacing shall be inspected by the City (and tested by the Contractor) prior to placement of paving, curb, or sidewalks.
 - c. Notify the City prior to the placement of any paving, curb, or sidewalks.
2. Other items of inspection notification are included under the various items of work outlined in the KEDM.

C. Progress of Construction

1. Construction shall proceed in a systematic manner that will result in a minimum of inconvenience to the public.
2. In the case of a pipe-laying job for sanitary sewer, storm drainage, and water improvements the trenching equipment at no time shall be greater than 100 feet ahead of the pipe-laying crew, unless given permission by the Director.

3. The trench shall be backfilled so that no section of the trench or pipe is left open longer than 24 hours. Trenches located in a right-of-way or public street shall be completely backfilled and cold patched, or securely plated before the Contractor leaves the site each day. All piping is to be plugged with a serviceable expansion plug at the end of each workday.

1.11 Contractor's Requirement for Testing

Testing shall be in accordance with the WSDOT Standard Specifications and performed by a certified independent testing lab hired by the applicant or applicant's contractor with the results being supplied to the Director. The applicant shall pay the cost of all testing.

The testing is not intended to relieve the Contractor from any liability for the trench restoration. It is intended to show the inspector and the City that the restoration meets these specifications. Testing shall include but not be limited to:

A. Asphalt Testing

Compaction of all lifts of asphalt as specified in the WSDOT Standard Specifications. Number of tests required:

1. For streets provide one (1) test per every 5,000 square feet of surface area.
2. For surface restoration of utility trenches provide one (1) test per every 200 feet of trench.

B. Subgrade and Crushed Surfacing Testing

Compaction testing as specified in the WSDOT Standard Specifications. Number of tests required:

1. For streets provide one test of the subgrade and one test of the crushed surfacing for every 5,000 square feet of surface area of pavement, curb, and sidewalk.

C. Bedding and Backfill for Utility Trenches

Compaction testing as specified in the WSDOT Standard Specifications. Number of tests required:

1. For utility trenches provide one test at top of bedding for every 500 feet of trench.
2. For utility trenches provide one test for each lift of backfill for every 500 feet of trench.

D. Embankment for Subgrade

Compaction testing as specified in the WSDOT Standard Specification. Number of tests required:

1. For each location where the fill is deeper than two (2) feet or greater than 300 cubic yards, provide one test per every two (2) vertical feet and every 500 cubic yards.

1.12 Safety Requirements

The Contractor is responsible for observing the safety of the work and all persons and property coming into contact with the work. The Contractor shall conduct his/her work in such a manner as to comply with all the requirements prescribed by the Occupational Safety and Health Administration (OSHA).

The City project inspector's role is not one of supervision or safety management, but is one of observation only. Nothing contained in this section or elsewhere in the book shall be interpreted to obligate the City to act in any situation, nor shift the Owner's responsibility for safety compliance to the City. No responsibility for the safety of the work or for construction means, methods, techniques, sequences, or procedures shall attach to the City by virtue of its action or inaction under this section.

1.13 Preservation, Restoration, and Cleanup

A. Site Preservation, Restoration, and Cleanup

1. During construction, the Contractor shall at a minimum flag areas of the site that have been designated for LID BMPs, including those areas to be preserved for dispersion, native vegetation retention, bioretention, rain garden, and permeable pavements.
2. The Contractor shall keep the premises clean and orderly at all times during the work and leave the project free of rubbish or excess materials of any kind upon completion of the work. During construction, the Contractor shall stockpile excavated materials so as to do the least damage to adjacent lawns, grassed areas, gardens, shrubbery, trees, or fences, regardless of the ownership of these areas. All excavated materials shall be removed from these areas, and these surfaces shall be left in a condition equivalent to their original condition and free from all rocks, gravel, boulders, or other foreign material. Stockpiling of construction materials shall not be allowed on existing public rights-of way.
3. All existing storm systems adjacent to the project area shall be cleaned and flushed with a vacuor truck and/or sewer jetter, and original drainage restored. Sediment, rock, and other debris shall be collected and disposed of in a proper manner. In no case shall debris be flushed down a storm or sanitary sewer for

disposal. All damaged/impaired storm facilities, irrigation, and house drainage pipes, drain tiles, sewer laterals, and culverts shall be repaired expeditiously.

4. All areas disturbed by the Contractor's operations inside dedicated rights-of-way or easements shall be restored to original condition. Areas outside of the easements or rights-of-way which are disturbed by the Contractor's operations shall be restored to their original or better condition in a method acceptable to the property owner. The Contractor shall obtain a written release from such property owners for any claims of injury or property damage prior to final acceptance of the work by the City.
5. On sites meeting certain thresholds for stormwater management in KEDM Chapter 2 of the KEDM, all soils disturbed by the Contractor's operations shall be replaced or amended to meet the standards of BMP T5.13, Post-Construction Soil Quality and Depth, in accordance with the SWMMWW.

B. Street Cleanup

The Contractor shall clean all spilled dirt, gravel, or other foreign material caused by the construction operations from all streets and roads at the conclusion of each day's operation. If any spilled material poses an erosion control threat, it shall be cleaned immediately. Cleaning shall be by grader and front-end loader, supplemented by power brushing, and hand labor, unless otherwise approved by the City. The Contractor shall follow the City's erosion control procedures.

As soon as practical after completion of all paving and gravel shoulder resurfacing, the Contractor shall remove all dirt, mud, rock, gravel, and other foreign material from the paved surface and storm drainage system.

C. Stream and Creek Crossings

The Contractor shall comply with all provisions of the permits required by the Washington State Departments of Fish and Wildlife, the U.S. Army Corps of Engineers, Washington State Department of Ecology, the Kelso Municipal Code, and all conditions placed on the applicant.

Prior to construction involving a present or future right-of-way is performed in any stream, the method of operation and the schedule of such work shall be approved in writing by the Director.

D. Protection of Property

The Contractor shall exercise all due care in protecting property along the route of the improvement. This protection shall include, but not be limited to, trees, yards, fences, drainage lines, mailboxes, driveways, shrubs, and lawns. If any of the above

has been disturbed, they shall be restored to as near their original condition as possible or replaced to the owners approval.

E. Use of Explosives

All use of explosives is to follow Washington State Law.

Surrounding property owners affected by blasting are to be notified in writing a minimum of 48 hours in advance of the use of explosives.

Use of explosives should be done to limit the effects on surrounding neighbors.

Use of explosives must be approved by the City.

1.14 Railroad Crossings

A. General

Crossings of railroad rights-of-way shall be done in a manner, which conforms with the requirements of the railroad having jurisdiction. If any bonds and/or certificates of insurance protection are required, they shall be furnished by the Contractor or Owner to the railroad company with the City as an additionally-named insured.

B. Permits or Easements

Crossing agreements, permits, and/or easements for such crossings will be obtained by the applicant and all the terms of such permits or easements shall be met by the Owner and Contractor. A copy of the agreement, permit and/or easement shall be provided to the Director prior to construction drawing approval.

1.15 Penalties

Failure to comply with the KEDM will be cause for withholding or withdrawing approval of plans or plats, forfeiture of bond, withholding Temporary and/or Final Certificate of Occupancy, and/or other penalties as provided by law.

Chapter 2

Storm Drainage, Grading, and Erosion Control

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Engineering Design Manual
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CHAPTER 2 - STORM DRAINAGE, GRADING, AND EROSION CONTROL

2.00 Purpose

This chapter is intended to provide minimum standards for managing storm drainage and controlling erosion and sedimentation with land-disturbing activities, including development, redevelopment, clearing, and grading.

A. Minimum standards are established to:

1. Protect the public health, safety, and welfare by minimizing risk from flood events;
2. Protect property and habitat from increased runoff caused by development;
3. Allow efficient operation, repair, and maintenance of the storm drain system;
4. Reduce discharge of pollutants to the storm drain system and protect water quality;
5. Reduce impacts to hydrology of surface waters;
6. Reduce the erosion of soils on active construction sites and cleared areas; and
7. Limit the discharge of sediment-laden runoff from active construction sites and cleared areas.

B. The requirements of this chapter cannot provide for all situations. They are intended to assist but not to substitute for competent work by design professionals.

2.01 General

- A. The KEDM is written to comply with the Department of Ecology's (Ecology's) Phase II Municipal Stormwater National Pollutant Discharge Elimination System (NPDES) Permit, which requires Kelso to adopt the 2012 Stormwater Management Manual for Western Washington, as Amended in December 2014 (SWMMWW) or an equivalent.
- B. This Chapter adopts the SWMMWW. The Chapter references and supplements the SWMMWW and is meant to be used in conjunction with the SWMMWW. An online version of the SWMMWW can be found at:

<http://www.ecy.wa.gov/programs/wq/stormwater/manual/2014SWMMWWinteractive/2014%20SWMMWW.htm>.

- C. When portions of this chapter and the SWMMWW conflict, this chapter shall apply. When provisions of this chapter conflict with other City of Kelso Code or state and federal requirements, the more stringent provisions apply.
- D. This Chapter is intended to represent the minimum Standards for the design and construction of stormwater drainage facilities.
 - 1. Compliance with these Standards does not relieve the designer of the responsibility to apply sound professional judgment to protect the health, safety, and welfare of the general public.
 - 2. Special site conditions and environmental constraints may require a greater level of protection than would be required under these Standards.
 - 3. Site or weather changes or other unforeseen conditions may require modification of a site's erosion and sediment control strategy.
 - 4. The project must be designed (and may require modification) to ensure compliance with the conditions of any permits, codes and regulations, and these Standards.
 - 5. The design of stormwater drainage and/or retention/detention systems will depend on their type and local site conditions.
- E. Erosion and sediment control BMPs shall be implemented prior to initial soil disturbance and until final stabilization following project completion and removal of temporary controls.
- F. The City may temporarily suspend project work or require additional or modified protection measures if it appears to the Director, based upon observed conditions, that the approved plan is insufficient to prevent environmental harm and that such suspension or additional measures will prevent or minimize the harm.
- G. The City may require a construction project to be scheduled to minimize the potential for erosion or other environmental harm.
- H. Clearing and grading activities for developments shall be permitted only if conducted pursuant to an approved site plan (e.g. subdivision approval) that establishes permitted areas of clearing, grading, cutting, and filling.
- I. Clearing and grading shall be prohibited in critical or environmentally sensitive areas unless written variances are secured from all applicable agencies.
- J. Preparation of submittals:
 - 1. All plans, studies, calculations, and reports that require the practice of engineering as defined in RCW 18.43.020(5)(a) shall be prepared by or under

the direction of a professional civil engineer registered in the state of Washington. Such plans, studies, calculations, and reports shall be stamped, signed, and dated by the licensed civil engineer(s) responsible for preparation of the Stormwater Site Plans.

2. Unless otherwise specified in these Standards, soils reports shall be prepared by a professional soil scientist certified by the Soil Science Society of America (or equivalent national program) or other suitably trained persons working under the supervision of a professional engineer, geologist, hydrogeologist, or engineering geologist registered in the state of Washington.
 3. Stormwater Site Plans shall be prepared in accordance with the SWMMWW Vol. I, Section 3.1, Stormwater Site Plans: Step-by-Step, as modified in Section 2.05 of the KEDM.
- K. Construction and Industrial Stormwater NPDES Permits. Obtain Ecology's Construction or Industrial Stormwater General Permit if/as required by Ecology. See Ecology website: <http://www.ecy.wa.gov/programs/wq/stormwater/index.html>.
- L. Other State and Federal requirements that could impact stormwater programs are summarized in SWMMWW Vol. IV, Appendix IV-D.

2.02 Applicability

- A. Development and redevelopment projects that meet the thresholds in the SWMMWW Vol. I, Section 2.4 shall:
1. Apply the Minimum Requirements (MRs) for stormwater management in accordance with the SWMMWW Vol. I, Section 2.5, and as modified in KEDM Section 2.03.
 2. Be evaluated using the definitions in the SWMMWW Vol. I, Section 2.3.
 3. Meet all the requirements of this Chapter.
- B. All land-disturbing projects regardless of size shall comply with KEDM Sections 2.11, 2.12, 2.13, and 2.15.

2.03 Minimum Requirements for Development and Redevelopment

- A. Instructions for complying with each MR are as follows:
1. Preparation of Stormwater Site Plans
 - Consult SWMMWW Vol. I, Section 2.5.1 for requirements for Preparation of Stormwater Site Plans.

- Consult SWMMWW Vol. I, Section 3.1 for step-by-step requirements for preparing a Stormwater Site Plan, as modified in KEDM Section 2.05.
 - Consult KEDM Chapter 1 for submittal requirements.
2. Construction Stormwater Pollution Prevention
 - Consult SWMMWW Vol. I, Section 2.5.2 and Vol. II for requirements for Erosion Control and Construction Stormwater Pollution Prevention.
 - Consult this KEDM Section 2.04.D for variations from MR 2.
 3. Source Control of Pollution
 - Consult SWMMWW Vol. I, Section 2.5.3 and Vol. IV for requirements for Source Control of Pollution.
 4. Preservation of Natural Drainage Systems and Outfalls
 - Consult SWMMWW Vol. I, Section 2.5.4 for requirements for Preservation of Natural Drainage Systems and Outfalls.
 - Supplemental Guidelines for Outfall Protection shall apply.
 5. On-site Stormwater Management
 - Consult SWMMWW Vol. I, Section 2.5.5 for requirements for On-Site Stormwater Management.
 - Also, consult SWMMWW Vol. III and V for design of on-site stormwater management facilities.
 6. Runoff Treatment
 - Consult SWMMWW Vol. I, Section 2.5.6 for requirements for Runoff Treatment.
 - Consult Section 2.04.C of these Standards for additional requirements.
 - Also, consult SWMMWW Vol. V for selection and design of runoff treatment facilities.
 7. Flow Control
 - Consult SWMMWW Vol. I, Section 2.5.7 for requirements for Flow Control.
 - Consult KEDM Section 2.04.A and B for exemptions and variations from MR 7.
 - Also, consult SWMMWW Vol. III for selection and design of flow control facilities.

8. Wetlands Protection

- Consult SWMMWW Vol. I, Section 2.5.8 for requirements for Wetlands Protection. Note that meeting the requirement of this Chapter does not substitute for compliance with the Critical Areas requirements of KMC Chapter 18.20.

9. Operation and Maintenance

- Consult SWMMWW Vol. I, Section 2.5.9 for requirements for Operation and Maintenance.
 - Consult KEDM Section 2.20 for additional requirements for long-term operation and maintenance.
- B. Redevelopment projects must rectify any drainage problems upon replacement or refurbishment of the affected system. For example, projects that grind and resurface a parking lot which sheets over a sidewalk shall divert or intercept that runoff to a drainage system or to landscaping.

2.04 Exemptions and Variations to the Minimum Requirements

- A. Development and redevelopment projects are exempt from MRs only as described in the SWMMWW Vol. I, Section 2.2 and in the following circumstances:
1. Minimum Requirement 7; Flow Control. Projects within the Consolidated Diking Improvement District #1 (CDID #1) and Consolidated Diking Improvement District #3 (CDID #3) boundaries and sites discharging to these boundaries via manmade conveyances are exempt from MR 7 if the discharge meets each restriction listed in SWMMWW Vol. I, Section 2.5.7.
 2. Regional Facilities. The requirements for on-site management and against the transfer of runoff from one basin to another may be waived by the Director in areas served by a regional stormwater control facility. Such a waiver must be conditioned on the following provisions:
 - a. Basin Planning. The alternative or regional approach must comply with the Basin Planning provisions of SWMMWW Vol. I, Appendix 1-A.
 - b. Services Contracted. The developer shall provide the City a copy of an executed contract with the regional facility demonstrating full compliance with the applicable standards.
 - c. Conveyance System Capacity. The conveyance system transporting the stormwater from the development to the facility shall be sized to handle the additional runoff. The developer shall be required to demonstrate the adequacy of the conveyance system by an engineer registered in the State of Washington.

3. Natural Drainage Features. Restoration of flow to natural drainage features may be allowed as an alternative to traditional detention to solve significant, pre-existing (i.e. not otherwise caused by the project) flooding, stream stability, water quality or habitat problems as determined by the Director. The project shall also satisfy all conditions of SWMMWW Vol. I, Sections 2.5.7 and 2.5.8, be documented by a qualified engineer or wetlands biologist, and receive approval from all relevant regulatory authorities.

B. Flow Control Variations

Flow control facilities shall be designed in accordance with the SWMMWW Vol. III and the following requirements:

1. Tailwater. Pond outfalls shall be analyzed for the tailwater effect on discharge with a backwater analysis. Consideration must be given to the backwater effect of high surface elevations in the downstream conveyance system. High tailwater elevations may affect performance of the upstream facility and reduce live storage volumes.
2. Fencing. Ponds shall be fenced in accordance with the SWMMWW Vol. III, Section 3.2.1, except as follows:
 - a. A pond in which less than 10% of the perimeter has a vertical drop of greater than 30" and the remaining interior side slope is not steeper than 3H:1V may provide guardrail over the vertical drop in lieu of fencing.
 - b. Where chain link fence is required, landscaping shall be installed as screening, unless not feasible.
3. Access.
 - a. Access to flow control facilities shall be provided in accordance with the SWMMWW Vol. III, Section 3.2.1.
 - b. Access roads shall have a durable all-weather surface.

C. Water Quality Variations

Water quality facilities shall be designed in accordance with the SWMMWW Vol. V and the following requirements:

1. All inlets and manholes within shall be stamped "Dump No Pollutants – Outfall to Stream," or equivalent. Similar-themed markers or stenciling in addition to this minimum requirement are encouraged.
2. Permanent markers or signs, such as those described in the SWMMWW Vol. III Ch. 3.2.1, shall be installed for significant aboveground facilities such as ponds, bioswales, pervious streets, bioretention, or developments that rely on numerous

dispersed LID BMPs. Signs should identify the feature(s), state the purpose and/or function, provide contact information (for public facilities), and give any advisory message that is key to its proper and continued performance, such as “Dump no debris or pollutants. For more information or to report littering, vandalism, or other problems, call 360-423-6590.”

D. Construction Stormwater Pollution Prevention Variations

1. Underground utility projects shall comply with MR 2 and the following additional requirements:
 - a. Where feasible, no more than five hundred (500) feet of trench shall be opened at one time;
 - b. Excavated material shall be placed to minimize runoff into the trench and adjacent roadway consistent with safety and space considerations; and
 - c. Trench dewatering devices shall be managed as described in Element #10 in SWMMWW Vol. II.
2. Diking District Maintenance. Routine dike and channel maintenance activities performed by diking districts must comply with MR 2 but are exempt from the requirement to submit a Construction Stormwater Pollution Prevention Plan.
3. Erosion Control Signage
 - a. Erosion control signage approved by the City shall be installed at each point of entry for a project prior to land disturbance and shall be removed no sooner than issuance of a Certificate of Occupancy. Erosion control signs can be obtained from the City prior to construction at no charge.

2.05 Preparation of Stormwater Site Plans

- A. The applicant for a development or redevelopment project that triggers MR 1 shall prepare a Stormwater Site Plan.
- B. The Stormwater Site Plan shall be prepared as follows:
 1. Follow the instructions in the SWMMWW Vol. I, Section 3.1, except:
 - a. References to “Projects that apply only Minimum Requirements 1 through #5” shall mean and refer to the City’s stormwater submittal type “Abbreviated Stormwater Site Plan,” and references to “Projects that are subject to Minimum Requirements #1 through #9” shall mean and refer to the City’s stormwater submittal type “Full Stormwater Site Plan”; and

- b. Step 6 – Prepare a Construction Stormwater Pollution Prevention Plan (Section 3.1.6) may be delayed at the applicant's option until the Pre-construction Conference; and
- c. Step 7 – Complete the Stormwater Site Plan (Section 3.1.7) shall be replaced with the following text:

The Stormwater Site Plan encompasses the entire submittal for stormwater and drainage review. Elements of the Stormwater Site Plan shall be submitted in accordance with Chapter 1 of the KEDM. The Stormwater Site Plan includes the following four separate documents:

1. *Site Development Drawings*
2. *Drainage Design Report*
3. *Long-Term Stormwater Site Management Plan*
4. *Construction Stormwater Pollution Prevention Plan*

Elements of the Long-Term Stormwater Site Management Plan include those items necessary to assure continued operation and maintenance of the site's stormwater management facilities. These elements are required as described in Sections 2.16 and 2.20 of the KEDM.

To complete the Stormwater Site Plan, prepare a either an Abbreviated Stormwater Site Plan or a Full Stormwater Site Plan in accordance with the specifications in Chapter 1 of the KEDM.

2.06 Setbacks

Setbacks for stormwater facilities and on-site stormwater management BMPs shall be according to Table 2.1 below:

Table 2.1: Stormwater Facility Setbacks

	Structure / Foundation	Sensitive Area¹	Property Line	Other
On-Site Infiltration BMP (serving <5,000 sf)	10'	10'	10'	See applications, limitations, suggested setbacks, and infeasibility criteria for each BMP in SWMMWW Vol. V.
Site Dispersion BMP Device (e.g. dispersion trench)²	5'	10'	5'	See applications, limitations, suggested setbacks, and infeasibility criteria for each BMP in SWMMWW Vol. V.
Large Infiltration Facility (serving >5,000 sf)	100', if building is downslope; 20' if building is upslope	20' (from buffer)	20'	See Site Suitability Criteria in SWMMWW Vol. III, Section 3.3.7. If the facility is bioretention or permeable pavement, also see infeasibility criteria for each BMP in Vol. V.

	Structure / Foundation	Sensitive Area¹	Property Line	Other
Detention Facility	20'	20' (from buffer)	20'	See suggested setbacks for each type of detention facility in SWMMWW Vol. III.
Water Quality Facility (e.g. bioswale)	20'	10'	20'	See setbacks for runoff treatment facilities in SWMMWW Vol. V, Section 4.3.1.

¹ Given setbacks to sensitive areas may be used when no specific setback is given in KMC 17.26.

² Setback is from the dispersion device, not from the flowpath. Flowpath may not enter an adjacent property.

2.07 Infiltration

- A. Infiltration facilities must comply with Ecology's Underground Injection Control (UIC) program, the Washington Department of Health's (DOH's) Wellhead Protection Program and other regulatory protections.

2.08 General Conveyance Requirements

- A. Conveyance, collection, culvert, and bridge design shall accommodate the entire contributing drainage area projected under full build-out conditions and not adversely affect existing downstream conveyance elements and flow conditions.
- B. Natural drainage flow routes to streams and wetlands shall be maintained, and discharges from the site shall occur at the natural location(s) and elevation(s), to the maximum extent practicable. See MRs 4 and 8.
- C. Vegetated open-channel conveyance is preferred and should be used wherever feasible and reasonable.
- D. Outfalls shall enter creeks or drainage channels perpendicular to the channel or angled downstream. Outfalls shall use energy dissipation to prevent erosion of the existing bank and/or channel bottom during the 100-year design storm in accordance with MR 4 Supplemental Guidelines. Energy dissipation shall be designed in accordance with SWMMWW Vol. V, Section 4.5.3, Outfall Systems.
- E. Storm drain conveyance systems shall be installed in accordance with the Kelso Standard Plans (see Appendix A) and the current WSDOT Standard Plans and Specifications for Road, Bridge, and Municipal Construction, with the notations as provided in this Chapter.
- F. Discharge to a diking district facility requires the diking district's approval.
- G. Any standard engineering methodology may be used to design closed conduit and open conveyance systems.
- H. Closed conduit systems shall be designed in accordance with KEDM Section 2.09.

- I. Open conveyance systems shall be designed in accordance with KEDM Section 2.10.

2.09 Closed Conduit Systems

A. Design Requirements

1. The 25-year storm shall show free-flowing conditions through the proposed and/or existing conveyance system.
2. The 100-year storm may overtop the conveyance system, provided:
 - a. The additional flow shall not extend beyond one-half of the width of the outside lane of the traveled way and shall not exceed a 4-inch depth at the deepest point, and
 - b. Waters do not rise to elevations more than one foot below that of the lowest aboveground floor of buildings.
3. Backwater. At the discretion of the Director, or for the conditions listed below, a backwater analysis shall be conducted to determine the hydraulic grade line to ensure a minimum of 1.0-foot freeboard between the water surface and the top of any manhole or catch basin for the 25-year storm:
 - a. Pipes with slopes less than 0.5 percent,
 - b. Pipes with velocities over 6.5 feet per second (fps) (for sub critical flow only),
 - c. Inlet and outlet pipes forming a sharp angle (45 degrees or greater) at junctions, and
 - d. Pipe inverts less than 3 feet deep when entering and leaving junctions.
 - e. Detailed information on this procedure can be found in the WSDOT Hydraulics Manual (WSDOT 2017) or Section 7 of the Federal Highway Administration (FHWA) Hydraulic Engineering Circular (HEC) 22, "Urban Drainage Design Manual."
4. Pipe. All storm pipes shall be constructed of smooth interior pipe including bell & spigot joints with gaskets and shall be subject to air testing.
 - a. Alternate Materials. Where required for strength, such as for shallow bury (less than 24 inches to top of pipe), Class 52 ductile iron pipe shall be used. Other pipe materials may be used if approved by the Director.
 - b. Location (Tracer) Wire. Non-conductive pipe shall be laid with warning tape and location wire.

5. Size. The minimum pipe size within the public right-of-way shall be 12 inches unless otherwise approved by the City Engineer. Storm laterals from private drains to inlets may be 6 inches and shall have a cleanout installed at the property line.
6. Velocity. All storm drains shall be on a grade which produces a mean velocity when flowing full of at least three fps, unless prohibited by site conditions. The Director may waive this minimum where existing drainage systems make it impractical to meet the standard.
 - a. If velocities exceed 15 fps during the 25-year storm, anchors shall be provided at bends and junctions.
 - b. Velocities in pipes other than HDPE and iron are limited to 30 fps.
7. Slope. A uniform slope between structures is required for all installed conveyance pipes. The allowable tolerance for sags or bellies in a newly installed pipe shall be 0.5 inches. For slopes steeper than 20 percent, closed conduit systems shall be designed by accepted engineering practices.
8. Minimum separations from storm drains to sewers and water lines shall be as required for sewers in the Kelso Standard Plans (see Appendix A), or as approved by the Director. Storm lines shall be laid higher than sanitary sewers where possible.
9. Pipes over 8 inches in diameter that “daylight” to the surface shall have a protective grate installed that prohibits wildlife and children from entering the storm line. The grate shall be hinged or otherwise designed to allow for cleaning and to reduce accumulation of debris from behind the grate.

B. Alignment and Cover

1. All changes in pipe direction, slope, size and junctions shall be made at a manhole or other City approved structure.
2. Storm drain lines shall not be curved between structures unless approved by the Director.
3. Unless otherwise approved by the Director, a minimum cover of 36 inches of cover is required above the top of the pipe to the top of the ground surface. There shall be a minimum of one 1-foot separation from the top of pipe to the bottom of the roadway section (e.g. laterals from catch basins).
4. In areas of relatively flat terrain, the design engineer must show that sufficient depth is provided at the boundary of the development to drain the upstream basins.

5. When necessary to locate drains in easements or tracts, the storm drain shall be centered in the easement. However, drains may be offset due to site conditions.
6. The invert elevation of all upstream pipes shall not be lower than the invert elevation of the downstream pipe.

C. Manholes

1. Manholes shall be located at all changes in slope, alignment, pipe size, and at all pipe junctions with present or future storm drains.
2. Manholes shall be spaced no greater than 300 feet apart.
3. Standard manholes are required when rim to crown of pipe elevations exceed four feet, otherwise flat-top manholes shall be used.
4. The manhole cover shall be stamped “STORM.”

D. Collection. Stormwater collection systems shall be designed by accepted engineering practices with the following notes:

1. Curb inlets shall be located in streets at the curb-line to receive stormwater and convey it to the main storm drain.
2. Curb inlets shall be at the following locations, whichever is less, unless otherwise approved by the Director:
 - a. Less than 300 feet apart;
 - b. In the tangent section immediately in advance of the curb returns on the upstream side of the intersection;
 - c. At all street ends with a descending grade, and
 - d. At intermediate locations such that gutter flow does not exceed three 3 feet in width or 3 inches in depth.
3. Catch Basin grates shall be stamped “Dump no Pollutants - Outfall to Stream,” or equivalent.
4. Catch basins shall have a sump at least 15 inches below the lowest invert to collect sediment and debris.
5. Curb inlets shall be used with curb and gutter installations up to 8% in tangential grade. Combination curb inlets shall be used for steeper grades and at road “low points.”

2.10 Open Conveyance

- A. The **25-year storm** shall show free-flowing conditions through the proposed and/or existing conveyance system. Culverts with contributing drainage areas greater than 200-acres shall be designed to pass the peak runoff from the 100-year design storm.
- B. The **100-year** storm may flow at bank-full, provided:
 - 1. Runoff is contained within defined conveyance system elements;
 - 2. The hydraulic grade line does not exceed the elevation of the roadway subgrade, and;
 - 3. Waters do not rise to elevations more than one foot below that of the lowest aboveground floor of buildings and no portions of a building will be flooded.
- C. Culverts. Culverts shall be designed in accordance with the current WSDOT Hydraulics Manual. Fish passage culverts shall meet the design criteria specified in the Washington Department of Fish and Wildlife (WDFW) *Design of Road Culverts for Fish Passage*.
- D. Backwater. A backwater analysis (see the King County Surface Water Design Manual for an example) shall be performed if a flow restriction (such as a bridge or culvert) causes flow to rise above normal depth within a channel reach.
- E. Side Slopes. Channel side slopes shall not exceed 2:1. Depth, safety, and erosion concerns must be considered with slopes steeper than 3:1. All constructed channels shall be compacted to a minimum 95 percent compaction verified by a modified Proctor test (ASTM D1557/AASHTO T180).
- F. Freeboard. Channels designed for 25-year storm flows of 10 cubic feet per second (cfs) or less shall have at least 0.5 feet of freeboard, and 1.0 feet for greater velocities.
- G. Lining and Armor. Open channels shall be designed to withstand channel erosion and not degrade water quality.
 - 1. Channels with peak velocities less than 5 fps shall be vegetated.
 - 2. Channels with velocities above 5 fps shall be sufficiently armored to the maximum water surface elevation.
 - 3. Channels must be stabilized against erosion at the completion of construction. This may require temporary erosion control practices until the design vegetation is established.

2.11 Private Drainage

- A. Drainage Accessibility. Subdivision lots which drain to the rear should be avoided; but if necessary to collect roof drains, footing drains, and surface run-off, the developer shall:
 - 1. Provide a recorded stormwater easement for the City inspection of the private system and/or a recorded stormwater easement for any crossing of private property to reach the approved point of discharge in favor of the upstream landowner.
 - 2. Design and install the system to meet the Uniform Plumbing Code requirements.
- B. Stormwater easement geometry shall be in accordance with KEDM Section 2.16.

2.12 Subsurface Drainage

Underdrains shall be provided at the following locations:

- A. For all existing springs and tile intercepted during construction.
- B. Where high ground water exists or when it is necessary to reduce the piezometric surface to an acceptable level to prevent land slippage or under-floor flooding of buildings.
- C. The drainage line installed shall begin at a cleanout and terminate at an approved point of discharge.

2.13 Curb Drains and Perforated Connections

- A. When downspouts and footing drains must be connected to the private or public storm sewer systems, perforated connections (SWMMWW Vol. III, Section 3.1.3) from the home to the property line or curb are required where feasible in accordance with MR 5.
- B. Drainage from residential roofs and footings may drain directly to a street via a curb drain under the following circumstances:
 - 1. If the project is subject to MR 5, MR 5 must be satisfied for roofs;
 - 2. Perforated connections are used and designed in accordance with the SWMMWW.
 - 3. It can be shown that gravity drainage is possible.
 - 4. The existing street is adequately crowned and its drainage system, including curb, gutter, and storm lines, is adequately sized to accept the additional flow.

5. Pressurized outfalls, e.g. sump pumps, shall not be allowed to plume into the street or where they cause standing pools in the gutter, a slip or a vector hazard.
 6. For residential redevelopment, historical installation of curb drains are evident in the immediate neighborhood.
 7. Perforated connections shall not act as a conduit to discharge groundwater or springs to the storm sewer system.
- C. Curb drains will be allowed for residential development and redevelopment as approved by the Director.
- D. Curb drains shall not be allowed for new commercial development. Commercial redevelopment may use curb drains as approved by the Director.

2.14 Stormwater Facility Plantings

Vegetated stormwater facilities shall be planted as described in this section.

- A. Bioretention BMPs and Rain Gardens within a City right-of-way shall:
1. Meet the planting plan requirements of KEDM Section 3.19 and;
 2. Be planted in accordance with KEDM Section 3.19.
- B. There are two options for planting Bioretention BMPs and Rain Gardens on private property or within a stormwater tract dedicated to the City.
1. Optional Schematic Rain Garden Planting Plan and Worksheet for Private Property.
 - a. The applicant may elect to use the Optional Schematic Rain Garden Planting Plan and Worksheet for Private Property to develop the planting plan.
 - b. Fill out the worksheet for each Rain Garden, and submit it with the Site Development Drawings (see KEDM Section 1.04.H).
 2. 2012 LID Technical Guidance Manual for Puget Sound planting guidance.
 - a. Develop a detailed planting plan in accordance with the 2012 LID Technical Guidance Manual for Puget Sound.
 - b. Submit the planting plan with the Site Development Drawings (see KEDM Section 1.04.H).
- C. Detention ponds, biofiltration swales and other vegetated stormwater facilities not listed in paragraphs A or B, above, shall be planted in accordance with recommended planting specifications in the SWMMWW.

2.15 Construction Site Limitations

A. Historical and Archaeological Areas

1. Upon excavation when burial sites, buried camp areas, village sites, and other distinctive archaeological or historical items are uncovered, or other items suspected of being of historical or archaeological significance are encountered, the Contractor shall report the matter to the City and the state liaison officer. Construction operations shall be stopped until the appropriate authorities can examine the area and give clearance to proceed with the work.
2. Under the National Historical Preservation Act (P.L. 89-665; 1966), state liaison officers shall be notified when historical or archaeological items are unearthed.
3. The Washington Criminal Code prohibits disinterment of a corpse without permission of the appropriate authorities.

B. Other Requirements

1. Construction noise shall be minimized by the use of proper engine mufflers, protective sound reducing enclosures, and other sound barriers. Construction activities producing excessive noise that cannot be reduced by mechanical means shall be restricted to locations where their sound impact is reduced to a minimum at the edge of the work area. All construction noise shall be in accordance with KMC 8.28.
2. The construction shall be done in a manner to minimize the adverse effects on fish, habitat, and wildlife resources.
3. The use of water from a stream or impoundment shall not result in altering the temperature of the water body enough to affect aquatic life.

2.16 Tracts and Easements

- A. Stormwater treatment and flow control facilities to be owned by the City shall be located in a City right-of-way or on a storm drainage tract dedicated to the City.
- B. Storm drainage conveyances (including watercourses), treatment facilities, flow control facilities, and those on-site stormwater management BMPs used to meet treatment and flow control requirements to be privately maintained shall be located on a drainage easement.

The drainage easement shall grant the City and its representatives the right of entry for the purposes of inspecting and of maintaining, repairing, or restoring BMPs that have not been properly operated and maintained by the property owner. The right shall include the right to charge the property owner for the cost of maintenance, repair, and restoration of BMPs. The right shall include the right to enter a property

when the City has a reasonable basis to believe that a violation of this Chapter is occurring or has occurred and to enter when necessary for abatement of a public nuisance or correction of a violation of this Chapter.

- C. Stormwater tracts and drainage easements shall be placed on all plats and property deeds and recorded with the Cowlitz County Auditor, after approval by the City.
- D. A drainage easement shall not be used for any purpose which would interfere with the unrestricted use of the storm drain line. No structures that prevent access are permitted within tracts or easements. Fences crossing tracts shall provide gates of sufficient width to provide access for maintenance.
- E. Minimum widths for public easements and/or tracts shall be as follows:
 - 1. Storm lines up to twenty-four inches in diameter shall have a minimum easement width of fifteen feet.
 - 2. Storm lines twenty-four inches and greater in diameter shall have a minimum easement width of twenty feet plus the pipe diameter.
 - 3. Depths greater than seven feet to the invert shall require wider easements. A slope of one horizontal to one vertical (1:1) from the storm drain invert to the ground surface shall be used in determining easement width.
 - 4. Channels with sufficient width to cover the 100-year floodplain line, fifteen feet from the waterway centerline, or ten feet from the top of the recognized bank, whichever is greater. A fifteen-foot-wide access easement shall be provided on both sides of the channel for channel widths greater than fourteen feet at the top of the recognized channel.
 - 5. Where right-of-way (or an easement) is required for access, it shall be a minimum of 15' wide and the tract (or easement) shall extend to an acceptable access location.

2.17 Stormwater Performance Bond

At the discretion of Community Development, the applicant seeking to build a stormwater facility may be required to furnish a stormwater facility performance bond, or equivalent guarantee in lieu of a bond in a form acceptable to the City, in an amount sufficient to cover all costs associated with the construction of the facility. This bond is to secure the installation and performance of the stormwater facilities identified in the approved Stormwater Site Plan. Performance shall include, when applicable, plant establishment, infiltration rate and/or facility drawdown time within parameters established in the design, and all workmanship and materials. The applicant shall be responsible for any costs incurred by the City to secure performance of the stormwater facilities that are in excess of the amount of the bond.

- A. Term of Performance Bond. The stormwater performance bond furnished pursuant to this section, or the unexpended or unobligated portion thereof, shall be released to the applicant within sixty (60) days of issuance of the final acceptance of the permanent stormwater facilities by the Community Development Department. A final inspection by Community Development is required before any performance bond will be released.
- B. Partial Release of Bond. Community Development shall have the sole discretion to adopt provisions for a partial pro-rata release of the performance bond on the completion of various stages or phases of development.
- C. Bond Estimation. The applicant shall be responsible for determining bond value and submitting the estimation to the Community Development for approval. If the Director disagrees with the applicant's estimate, the Director shall determine a reasonable estimate. The bond value for public and private facilities is to be 125 percent of the estimated cost for the City to construct the stormwater features and achieve final stabilization.

2.18 Stormwater Maintenance Bond

- A. Stormwater Maintenance Bond. The applicant seeking final acceptance of a stormwater treatment and/or flow control facility for public ownership shall be required to furnish a maintenance bond, or equivalent financial guarantee in a form acceptable to the city, in an amount sufficient to cover costs associated with maintenance or repair in the event the stormwater facility does not meet the maintenance standards of the manufacturer, the SWMMWW, the KEDM, and/or the approved operation and maintenance plan. A finding of deficiency in facility condition shall be based on inspection. For vegetated facilities, a finding of deficiency shall be made if plant survival after two years is less than 90% of the approved design. This bond is to secure the maintenance and repair of the stormwater facilities identified in the approved stormwater site plan. The applicant shall be responsible for any costs incurred by the City to bring the facility up to maintenance into compliance with approved standards in the event such costs that are in excess of the amount of the bond.
- B. Term of Maintenance Bond. The stormwater maintenance bond furnished pursuant to this section, or the unexpended or unobligated portion thereof, shall be released to the applicant within ninety days of the City inspection conducted on or after two years after the City's final acceptance of the permanent stormwater facilities by the Community Development department.
- C. Bond Estimation. The applicant shall be responsible for submitting the estimation of bond value to community development for approval. If the director disagrees with the applicant's estimate, the director shall determine a reasonable estimate. The bond value for public facilities shall be ten percent of the cost to construct the facility.

2.19 As-Built Plans

As-Built Plans. Applicants are required to submit as-built plans for all permanent stormwater treatment and/or flow control facilities meeting MR 6 or MR 7, including any on-site stormwater management BMPs that are used to meet treatment or flow control requirements, after final construction is completed. The plans must show the final design specifications for all stormwater management facilities, meet the criteria for as-built plans in KEDM Chapter 1, and be sealed by a registered professional engineer.

2.20 Dedication of Facilities

The City will accept a dedication of a stormwater facility, together with necessary easements and appurtenances, upon a determination and acceptance, as provided herein, except that dedications made during the subdivision platting process shall not be subject to the following process:

- A. Preliminary Determination by Community Development. Upon receipt by the City of an offer of dedication of a stormwater facility, the Director shall make a preliminary determination that the dedication of the facility is appropriate to protect the public health, safety and general welfare, and furthers the goals of the City's stormwater management program and/or associated watershed plans. Budgetary implications will be a component of the determination. Prior to making a determination, the Director will inspect the facility to determine whether it has been properly maintained and is in good repair, and may condition the recommendation of acceptance on completion of any necessary maintenance items. The Director will forward his/her determination to the City Council.
- B. Acceptance by City Council. City Council may reject or accept the offer of dedication by adoption of a resolution. Upon acceptance, the owner shall record the document dedicating the stormwater facility with the Cowlitz County Auditor by and at the owner's sole expense.
- C. Owner to Provide Documentation. The owner, at his or her sole expense, shall provide any document or information requested by the Director and/or the City Council in order for a decision to be reached on whether or not to accept the facility.

2.21 Long-Term Operation and Maintenance

- A. Operation and Maintenance Required. All erosion controls and stormwater facilities (including, but not limited to, structural and operational BMPs, on-site stormwater management BMPs, treatment and flow control facilities, catch basins and other protective devices, necessary access routes, and appurtenances) shall be operated and maintained in accordance with the manufacturer's specifications, the SWMMWW, the KEDM, the approved Stormwater Site Plan, and the stormwater maintenance agreement and plan, as discussed below.

- B. Responsible Party. The owner shall be responsible for the proper operation and maintenance of the parcel's stormwater facilities and shall pass such responsibility to any successor owner, unless such responsibility is transferred to the City or to another governmental entity as per KEDM Sections 2.16 or 2.20.
- C. Stormwater Improvement Restrictive Covenant. The applicant shall prepare a Stormwater Improvement Restrictive Covenant that runs with the land for the site (e.g. plat) and for each lot within a subdivision that contains stormwater facilities. Prior to final acceptance of the project, the applicant shall record the covenant(s) with the Cowlitz County Auditor. A sample of a Stormwater Improvement Restrictive Covenant is included in Appendix 2-C.
 - 1. Each Stormwater Improvement Restrictive Covenant for the site shall, at a minimum, include the following:
 - a. Designate the responsible party permanently responsible for maintenance.
 - b. Pass the responsibility for such maintenance to successors in title.
 - c. Establish a Stormwater Operation and Maintenance Plan to ensure the continued effectiveness of the stormwater facilities. The specifications of the Operation and Maintenance Plan vary depending on the types of facilities used on the site, as described in KEDM Section 2.21.D.
 - d. Restrict the removal and alteration of stormwater and drainage facilities without approval from the City of Kelso.
 - e. Grant the City and its representatives the right of entry for the purposes of inspecting all stormwater BMPs and of maintaining, repairing, or restoring BMPs that have not been properly operated and maintained by the property owner. The right shall include the right to charge the property owner for the cost of maintenance, repair, and restoration of BMPs.
 - 2. Each Stormwater Improvement Restrictive Covenant for individual lots, if required, shall include the following:
 - a. Designate the responsible party permanently responsible for maintenance.
 - b. Pass the responsibility for such maintenance to successors in title.
 - c. Describe and illustrative the operation and maintenance of the on-site stormwater management BMPs as described in KEDM Section 2.21.D.
 - d. Restrict the removal and alteration of on-site stormwater and drainage facilities without approval from the City of Kelso.
- D. Stormwater Operation and Maintenance Plan
 - 1. Site Stormwater System Manual. The applicant shall prepare a Site Stormwater System Manual for treatment facilities (MR 6) and flow control facilities (MR

7), including any on-site stormwater management facilities (MR 5) used to help meet MR 6 or MR 7 requirements.

The manual shall be submitted on 8 1/2" x 11" paper.

The Site Stormwater System Manual shall be customized to the particular facilities used on the site and shall contain at the minimum:

- a. An illustrative drawing of all stormwater management facilities, on-site stormwater management BMPs, and conveyances on the site.
- b. A narrative description of each facility, what it does, and how it works using language suitable for a non-technical audience such as an owner or maintenance staff.
- c. An illustration of each facility.
- d. Maintenance tasks and frequencies meeting standards of the SWMMWW.

Pages drawn from the Clark County Stormwater Manual 2015, Book 4, or the City of Olympia 2016 Drainage Design and Erosion Control Manual Appendix IV-J may be used to meet the requirements of items b through d.

- e. Sample inspection form/checklist for each facility.
 - f. Sample maintenance activity log.
 - g. A prominent notification that the site owner must make the Site Stormwater System Manual and inspection records available for inspection by the City.
 - h. A prominent notification that the site owner is required to record inspection and maintenance activities and to submit to the City by January 31 documentation of inspections performed during the previous year.
2. Individual Lot Operation and Maintenance Instructions. The applicant shall prepare simplified operation and maintenance instructions for each on-site stormwater management BMP (MR 5) on an individual lot or commercial site.

The Individual Lot Operation and Maintenance Instructions shall be customized to the particular facilities used on the lot or site and shall contain at the minimum:

- a. An illustrative drawing of all on-site stormwater management BMPs and conveyances on the site.
- b. A narrative description and maintenance instructions for each BMP on the lot using language suitable for a non-technical audience. The City offers simplified maintenance instruction handouts, which may be used to meet this requirement.
- c. An illustration or design detail of each facility.

- d. If full dispersion is proposed, or if newly planted trees or retained trees were claimed as flow reduction credits, then include a map of trees and vegetation areas to be retained.

E. Maintenance Escrow Requirement

1. At the discretion of the Director, the property owner will be required to post a cash escrow, letter of credit, or other acceptable form of performance security in an amount that would cover costs associated with maintenance and repair in the event of stormwater facility failure, at least 10% of the project engineer's estimate to construct the facility, in the event the Director determines that such security is necessary to ensure the facility satisfies the maintenance and performance requirements identified in these Standards and the approved Operation and Maintenance Plan. This instrument is required to be posted prior to completion of construction and release of the Stormwater Performance Bond and remain in place for a minimum of two (2) years.
2. At the discretion of the Director, the stormwater performance bond may be extended in lieu of the maintenance escrow account.

- F. Maintenance Records. The responsible party shall keep records of the BMPs' installation and all subsequent maintenance and repairs, and shall retain the records for at least five (5) years. These records shall be made available to the City within 1 week of inspection or upon request by the City.

2.22 Enforcement

Enforcement shall be consistent with KMC 1.50.

- A. Protection of Watercourses and Facilities. It shall be a criminal violation to break, block, damage, destroy, uncover, deface or tamper with any watercourse, stormwater facility, or erosion control system.
- B. Public Nuisance Declared. In addition to other remedies, failure to install and/or maintain watercourses, stormwater facilities, or erosion controls as required in this Manual and applicable permits is declared to be a public nuisance, subject to abatement as provided by KMC 1.50.
- C. Suspension of Work or Access
 1. Access to the municipal stormwater drainage system may be suspended if such termination is needed to abate or reduce an illicit discharge.
 2. Work shall be suspended for un-permitted clearing and grading, or for projects that fail to provide required runoff controls for land-disturbing activities. After the stop-work period, the Director may allow work on-site to resume, provided

that such work is necessary to ensure compliance with this Manual, permits, or an approved stormwater drainage plan or SWPPP.

3. Resumption of work or reinstatement of connection to the municipal stormwater drainage system, without the prior approval of the City, shall be subject to the civil and/or criminal penalties delineated in KMC 1.50.
- D. Financial Liability. The property owner and all persons engaged in development or land-disturbing activity shall be liable, jointly and severally, for all costs incurred by the City in any public nuisance action taken hereunder, or on account of damage or threatened damage to City property or facilities or water bodies, or associated with remedial actions necessitated by the damage or failure to install and/or maintain required stormwater facilities. The City may assess the responsible parties for these costs which shall be a lien on the property, or prorated against the beneficial users of the property, and may be placed on the tax bill and collected as ordinary taxes by the City.

APPENDIX 2-A

STORM DRAINAGE STANDARD DETAILS

Appendix 2-A Contents

Stormwater Details

		<u>Revision Date</u>
Storm Drain General Notes	SD/EC-000	JUNE 2017
Gutter Transition Section	SD-010	JUNE 2017
Curb Inlet	SD-020	JUNE 2017
Ditch Inlet	SD-030	JUNE 2017
(vacant)	SD-040	JUNE 2017
Bioretention Planter	SD-050 LID	JUNE 2017
Bioretention Curb Extension Plan	SD-060 LID	JUNE 2017
Bioretention Curb Extension Planting Plan	SD-070 LID	JUNE 2017
Planter Wall	SD-080 LID	JUNE 2017
Beehive Outlet Structure	SD-090 LID	JUNE 2017
Trench Drain to Bioretention Facility	SD-100 LID	JUNE 2017
Inlet/Outlet for Curb Extensions	SD-110 LID	JUNE 2017
Side Curb Cut	SD-120 LID	JUNE 2017
Catch Basin Type 1	WSDOT B-5.20-02	JUNE 2017
Catch Basin Type 1L	WSDOT B-5.40-02	JUNE 2017
Combination Inlet	WSDOT B-25.20-01	JUNE 2017
Rectangular Frame	WSDOT B-30.10-02	JUNE 2017
Rectangular Vaned Gate	WSDOT B-30.30-02	JUNE 2017
Catch Basin Type 2	WSDOT B-10.20-01	JUNE 2017
Manhole Type 1	WSDOT B-15.20-01	JUNE 2017
Circular Frame (Ring) and Cover	WSDOT B-30.70-03	JUNE 2017
Miscellaneous Details for Drainage Structures	WSDOT B-30.90-02	JUNE 2017
Grate Inlet Type 2	WSDOT B-35.40-00	JUNE 2017
Welded Grates for Grate Inlet	WSDOT B-40.20-00	JUNE 2017
Pipe Zone Bedding and Backfill	WSDOT B-55.20-01	JUNE 2017
Connection Details for Dissimilar Culvert Pipe	WSDOT B-60.20-00	JUNE 2017
Beveled End Sections	WSDOT B-70.20-00	JUNE 2017

Erosion Control Details

		<u>Revision Date</u>
Erosion Control General Notes	SD/EC-000	JUNE 2017
Silt Fence	WSDOT I-30.15-02	JUNE 2017
Wattles	WSDOT I-30.30-01	JUNE 2017
Compost Sock	WSDOT I-30.40-01	JUNE 2017
Storm Drain Inlet Protection	WSDOT I-40.20-00	JUNE 2017
Check Dams	WSDOT I-50.20-01	JUNE 2017
Erosion Control Blanket	WSDOT I-60.10-01	JUNE 2017
Sediment Trap	WSDOT I-80.10-02	JUNE 2017
Stabilized Construction Entrance	WSDOT I-80.10-02	JUNE 2017

EROSION CONTROL GENERAL NOTES

1. ALL EROSION CONTROL DEVICES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE EROSION CONTROL PLAN AND EROSION CONTROL DETAILS AND IN PLACE PRIOR TO START OF ANY LAND DISTURBING ACTIVITY .
2. ALL EROSION PREVENTION AND CONTROL BMPS SHALL BE INSPECTED, MAINTAINED AND REPAIRED AS NEEDED THROUGHOUT CONSTRUCTION TO INSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION.
3. PERFORM ALL ACTIONS NECESSARY TO PREVENT EROSION AND CONTROL SEDIMENT, INCLUDING DUST, FROM LEAVING THE CONSTRUCTION SITE.
4. AS CONSTRUCTION PROGRESSES AND SEASONAL CONDITIONS DICTATE, MORE EROSION AND SEDIMENT CONTROLS MAY BE REQUIRED TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATERS DO NOT ENTER THE DRAINAGE SYSTEM, ROADWAYS, OR SURFACE WATERS.
5. SITES THAT ARE REQUIRED TO HAVE A CERTIFIED EROSION AND SEDIMENT CONTROL LEAD SHALL KEEP A CURRENT INSPECTION LOG ONSITE THAT SHALL BE AVAILABLE FOR CITY REVIEW.

STORM DRAIN GENERAL NOTES

1. TRACER WIRE SHALL BE INSTALLED IN THE SAME ORIENTATION TO THE INSTALLED NON-CONDUCTIVE PIPE IN ONE CONTINUOUS STRAND. INSTALL A WARNING TAPE 12 TO 18 INCHES ABOVE THE INSTALLED PIPE. CONTINUITY TESTING OF TRACER WIRE IS REQUIRED.
2. INSTALLED PIPE SHALL BE CLEANED BY USE OF HIGH PRESSURE NOZZLE AND VACUUM TRUCK PRIOR TO VIDEOING OR TESTING.
3. VIDEO INSPECTION SHALL BE PERFORMED ON THE INSTALLED PIPE. VIDEO INSPECTION SHALL DEMONSTRATE NO DEFORMATION, MANUFACTURING OR INSTALLATION DEFECTS, OR ANY DEBRIS IN THE LINES, FOR APPROVAL AND ACCEPTANCE BY THE CITY.
4. PRESSURE TESTING IN ALL STORM MAIN LINES IS REQUIRED.
5. IF SUBGRADE CONDITIONS ARE SUBSTANDARD, FOUNDATION MATERIAL SHALL BE INSTALLED TO THE DEPTH AS DIRECTED BY THE CITY ENGINEER.



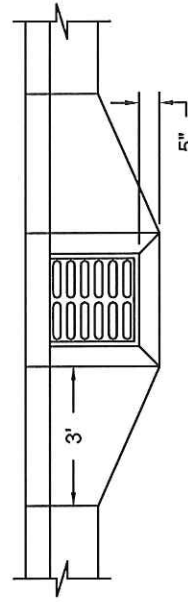
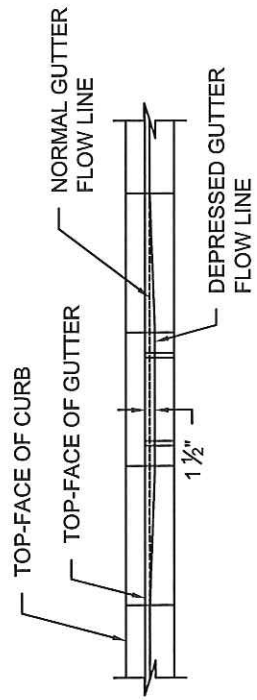
STORM DRAIN AND EROSION CONTROL NOTES

STANDARD PLAN: **SD/EC-000**

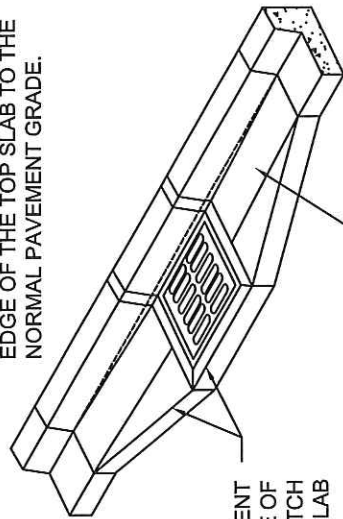
DATE: **6-1-2017**

CITY ENGINEER APPROVAL:

Michael Kardas, P.E.



PRECAST TOP SLAB SHOWN WITH
GUTTER TRANSITION FLARE.
MATCH THE TOP FRONT EDGE OF
THE FRAME AND THE TOP FRONT
EDGE OF THE TOP SLAB TO THE
NORMAL PAVEMENT GRADE.



MATCH NORMAL PAVEMENT
GRADE AT FRONT EDGE OF
GUTTER FLARE AND CATCH
BASIN TOP SLAB

FLARE GUTTER IN
TRANSITION SECTION



GUTTER TRANSITION SECTION

STANDARD PLAN: **SD-010**

DATE: **6-1-2017**

CITY ENGINEER APPROVAL:

Michael Kardas, P.E.

CURB INLET



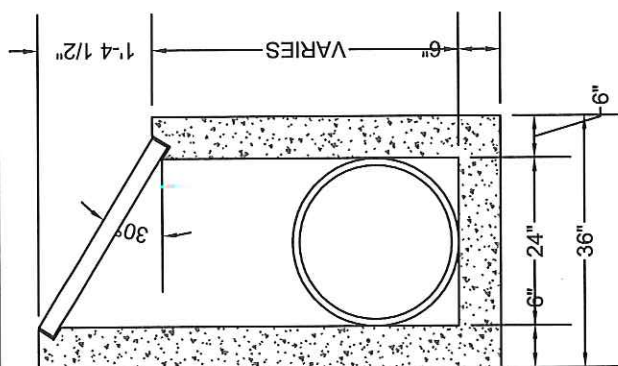
STANDARD PLAN: **SD-030**

DATE: **6-1-2017**

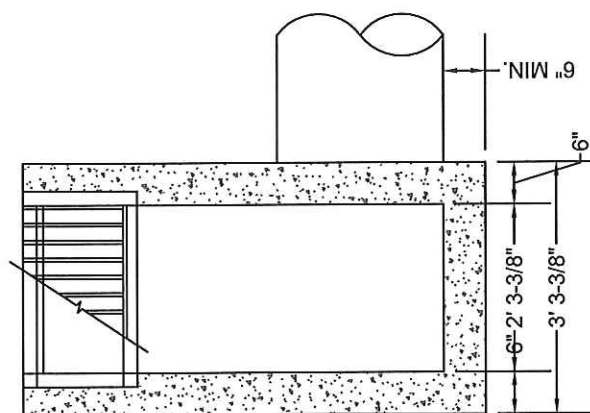
DITCH INLET

CITY ENGINEER APPROVAL:

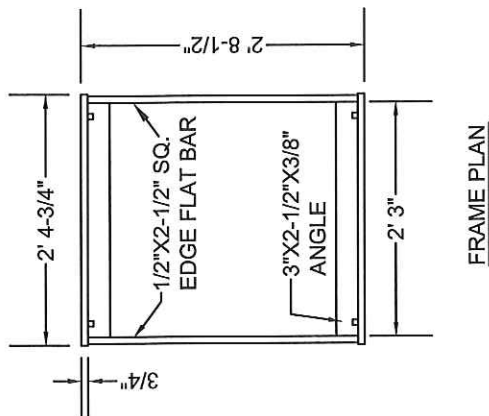
Michael Kardas, P.E.



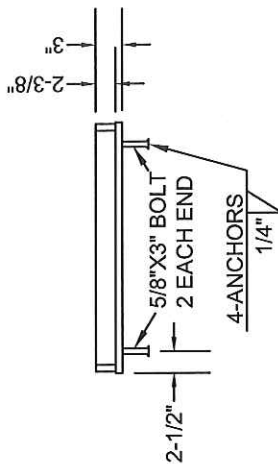
SECTION A-A



SECTION B-B

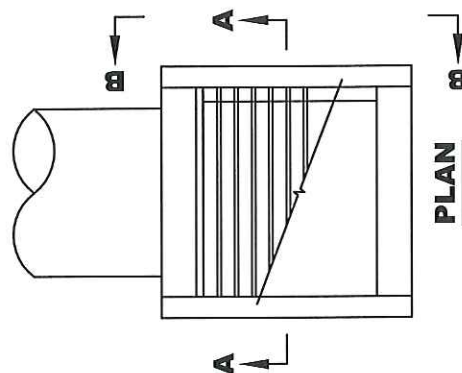


FRAME PLAN

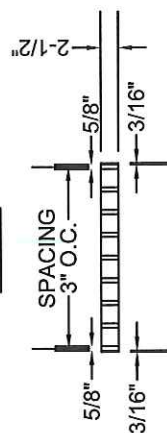


FRAME SECTION

NOTE:
3/8" CROSS BARS SHALL BE FLUSH WITH THE GRATE SURFACE AND MAY BE FILLET WELDED, RESISTANCE WELDED OR ELECTROFORGED TO BEARING BARS.



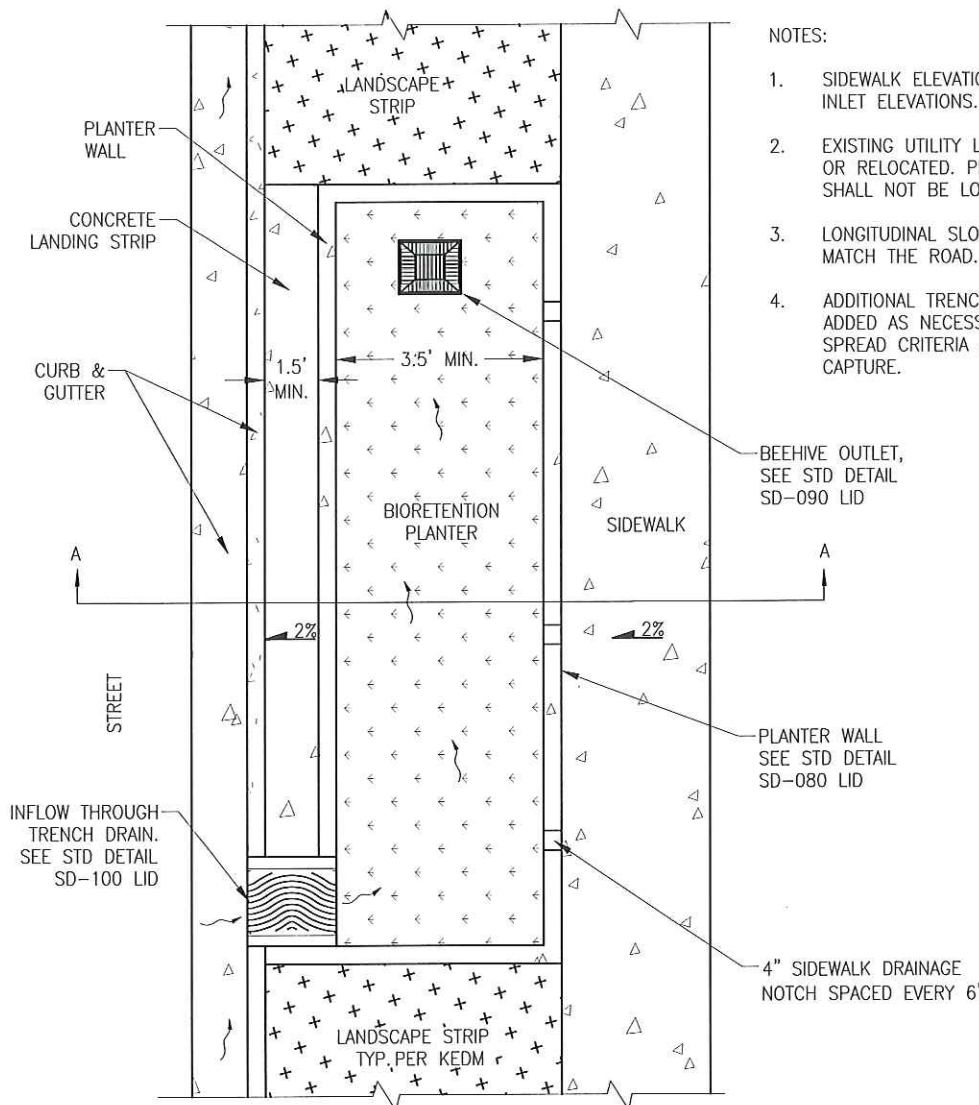
PLAN



**GRATE SECTION
TYPE 1**

NOTE:

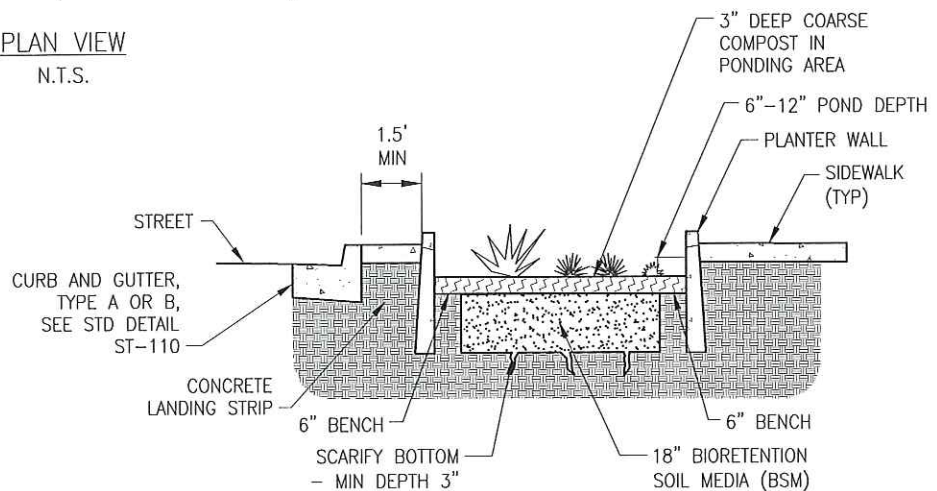
1. CONCRETE STRENGTH SHALL BE COMMERCIAL GRADE CONCRETE.
2. G-2 GRATES MAY BE USED IF APPROVED BY THE ENGINEER.
3. CATCH BASIN, FRAME & GRATES SHALL MEET H20 LOADING.
4. INSIDE FRAME DIMENSIONS: 2' 3-3/8" X 2' 8-1/2"
5. GROUTING SHALL BE SUFFICIENT TO PREVENT LEAKS BETWEEN THE PRECAST COMPONENTS OF THE COMPLETED STRUCTURE & SHALL BE PERFORMED INSIDE, BETWEEN & OUTSIDE OF ALL RISERS, JOINTS & PIPE PENETRATIONS.
6. ALL RISERS OR ADJUSTMENT SECTIONS SHALL BE THE SAME INSIDE DIMENSIONS AS BASE SECTIONS.



NOTES:

1. SIDEWALK ELEVATION SHALL BE SET ABOVE INLET ELEVATIONS.
2. EXISTING UTILITY LINES SHALL BE SLEEVED OR RELOCATED. PROPOSED UTILITY LINES SHALL NOT BE LOCATED IN THE FACILITY.
3. LONGITUDINAL SLOPE OF PLANTER TO MATCH THE ROAD.
4. ADDITIONAL TRENCH DRAIN INLETS TO BE ADDED AS NECESSARY TO MEET FLOW SPREAD CRITERIA AND FULL STORMWATER CAPTURE.

PLAN VIEW
N.T.S.



SECTION A-A
N.T.S.



BIORETENTION PLANTER

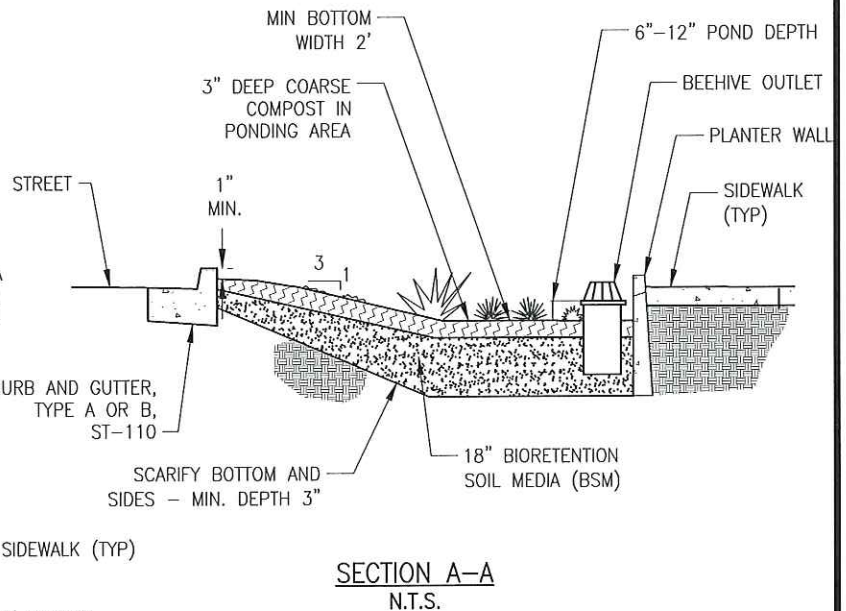
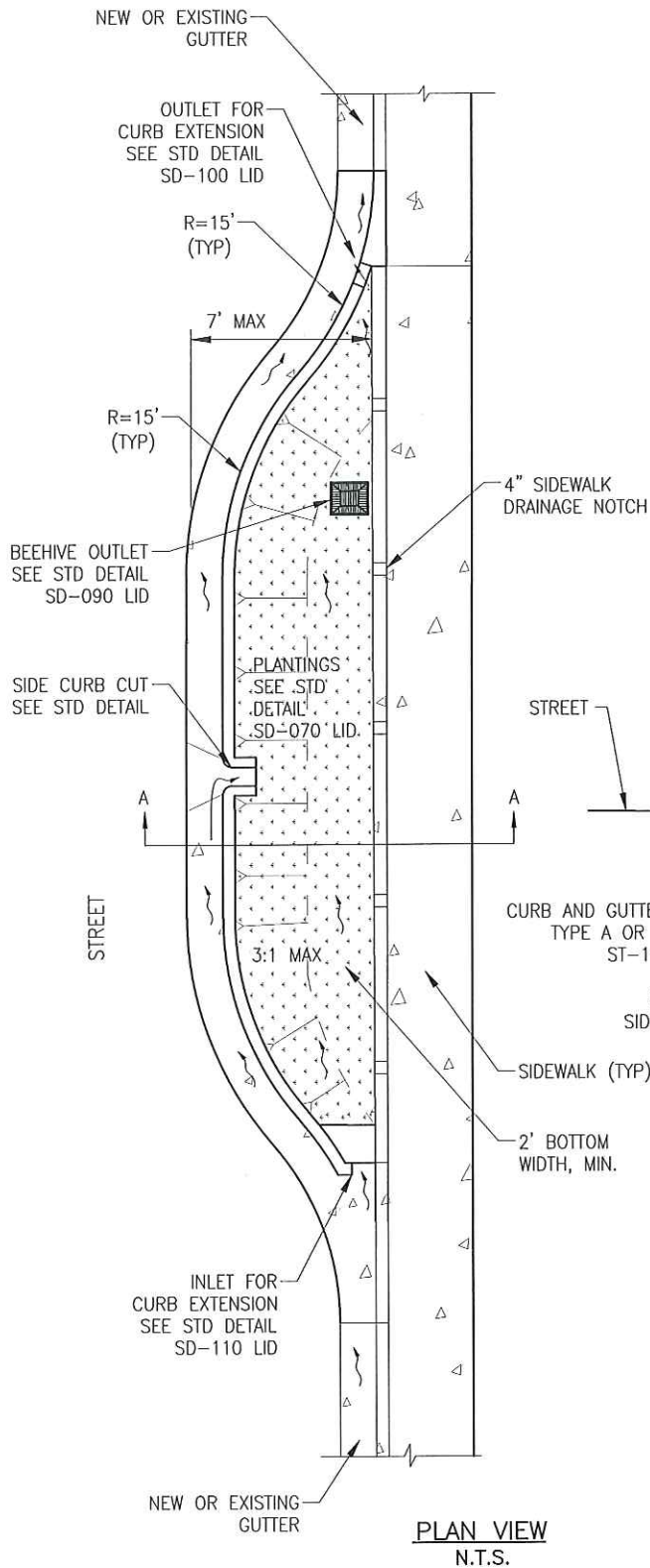
STANDARD PLAN:
SD-050 LID

DATE: JUNE 2017

CITY ENGINEER APPROVAL:

NOTES:

1. SIDEWALK ELEVATION MUST BE SET MIN 1" ABOVE INLET ELEVATIONS.
2. EXISTING UTILITY LINES MUST BE SLEEVED OR RELOCATED. PROPOSED UTILITY LINES MUST NOT BE LOCATED IN THE FACILITY.
3. LONGITUDINAL SLOPE OF CURB EXTENSION TO MATCH THE ROAD.
4. ADDITIONAL SIDE CURB CUT INLETS TO BE ADDED AS NECESSARY TO MEET FLOW SPREAD CRITERIA AND FULL STORMWATER CAPTURE.
5. SLOPE SIDEWALK TO FACILITY AT 2%, AND NOTCH PLANTER WALL (4" NOTCH) EVERY 6' TO ALLOW FLOW ENTRANCE.



BIORETENTION CURB EXTENSION PLAN

STANDARD PLAN:
SD-060 LID

DATE: JUNE 2017

CITY ENGINEER APPROVAL:

SECTION ONE: INSTRUCTIONS TO ENGINEER/DESIGNER/HOMEOWNER

FILL OUT PLANT SELECTION AND QUANTITY IN SECTION TWO PER THESE NOTES:

- CHOOSE PLANT PALETTE A OR B BELOW
- CALCULATE PLANT QUANTITIES AS FOLLOWS:
 ZONE 1 EMERGENT GRASS: 115 PER 100 SF
 ZONE 2 SHRUBS: 13 PER 100 SF
 ZONE 2 GROUND COVER: 20 PER 100 SF
 OPTIONAL BULBS: UP TO 40 PER 100 SF
 OPTIONAL TREE: 1 PER FACILITY
- NO HEAVY EQUIPMENT SHALL BE USED WITHIN THE PERIMETER OF THE BIORETENTION FACILITY BEFORE, DURING, OR AFTER THE PLACEMENT OF THE BIORETENTION SOIL MIX

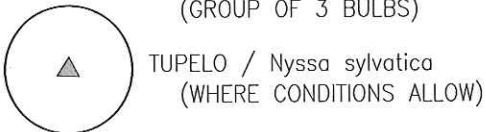
PLANTING LEGEND

CIRCLE PREFERRED PLANT PALETTE:

	PLANT PALETTE A	PLANT PALETTE B
ZONE 1 GRASS 1 - #1 CONTAINER		
	SLOUGH SEDGE <i>Carex obnupta</i>	SPREADING RUSH <i>Juncus patens</i>
ZONE 1 GRASS 2 (CLOSE TO SIDEWALK) - #1 CONTAINER		
	DAGGER-LEAF RUSH <i>Juncus ensifolius</i>	ORANGE SEDGE <i>Carex testacea</i>
ZONE 2 SHRUB - #1 CONTAINER		
	KELSEY REDTIG DOGWOOD <i>Cornus sericea 'Kelsey'</i>	BIRCH LEAF SPIREA <i>Spiraea betulifolia</i>
ZONE 2 GROUND COVER - #1 CONTAINER		
	KINNIKINNICK (BOTH PALETES) <i>Arctostaphylos uva-ursi</i>	

CIRCLE OPTIONAL PLANTS, IF USED:

- GREAT CAMAS LILY / *Camassia leichtlinii*
(GROUP OF 3 BULBS)



SECTION TWO: INSTRUCTIONS TO CONTRACTOR

PLANT SELECTION AND QUANTITIES

ZONE 1 EMERGENT GRASS 1 AREA IN SF: _____
(AREA AT POND DEPTH)

ZONE 1 EMERGENT GRASS 2 AREA IN SF: _____

ZONE 2 AREA IN SF: _____

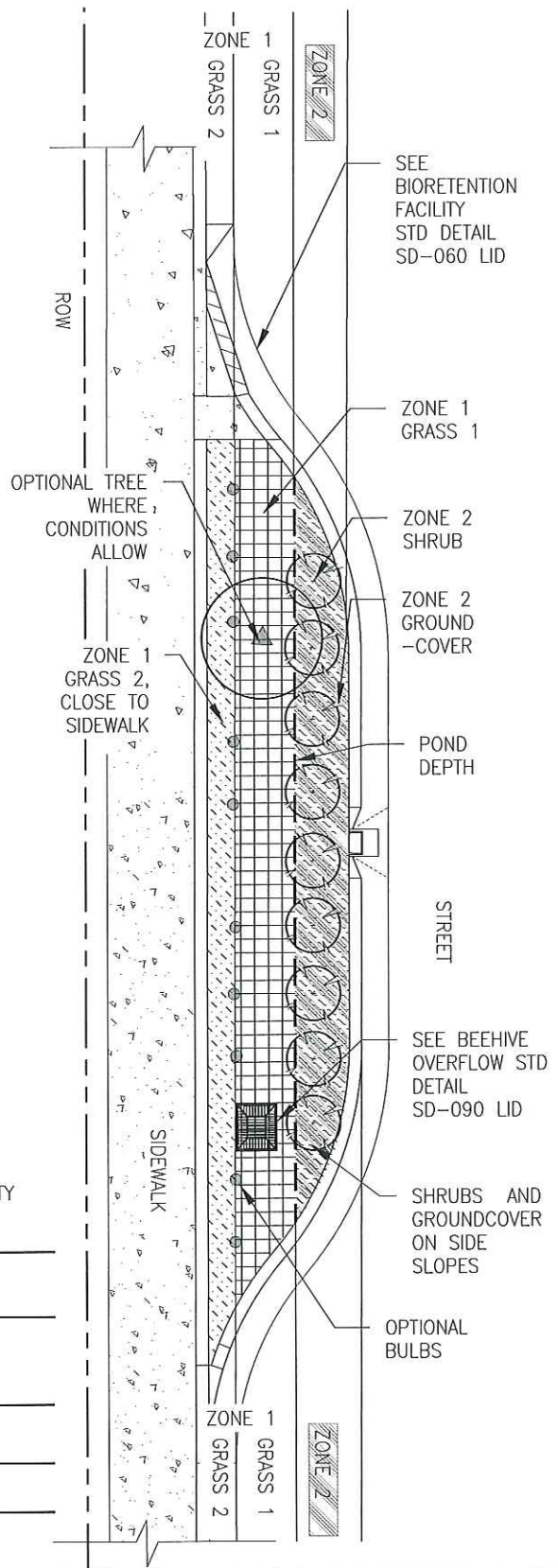
ZONE 2 SHRUBS AT 13 PER 100 SF:

ZONE 2 GROUND COVER AT 20 PER 100 SF:

OPTIONAL BULBS UP TO 40 PER 100 SF:

INCLUDE TREE: YES NO (CIRCLE ONE)

QUANTITY



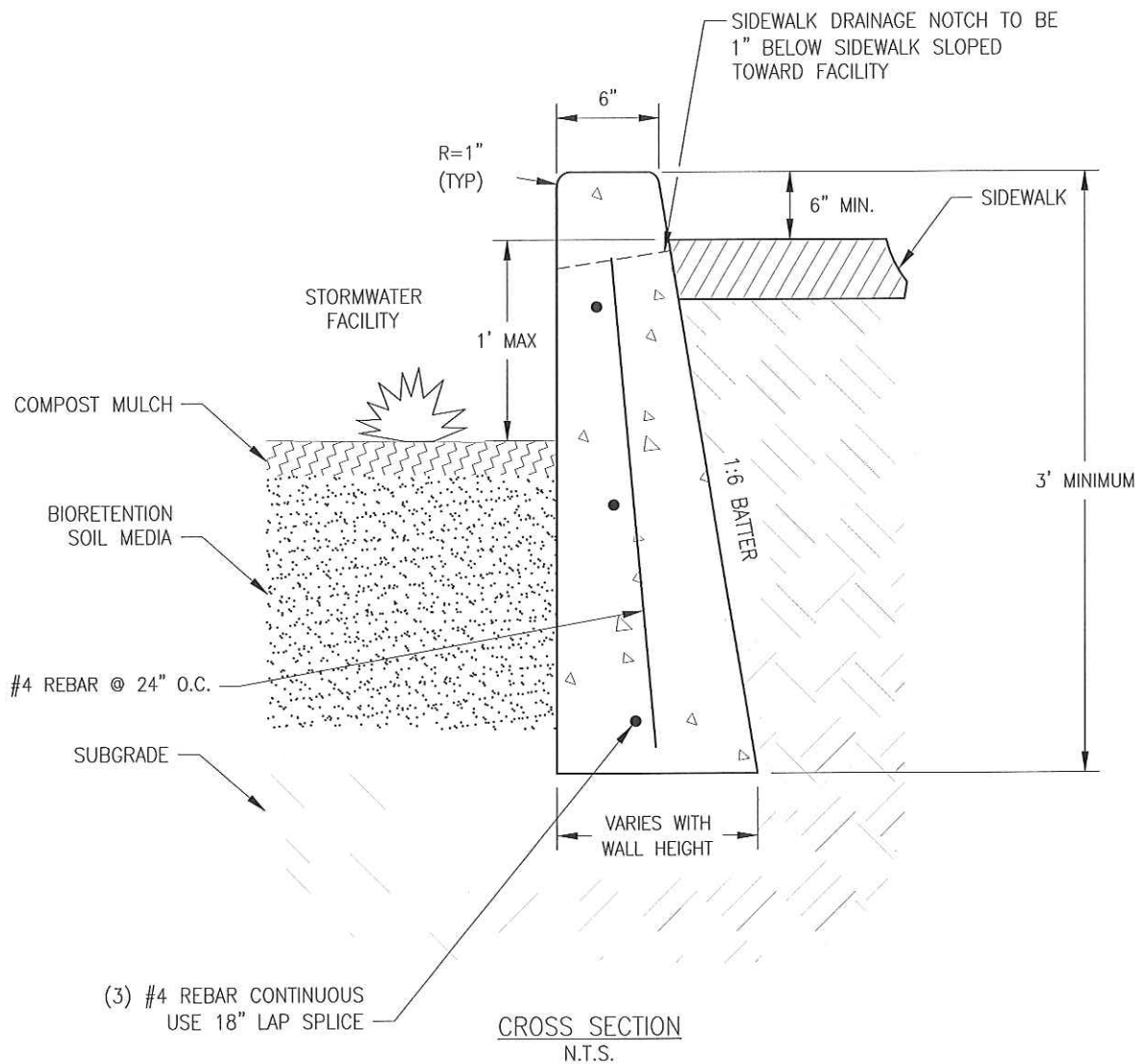
BIORETENTION CURB EXTENSION PLANTING PLAN

STANDARD PLAN:
SD-070 LID

DATE: JUNE 2017

CITY ENGINEER APPROVAL:

[Signature]



NOTES:

1. SPECIAL DESIGN CONSIDERATIONS OR STRUCTURAL REVIEW MAY BE REQUIRED FOR TALLER PLANTER WALLS. STEEL REINFORCEMENT MAY BE NEEDED FOR STABILITY.
2. MAINTAIN 1:6 BATTER FOR WALLS AND 6" MIN. TO TOP OF CURB.
3. BROOM FINISH ALL EXPOSED CONCRETE SURFACES.
4. PROVIDE A $\frac{3}{4}$ " DUMMY JOINT AT 10' O.C. ON SIDES AND TOP. PROVIDE $\frac{1}{2}$ " EXPANSION JOINT AT MAXIMUM 100' O.C.

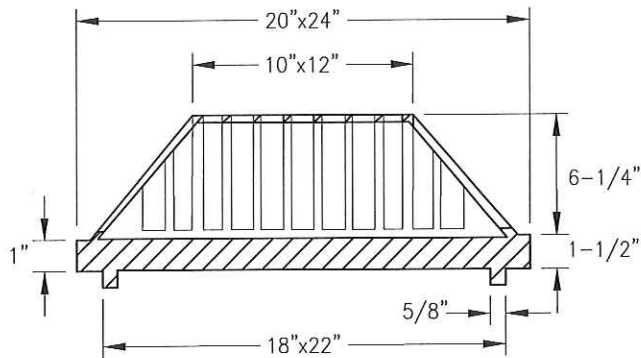
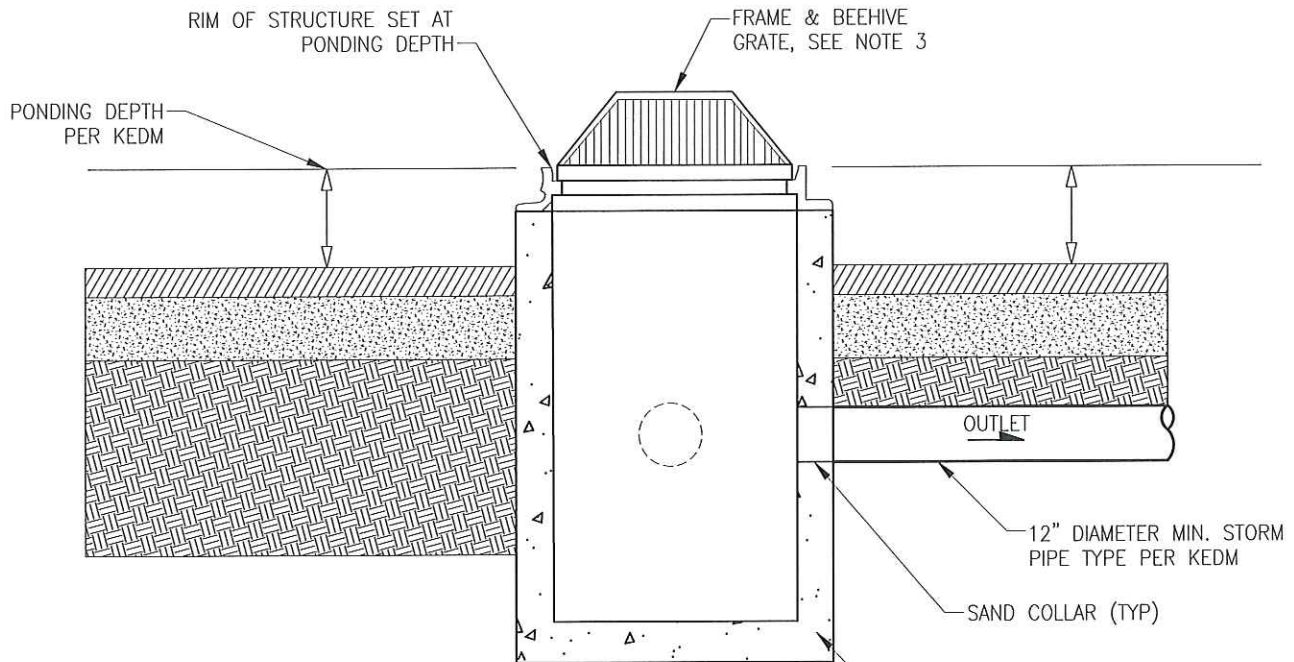


PLANTER WALL

STANDARD PLAN:
SD-080 LID

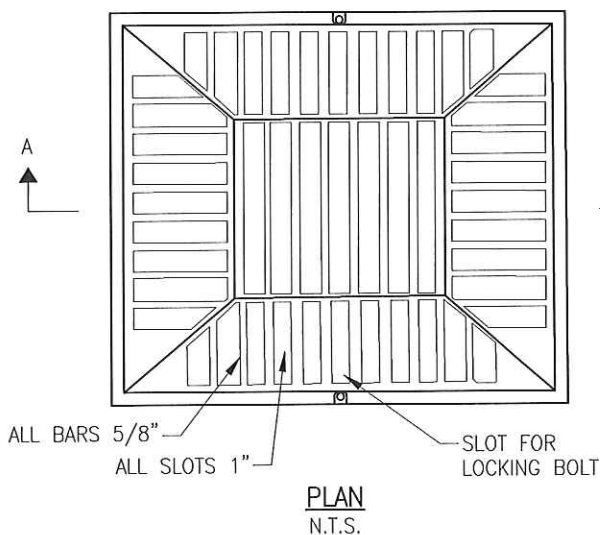
DATE: JUNE 2017

CITY ENGINEER APPROVAL:



NOTES:

1. FRAME AND GRATE SHALL BE LOCKING AND GRATE SHALL BE BOLTED TO FRAME. FRAME SHALL CONFORM TO WSDOT STANDARD PLAN B-30.10-01.
2. OVERFLOW STRUCTURE SHALL BE LOCATED WITHIN 10 FEET OF ROAD EDGE FOR MAINTENANCE ACCESS, UNLESS APPROVED OTHERWISE. OVERFLOW STRUCTURE MAY BE LOCATED IN SIDE SLOPES.
3. FRAME AND GRATE TO CONFORM TO WSDOT STANDARD SPECIFICATIONS 9-05.15(2).
4. SPACE PLANTS WITHIN FACILITY TO ALLOW MAINTENANCE ACCESS TO STRUCTURE.

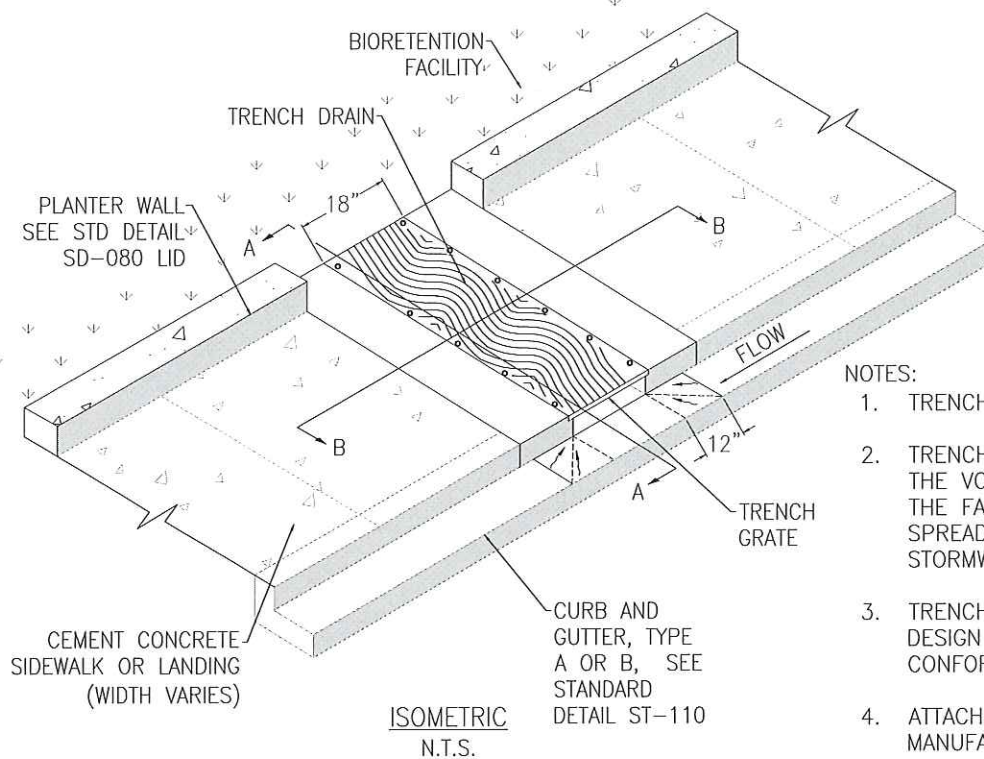


BEEHIVE OUTLET STRUCTURE

STANDARD PLAN:
SD-090 LID

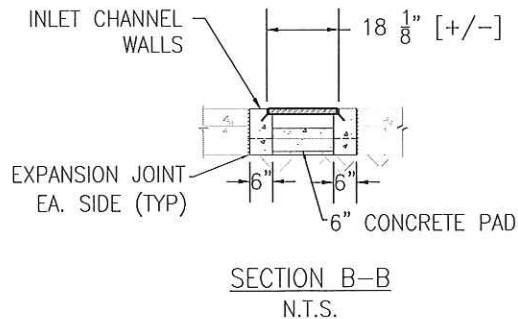
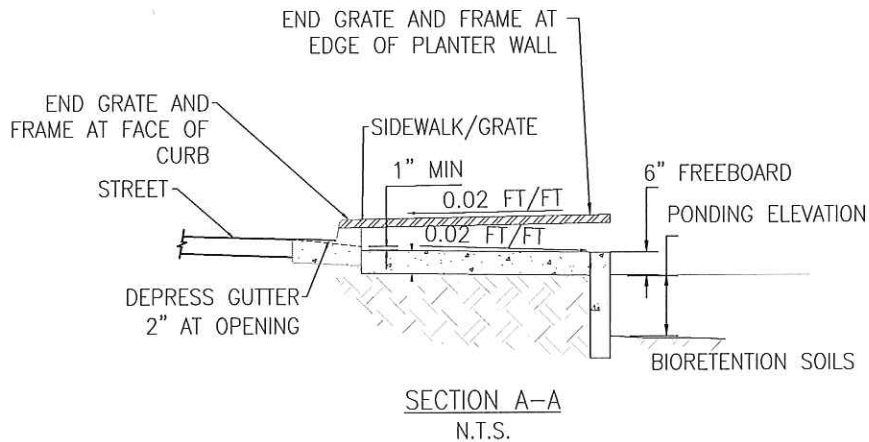
DATE: JUNE 2017

CITY ENGINEER APPROVAL:



NOTES:

1. TRENCH GRATE WIDTH SHALL BE 18".
2. TRENCH DRAINS SHALL BE SPACED FOR THE VOLUME OF WATER CONVEYED INTO THE FACILITY, IN ORDER TO MEET FLOW SPREAD CRITERIA AND FULL STORMWATER CAPTURE.
3. TRENCH GRATE SHALL BE A DECORATIVE DESIGN OF IRON OR ALUMINUM AND CONFORM TO ADA STANDARDS.
4. ATTACH TRENCH GRATE PER MANUFACTURER INSTRUCTIONS. USE FRAME SPECIFIED BY MANUFACTURER.

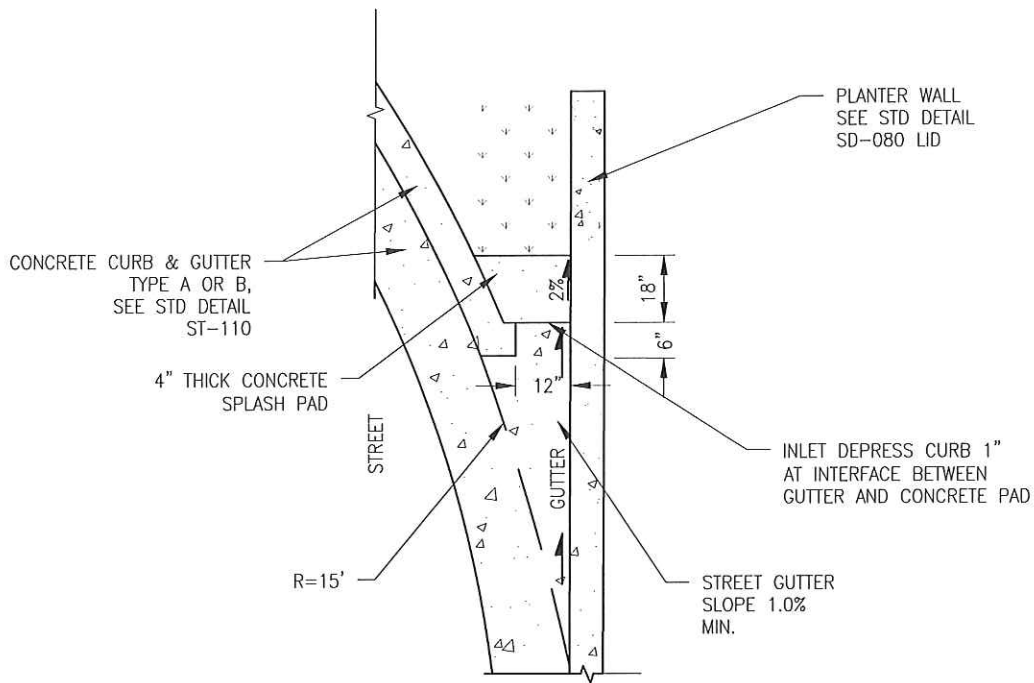


TRENCH DRAIN TO BIORETENTION FACILITY

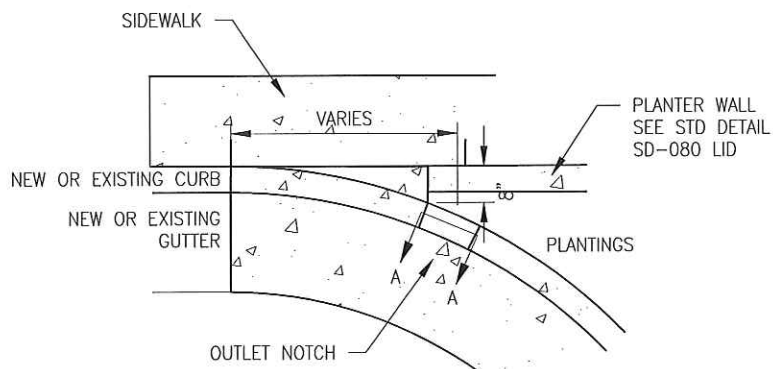
STANDARD PLAN:
SD-100 LID

DATE: JUNE 2017

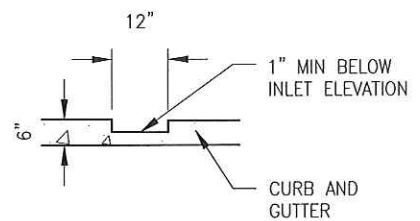
CITY ENGINEER APPROVAL:



**INLET OPENING
PLAN VIEW
N.T.S.**



**OUTLET PLAN VIEW
N.T.S.**



**SECTION A-A
OUTLET NOTCH
N.T.S.**

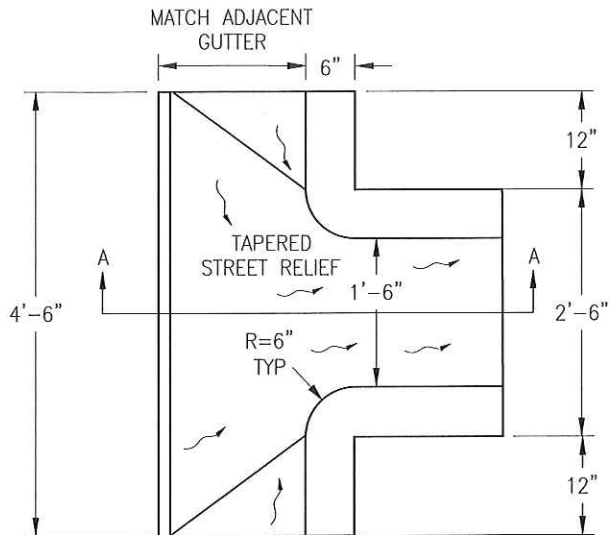


INLET/OUTLET FOR CURB EXTENSIONS

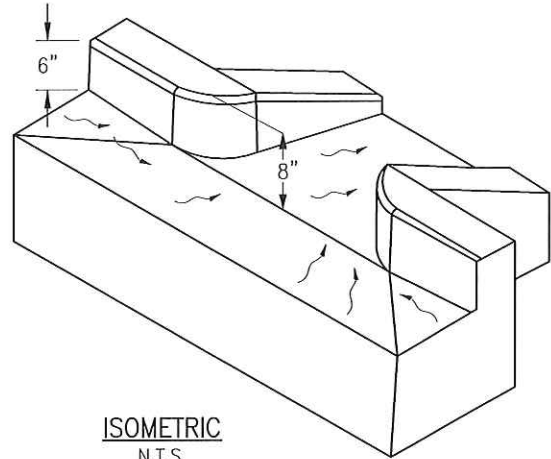
STANDARD PLAN:
SD-110 LID

DATE: JUNE 2017

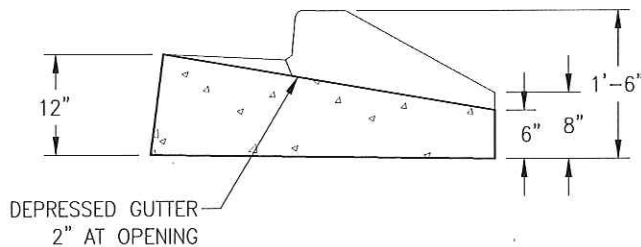
CITY ENGINEER APPROVAL:



PLAN
N.T.S.



ISOMETRIC
N.T.S.



SECTION A-A
N.T.S.

NOTES:

1. FOR USE WITH STORMWATER FACILITIES WITH SIDE SLOPES.
2. REFER TO STANDARD DRAWINGS ST-090 FOR CURB CONSTRUCTION AND ST-110 FOR CURB AND GUTTER TYPE A AND B. MATCH GUTTER PAN OF ADJACENT CURB AND GUTTER.



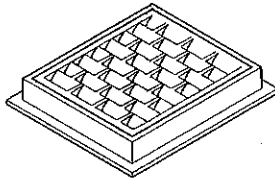
SIDE CURB CUT

STANDARD PLAN:
SD-120 LID

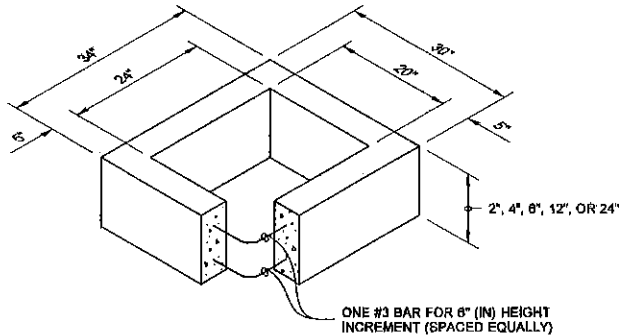
DATE: JUNE 2017

CITY ENGINEER APPROVAL:

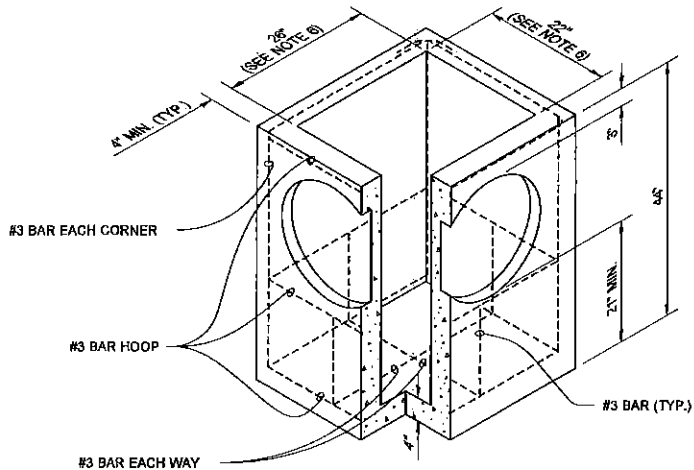
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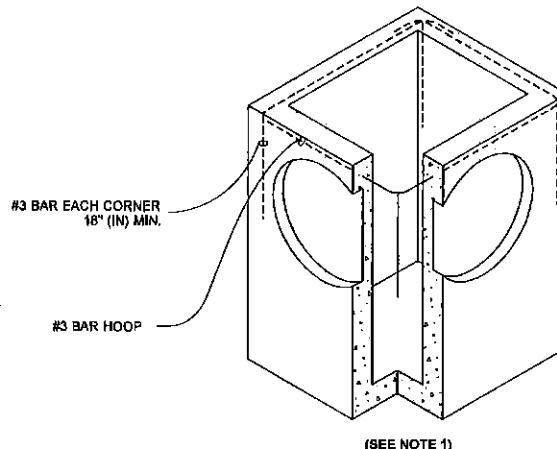
FRAME AND VANED GRATE



RECTANGULAR ADJUSTMENT SECTION



PRECAST BASE SECTION



ALTERNATIVE PRECAST BASE SECTION

PIPE ALLOWANCES	
PIPE MATERIAL	MAXIMUM INSIDE DIAMETER (INCHES)
REINFORCED OR PLAIN CONCRETE	12"
ALL METAL PIPE	15"
CPSSP * (STD. SPEC. SECT. 9-05.20)	12"
SOLID WALL PVC (STD. SPEC. SECT. 9-05.12(1))	15"
PROFILE WALL PVC (STD. SPEC. SECT. 9-05.12(2))	15"

* CORRUGATED POLYETHYLENE STORM SEWER PIPE

NOTES

1. As acceptable alternatives to the rebar shown in the PRECAST BASE SECTION, fibers (placed according to the Standard Specification) or wire mesh having a minimum area of 0.12 square inches per foot shall be used with the minimum required rebar shown in the ALTERNATIVE PRECAST BASE SECTION. Wire mesh shall not be placed in the knockouts.
2. The knockout diameter shall not be greater than 20" (in). Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with Standard Specification Section 9-04.3.
3. The maximum depth from the finished grade to the lowest pipe invert shall be 5' (ft).
4. The frame and grate may be installed with the flange down, or integrally cast into the adjustment section with flange up.
5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1 : 24 or steeper.
6. The opening shall be measured at the top of the Precast Base Section.
7. All pickup holes shall be grouted full after the basin has been placed.



Julie Heilman
Heilman, Julie
Jan 25 2017 2:53 PM
design

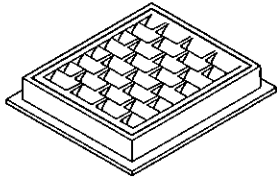
CATCH BASIN TYPE 1

STANDARD PLAN B-5.20-02

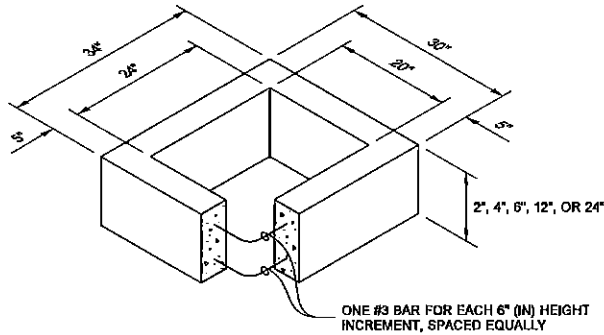
SHEET 1 OF 1 SHEET

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Carpenter, Jeff
Jan 26 2017 6:48 AM
design

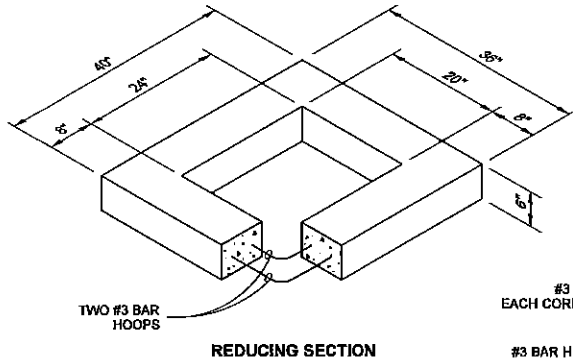
STATE DESIGN ENGINEER
Washington State Department of Transportation



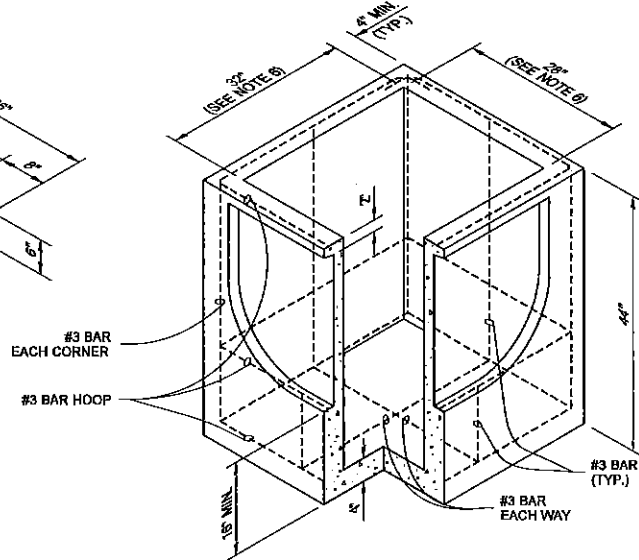
FRAME AND VANED GRATE



RECTANGULAR ADJUSTMENT SECTION



REDUCING SECTION



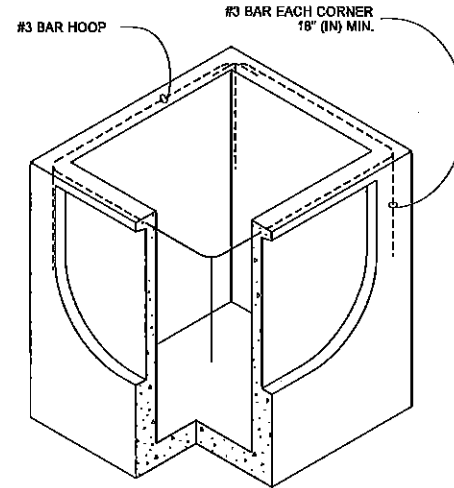
PRECAST BASE SECTION

PIPE ALLOWANCES	
PIPE MATERIAL	MAXIMUM INSIDE DIAMETER (INCHES)
REINFORCED OR PLAIN CONCRETE	18"
ALL METAL PIPE	21"
CPSSP * (STD. SPEC. SECT. 9-05.20)	18"
SOLID WALL PVC (STD. SPEC. SECT. 9-05.12(1))	21"
PROFILE WALL PVC (STD. SPEC. SECT. 9-05.12(2))	21"

* CORRUGATED POLYETHYLENE STORM SEWER PIPE

NOTES

1. As acceptable alternatives to the rebar shown in the **PRECAST BASE SECTION**, fibers (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot, shall be used with the minimum required rebar shown in the **ALTERNATIVE PRECAST BASE SECTION**. Wire mesh shall not be placed in the knockouts.
2. The knockout shall not be greater than 26" (in), in any direction. Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification Section 9-04.3**.
3. The maximum depth from the finished grade to the lowest pipe invert shall be 5' (ft).
4. The frame and grate may be installed with the flange down or integrally cast into the adjustment section with flange up.
5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1 : 24 or steeper.
6. The opening shall be measured at the top of the Precast Base Section.
7. All pickup holes shall be grouted full after the basin has been placed.



(SEE NOTE 1)

ALTERNATIVE PRECAST BASE SECTION



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Heilman, Julie
Jan 25 2017 2:56 PM
design

CATCH BASIN TYPE 1L

STANDARD PLAN B-5.40-02

SHEET 1 OF 1 SHEET

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Jan 26 2017 6:49 AM

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Technical drawing of a rectangular box with the following dimensions and features:

- Top horizontal dimension: 29" MIN.
- Left vertical dimension: 24 1/4" MIN.
- Top-left corner detail: 1" MIN. (TYP.)
- Left vertical detail: 1 1/2" MIN. (TYP.)
- Top horizontal detail: 20 1/4"
- Internal features:
 - SEE NOTE 4 (TYP.)
 - SEE NOTE 2 (TYP.)
 - HOLE OR SLOT FOR ATTACHING HOOD (TYP.)

Diagram illustrating the cross-section of a Catch Basin Type 1 and Type 1L. The diagram shows the face of the curb, the grate, and the catch basin structure. Dimensions are provided for the grate width (7" and 3") and the catch basin width (34" wide side and 40" wide side). The catch basin is labeled "CATCH BASIN TYPE 1" and "CATCH BASIN TYPE 1L".

Labels and Dimensions:

- FACE OF CURB
- 7"
- 3"
- CATCH BASIN - SEE NOTE 1
- GRATE ~ SEE NOTE 1
- 34" (WIDE SIDE)
- CATCH BASIN TYPE 1
- 40" (WIDE SIDE)
- CATCH BASIN TYPE 1L

Diagram illustrating the components and dimensions of a catch basin assembly:

- CURB OR CURB AND GUTTER
- MATCH TOP OF HOOD TO TOP OF CURB (TYP.)
- HOOD
- SAFETY BAR / DEBRIS GUARD
- 20" x 24" VANED GRATE
- FRAME
- CATCH BASIN TYPE 1 SHOWN
- 34"
- 90"

1. This Inlet requires the precast catch basin unit to be rotated 90 degrees so that the narrow side is parallel to the curb line. When calculating offsets from curb to CL of the precast catch basin, please note that the CL of the grate is not the CL of the precast catch basin. See **Section A**.
2. The dimensions of the frame and hood may vary slightly among different manufacturers. The Frame may have cast features intended to support a debris guard. Hood units may be mounted inside or outside of the frame. The methods for fastening the safety bar / debris guard rod to the hood may vary. The hood may include casting lugs. The top of the hood may be cast with a pattern.
3. Attach the hood to the frame with two 3/4" x 2" hex head bolts, nuts, and oversize washers. The washers should have diameters adequate to ensure full bearing across the slots.
4. Bolt-down capability is required on all frames, grates and covers, unless specified in the Contract. Provide two holes in the Frame that are vertically aligned with the grate slots. The frame shall accept the 5/8" x 11 NC x 2" allen head cap screw by being tapped, or other approved mechanism. The location of bolt-down holes varies among manufacturers. See **BOLT-DOWN DETAIL, Standard Plan B-30.10**.
5. Only ductile Iron Vaned Grates shall be used. See **Standard Plans B-30.30 and B-30.40** for grate details. Refer to **Standard Specification 9-05.15(2)** for additional requirements.
6. This plan is intended to show the installation details of a manufactured product. This plan is not intended to show the specific details necessary to fabricate the castings depicted in this drawing.

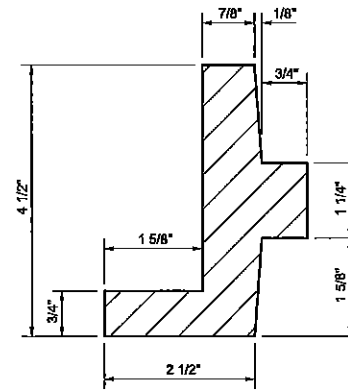
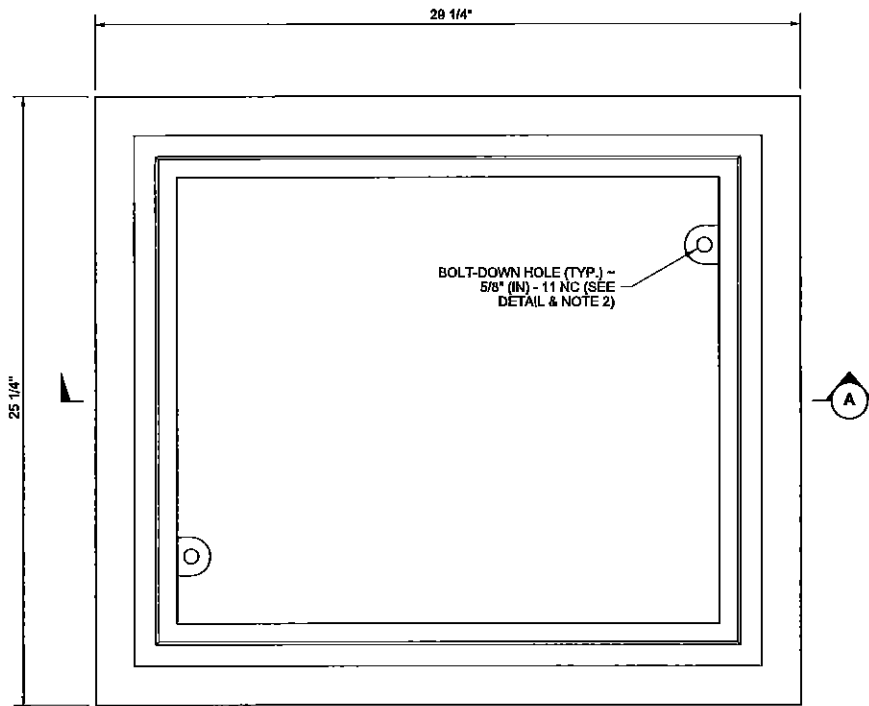


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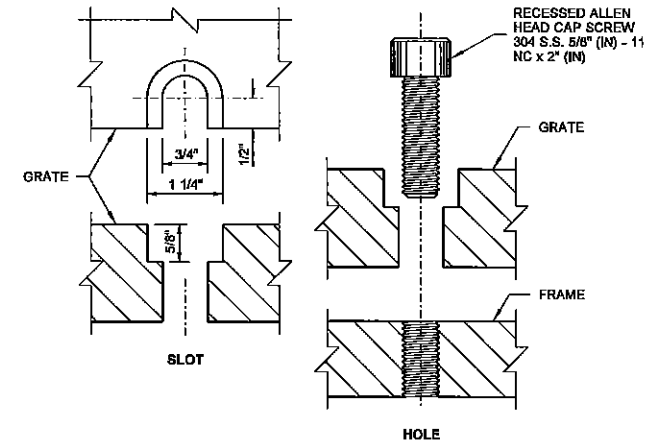
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION	
Pasco Bakotich III	03-15-12
STATE DESIGN ENGINEER	DATE
Washington State Department of Transportation	

DRAWN BY: FERN LIDDELL

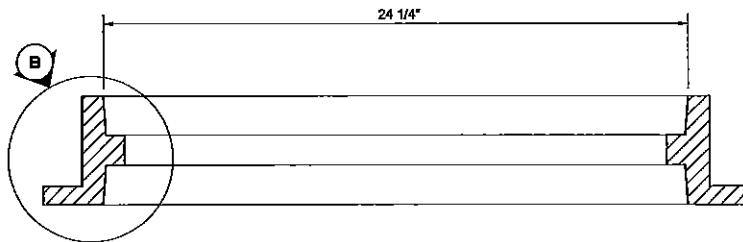


DETAIL B



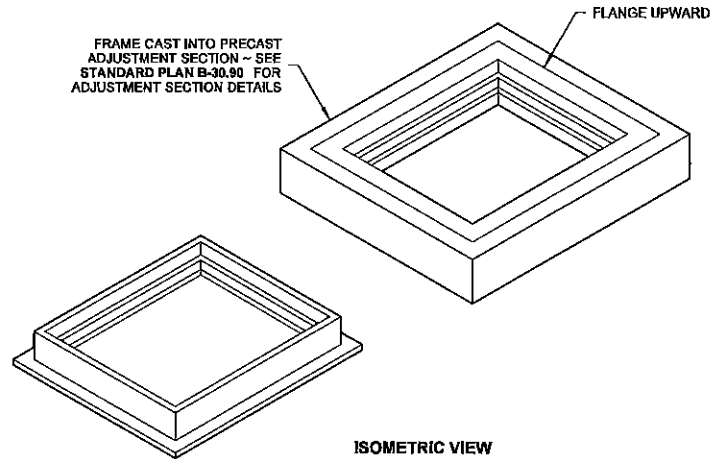
BOLT-DOWN DETAILS
SEE NOTE 2

TOP



SECTION A

FRAME CAST INTO PRECAST
ADJUSTMENT SECTION ~ SEE
STANDARD PLAN B-30.90 FOR
ADJUSTMENT SECTION DETAILS



Julie Heilman
Heilman, Julie
Jan 25 2017 2:59 PM

**RECTANGULAR FRAME
(REVERSIBLE)**

STANDARD PLAN B-30.10-02

SHEET 1 OF 1 SHEET

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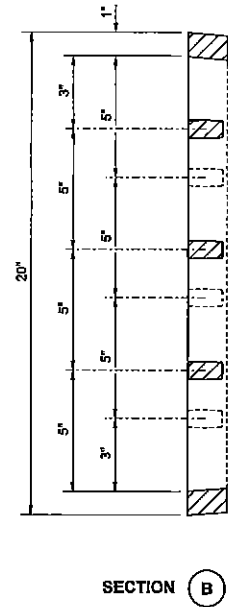
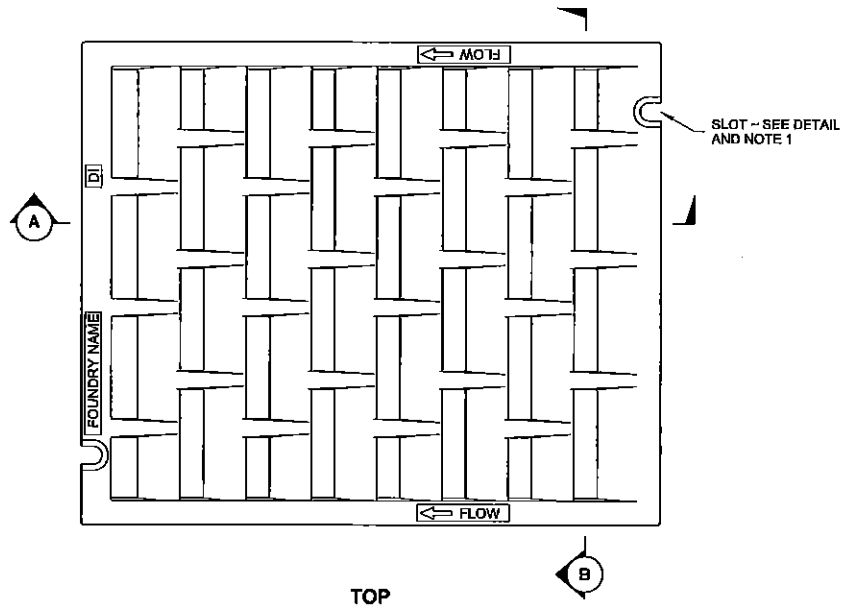
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Jan 26 2017 6:51 AM

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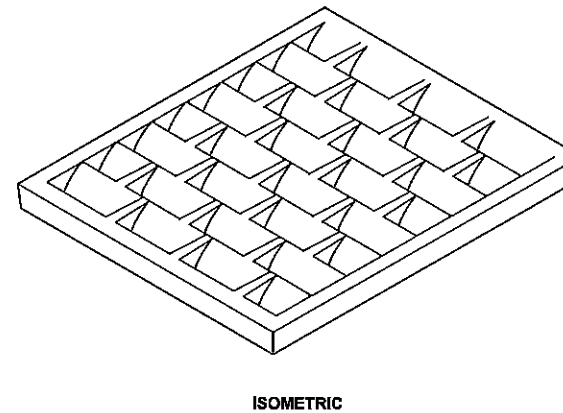
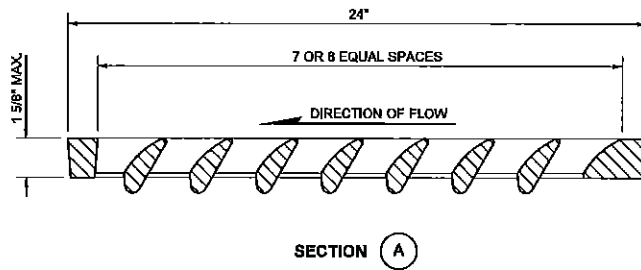
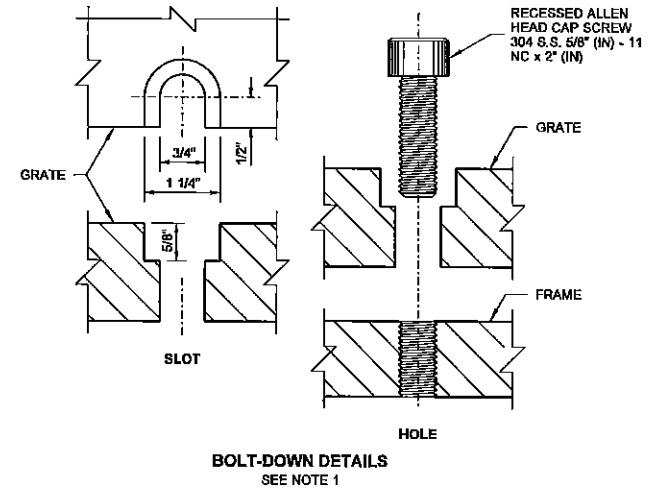
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



NOTES

1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC x 2" (in) Allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
2. Refer to Standard Specification Section 9-05.15(2) for additional requirements.
3. For frame details, see Standard Plan B-30.10.



Julie Heilman
Heilman, Julie
Jan 25 2017 3:00 PM

**RECTANGULAR
VANED GRATE**

STANDARD PLAN B-30.30-02

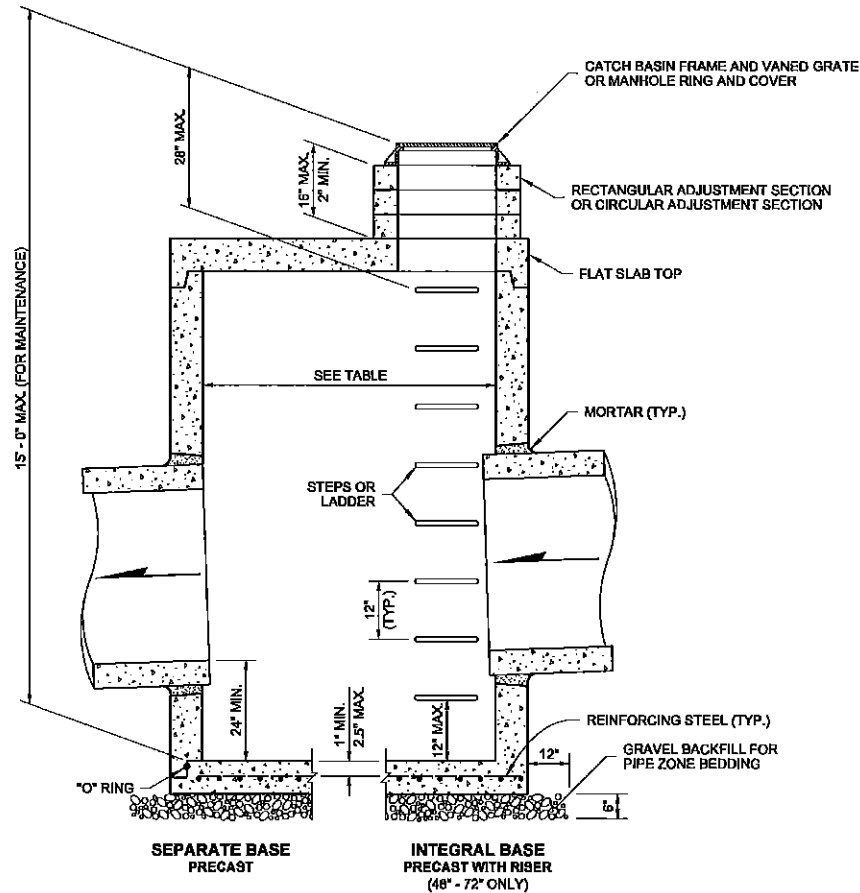
SHEET 1 OF 1 SHEET

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Chapman, Jeff
Jan 25 2017 6:31 AM



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NOTES

1. No steps are required when height is 4' or less.
2. The bottom of the precast catch basin may be sloped to facilitate cleaning.
3. The rectangular frame and grate may be installed with the flange up or down. The frame may be cast into the adjustment section.
4. Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum. Provide a 1.5" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification 9-04.3**.

CATCH BASIN DIMENSIONS

CATCH BASIN DIAMETER	MIN. WALL THICKNESS	MIN. BASE THICKNESS	MAXIMUM KNOCKOUT SIZE	MINIMUM DISTANCE BETWEEN KNOCKOUTS
48"	4"	6"	36"	8"
54"	4.5"	8"	42"	8"
60"	5"	8"	48"	8"
72"	6"	8"	60"	12"
84"	8"	12"	72"	12"
96"	8"	12"	84"	12"
120"	10"	12"	96"	12"
144"	12"	12"	108"	12"

PIPE ALLOWANCES

CATCH BASIN DIAMETER	PIPE MATERIAL WITH MAXIMUM INSIDE DIAMETER				
	CONCRETE	ALL METAL	CPSPP ①	SOLID WALL PVC ②	PROFILE WALL PVC ③
48"	24"	30"	24"	30"	30"
54"	30"	36"	30"	36"	36"
60"	36"	42"	36"	42"	42"
72"	42"	54"	42"	48"	48"
84"	54"	60"	54"	48"	48"
96"	60"	72"	60"	48"	48"
120"	66"	84"	60"	48"	48"
144"	78"	96"	60"	48"	48"

- ① Corrugated Polyethylene Storm Sewer Pipe (Standard Specification 9-05.20)
 ② (Standard Specification 9-05.12(1))
 ③ (Standard Specification 9-05.12(2))



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CATCH BASIN TYPE 2

STANDARD PLAN B-10.20-01

SHEET 1 OF 1 SHEET

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Pasco Bakotich III

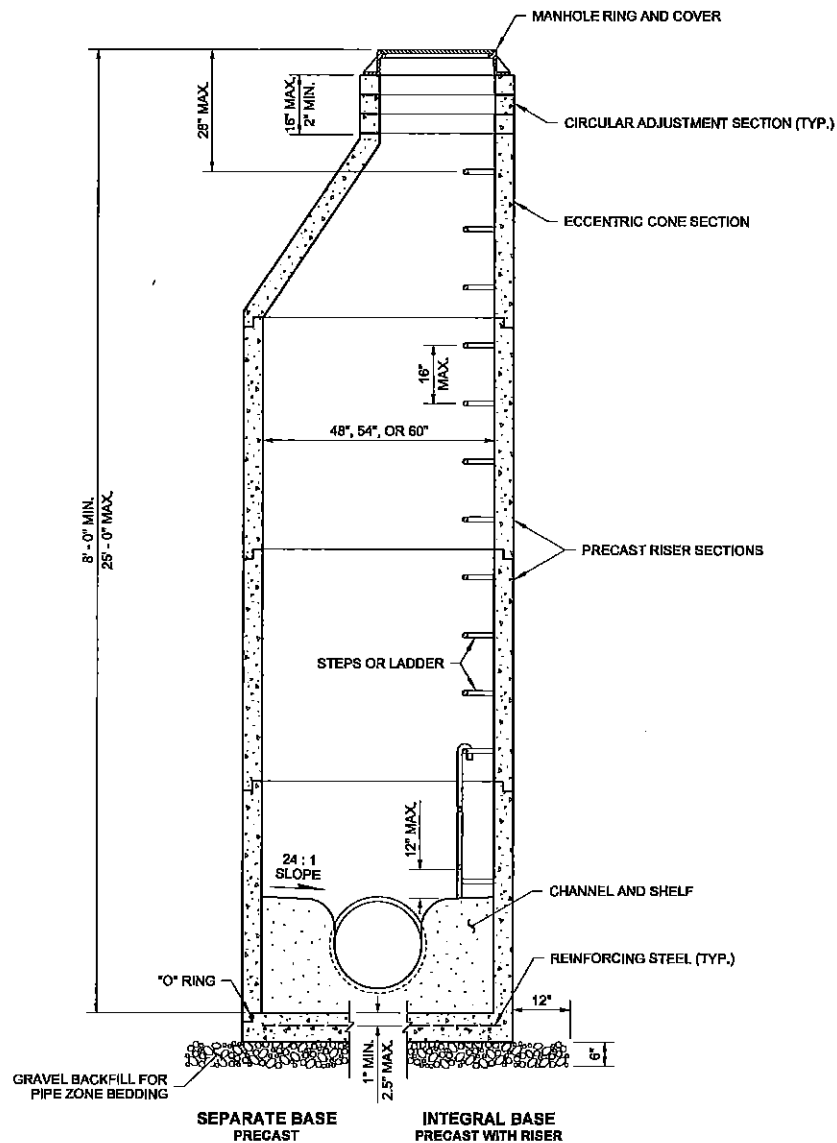
02-07-12

STATE DESIGN ENGINEER

DATE



Washington State Department of Transportation



NOTES

- Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum.
- For pipe allowances, see **Standard Plan B-10.20**.

MANHOLE DIMENSION TABLE				
DIAM.	MIN. WALL THICKNESS	MIN. BASE THICKNESS	MAXIMUM KNOCKOUT SIZE	MINIMUM DISTANCE BETWEEN KNOCKOUTS
48"	4"	6"	36"	8"
54"	4.5"	6"	42"	8"
60"	5"	6"	48"	8"



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MANHOLE TYPE 1

STANDARD PLAN B-15.20-01

SHEET 1 OF 1 SHEET

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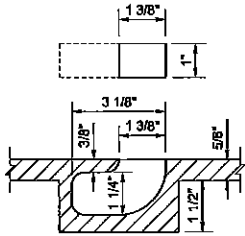
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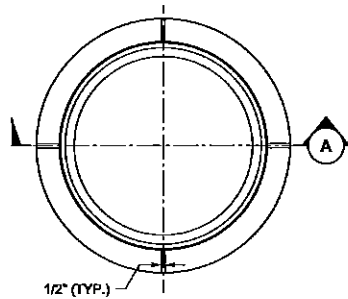
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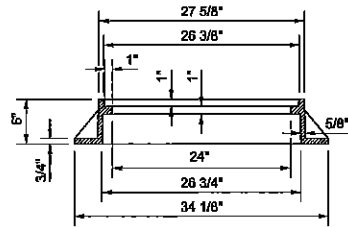
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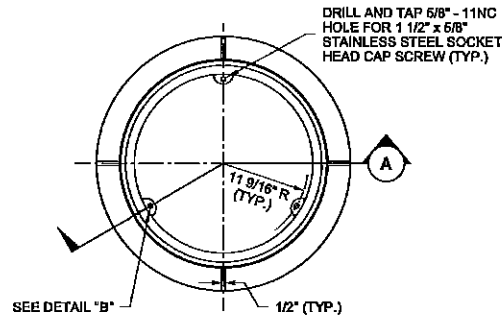
BLIND PICK NOTCH
DETAIL "A"



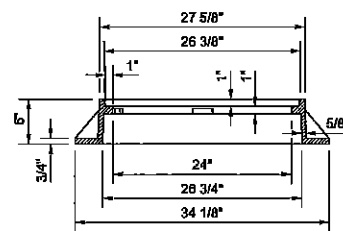
RING PLAN



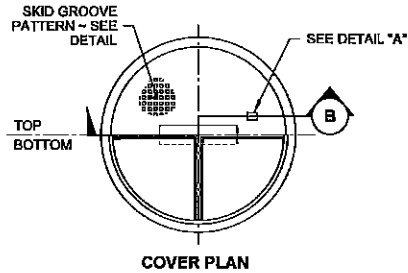
RING SECTION A



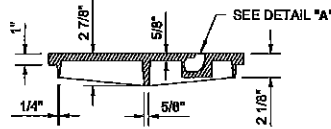
RING PLAN



RING SECTION A



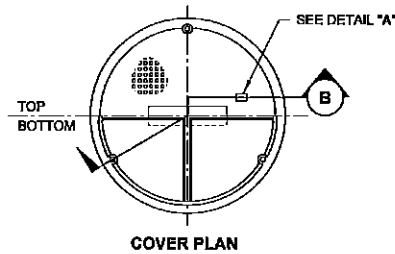
COVER PLAN



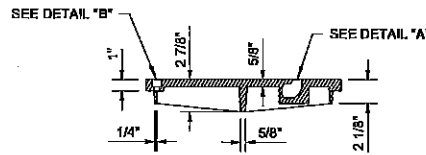
COVER SECTION B

(SEE NOTE 7)

STANDARD
TYPE 1



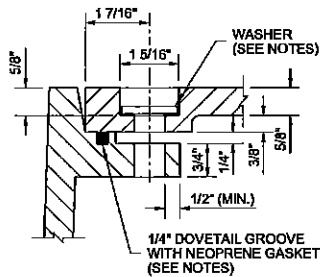
COVER PLAN



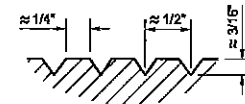
COVER SECTION B

(SEE NOTE 7)

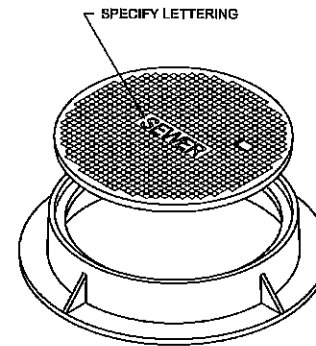
BOLT-DOWN / WATERTIGHT
TYPE 2



BOLT-DOWN / WATERTIGHT
DETAIL "B"



SKID GROOVE PATTERN
DETAIL



ISOMETRIC VIEW

NOTES

1. The gasket and groove may be in the seat (frame) or in the underside of the cover. The gasket may be "T" shaped in section. The groove may be cast or machined.
2. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 3 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 5/8" - 1 NC x 2" Allen head cap screw by being tapped, or other approved mechanism. Location of bolt down holes varies by manufacturer.
3. For bolt-down manhole ring and covers that are not designated "Watertight," the neoprene gasket, groove, and washer are not required.
4. Washer shall be neoprene (Detail "B").
5. In lieu of blind pick notch for manhole covers, a single 1" pick hole is acceptable. Hole location and number of holes may vary by manufacturer.
6. Alternative reinforcing designs are acceptable in lieu of the rib design.
7. For clarity, the vertical scale of the Cover Section has been exaggerated, it is 1.5 times the horizontal scale (1H:1.5V).



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CIRCULAR FRAME (RING) AND COVER STANDARD PLAN B-30.70-03

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

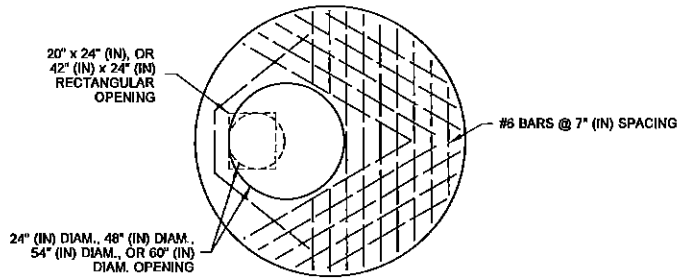
Pasco Bakotich III 04/26/12

STATE DESIGN ENGINEER DATE

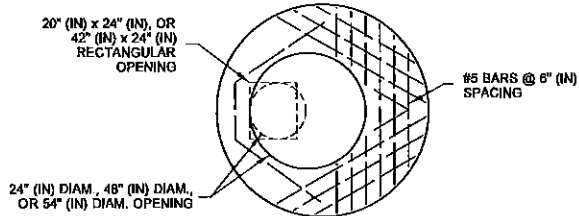


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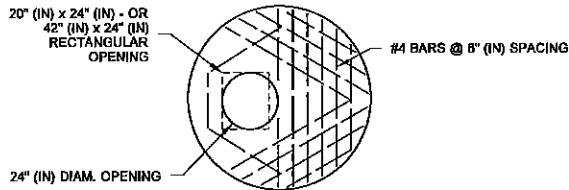
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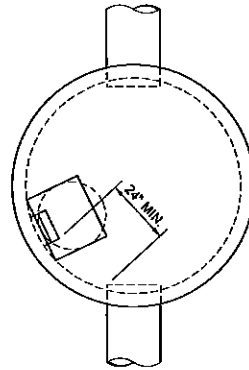
84" (IN) or 96" (IN) FLAT SLAB TOP



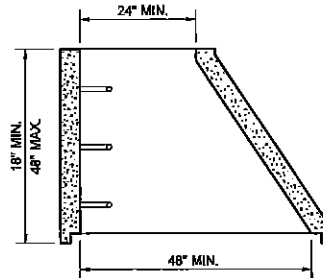
72" (IN) FLAT SLAB TOP



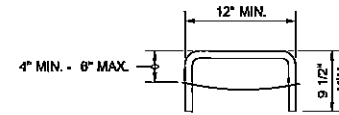
48" (IN), 54", or 60" (IN) FLAT SLAB TOP



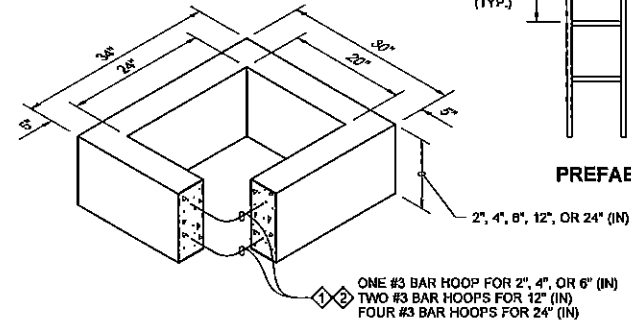
TYPICAL ORIENTATION FOR ACCESS AND STEPS



ECCENTRIC CONE SECTION



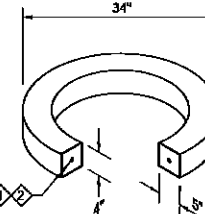
STEP



PREFABRICATED LADDER

RECTANGULAR ADJUSTMENT SECTION

- As an acceptable alternative to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used for adjustment sections.
- As an acceptable alternative to conventional steel reinforcement, manufacturers shall use Synthetic Structural Fibers meeting the requirements of Standard Specification Section 9-05.60(10).



ONE #3 BAR HOOP FOR 2", 4", OR 6" (IN)
TWO #3 BAR HOOPS FOR 12" (IN)

CIRCULAR ADJUSTMENT SECTION

For rectangular and circular adjustment sections, approved alternate material compositions are acceptable in lieu of precast concrete designs

NOTE

- Ladder rungs for manholes and catch basins shall meet the requirements of AASHTO M 199.



MISCELLANEOUS DETAILS
FOR
DRAINAGE STRUCTURES
STANDARD PLAN B-30.90-02

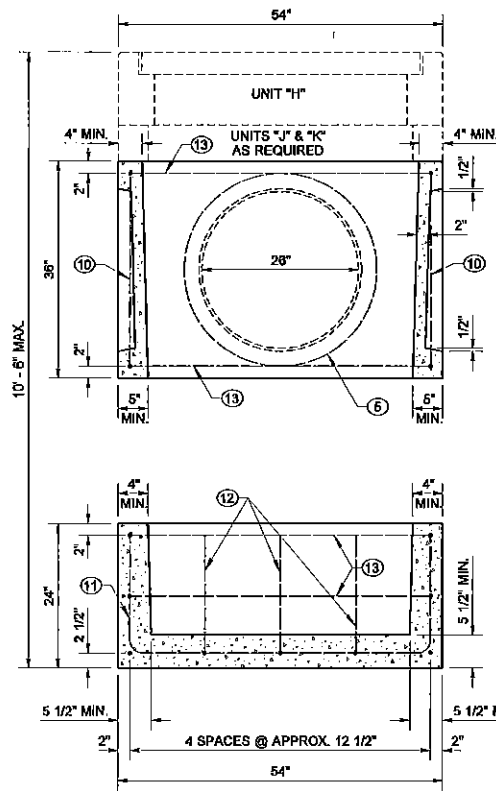
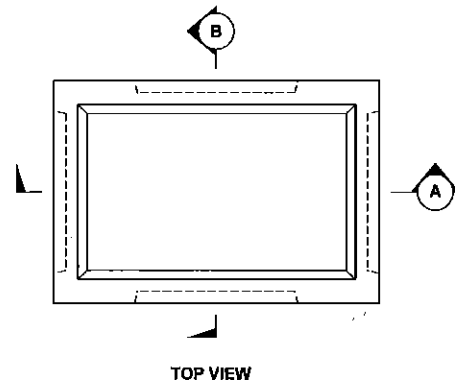
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

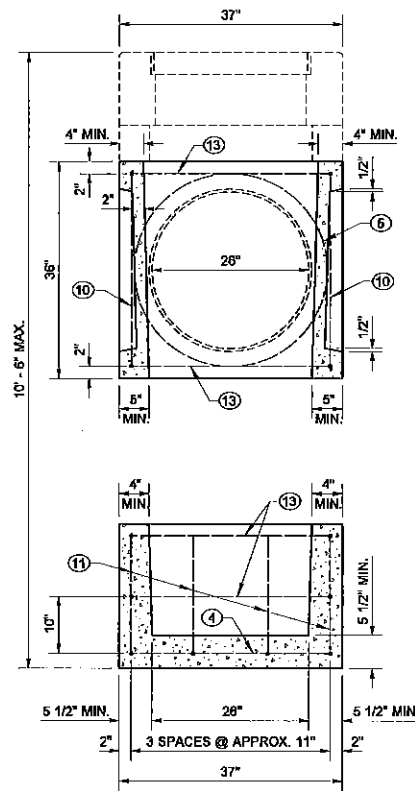
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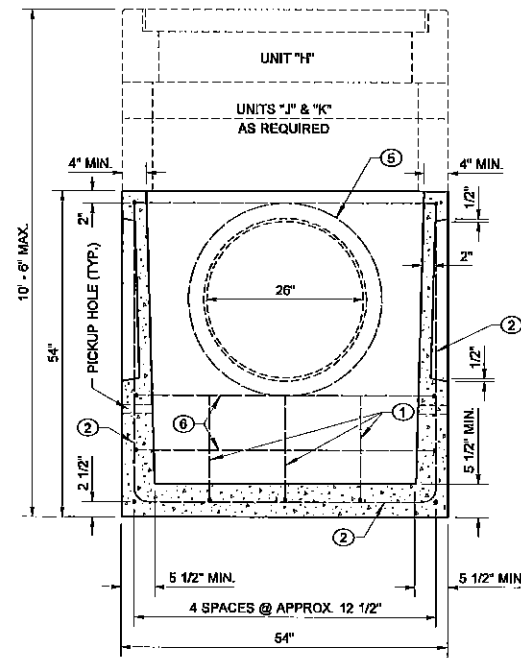
Washington State Department of Transportation



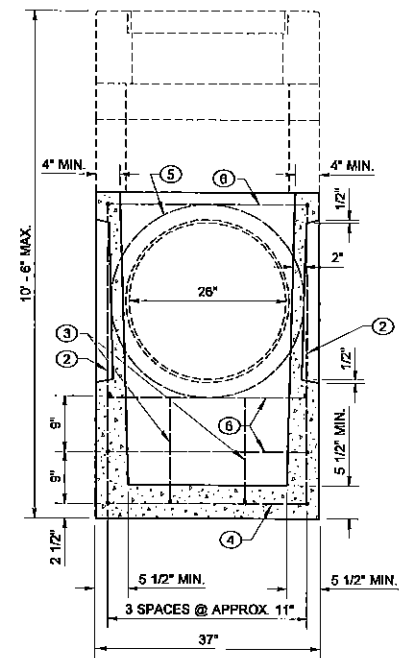
SECTION A TWO PIECE BASE



SECTION B TWO PIECE BASE



SECTION A ONE PIECE BASE



SECTION B ONE PIECE BASE

PIPE ALLOWANCES

PIPE MATERIAL	MAXIMUM INSIDE DIAMETER
REINFORCED OR PLAIN CONCRETE	18"
ALL METAL PIPE	21"
CPSSP * (STD. SPEC. 9-05.20)	18"
SOLID WALL PVC (STD. SPEC. 9-05.12(1))	21"
PROFILE WALL PVC (STD. SPEC. 9-05.12(2))	21"

* CORRUGATED POLYETHYLENE
STORM SEWER PIPE



EXPIRES JULY 1, 2007

GRATE INLET TYPE 2

STANDARD PLAN B-35.40-00

SHEET 1 OF 2 SHEETS

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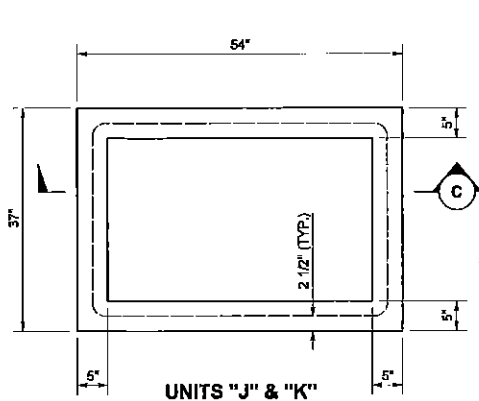
Harold J. Peterfeso 06-08-06

STATE DESIGN ENGINEER

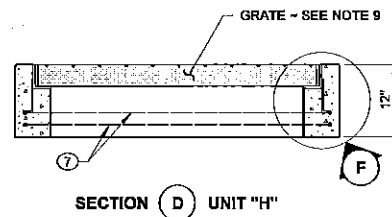
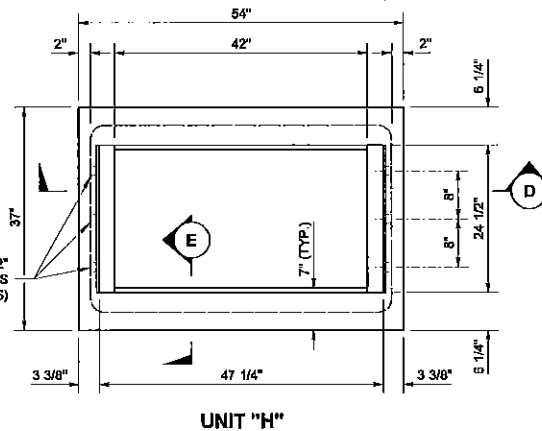
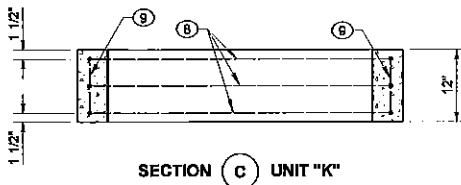
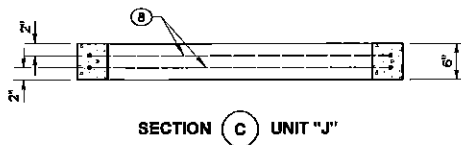


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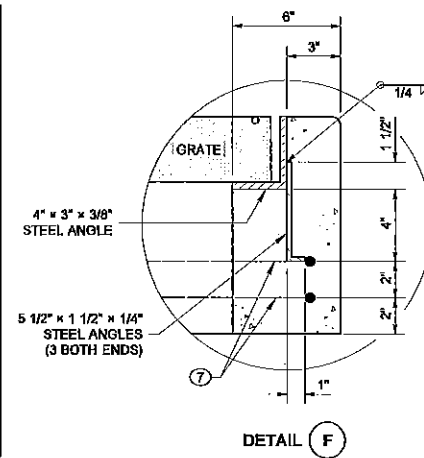
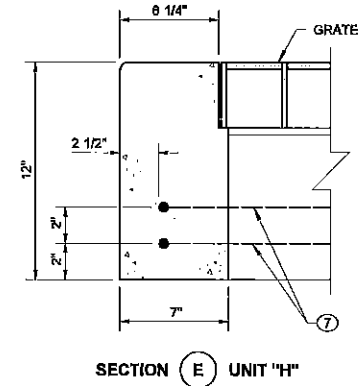


1/4" x 5 1/2" x 1 1/2"
STEEL ANGLES
(3 BOTH ENDS)

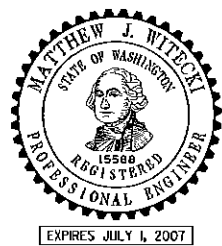


NOTES

1. The Steel Angles shall be set so that each bearing bar of prefabricated grate shall have full bearing on both ends. The finished top of concrete shall be even with the grate surface.
2. Top of Inlet grate shall be placed at ground level to present an unobstructed ditch or median section.
3. All exposed concrete edges shall be finished with a 1/2" radius.
4. Pipes may enter through the knockouts on any side at any reasonable angle, provided the outside of the pipe can be contained between two opposite walls.
5. The flow line of the outlet pipe shall be 18" minimum above the inside bottom of the inlet structure.
6. The grade line of the top inside of any inlet pipe shall enter no lower than the grade line of the top inside of the outlet pipe.
7. Unit "H" and optional extension units "J" and "K" shall be grouted in place to the satisfaction of the Engineer.
8. All pickup holes shall be grouted full after the basin has been placed.
9. See contract for type of grate specified. See Standard Plan B-40.20 and B-40.40 for grate details.



BAR LIST						BENDING DIAGRAM (ALL DIMENSIONS ARE OUT TO OUT)			
MARK	LOCATION	QTY.	SIZE	LENGTH	DESCRIPTION				
①	BOTTOM SLAB AND SIDE WALL	3	3	5' - 9"	STRAIGHT				
②	BOTTOM SLAB AND SIDE WALL	2		12' - 6"					
③	BOTTOM SLAB AND SIDE WALL	2		7' - 2"					
④	BOTTOM SLAB AND SIDE WALL	2		2' - 9"					
⑤	WALL	4		9' - 1"	HOOP				
⑥	SIDE WALL	3		14' - 6"	HOOP				
⑦	UNIT H	2		14' - 2"	HOOP				
⑧	UNIT J	2		14' - 2"	HOOP				
⑧	UNIT K	3		14' - 2"	HOOP				
⑨	UNIT K	4		0' - 8"	STRAIGHT				
⑩	SIDE WALL	8		2' - 8"	STRAIGHT				
⑪	BOTTOM SLAB AND SIDE WALL	4		7' - 5"	STRAIGHT				
⑫	BOTTOM SLAB AND SIDE WALL	3		6' - 0"					
⑬	SIDE WALL	4	14' - 6"	HOOP					



GRATE INLET TYPE 2

STANDARD PLAN B-35.40-00

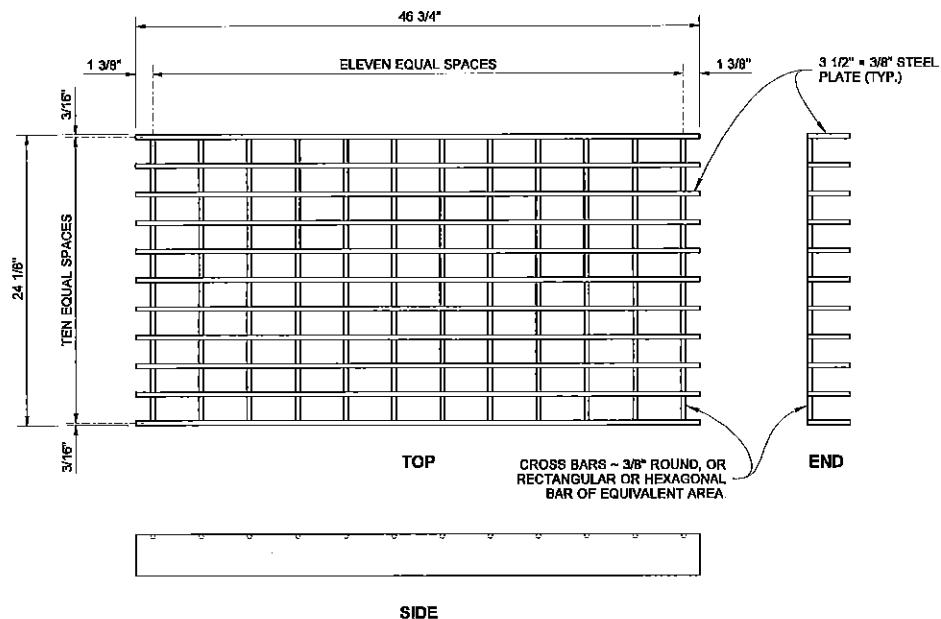
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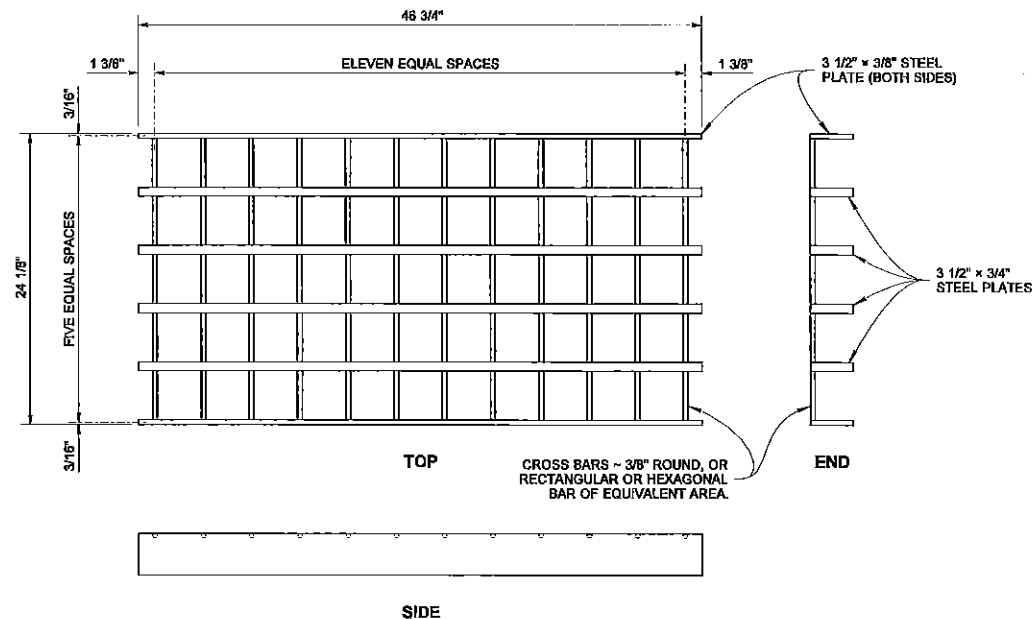
Harold J. Peterfeso 06-08-06

STATE DESIGN ENGINEER DATE

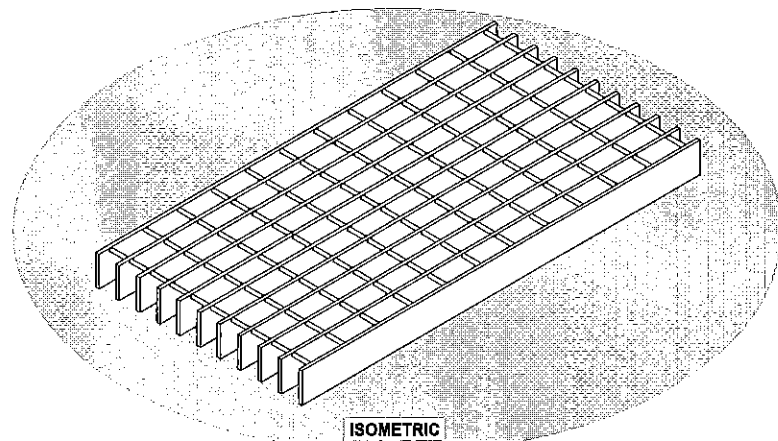
Washington State Department of Transportation



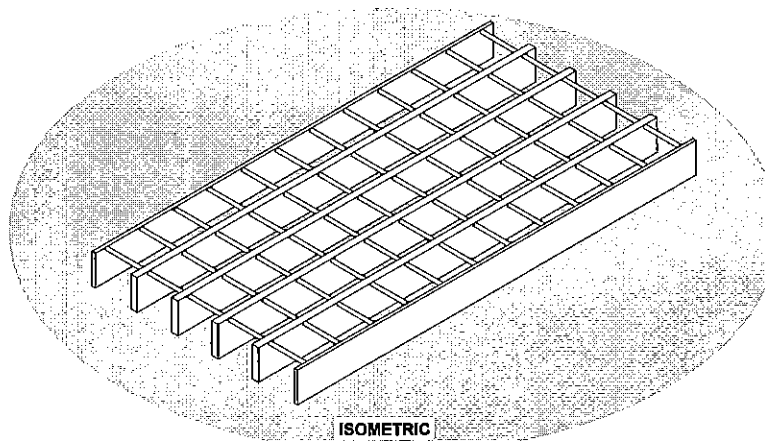
GRATE "A"
(APPROXIMATE WEIGHT 215 LBS)



GRATE "B"
(APPROXIMATE WEIGHT 215 LBS)



ISOMETRIC



ISOMETRIC



EXPIRES JULY 1, 2007

**WELDED GRATES
FOR GRATE INLET
STANDARD PLAN B-40.20-00**

SHEET 1 OF 1 SHEET

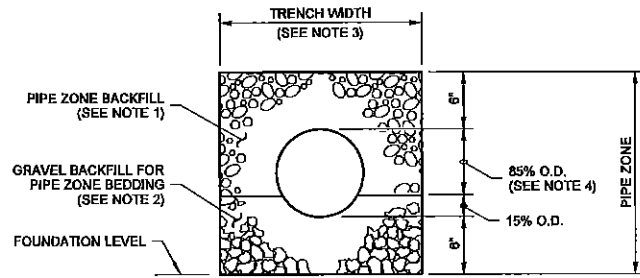
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Harold J. Peterfeso 06-01-06

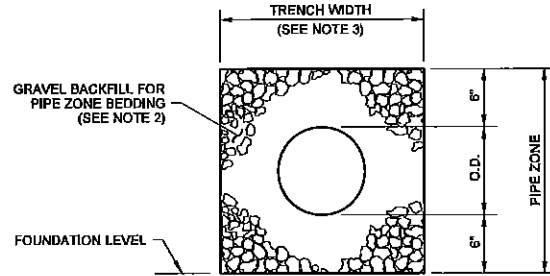
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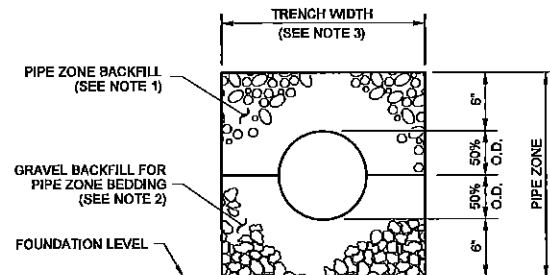
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CONCRETE AND DUCTILE IRON PIPE



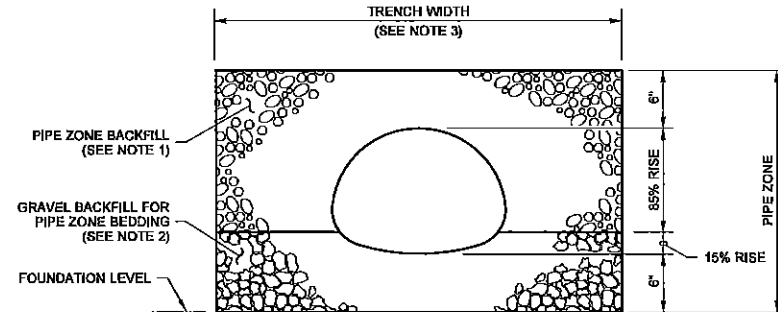
THERMOPLASTIC PIPE



**METAL AND STEEL RIB
REINFORCED POLYETHYLENE PIPE**

NOTES

1. See **Standard Specifications Section 7-08.3(3)** for Pipe Zone Backfill.
2. See **Standard Specifications Section 9-03.12(3)** for Gravel Backfill for Pipe Zone Bedding.
3. See **Standard Specifications Section 2-09.4** for Measurement of Trench Width.
4. For sanitary sewer installation, concrete pipe shall be bedded to spring line.



PIPE ARCHES

**CLEARANCE BETWEEN PIPES
FOR MULTIPLE INSTALLATIONS**

PIPE	SIZE	MINIMUM DISTANCE BETWEEN BARRELS
CIRCULAR PIPE (DIAMETER)	12" to 24"	12"
	30" to 96"	DIAM. /2
	102" to 180"	48"
PIPE ARCH (SPAN) METAL ONLY	18" to 36"	12"
	43" to 142"	SPAN /3
	148" to 200"	48"



Heilman, Julie
Jan 25 2017 3:01 PM
cc: gpr

**PIPE ZONE BEDDING
AND BACKFILL
STANDARD PLAN B-55.20-01**

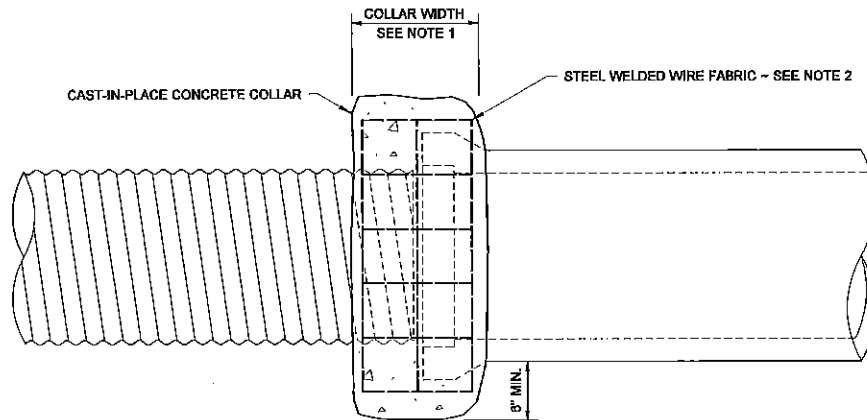
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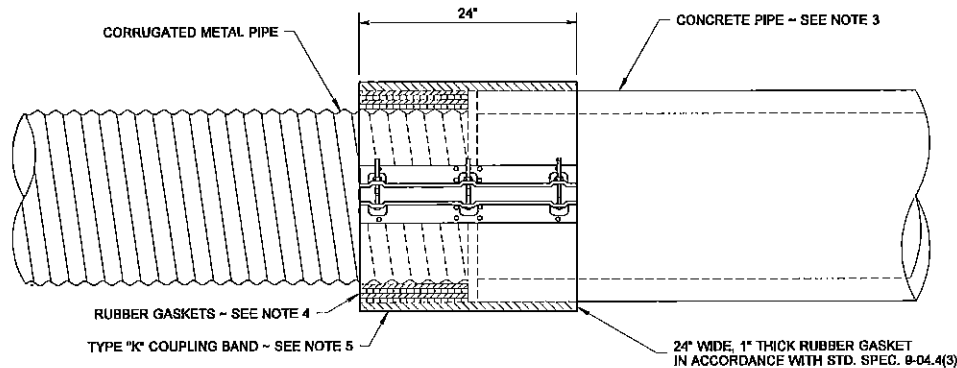
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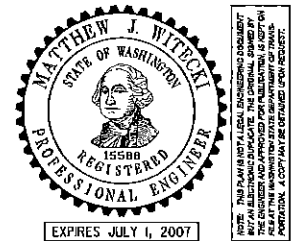
CONCRETE COLLAR OPTION



COUPLING BAND OPTION

NOTES

1. The Concrete Collar width shall be one half of the outside pipe diameter of the largest pipe. The minimum Concrete Collar width shall be 12". Concrete Collars may be used with all pipe materials and diameters. The Concrete Collar option shall only be used to extend existing pipes.
2. Steel Welded Wire Fabric shall be in accordance with Standard Specification 9-07.7. Install two wraps for size 6 x 6 W1.4 x W1.4 (10 Gage) Steel Welded Wire Fabric or one wrap for any of the following sizes:
 - 6 x 6 W2.1 x W2.1 (8 Gage)
 - 6 x 6 W2.9 x W2.9 (6 Gage)
 - 4 x 4 W2.9 x W2.9 (6 Gage)
 - 4 x 4 W4.0 x W4.0 (4 Gage)
3. When a Coupling Band connection requires attachment to the bell end of a concrete pipe, the bell end of the pipe shall be removed before the connection is installed.
4. Increase the outside diameter of the metal pipe to match the outside diameter of the concrete pipe by installing 12" wide rubber gaskets, thickness as required (Coupling Band only). The rubber gaskets shall be in accordance with Standard Specification 9-04.4(3).
5. Use a flat Type K Coupling Band. Type K Coupling Bands with dimples are not allowed for the installation detail shown. The Coupling Band option shall only be used for extending existing pipes that have an inside diameter of 36" or less.



CONNECTION DETAILS FOR DISSIMILAR CULVERT PIPE STANDARD PLAN B-60.20-00

SHEET 1 OF 1 SHEET

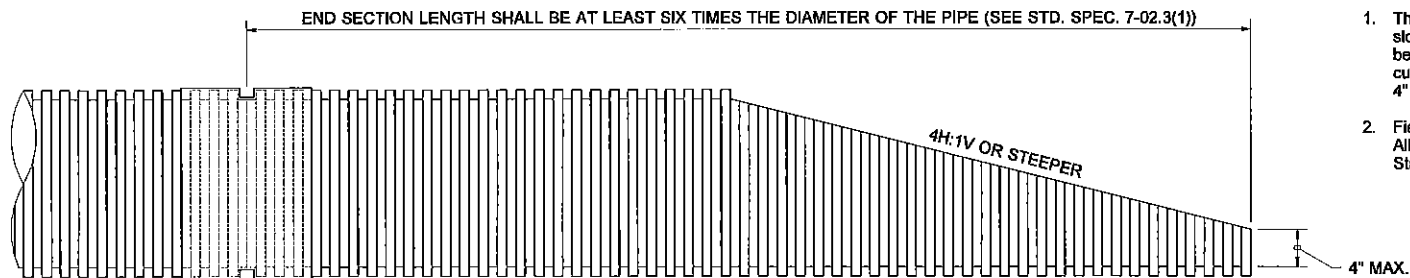
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Harold J. Peterfeso 08-08-06

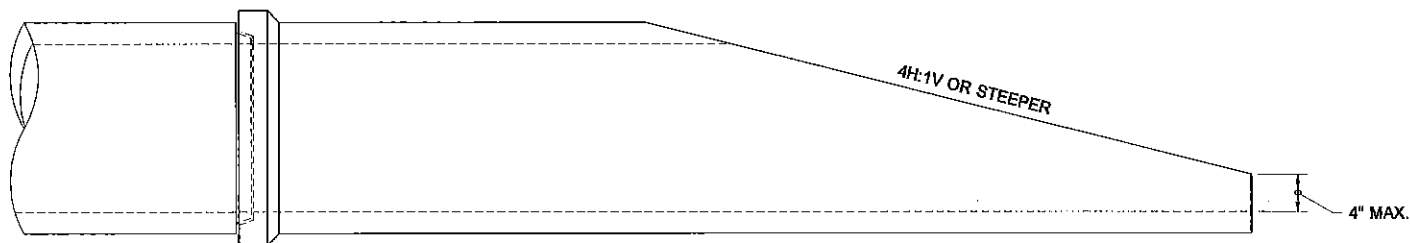
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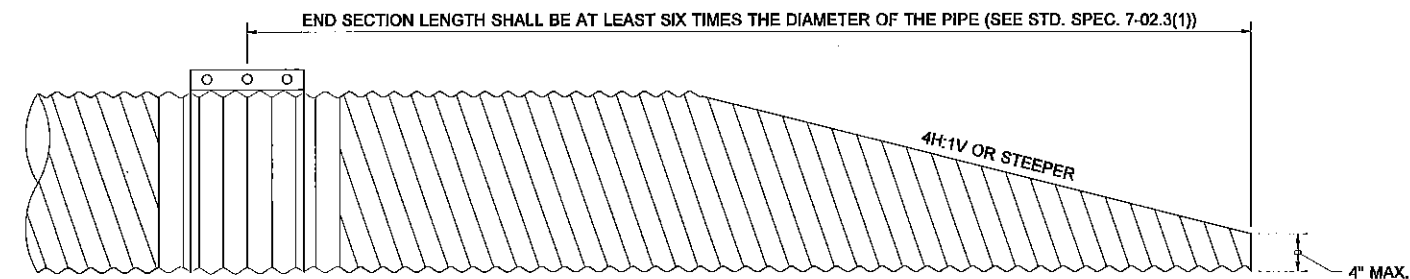
 Washington State Department of Transportation



THERMOPLASTIC PIPE



CONCRETE PIPE

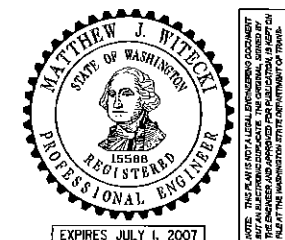


METAL PIPE

NOTES

1. The culvert ends shall be beveled to match the embankment or ditch slope and shall not be beveled flatter than 4H:1V. When slopes are between 4H:1V and 6H:1V, shape the slope in the vicinity of the culvert end to ensure that no part of the culvert protrudes more than 4" above the ground line.
2. Field cutting of culvert ends is permitted when approved by the Engineer. All field-cut culvert pipe shall be treated with treatment as shown in the Standard Specifications or General Special Provisions

**FOR CULVERTS 30"
DIAMETER OR LESS**



BEVELED END SECTIONS

STANDARD PLAN B-70.20-00

SHEET 1 OF 1 SHEET

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Harold J. Peterfeso 06-01-06

STATE DESIGN ENGINEER

DATE



Washington State Department of Transportation

DURING EXCAVATION, MINIMIZE DISTURBING THE GROUND AROUND TRENCH AS MUCH AS IS FEASIBLE, AND SMOOTH SURFACE FOLLOWING EXCAVATION TO AVOID CONCENTRATING FLOWS. COMPACTION MUST BE ADEQUATE TO PREVENT UNDERCUTTING FLOWS.

INSTALLATION DETAIL
(POSTS SHOWN)

MINIMIZE DISTURBING THE GROUND
MUCH AS IS FEASIBLE, AND SMOOTH
EXCAVATION TO AVOID CONCENT-
RATION MUST BE ADEQUATE TO
ING FLOWS.

GEOTEXTILE
IN TRENCH

2' - 0" MIN

2' - 4"

2' - 4"

SEE NOTE 1

FLOW

FLOW

FLOW

FLOW

SHEET FLOW
(TYPICAL)

PROTECTED AREA

PROTECTED AREA

PROTECTED AREA

PROTECTED AREA

6' - 0" MAX. SPACING

GEOTEXTILE FOR SILT FENCE - SEE STANDARD
SPECIFICATION SECTION
9-33.2 (1), TABLE 8

POST
- WOOD OR STEEL
(TYPICAL)

FASTEN TO POST
EVERY 6" O.C

FABRIC (GEOTEXTILE)
(TYPICAL)

SEE NOTE 1

**TYPICAL SILT FENCE
WITHOUT BACKUP SUPPORT
ISOMETRIC
(STEEL POSTS SHOWN)**

**TYPICAL SILT FENCE
WITHOUT BACKUP SUPPORT
ISOMETRIC
(STEEL POSTS SHOWN)**

SPliced fence sections shall be close enough together to prevent silt laden water from escaping through the fence at the overlap.

SPLICE DETAIL
(WOOD POSTS SHOWN)

1. Install the ends of the silt fence to point slightly upslope to prevent sediment from flowing around the ends of the fence.
2. Perform maintenance in accordance with **Standard Specifications 8-01.3(9)A and 8-01.3(15)**.
3. Splices shall never be placed in low spots or sump locations. If splices are located in low or sump areas, the fence may need to be reinstalled unless the Project Engineer approves the installation.
4. Install silt fencing parallel to mapped contour lines.



STATE OF
WASHINGTON
REGISTERED
LANDSCAPE ARCHITECT

SANDRA L. SALISBURY
CERTIFICATE NO. 000860

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SILT FENCE

STANDARD PLAN I-30.15-02

SHEET 1 OF 1 SHEET

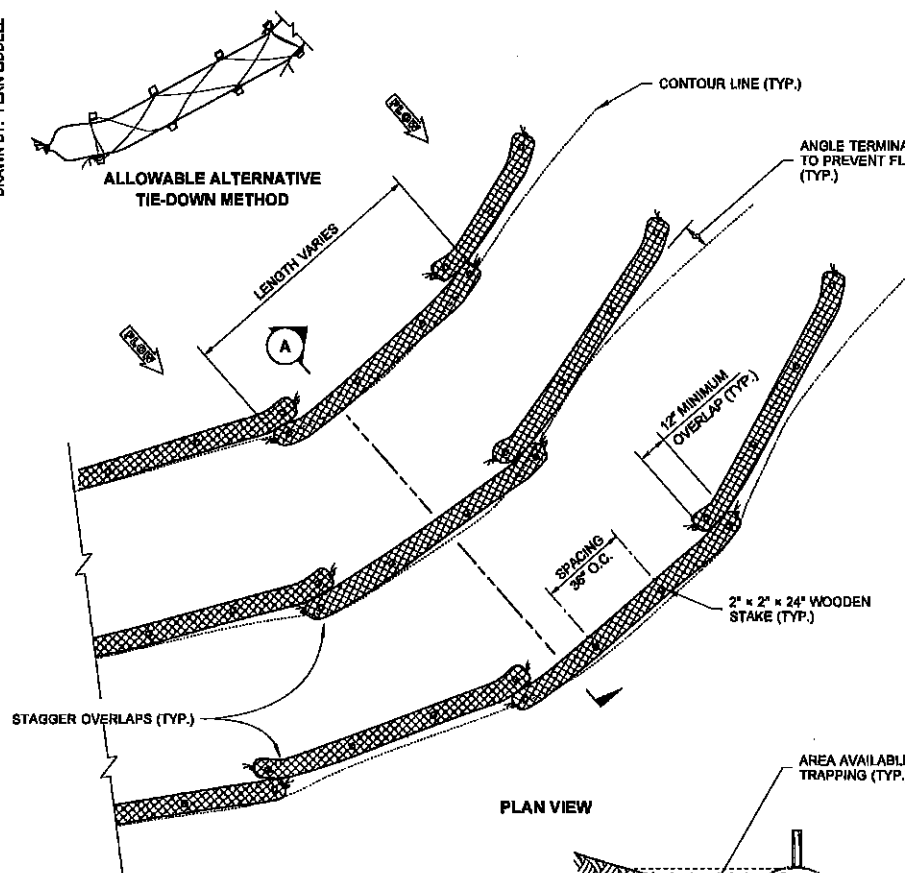
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Pasco Bakotic III

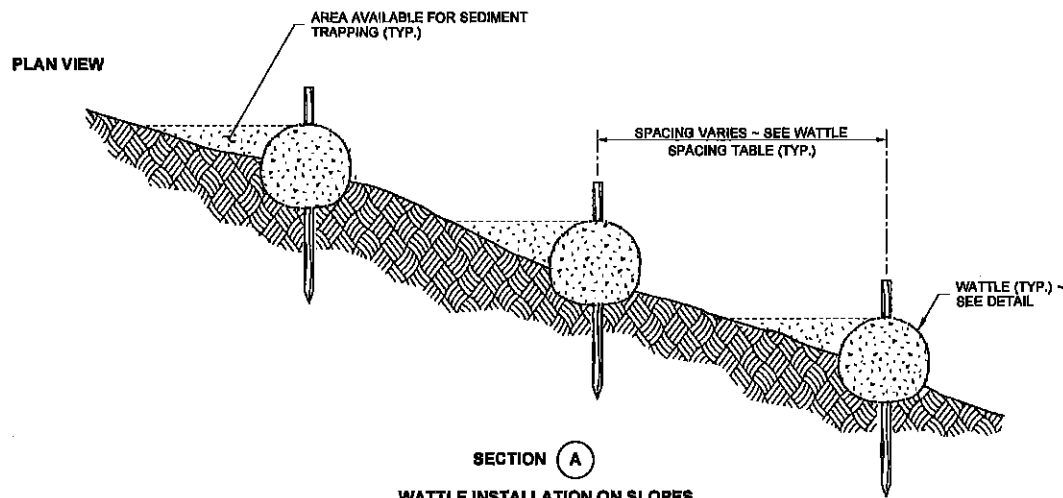
3/22/13

STATE DESIGN ENGINEER

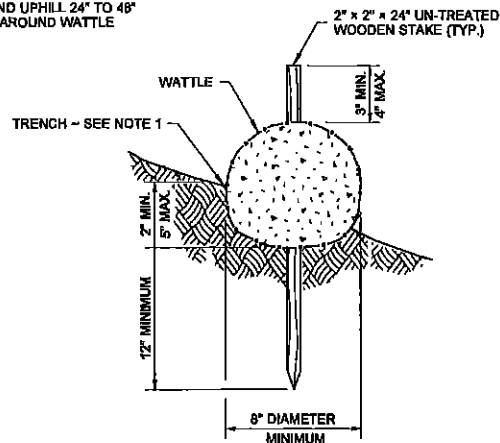
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8" DIAMETER WATTLE SPACING TABLE	
SLOPE	MAXIMUM SPACING
1H : 1V	10' - 0"
2H : 1V	20' - 0"
3H : 1V	30' - 0"
4H : 1V	40' - 0"



WATTLE INSTALLATION ON SLOPES



WATTLE DETAIL

NOTES

1. Wattles shall be in accordance with **Standard Specification 9-14.8(6)**. Install Wattles along contours. Installation shall be in accordance with **Standard Specification 8-01.3(10)**.
2. Securely knot each end of Wattle. Overlap adjacent Wattle ends 12" behind one another and securely tie together.
3. Compact excavated soil and trenches to prevent undercutting. Additional staking may be necessary to prevent undercutting.
4. Install Wattle perpendicular to flow along contours.
5. Wattles shall be inspected regularly, and immediately after a rainfall produces runoff, to ensure they remain thoroughly entrenched and in contact with the soil.
6. Perform maintenance in accordance with **Standard Specification 8-01.3(16)**.
7. Refer to **Standard Specification 8-01.3(16)** for removal.



STATE OF
WASHINGTON
REGISTERED
LANDSCAPE ARCHITECT

Sandra L. Salisbury
SANDRA L. SALISBURY
LICENSE NO. 880

DATE: June 10, 2013

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WATTLE INSTALLATION ON SLOPE

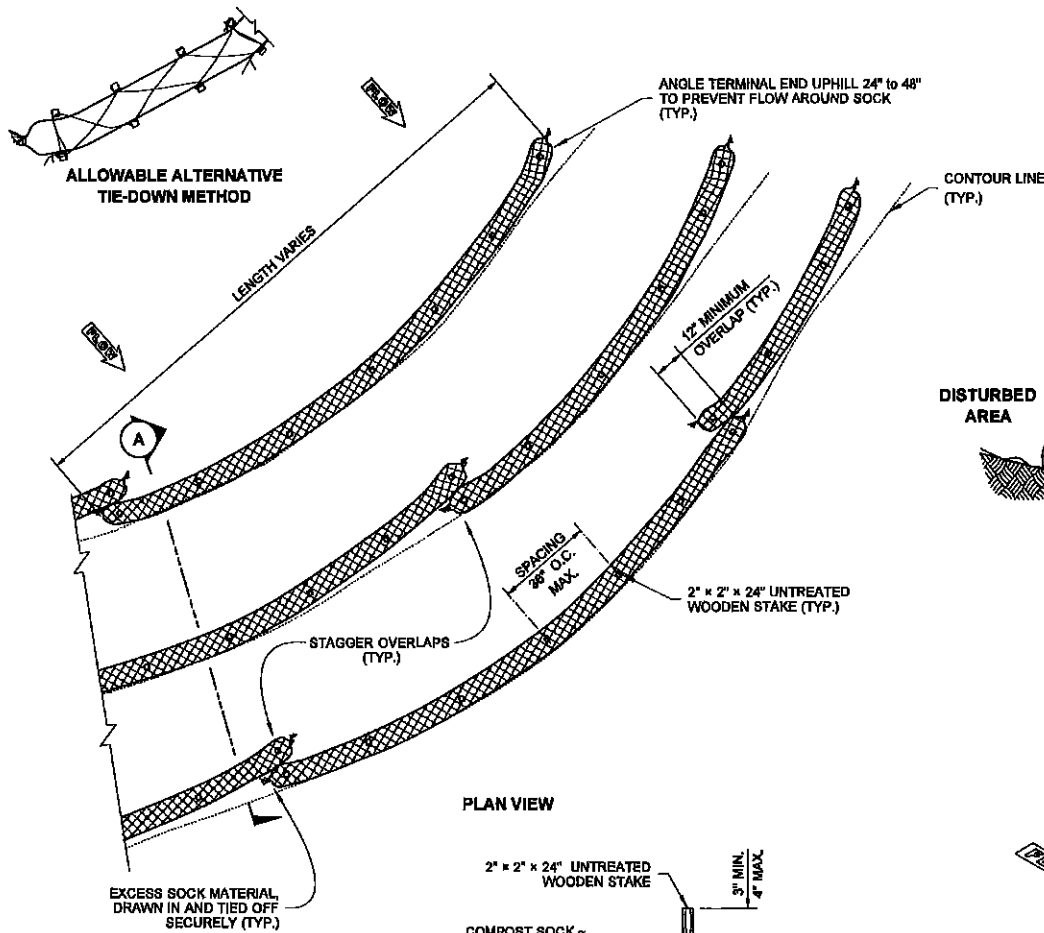
STANDARD PLAN I-30.30-01

SHEET 1 OF 1 SHEET

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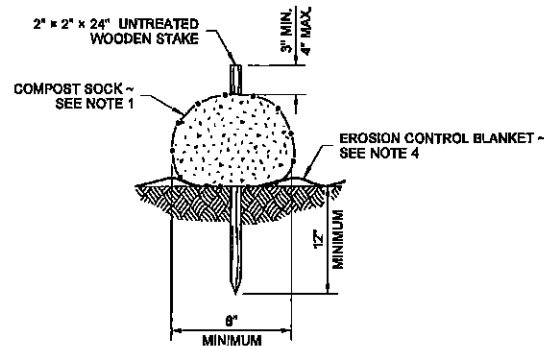
Pasco Bakotich III 6/10/13

STATE DESIGN ENGINEER DATE
Washington State Department of Transportation

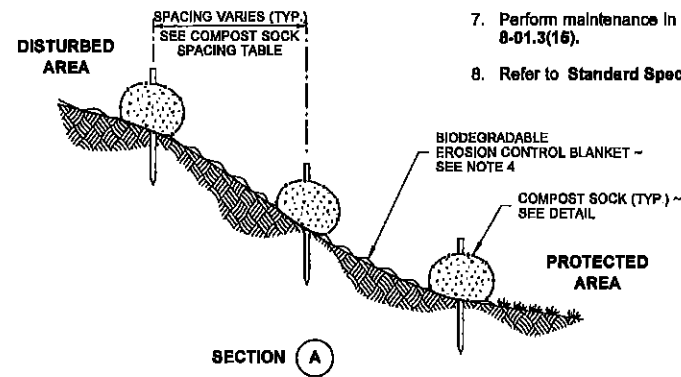


PLAN VIEW

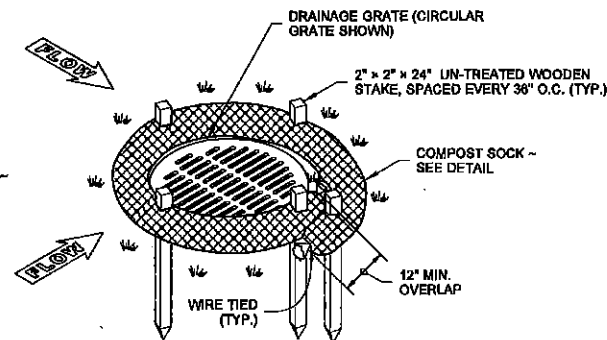
8" DIAMETER COMPOST SOCK SPACING TABLE	
SLOPE	MAXIMUM SPACING
1H : 1V	10' - 0"
2H : 1V	20' - 0"
3H : 1V	30' - 0"
4H : 1V	40' - 0"



COMPOST SOCK DETAIL



SECTION A



ISOMETRIC VIEW
CATCH BASIN INSTALLATION

NOTES

1. Compost Sock shall be in accordance with **Standard Specification 9-14.6(6)**.
2. Securely knot each end of Compost Sock. Overlap adjacent Compost Sock ends 12" behind one another and securely tie together.
3. Compost to be dispersed on site as determined by the Engineer, when vegetation covers the surface.
4. If Erosion Control Blanket is specified, place Compost Sock on top of blanket. See **Standard Plan I-60.10**.
5. Install Compost Sock perpendicular to flow along contours.
6. Remove sediment from the up slope side of the Compost Sock when accumulation has reached 1/2 of the effective height of the Compost Sock.
7. Perform maintenance in accordance with **Standard Specification 8-01.3(16)**.
8. Refer to **Standard Specification 8-01.3(16)** for removal.



STATE OF
WASHINGTON
REGISTERED
LANDSCAPE ARCHITECT

Sandra L. Salisbury
SANDRA L. SALISBURY
LICENSE NO. 860
DATE: June 6, 2013

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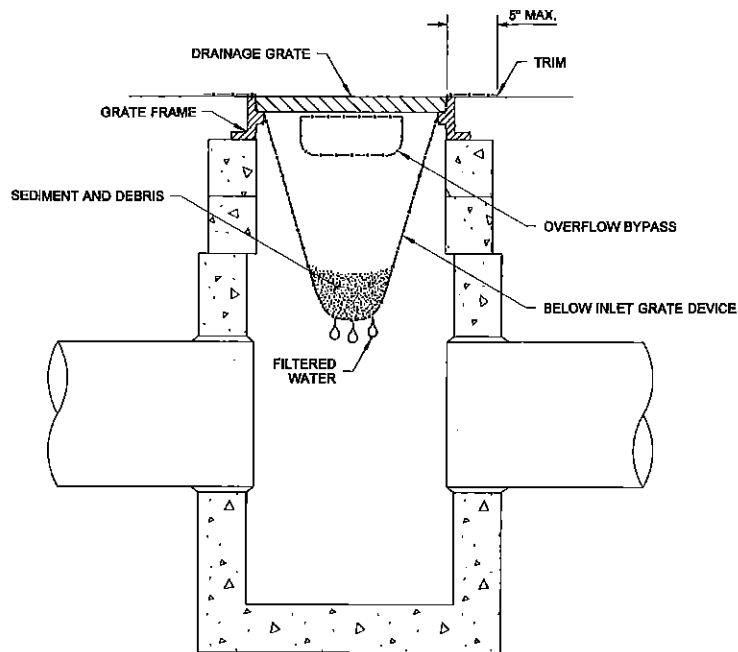
COMPOST SOCK
STANDARD PLAN I-30.40-01

SHEET 1 OF 1 SHEET

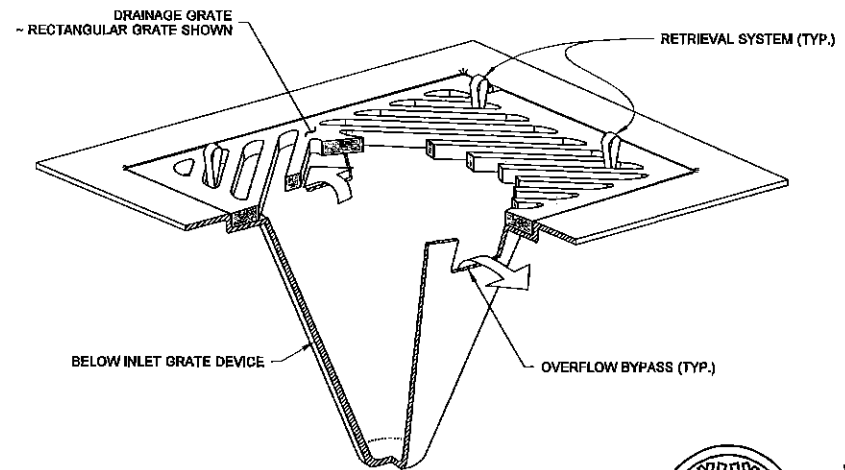
APPROVED FOR PUBLICATION

Pasco Bakotich III 6/10/13
STATE DESIGN ENGINEER DATE

Washington State Department of Transportation



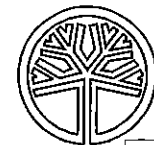
SECTION VIEW
NOT TO SCALE



ISOMETRIC VIEW

NOTES

1. Size the Below Inlet Grate Device (BIGD) for the storm water structure it will service.
2. The BIGD shall have a built-in high-flow relief system (overflow bypass).
3. The retrieval system must allow removal of the BIGD without spilling the collected material.
4. Perform maintenance in accordance with Standard Specification 8-01.3.(15).



STATE OF
WASHINGTON
REGISTERED
LANDSCAPE ARCHITECT

MARK W. MAURER
CERTIFICATE NO. 000698

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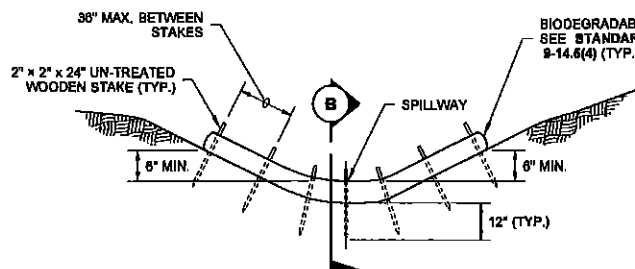
STORM DRAIN INLET PROTECTION STANDARD PLAN I-40.20-00

SHEET 1 OF 1 SHEET

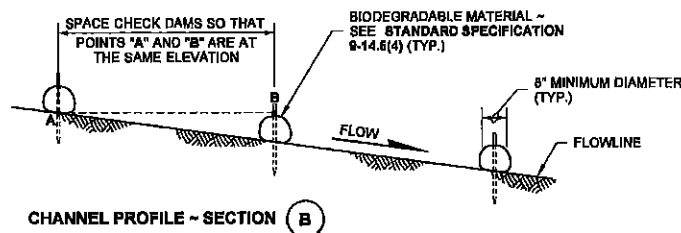
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Pasco Bakotich III 09-20-07

STATE DESIGN ENGINEER DATE
Washington State Department of Transportation



TYPICAL CHANNEL SECTION



CHANNEL PROFILE ~ SECTION B

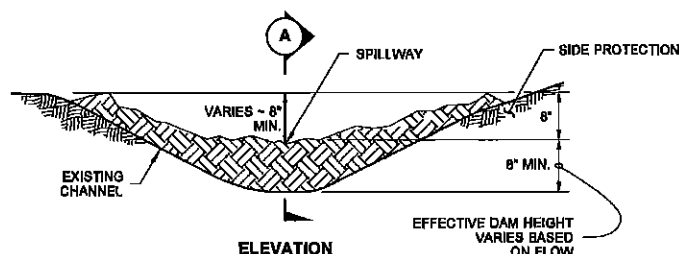
BIODEGRADABLE CHECK DAM

BIODEGRADABLE CHECK DAM NOTE

1. Biodegradable Check Dams may need additional or modified staking to prevent undercutting or scouring.

GENERAL NOTES

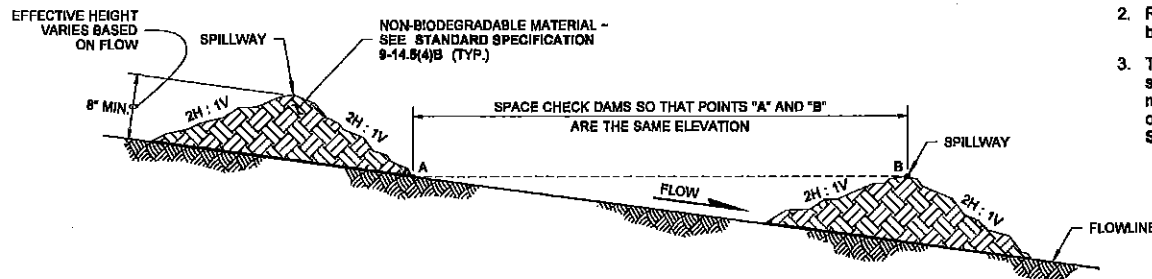
1. Check Dams shall meet the requirements of **Standard Specifications 8-01.3(6) and 9-14.5(4)**.
2. In channels, install the sloped ends of the Check Dam a minimum of 8" higher than the spillway to ensure water flows over the dam and not around it.
3. Perform maintenance in accordance with **Standard Specification 8-01.3(15)**.
4. Remove Check Dams in accordance with **Standard Specification 8-01.3(16)**.



ELEVATION

NON-BIODEGRADABLE CHECK DAM NOTES

1. Non-Biodegradable Manufactured Check Dam devices approved for use under **Standard Specification 9-14.5(4)** shall be installed per manufacturer's recommendations and shall perform in accordance with **Standard Specification 8-01.3(6)**.
2. Rock Check Dams shall be placed outside of the clear zone or behind traffic barrier.
3. To ensure adequate damming time, Rock Check Dams used as sediment control may need to be enhanced with plastic that meets the requirements of **Standard Specification 9-14.5(3)** or fabric that meets the geotextile requirements of **Standard Specification 9-33.2(1), Table 6**.



EXTENDED SECTION A

NON-BIODEGRADABLE CHECK DAM



STATE OF
WASHINGTON
REGISTERED
LANDSCAPE ARCHITECT

Sandra L. Salisbury
SANDRA L. SALISBURY
LICENSE NO. 880
DATE: June 6, 2013

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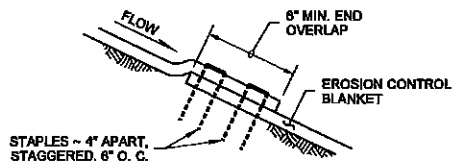
CHECK DAMS ON CHANNELS STANDARD PLAN I-50.20-01 SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

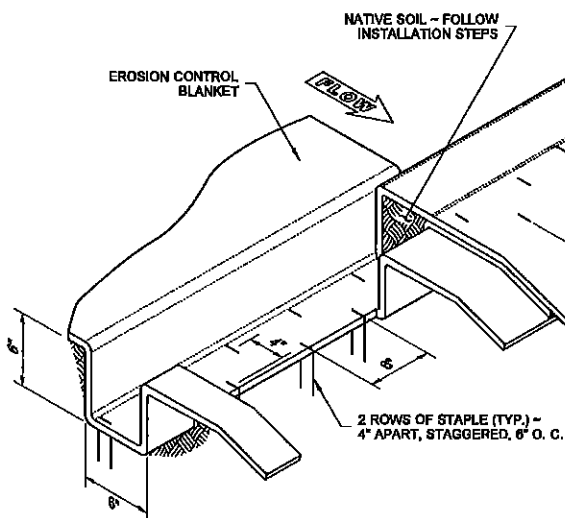
Pasco Bakotich III 6/10/13
STATE DESIGN ENGINEER DATE

 Washington State Department of Transportation

DRAWN BY: LISA CYFORD



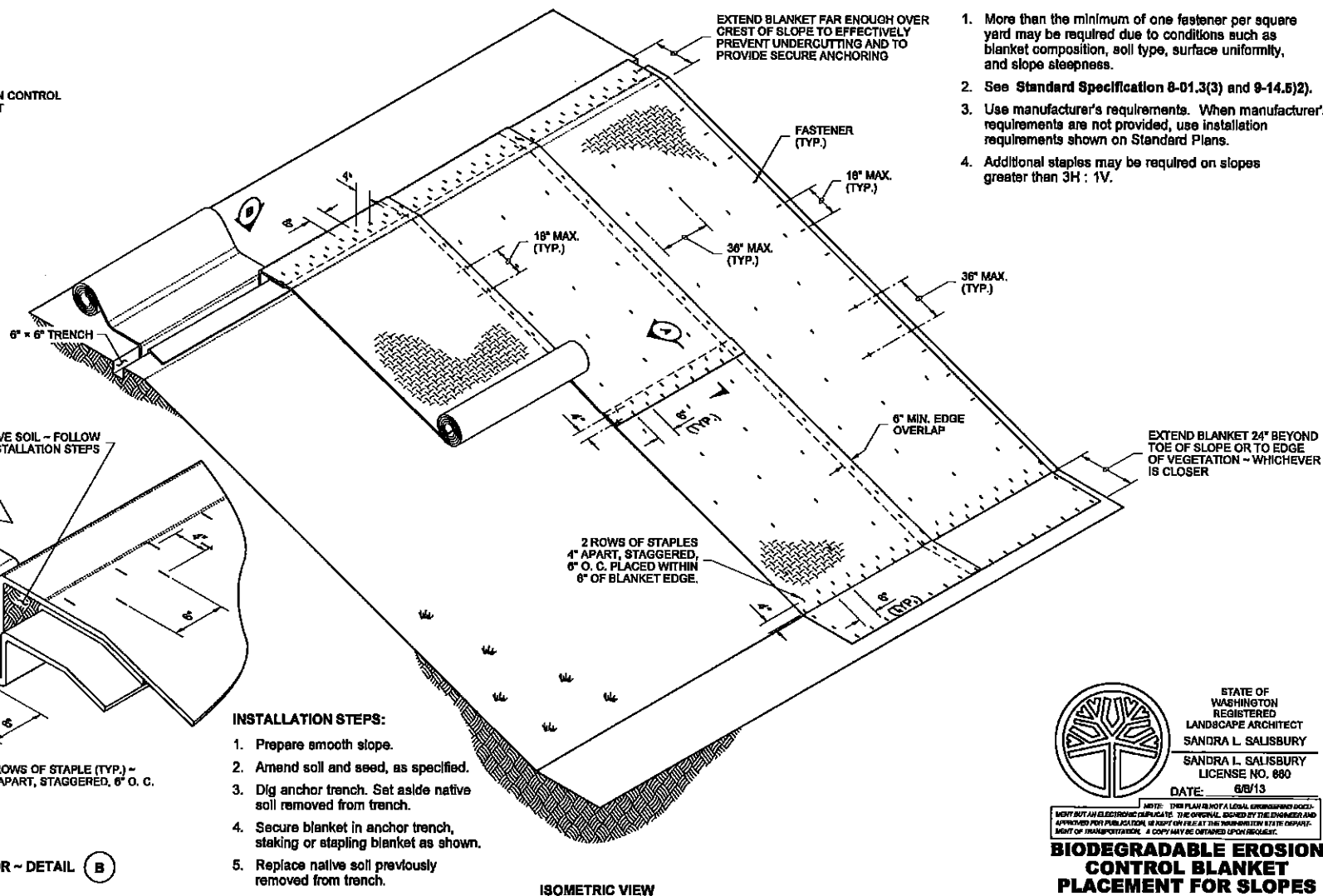
SHINGLE SPLICE ~ SECTION A



INITIAL ANCHOR ~ DETAIL B

INSTALLATION STEPS:

1. Prepare smooth slope.
2. Amend soil and seed, as specified.
3. Dig anchor trench. Set aside native soil removed from trench.
4. Secure blanket in anchor trench, staking or stapling blanket as shown.
5. Replace native soil previously removed from trench.
6. Roll blanket down the slope in a controlled manner, taking care to remove excess slack, and taking care not to stretch blanket.
7. Stake or staple blanket as shown so there are no gaps between the blanket and the soil. Staple while unrolling blanket to minimize walking on blanket.



NOTES

1. More than the minimum of one fastener per square yard may be required due to conditions such as blanket composition, soil type, surface uniformity, and slope steepness.
2. See Standard Specification 8-01.3(3) and 9-14.5(2).
3. Use manufacturer's requirements. When manufacturer's requirements are not provided, use installation requirements shown on Standard Plans.
4. Additional staples may be required on slopes greater than 3H : 1V.



STATE OF
WASHINGTON
REGISTERED
LANDSCAPE ARCHITECT
SANDRA L. SALISBURY
LICENSE NO. 880
DATE: 6/8/13

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BIODEGRADABLE EROSION CONTROL BLANKET PLACEMENT FOR SLOPES STANDARD PLAN I-60.10-01

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Pasco Bakotich III

6/10/13

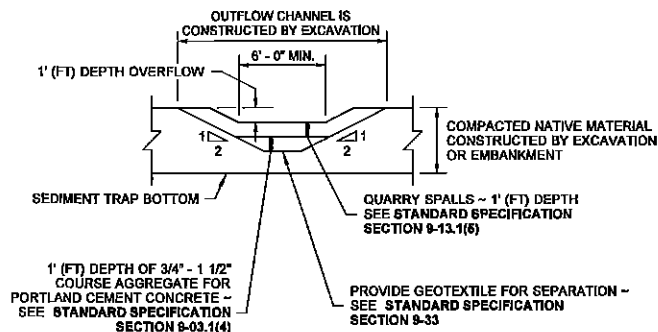
STATE DESIGN ENGINEER

DATE

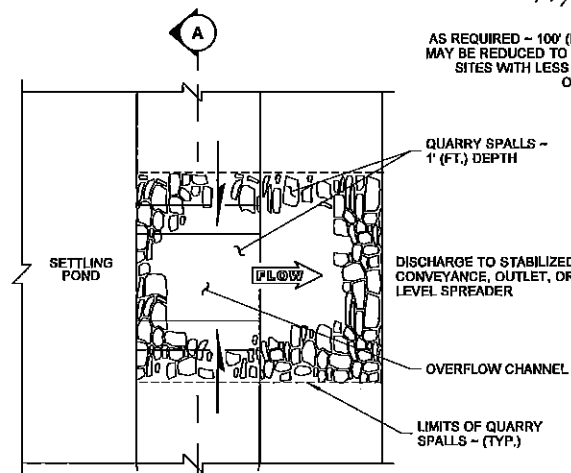


Washington State Department of Transportation

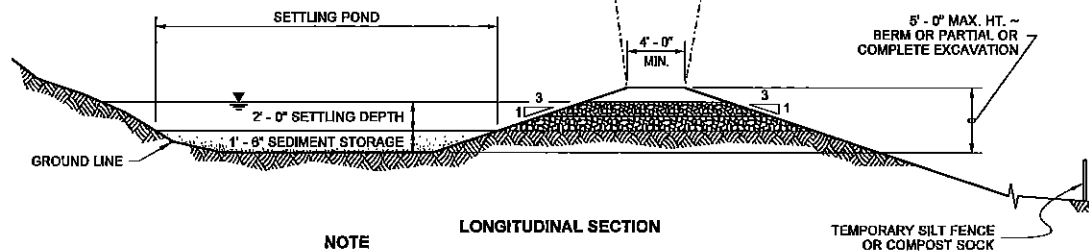
DRAWN BY: FERN LIDDELL



SECTION A



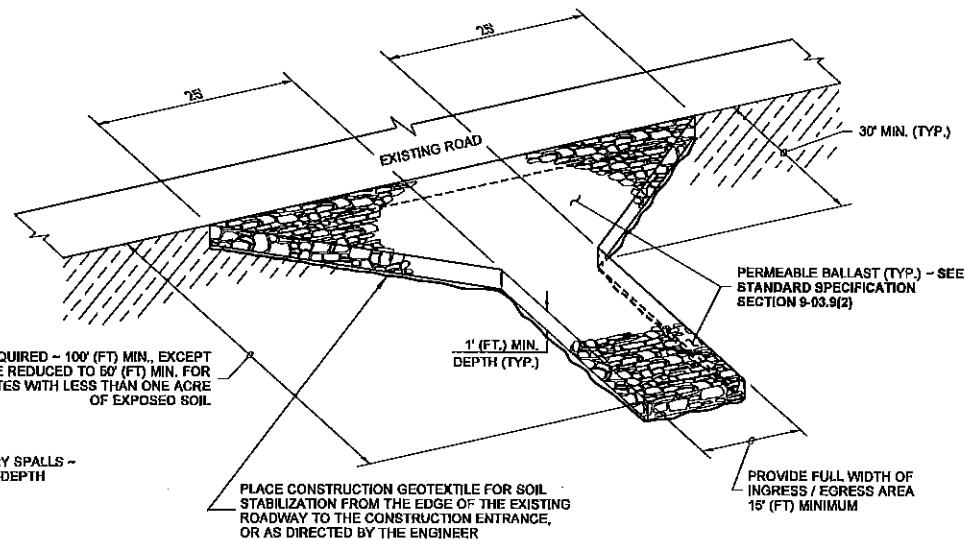
PARTIAL PLAN VIEW OF BERM
SHOWN LARGER FOR CLARITY



NOTE

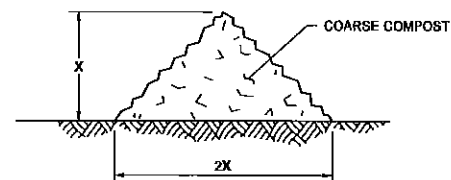
PLACE GEOTEXTILE UNDER THE SPILLWAY AND SIDE SLOPES. PROVIDE A
CONTINUOUS LAYER BETWEEN THE GRAVEL/ROCK AND THE NATIVE EARTHEN MATERIAL.

TEMPORARY SEDIMENT TRAP



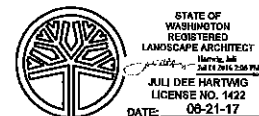
**ISOMETRIC VIEW
STABILIZED CONSTRUCTION ENTRANCE**

STABILIZED CONSTRUCTION ENTRANCE SHALL MEET THE REQUIREMENTS
OF STANDARD SPECIFICATION SECTION 9-01.3(7).



X = 1' - 0" FOR SLOPES 4H:1V OR FLATTER
X = 1' - 6" FOR SLOPES STEEPER THAN 4H:1V

TYPICAL SECTION
COMPOST BERM DETAIL



**MISCELLANEOUS
EROSION CONTROL DETAILS
STANDARD PLAN I-80.10-02**

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Carpenter, Jeff Carpenter, Jeff
Jul 15 2016 2:28 PM

STATE DESIGN ENGINEER
Washington State Department of Transportation

APPENDIX 2-B

DESIGN STORM DATA

Design Storm Data

Longview-Kelso Urban Area Rainfall Depth Relationships							
Storm Duration	Rainfall Depth, Inches						Storm Duration
	2-year	5-year	10-year	25-year	50-year	100-year	
5-minute	0.14	0.20	0.23	0.28	0.32	0.36	5-minute
10-minute	0.22	0.31	0.36	0.43	0.49	0.55	10-minute
15-minute	0.28	0.39	0.45	0.54	0.62	0.70	15-minute
30-minute	0.39	0.54	0.63	0.75	0.86	0.97	30-minute
1-hour	0.50	0.68	0.80	0.95	1.09	1.23	1-hour
2-hour	0.69	0.90	1.04	1.28	1.47	1.69	2-hour
3-hour	0.87	1.11	1.27	1.59	1.82	2.12	3-hour
6-hour	1.30	1.60	1.80	2.31	2.66	3.14	6-hour
12-hour	1.92	2.35	2.70	3.34	3.91	4.65	12-hour
24-hour	2.54	3.10	3.60	4.37	5.17	6.17	24-hour

Longview-Kelso Urban Area						
Rainfall Depth, Inches						
Time						
Minutes	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
5	0.14	0.20	0.23	0.28	0.32	0.36
10	0.22	0.31	0.36	0.43	0.49	0.55
15	0.28	0.39	0.45	0.54	0.62	0.70
30	0.39	0.54	0.63	0.75	0.86	0.97
60	0.50	0.68	0.80	0.95	1.09	1.23
120	0.69	0.90	1.04	1.28	1.47	1.69
180	0.87	1.11	1.27	1.59	1.82	2.12
240	1.02	1.27	1.44	1.83	2.10	2.46
300	1.16	1.44	1.62	2.07	2.38	2.80
360	1.30	1.60	1.80	2.31	2.66	3.14
420	1.40	1.73	1.95	2.48	2.86	3.39
480	1.51	1.85	2.10	2.66	3.07	3.64
540	1.61	1.98	2.25	2.83	3.28	3.89
600	1.71	2.10	2.40	3.00	3.49	4.15
660	1.82	2.23	2.55	3.17	3.70	4.40
720	1.92	2.35	2.70	3.34	3.91	4.65
780	1.97	2.41	2.78	3.43	4.02	4.78
840	2.02	2.48	2.85	3.51	4.12	4.90
900	2.08	2.54	2.93	3.60	4.23	5.03
960	2.13	2.60	3.00	3.68	4.33	5.16
1020	2.18	2.66	3.08	3.77	4.44	5.28
1080	2.23	2.73	3.15	3.86	4.54	5.41
1140	2.28	2.79	3.23	3.94	4.65	5.54
1200	2.33	2.85	3.30	4.03	4.75	5.66
1260	2.39	2.91	3.38	4.11	4.86	5.79
1320	2.44	2.98	3.45	4.20	4.96	5.92
1380	2.49	3.04	3.53	4.28	5.07	6.04
1440	2.54	3.10	3.60	4.37	5.17	6.17

Longview-Kelso Urban Area						
Rainfall Intensity, Inches per Hour						
Time						
Minutes	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
5	1.73	2.37	2.78	3.31	3.80	4.27
10	1.35	1.84	2.15	2.56	2.94	3.31
15	1.14	1.55	1.82	2.17	2.49	2.80
30	0.79	1.07	1.26	1.50	1.72	1.94
60	0.50	0.68	0.80	0.95	1.09	1.23
120	0.35	0.45	0.52	0.64	0.73	0.84
180	0.29	0.37	0.42	0.53	0.61	0.71
240	0.25	0.32	0.36	0.46	0.53	0.61
300	0.23	0.29	0.32	0.41	0.48	0.56
360	0.22	0.27	0.30	0.39	0.44	0.52
420	0.20	0.25	0.28	0.35	0.41	0.48
480	0.19	0.23	0.26	0.33	0.38	0.46
540	0.18	0.22	0.25	0.31	0.36	0.43
600	0.17	0.21	0.24	0.30	0.35	0.41
660	0.17	0.20	0.23	0.29	0.34	0.40
720	0.16	0.20	0.23	0.28	0.33	0.39
780	0.15	0.19	0.21	0.26	0.31	0.37
840	0.14	0.18	0.20	0.25	0.29	0.35
900	0.14	0.17	0.20	0.24	0.28	0.34
960	0.13	0.16	0.19	0.23	0.27	0.32
1020	0.13	0.16	0.18	0.22	0.26	0.31
1080	0.12	0.15	0.18	0.21	0.25	0.30
1140	0.12	0.15	0.17	0.21	0.24	0.29
1200	0.12	0.14	0.17	0.20	0.24	0.28
1260	0.11	0.14	0.16	0.20	0.23	0.28
1320	0.11	0.14	0.16	0.19	0.23	0.27
1380	0.11	0.13	0.15	0.19	0.22	0.26
1440	0.11	0.13	0.15	0.18	0.22	0.26

APPENDIX 2-C

EXAMPLE STORMWATER IMPROVEMENT RESTRICTIVE COVENANT

When Recorded Return To:

WASHINGTON STATE COUNTY AUDITOR/RECORDER'S
INDEXING FORM (Cover Sheet)
RCW 65.04

Please print or type information

Document Title(s) (or, transactions contained therein):
Reference Number(s) of Documents assigned or released:
☐ Additional reference #'s on page of document.
Grantor(s) (Last name first, then first name and initials):
☐ Additional Grantor(s) on page of document.
Grantee(s) (Last name first, then first name and initials):
☐ Additional Grantee(s) on page of document.
Legal Description (abbreviated: i.e. lot, block, plat or section, township, range):
☐ Additional legal description on page of document.
Assessor's Property Tax Parcel/Account Number(s):
☐ Assessor Tax # not yet assigned.
The Auditor/Recorder will rely on the information provided on the form. The staff will not read the document to verify the accuracy or completeness of the indexing information provided herein.

After recording return to:

City of Kelso
P.O. Box 819
203 S. Pacific Ave., Suite #205
Kelso, WA 98626

CITY OF KELSO

**STORMWATER IMPROVEMENT
RESTRICTIVE COVENANT**
(For Commercial Sites and Subdivisions)

Grantor (owner):

Grantee:

City of Kelso

Legal Description:

**Assessor's Property Tax
Parcel/Account No(s):**

**Subdivision/Site Plan
Review Case No.:**

THIS STORMWATER IMPROVEMENT RESTRICTIVE COVENANT (this "Covenant") is made this
_____ day of _____, 20_____, by
_____ ("Grantor") and the City of Kelso, a Washington
municipal corporation ("Grantee").

RECITALS

- A. Grantee is the regulatory agency responsible for managing stormwater within the City of Kelso.
- B. Grantor is the owner of certain real Property in the City of Kelso, Washington, described above and referred to in this Agreement as the "Property."
- C. Grantor desires to construct a development on said Property, which development is known as _____. In conjunction with this development, Grantor is constructing a storm collection, conveyance, treatment, flow control, and/or on-site stormwater management system (System), attached hereto and incorporated herein, that must meet the regulatory requests of Grantee.
- D. Grantor and Grantee hereby covenant and agree as follows:

1.0 Construction

1.1 In connection with Grantor's proposed development of the Property, Grantee has required and Grantor has agreed to construct a System. The System is described and shown on a construction drawing prepared by the engineering firm of _____, approved by the City on _____, 20____, and as conditioned under Permit No. _____.

1.2 As a condition of project approval, Grantor agrees, pursuant to this Agreement to ensure that the System is constructed and, where herein indicated, maintain specified components of the System.

2.0 Maintenance of Specified Components

Grantor, its heirs, successors or assigns agree to maintain, at his or her sole cost, the System and its internal and external appurtenances, placed in the right-of-way or on private property, including designated common areas, in their entirety, in perpetuity, and in accordance with this Covenant, the approved construction plans, the approved maintenance plan (attached), the manufacturer's recommendations, Kelso Municipal Code 13.09, and the Stormwater Management Manual for Western Washington ("SWMMWW") or comparable standards approved by the Grantee.

3.0 Records

The Grantor, its heirs, successors or assigns agree to provide to the City, by January 31st of each year, complete records of the inspection and maintenance performed on the system during the preceding year. These records shall document, at a minimum, the date and location of all inspections, cleaning, and any other measures taken as part of maintenance of the System.

4.0 No Removal

No part of the System shall be altered or removed except as necessary for maintenance, repair or replacement, except as may be agreed to in writing by the parties.

5.0 Access

Each drainage structure shall be designed and built in accordance with the approved plans to permit Grantor and Grantee access to the System at all times. Grantor hereby grants to Grantee the right to enter upon the property after due notice to inspect the System and/or to provide necessary maintenance as set forth below. Notwithstanding anything to contrary in this Agreement, Grantee's right to access the System is limited to the System area only; Grantee acknowledges that Grantee has no right to access any portion of the Property that is outside of the System area; additionally, Grantee's access to the System area shall not interfere with Grantor's business operation on the Property.

6.0 Failure to Maintain

If Grantor fails to adequately maintain or repair the specified components, Grantee shall provide Grantor with written notice of such failure to adequately maintain or repair the System. Following receipt of such notice, Grantee shall provide Grantor with a reasonable opportunity (no less than 60 days) to adequately repair the System; provided, however, that in the event of an emergency, Grantee has the right to repair the System without notice to Grantor. In the event Grantee performs any maintenance or repair on the System, Grantee shall charge Grantor and provide a detailed itemized invoice together with a copy of all invoices paid by Grantee for such repair or maintenance, and Grantor shall pay, the reasonable costs of such work. If Grantee is required to bring action to recover such costs, Grantee shall also recover its reasonable attorney's fees and costs, together with interest at the rate of twelve percent (12%) per annum.

7.0 Enforcement

This Agreement may be enforced by Grantee in law or equity against the Grantor, its heirs, successors and assigns.

8.0 Successors and Assigns

These obligations shall run with the Property and be binding upon the Grantor, its heirs, successors and assigns.

9.0 Effective Date

This Agreement is effective on the date first written above.

10.0 Attachments [example only]

Attachment 1: Site Stormwater System Manual

Chapter 3

Streets

City of Kelso
Engineering Design Manual
February 2011
Amended June 2017

Chapter 3
Streets
City of Kelso
Engineering Design Manual
February 2011
Amended June 2017

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CHAPTER 3 – STREETS

3.00 Functional Classification

The functional classification of existing and proposed roads is established by the City on an individual basis using the existing land use and existing operational characteristics. The Director will maintain a map that classifies each roadway. Kelso classifies roads and streets as follows:

A. Major Arterial

These facilities are the supporting elements of both the arterial routes and collector systems. Major arterials, in combination with minor arterial routes, are intended to provide a high level of mobility for travel within the region. All trips from one sub-area through an adjacent sub-area traveling to other points in the region should occur on a major arterial.

Access is generally limited to intersections with other arterials and collectors; direct residential access is not permitted. Direct land access is discouraged, kept to a minimum, and controlled. The level of fixed route transit service is high.

B. Minor Arterial

The minor arterial system complements and supports the major arterial system, but is primarily oriented toward travel within and between adjacent sub-areas. An adequate minor arterial system is needed to ensure that these movements do not occur on major arterials. These facilities provide connections to major activity centers and provide access from the major arterial systems into each sub-area.

They serve through traffic and provide direct access for commercial, industrial, office, and multi-family development, but generally, not for residential properties. Access to abutting lots is limited. Since minor arterials serve a more localized area, fixed route transit is moderate.

C. Collector

Collector streets connect local traffic within a subarea to arterial roads. Service to adjacent land uses is subordinate to traffic movement. Access to abutting properties and parking is controlled through the use of raised channelization, driveway spacing, bicycle and/or pedestrian lanes, and pavement markings. Typically, collector streets are not continuous for any great length, nor do they form a connected network by themselves. Since collector streets connect arterial networks and also connect neighborhoods to commercial areas as well as each other, fixed route transit service is low. Access to abutting lots is limited.

D. Local: Multi-family Areas

Local: Multi-family streets serve to distribute traffic from collectors and provide direct access for abutting properties. Through trips are discouraged and parking is allowed.

E. Local: Single-family Areas

Local: Single-family streets provide access to adjoining properties within a neighborhood. Through trips are discouraged and parking is allowed. Service a very limited number of houses.

F. Alleys (Commercial & Industrial, Residential)

Alleys provide service access to adjoining properties through one-way traffic. Through trips and parking are not allowed. No fixed route transit usage and the focus is for service and localized access. Service a very limited number of lots.

3.01 Access

The Director shall have the authority to limit access and designate access locations on public streets under the jurisdiction of the City. When a parcel has multiple roadway frontages, access shall be granted from the lesser classification roadway. Access to streets and highways under Cowlitz County or State of Washington jurisdiction must be formally approved by those entities at the applicant's initiative and expense.

A. Request Process

1. *Applications.* Applicants may request a street access connection permit as part of an underlying Development application, or they may file separately for a street access connection permit if the connection is being requested without relation to an underlying land use application.
2. *Approval.* The issuance or denial of the street access connection permit shall be made administratively by the Director.
3. *Submittal Requirements for Street Access.* Per KEDM Section 1.04.K.
4. *Permit Issuance.* In order to receive a street access connection permit the applicant must comply with the following:
 - a. The design standards for the functional classification of the roadway that the proposed connection will access.
 - b. If the proposed connection is an expansion or change of use of a pre-existing non-conforming access, the applicant must demonstrate that the

- proposed connection will not substantially adversely affect the safety of the roadway section that the proposed connection will access through an interim access permit application.
- c. Pursuant to the Washington State Environmental Policy Act (SEPA), the City shall have the authority to impose conditions upon the permit to mitigate the specific adverse impacts created by the connection.
5. *Variance from Access Standards.* The Access Standards may be modified by the Director on the street access connection permit upon a showing by the applicant of the following:
- a. Topography, right-of-way, existing construction or physical conditions, or other geographic conditions impose an unusual hardship on the applicant, and an equivalent alternative which can accomplish the same access management purpose is available.
 - b. A minor change to a standard is required to address a specific design or construction problem, which if not enacted, will result in an unusual hardship.
 - c. An alternative standard is proposed which is equal to or superior to these standards.
 - d. Application of the standards of this chapter to the development would be grossly disproportional to the impacts created.
6. *Interim Access.* When and if a property/parcel cannot meet current access spacing standards, an interim access permit may be pursued. The purpose of the interim access permit is to allow access (that does not meet approved access spacing standards) to a property until such time when acceptable access spacing standards can be met. An interim access permit shall be granted upon meeting the following criteria:
- a. Access to the property/parcel cannot meet current access spacing criteria;
 - b. The interim access shall be evaluated for traffic operations (including queuing) and safety criteria and shall meet minimum transportation operating conditions and not create an adverse safety situation (dependent upon review from the City Traffic Engineer).
 - c. The property owner agrees to sign a waiver of the right to demonstrate against the formation of a local improvements district, or similar financing mechanism, for the primary purpose of providing roadway infrastructure to help create a network that would allow for adequate access to the parcel that meets current access spacing standards. Once that infrastructure is in place the interim access would be closed.

- d. The property owner records an agreement with the City, County and/or WSDOT to participate in efforts to achieve adequate access that meets access spacing standards to help eliminate the interim access.
 - e. The property owner agrees to vacate (and close) the interim access when an appropriate alternative access is identified and constructed which meets the current access spacing criteria.
7. *Suspension.* The Director shall have the right to suspend a street access connection permit where the applicant fails to comply with the conditions and access standards of the street access connection permit. The street access connection permit can be reinstated upon compliance with conditions and access standards of the street access connection permit. If after 180 days the applicant has failed to comply with conditions, the Director has the right to revoke the street access connection permit.

3.02 Intersections, Driveways, and Approaches

A. General Requirements

- 1. Standard residential, commercial, or industrial driveway approaches shall be required for all driveways accessing onto a public (or private) right-of-way or easement.
- 2. A private intersection opening may be used in lieu of a conventional driveway approach in commercial and industrial areas where all of the following criteria are met:
 - a. Projected driveway usage is greater than two-thousand (2,000) vehicles per day.
 - b. In any case where traffic signalization is approved, warranted, and provided.
 - c. A minimum one-hundred (100) foot storage area is provided between the street and any turning or parking maneuvers within the development.
 - d. The opening is at least one-hundred and fifty (150) feet from any other intersection opening, including driveways on or off the property frontage and under control of the applicant or not.
 - e. Easement dedication for traffic control devices is provided.

B. Conditions of Approval

- 1. Driveways directly giving access onto arterials shall be denied if alternate access is available.

2. All abandoned driveway areas on the street frontage to be improved shall be removed and new curb, gutter, and sidewalk shall be installed.
 3. No commercial or industrial driveway shall be approved where backing onto the sidewalk or street will occur.
 4. No driveway shall be approved where backing onto a street might occur if the slope of the driveway is greater than ten percent (10%) within the first twenty (20) feet of the property line.
 5. Left turns from and to a driveway may be restricted as a development condition or in the future if such maneuvers are found to be unduly hazardous.
 6. Driveways approaches shall be aligned wherever practicable with existing driveways on the opposite side of the street.
 7. All driveways shall be angled ninety-degrees (90°) to the street, unless otherwise approved by the Director.
- C. Intersection/Driveway Spacing. Intersections are divided into two categories for determining spacing requirements: signalized access spacing and unsignalized access spacing, which include both driveways and intersections.
1. *Number of Driveways Approaches per Property.* Property owners shall be granted one access per property. Design modification requests for additional driveways must be supported by a traffic impact study. Any additional access should conform to the KEDM. If the property has frontage along two or more streets, access shall be from the lower classification street unless approved through the design modification process. Final approval of access (per property) shall be through the Director.
 2. *Signal Spacing.* Signalized access on all roadways shall be no less than 1,250 feet for full access, and should maintain adequate signal progression.
 3. *Measurement of Access Spacing.* Spacing of signalized and unsignalized roadway intersections, as well as driveways, are described in Table 3.1 and shall be measured from the centerline of the intersections being measured. Distances from intersection corners for access driveways as described in Table 3.2 shall be measured between the nearest edges of the driveways, edge of roadway or curb line. Where the distance required from the corner is greater than the parcel frontage, the driveway approach shall be placed at the farthest distance from the adjacent driveway.

Table 3.1
Unsignalized Intersection Spacing

Roadway Classification	Minimum Full Access Spacing (ft)	Maximum Full Access Spacing (ft)	Right-in/Right-out Access Spacing (ft)
Major Arterial	1,250	2,000	400
Minor Arterial	600	1,000	300
Collector	400	800	200
Local Multi-Family	100	500	n/a
Local Single-Family	25	500	n/a

In the case of long or oddly shaped blocks and to facilitate pedestrian access to parks, playgrounds, open space or schools, the applicant shall construct pedestrian paths of not less than ten feet in width on a dedicated right-of-way or perpetually unobstructed easement of not less than twenty feet in width, to extend through the block(s) at location(s) deemed necessary by the Director.

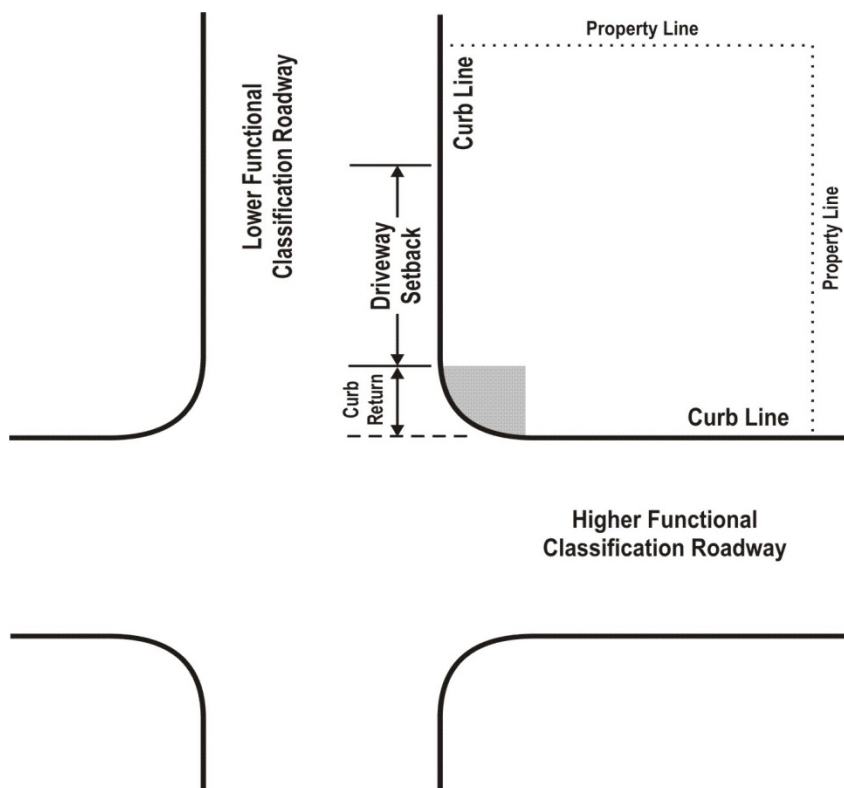
- D. Access from Alleys. There shall be no access from alleys except where the intersecting and parallel streets are classified as Local Access Residential. On Local Access Residential streets, one alley access shall be permitted whose width shall conform to the standard widths for a driveway if the alley access is the only access for the residence.
- E. Corner Standards. Driveways approaches on corner parcels shall be placed on the roadway with the lower classification. If both roadways have the same classification, the Director shall determine on which roadway the driveway shall be located. It may be necessary to perform a queuing analysis to determine if the queue on the roadway where access is being requested blocks the proposed access.

Table 3.2
Minimum Distances from Corner Standards

Functional Classification	Minimum Access Set-back from Corner (ft)
Major Arterial	300
Minor Arterial	200
Collector	100
Local	50

The corner point from which to measure is the curb return radius and is shown in Figure 3-1. Where the distance required from the corner is greater than the parcel frontage, the driveway shall be placed at the furthestmost distance from the intersection.

Figure 3-1: Corner Lot Setback



- F. Sight Triangles for All Uses in All Zones. The corner areas of lots adjacent to street intersections as well as the corner areas adjacent to road approaches and other access easements shall be kept clear of all obstructions, as denoted below.
1. All corner building sites shall maintain a clear triangle at the intersection with the street rights-of-way to assure traffic safety. No building, structure, object or growth over thirty-six inches in height, measured from the mean grade of the intersecting street, shall be allowed within this triangle. The triangle shall be computed as follows: Starting at the apex of the intersecting street rights-of-way, measuring down the triangle legs thirty feet; the base of the triangle shall be found by drawing a straight line connecting the triangle legs. The land inside the triangle shall be regulated for visibility.
 2. All other lots not identified as corner lots shall be considered as mid-lots for the purpose of sight line development and regulation. The mid-lot sight line setback area shall be computed as follows: Starting at the intersection of the driveway centerline and the fronting street lot line, measure fifteen feet in opposite directions. From these points draw a straight forty-five-degree line back to the driveway centerline. The land inside the triangle shall be regulated for visibility. No building, structure, object or growth over thirty-six inches in height, as measured from the mean grade of the fronting street, shall be allowed in this triangle.
- G. Restrictive Median Curbs. Except for Local Access and Local Access Residential roadways, restrictive median curbs shall be used to restrict turning and crossing movements as follows:
1. If access spacing outlined in Tables 3.1 and 3.2 cannot be met, median barrier curbs shall be installed of sufficient length to restrict left turn and crossing movements, or between full access intersections, whichever is greater.
 2. At signalized intersections on principal arterials, the length of restrictive median curbs shall be equal to the driveway spacing distance determined by Table 3.2, regardless whether or not driveways exist.
 3. At intersections with left turn lanes on principal arterials, minor arterials, and neighborhood collectors, the length of restrictive median curbs shall be equal to the left turn lane storage length, except as may be required by condition number 2 above.
 4. The respective Director shall determine restrictive median curb types and placements.

H. Turn Lane Warrants

1. Turn lanes (left and right) may be warranted at unsignalized intersections, and should be evaluated using appropriate left or right turn lane warrants utilizing standards adopted by the City or State depending on which facility is being analyzed.
2. At signalized intersections, a traffic impact study should be used to determine required storage length for left or right turn lanes.

I. Driveway Design Criteria:

1. Width.
 - a. Two-way multi-family residential driveways shall have a minimum width of sixteen (16) feet and a maximum width of twenty-two (22) feet. Where intersection openings are approved the width shall be as determined by the Director. One-way multi-family residential driveways shall have a minimum width of ten (10) feet and a maximum width of twelve (12) feet. Parking lot circulation needs shall be met on site. The public right-of-way shall not be utilized as part of a one-way parking lot flow.
 - b. Two-way commercial/industrial driveways shall have a minimum width of twenty-four (24) and a maximum width of twenty-eight (28) feet. Where intersection openings are approved the width shall be as determined by the Director. One-way commercial/industrial driveways shall have a minimum driveway width of twelve (12) feet with a maximum width of sixteen (16) feet. Commercial/industrial driveways shall meet the separation requirements of Section 3.02. Parking lot circulation needs shall be met on site. The public right-of-way shall not be utilized as part of a one-way parking lot flow. A wider commercial/industrial driveway width may be approved by the Director where a substantial percentage of oversized vehicle traffic is anticipated and a written request and turning diagrams are submitted. The request shall include justification for the oversized vehicles and the design vehicle selection as well as detailed alternatives and considerations that were evaluated.
 - c. A single-family driveway shall have a minimum width of nine (9) feet and maximum width of sixteen (16) feet.
2. Clearance from structures. No object (including fire hydrants, light or power poles, street trees) shall be placed or allowed to remain within six (6) feet of the driveway wing and edge.

Where the building facade or other design element is less than ten (10) feet behind the sidewalk, both pedestrian and vehicular sight distance shall be maintained.

3. Sight Distance. Sight distance shall be designed per AASHTO guidelines.
 4. A landing shall be provided in accordance with KEDM Section 3.07.
 5. A single-family residential driveway less than 100 feet in length may be designed as a ribbon (two-track) driveway. A commercial driveway less than 100 feet in length may be designed as a ribbon (two-track) driveway with approval of the Director.
- J. Permeable Pavement. Use of permeable pavement for commercial driveways is encouraged where feasible in accordance with the SWMMWW.

The following specifies the minimum requirements for intersections:

- K. Angle between intersections.

The interior angle at intersecting streets shall be kept as near to ninety degrees (90°) as possible and in no case shall it be less than seventy-five degrees (75°), nor more than fifteen degrees (15°), from the ninety (90°). A tangent section shall be carried a minimum of fifty (50) feet each side of intersecting right-of-way lines. When possible, intersections shall align with any existing intersection on the opposite side of the street.

- L. Curb returns:

Minimum curb radii at intersections shall be shown in Table 3.3 for the various functional classifications. The right-of-way radii at intersections shall be sufficient to maintain at least the same right-of-way to curb spacing as the upper classified street.

Sidewalk access ramps shall be provided at all corners of all intersections, regardless of curb type.

Table 3.3
Curb Return Radii (Feet)
Edge of Pavement/Curb –Minimums

<u>Street Classification</u>	<u>Major/Minor Arterial Street</u>	<u>Collector Street</u>	<u>Local Streets</u>
Major/Minor Arterial Street	25	25	25
Collector Street	25	20	20
Local Streets	25	20	15

- M. It is the policy of the City to have the applicant's engineer evaluate safe intersection sight distance using the principles and methods recommended by AASHTO.
- N. Traffic control will be as specified in the Manual of Uniform Traffic Control Devices (M.U.T.C.D.) or as modified by the Engineer as a result of appropriate traffic engineering studies.
- O. Traffic signal modification, relocation, or installation is required when roadway or driveway geometrics interfere with existing signal facilities, or would result in an un-signalized approach, or intersection that meets signal warrants.

3.03 Street Widths

The figures below show the road width standards by the functional classification of the road. Authority to determine a street's class shall lie with the Director. It should be noted that public utility easements beyond the right-of-way are typically required.

Lane configuration shall be compared to existing conditions and determined at the time of construction drawing approval.

Additional right-of-way and pavement width may be required, in addition to that shown in Figures 3-2 through 3-8, to allow parking, LID, turn lanes and median strips. Additional right-of-way or easements may be required for cut or fill embankments. Bioretention curb extensions may be located in the parking lane with approval of the Director to reduce the need for additional right-of-way.

Figure 3-2: Major Arterial

Design Speed: 35 mph

***6' PUE unless otherwise approved**

***66' paved width to accommodate a 12' center turn lane/median if determined necessary by the Director**

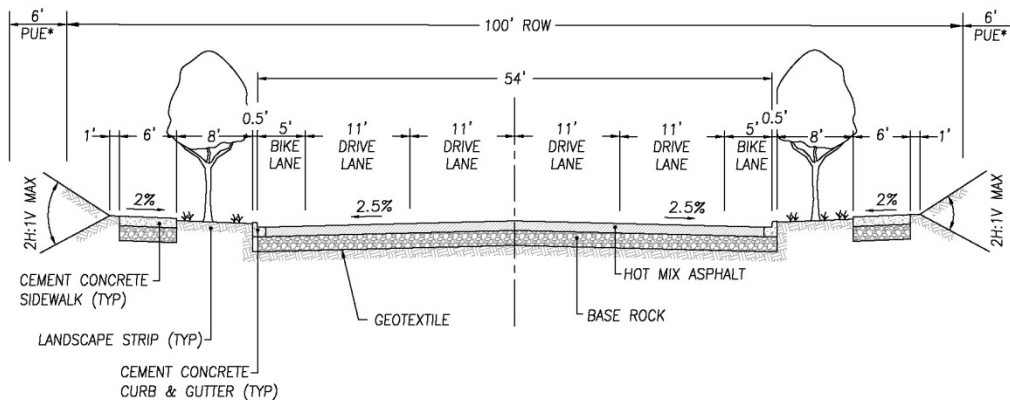


Figure 3-3: Minor Arterial

Design Speed: 35 mph

***6' PUE unless otherwise approved**

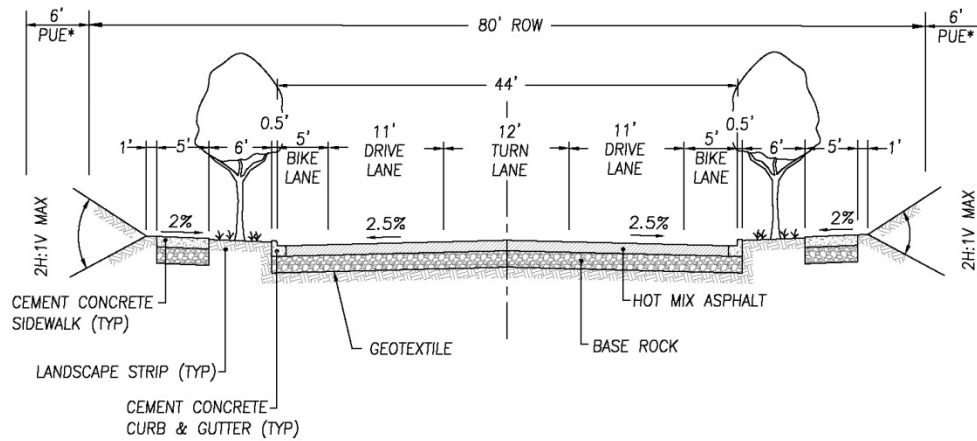


Figure 3-3a: Industrial Minor Arterial

Design Speed: 35 mph

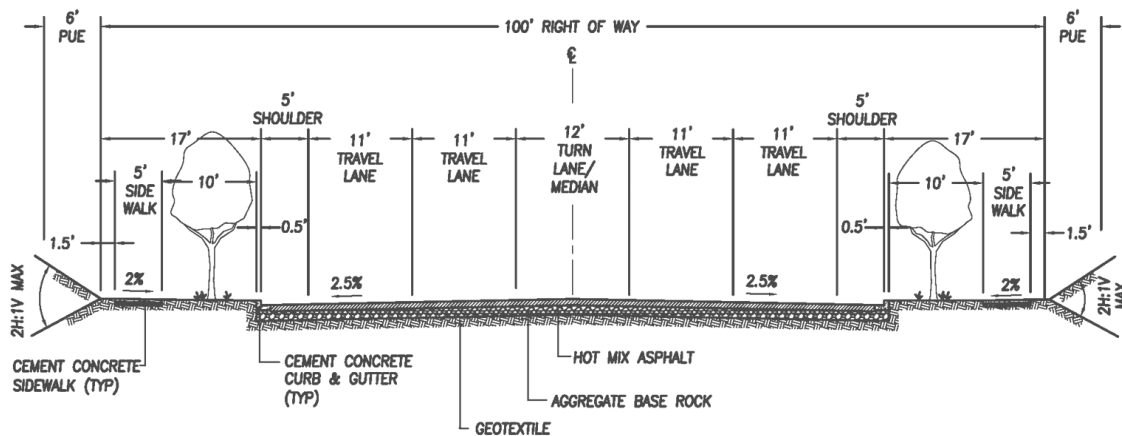


Figure 3-4: Collector

Design Speed: 25 mph

***6' PUE unless otherwise approved**

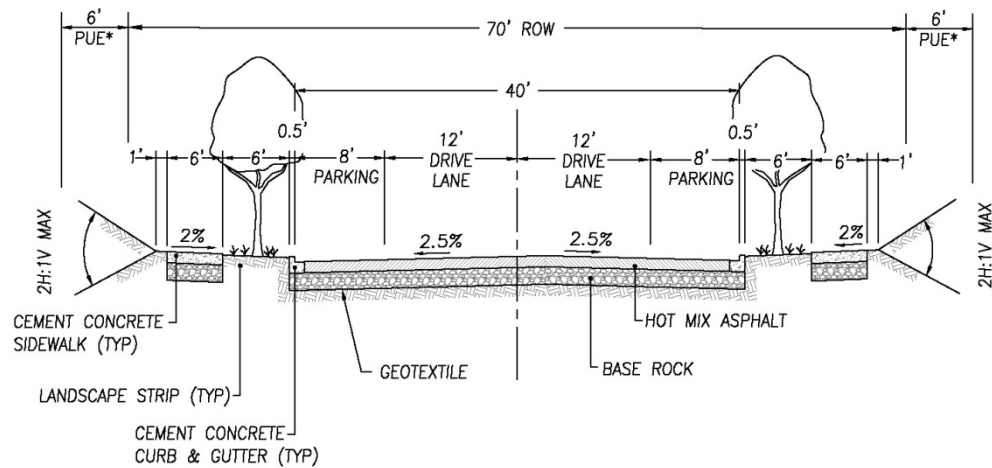


Figure 3-4a: Industrial Collector

Design Speed: 35 mph

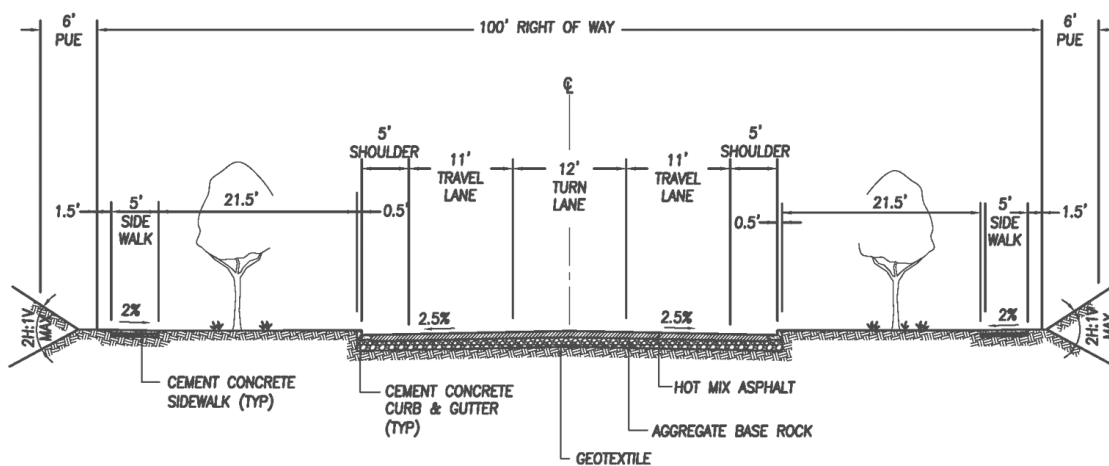


Figure 3-4b: Industrial Collector with Ditch

Design Speed: 35 mph

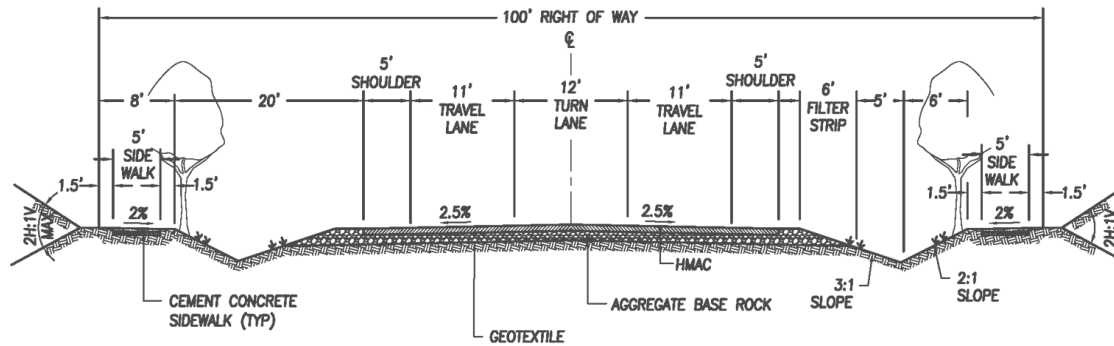


Figure 3-5: Local: Multi-family Area

Design Speed: 25 mph

***6' PUE unless otherwise approved**

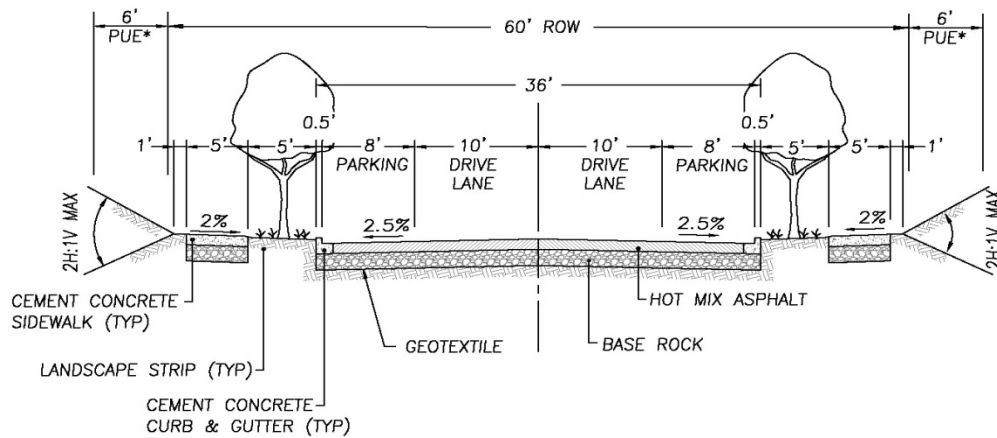


Figure 3-6: Local: Single-family Areas

Design Speed: 25 mph

***6' PUE unless otherwise approved. Utilities may be placed under the sidewalk in new subdivisions with approval of the Director if on-site bioretention is used to manage stormwater on residential lots.**

Alternate pavement widths may be allowed in new subdivisions with approval of Director and Fire Marshal.

Sidewalks may be allowed on one side of the road in new subdivisions with approval of the Director.

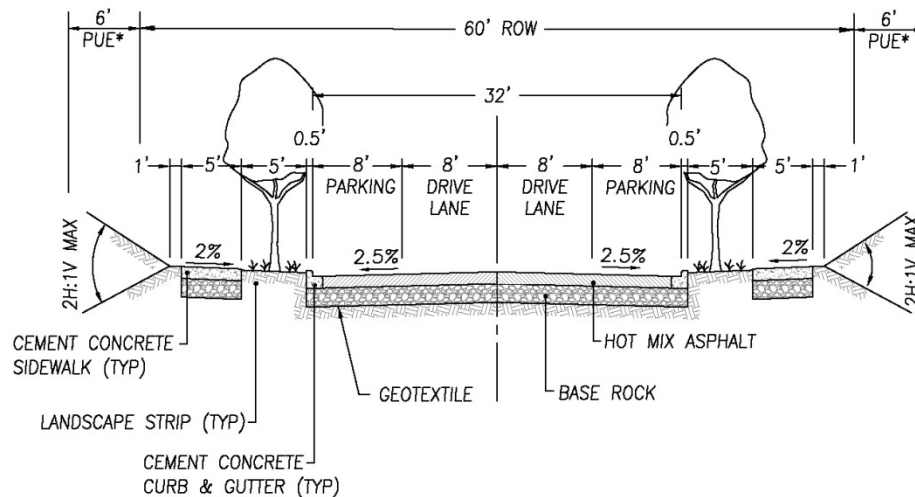


Figure 3-6a: Local: Traffic Calming

Design Speed: 25 mph

Alternate pavement widths may be allowed in new residential single-family subdivisions with approval of Director and Fire Marshal.

Sidewalks may be allowed on one side of the road in new single-family residential subdivisions with approval of the Director.

Utilities may be placed under the sidewalk in new subdivisions with approval of the Director if on-site bioretention is used to manage stormwater on residential lots.

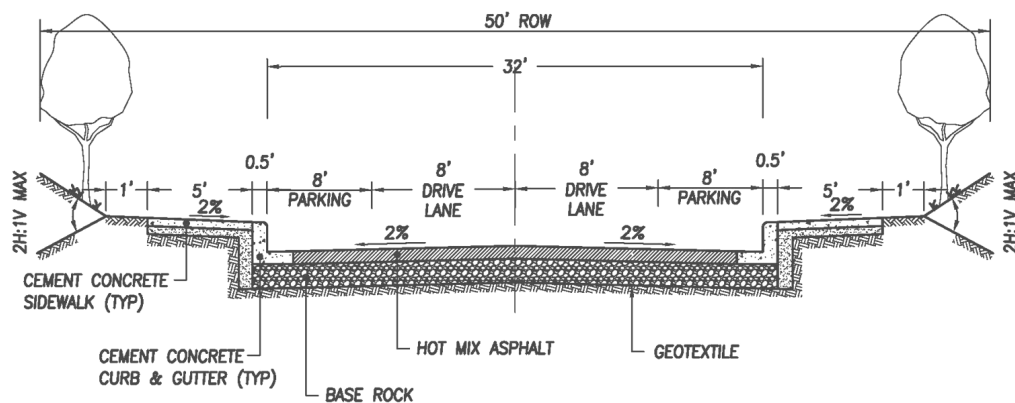


Figure 3-6b: Roadway with Rain Gardens

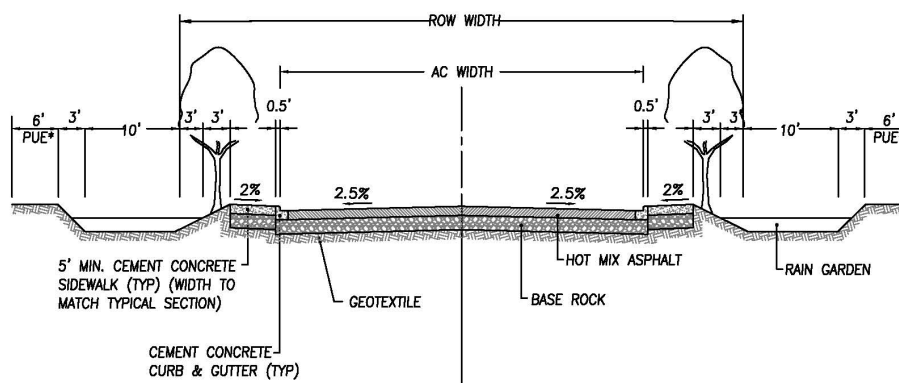


Figure 3-7: Alleys: Commercial & Industrial

Design Speed: 25 mph

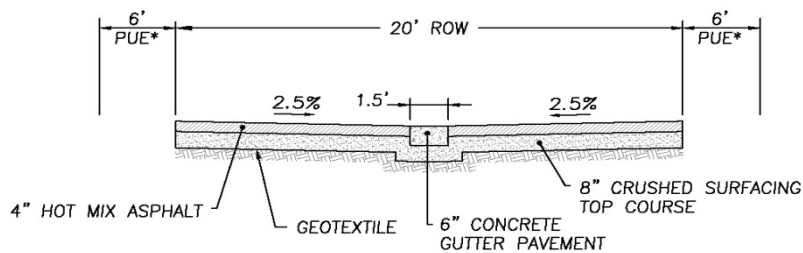
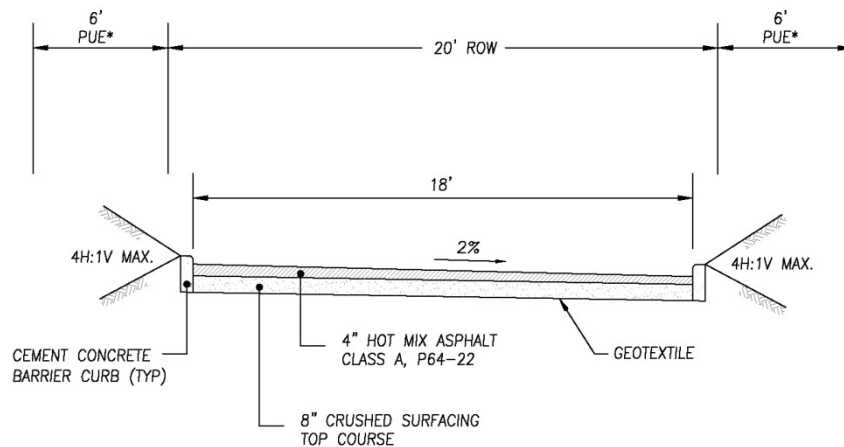


Figure 3-8: Alleys: Residential

Design Speed: 25 mph



3.04 Surfacing Requirements

The pavement structure thickness identified for these soil and roadway types is required unless a site-specific pavement design is done. The total pavement structure shall not exceed two and one half (2.5) feet. Asphalt concrete pavement shall be hot mix concrete (HMA) Class A, PG 64-22 per the Standard Specifications. Subgrade reinforcement geotextiles shall be installed prior to constructing the base and surfacing.

Table 3.4
Major Arterial
Surfacing Requirements

AASHTO Soil Type	Hot Mix Asphalt Thickness	Base Rock Thickness
A-1 – A-3	0.55'	0.55'
A-4 – A-7	0.60'	1.35'
Other	No Section Estimated	

Table 3.5
Minor Arterial
Surfacing Requirements

AASHTO Soil Type	Hot Mix Asphalt Thickness	Base Rock Thickness
A-1 – A-3	0.50'	0.50'
A-4 – A-7	0.50'	1.45'
Other	No Section Estimated	

Table 3.6
Collector Street
Surfacing Requirements

AASHTO Soil Type	Hot Mix Asphalt Thickness	Base Rock Thickness
A-1 – A-3	0.45'	0.45'
A-4 – A-7	0.45'	1.15'
Other	No Section Estimated	

Table 3.7
Local Street and Alley Access,
Surfacing Requirements

AASHTO Soil Type	Hot Mix Asphalt Thickness	Base Rock Thickness
A-1 – A-3	0.35'	0.50'
A-4 – A-7	0.35'	0.90'
Other	No Section Estimated	

3.05 Design Speed

The minimum design speed for each road classification shall be as shown in Figures 3-2 through 3-8 or as otherwise approved by the Director.

3.06 Horizontal Alignment

A. General Design

1. Horizontal alignment shall be designed per AASHTO guidelines.
2. Super elevations may only be used with the written approval of the Director. Where super elevation is used, street curves should be designed per AASHTO guidelines, except that the maximum super elevation rate of 0.04 shall be used.
3. Off-set crown cross-sections are not acceptable as super elevation sections.
4. Streets shall be related appropriately to the topography and shall follow the more gradual natural contours of the land.

B. Residential Design

1. Streets shall be aligned to provide for continuation of streets in adjoining subdivisions and to allow for future opening of streets to possible adjoining subdivisions.
2. Streets shall be oriented within twenty-five degrees of east-west to the maximum extent possible to enhance solar access to residences. If other considerations such as topography and contours or connection with existing principal streets adversely affect this standard then alternatives may be considered. This may include assurance that the majority of lots have their axes oriented north-south regardless of the angle of incidence of lot lines with street lines.
3. Direct driveway access to major arterials shall be prohibited, and direct driveway access to minor arterials and collectors shall be minimized. A buffer strip may be used and a separated service or marginal access road may be utilized.

3.07 Vertical Alignment

A. Street alignments shall meet the following requirements:

1. Minimum tangent street gradients shall be one-half percent (0.5%) along the crown and curb;

2. Maximum street gradients shall not exceed fifteen percent (15%) for residential streets, ten percent (10%) for collector streets, and seven percent (7%) for arterials;
 3. Minimum street gradients shall be at least one-half percent (0.5%) along the gutter;
 4. Long sweeps of more than ten percent (10%) shall be avoided;
 5. Local streets intersecting with a collector or greater functional classification street or streets intended to be posted with a stop sign shall provide a landing averaging five percent (5%) or less and must meet ADA Guidelines where applicable. Landings are that portion of the street within twenty (20) feet of the projected curb line of the intersecting street at full improvement;
 6. Commercial and industrial driveway approach landings are not to exceed two (2) feet difference in elevation for a distance of thirty (30) feet approaches an arterial or twenty (20) feet approaching a collector or industrial, measured from the back of sidewalk or the back of curb if no sidewalk exists;
 7. Grade changes of more than one percent (1%), no less than 1000 feet apart, shall be accomplished with vertical curves;
 8. At street intersections, the crown of the major (higher classification) street shall continue through the intersection. The roadway section of the minor street will flatten to match the longitudinal grade of the major street at the projected curb line;
 9. Street grades, intersections, and super elevation transitions shall be designed to not allow concentrations of storm water to flow across the travel lanes; and
 10. Streets intersected by streets not constructed to full urban standards shall be designed to match both present and future (as far as practicable) vertical alignments of the intersecting street. The requirements of this manual shall be met for both present and future conditions.
- B. When new streets are built adjacent to or crossing drainage ways, a no rise analysis (as defined by the Federal Emergency Management Agency) shall be stamped by a professional engineer and submitted to the City for review and approval. At a minimum, the following standards shall govern the vertical alignment:

Table 3.8
Vertical Alignments and Flood Plains

Functional Classification	Vertical Standard
Arterial Streets	Travel lanes at or above the 50-year flood elevation but not lower than 6-inches below the 100-year flood elevation.
All other streets	Travel lanes at or above the 25-year flood elevation but not lower than 6-inches below the 50-year flood elevation.

Vertical curves shall be designed per AASHTO guidelines.

3.08 Transitions

- A. Street width transitions from a narrower width to a wider width shall be designed with a ten to one (10:1) taper. Street width transitions from a wider width to a narrower width shall be designed in accordance with AASHTO Standards or a ten to one (10:1) taper whichever is greater. Delineators, as defined by the MUTCD and approved by the City, shall be installed to define the configuration.

In situations where a tapered transition cannot be provided, a type III barricade shall be installed at the end of the wider section of the street and a taper shall be appointed and delineated as approved by the Director.

- B. Lane transitions shall be designed per AASHTO guidelines.

3.09 Dedications and Guarantees

- A. Right-of-way shall be deeded for streets and other improvements as required per Figures 3-2 through 3-8 to accommodate motorized and non-motorized transportation, landscaping, utility, drainage, LID, and buffer requirements.

If the Fire Marshal and Director approve a narrower pavement width in accordance with Figure 3-6 or 3-6a, right-of-way width may be reduced accordingly.

- B. Public utility tracts and/or easements for all public systems shall be provided as required. Specific requirements for sewer, water, and storm drainage easements are detailed in the relevant chapters. Particular design features of a road may necessitate slope, wall, or drainage easements. Such easements may be required by the Director in conjunction with dedication or acquisition of rights-of-way and other

standard easements (temporary construction, right-of-entry, sidewalk, pedestrian, street lighting, and traffic control devices, etc.)

C. Special Access Easements or Tracts.

Where it is necessary to facilitate pedestrian circulation between neighborhoods, schools, shopping, or other activity centers, public access easements or tracts shall be dedicated.

Improvements to the easement shall include a sidewalk or trail consistent with other non-motorized facilities in the area. Fences shall be constructed along access easements in residential areas where buildings will be located nearer than fifty (50) feet to the edge of the easement. Traffic diverters or bollards shall be installed at the direction of the Director.

Pedestrian access easements or tracts shall be a minimum of fifteen (15) feet wide. If the easement is over one-hundred and fifty (150) feet in length, the width shall be twenty (20) feet. Structure setbacks shall be a minimum of five (5) feet from the edge of the easement or tract.

- D. All subdivisions and short subdivisions (short plats) will be required to deed additional right-of-way, as a condition of approval of the subdivision, where the existing right-of-way for a public street is not adequate to incorporate necessary frontage improvements for public safety and provide compatibility with the area's circulation system.

All short subdivisions (short plats) will be required to deed additional right-of-way, as a condition of approval of the short plat, under one or more of the following conditions:

1. The short plat abuts an existing substandard public street and the additional right-of-way is necessary to incorporate future frontage improvements necessary for public safety, or
2. Additional right-of-way is needed to provide right-of-way for the extension of existing public street improvements necessary for public safety, or
3. Additional right-of-way is needed to provide future street improvements necessary for public safety for planned new public streets.

- E. All recording costs for easements created by private development shall be borne by the applicant.
- F. Prior to commencing construction of any component of the public street or sidewalk, the applicant shall submit to the City an approved performance bond in accordance with the requirements of Section 1.08 of the KEDM.

3.10 Private Streets

- A. **Criteria for Authorization.** It is the City of Kelso's policy to discourage private streets and to only permit them under unusual circumstances. Private streets may be permitted only if they meet all the following conditions:
 - 1. A road modification for the street has been approved by the Director;
 - 2. Covenants have been approved, recorded, and verified with the City which provide for maintenance of the private streets and associated parking areas by owners in the development. Covenant shall include a periodic maintenance schedule, be enforceable by any property owner served by that road, include a formula for assessing maintenance and repair costs, shall run with the land;
 - 3. Provisions are made for the streets to be open at all times for emergency and public service vehicles;
 - 4. The private streets will not obstruct public street circulation; and
 - 5. The following conditions exist:
 - a. The plat or short plat street will ultimately serve no more than fifty (50) single family lots or the roadways serve commercial or industrial facilities where no circulation continuity is necessary; and
 - b. The Director determines that no other access is available and the private road is adequate for the area it is to service,
 - c. The private road shall not connect two public roads,
 - d. No public utilities shall be located within the private street without approval from the Director.
- B. **Notice.** A statement is required on the face of any plat or short plat and in the CCRs containing a private road with the following: "The City of Kelso has no responsibility to improve or maintain the private roads contained within, or private roads providing access to the property described in this plat."
- C. **Easements.** Private streets shall be constructed within easements with an easement width of sixty (60) feet. If the applicant does not own the property in which the easement crosses a modification may be applied for in accordance with Chapter 12

of the KMC. Easements shall be expanded in width as may be necessary to include all cuts, fill, turnouts and turnarounds as required.

- D. Turnarounds. Turnarounds shall be provided at the end of all private streets longer than one-hundred and fifty (150) feet and at one-thousand feet intervals along the length of a private street where no intersecting roadway exists. Turnarounds shall have a minimum radius of forty (40) feet and all interior corners shall have a minimum radius of twenty-five (25) feet.
- E. Grading. All filling and grading associated with the construction of a private road shall be conducted in accordance with current WSDOT Standard Specifications for Roads and Bridges. A geotechnical report, prepared by a qualified expert shall be provided for any grading which will incorporate cutting or filling in excess of five (5) feet, cut slopes in excess of one vertical to two horizontal (2:1), or fill slopes in excess of one vertical to two horizontal (2:1). Such report shall identify materials to be used, compaction rates and methods, maximum allowable slopes, and erosion control methods.
- F. Construction Requirements. Private streets shall conform to public street construction standards with the following exceptions:

Figure 3-9: Private Street Type I
20-50 Residential Units

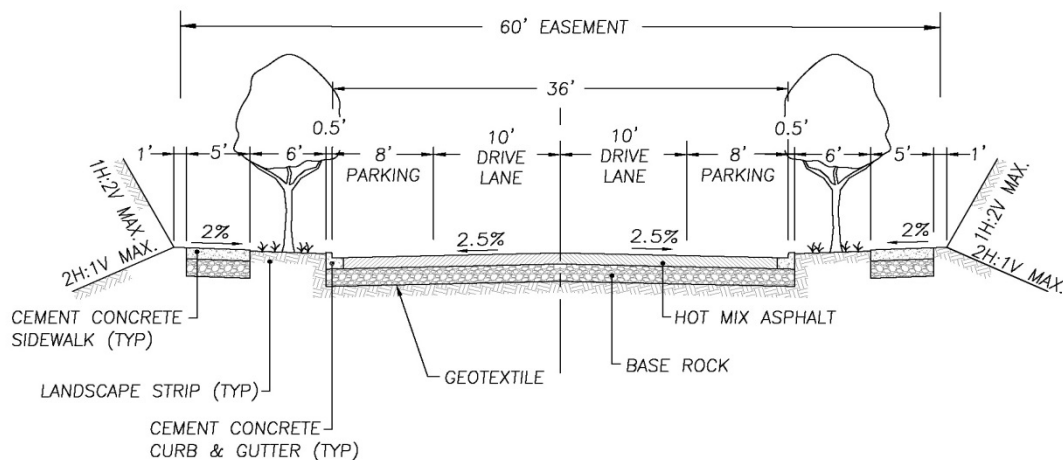


Figure 3-10: Private Street Type II

10-19 Residential Units

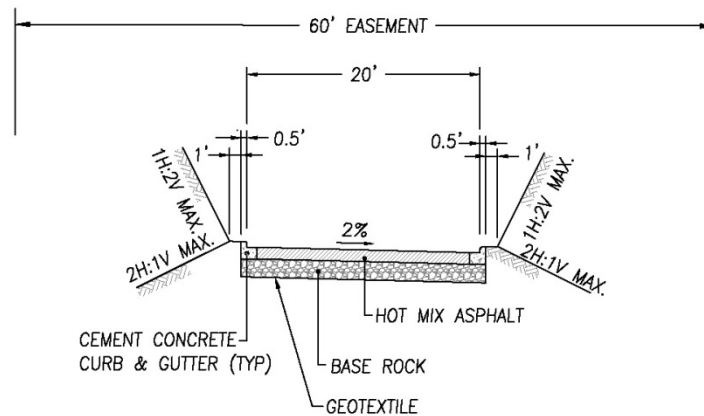
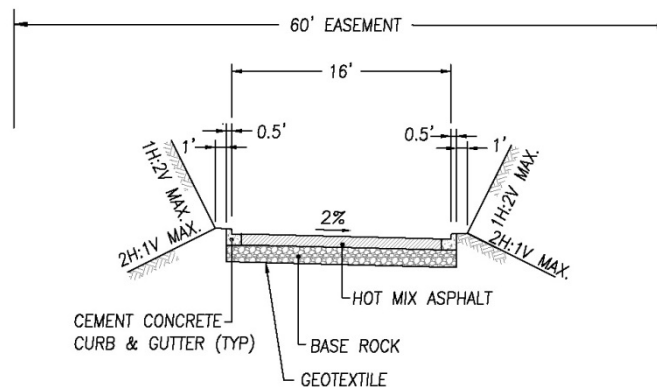


Figure 3-11: Private Street Type III

2-9 Residential Units



1. The maximum grade for Type II and Type III private streets shall be twelve percent (12%) for a gravel surface and fifteen percent (15%) for a paved surface;
2. Private streets shall be designated by a sign stating the name of the road and "Private Roadway".
3. Intersection of a private street with another private street shall be constructed per the most restrictive requirements of the two intersecting roads. The

approach to the intersection shall be as level as possible in all directions for a minimum of fifty (50) feet. Curb returns shall have a minimum radius of fifteen (15) feet.

4. Intersections with public streets shall be constructed with a driveway drop; have interior angles no less than seventy-five (75) degrees; a maximum gradient of four percent (4%) shall be maintained for a minimum of twenty-five (25) feet. If the minimum gradient cannot be achieved, an alternate solution showing fifty-foot paving shall be submitted for approval. The approaching private street shall have a minimum of four (4) inches of HMA, twelve inches of crushed surfacing top course, underlain by geotextile fabric. The width of this section shall be a minimum of twenty-four (24) feet with one (1) foot gravel shoulders.
 5. Intersection with state roadways shall at a minimum comply with the requirements for city intersection above and shall require the approval of the appropriate agency prior to construction.
 6. A drainage report shall be provided for all Type I and Type II roadways. Drainage of surface water shall be accomplished by either an enclosed system or a series of ditches and/or culverts. Drainage water from any private road shall not be discharged directly to streams. All stormwater design must comply with Chapter 4.
 7. All work must be completed in accordance with the erosion control standards as set forth in Chapter 2.
 8. Any bridge on a Type II roadway shall be constructed to the AASHTO and/or state standards, whichever is more restrictive. Any bridge on a Type III shall be built to a bridge design standard as specified in the International Building Code using live loading and/or state, standards whichever is more restrictive.
- G. Acceptance as Public Streets. Acceptance of private streets as public streets will be considered only if the street meets all applicable public street standards contained herein.
- H. Maintenance. The City will not maintain roadways, signs or drainage improvements on private roads. A private maintenance covenant recorded with the county auditor will be required for any private road. The covenant shall set out the distribution of expenses, remedies for noncompliance with the terms of the agreement, right of use easements and other considerations. The covenant shall include the following terms:
1. The covenant shall establish minimum annual assessments in an amount adequate to defray costs of ordinary maintenance and procedures for approval of additional needed assessments.

2. The covenant shall include a periodic maintenance schedule.
3. The covenant for maintenance shall be enforceable by any property owner served by that road.
4. The covenant shall establish a formula for assessing maintenance and repair costs equitably to property owners served by the private road.
5. The covenant shall run with the land.
6. Maintenance shall include, but not be limited to, road surfacing, shoulders, signs, storm drainage facilities and control.

The requirements of maintenance agreements on existing private roads will be determined on legal viability.

3.11 Street Frontage Improvements

- A. All developments shall install street frontage improvements at the time of construction as detailed in their approval, or as directed by the Director. Such improvements shall include, but not be limited to, curb and gutter; sidewalk; storm drainage; street lighting system; utility undergrounding (relocation may be required); and street and/or right-of-way widening per the KEDM. Traffic signal modification, relocation or installation; landscaping and irrigation may also be required. The frontage street shall be reconstructed from the center line of the proposed street width.
- B. Corner parcels shall provide full half street frontage improvements on arterials roadways and be evaluated according to 3.10C for each non-arterial fronting street
- C. Frontage improvements shall include a two (2) inch inlay of the half width if construction invades the opposite side of the street.
- D. Subdivisions under 4 lots and site plans under five thousand (5,000) square feet shall be required to provide full half-street frontage improvements along arterial roadways and shall at a minimum be required to match the predominant characteristic/condition of the existing non-arterial fronting roadway, where the majority of the parcels are developed.

The predominant existing or potential condition shall be defined by considering the existing frontage conditions for all parcels fronting the half-street without development or redevelopment potential; if less than fifty percent (50%) have frontage improvements or partial improvements only, the subject development shall meet that standard. Where fifty percent (50%) or more have full improvements, or the potential for development or redevelopment, half-street frontage improvements shall be required.

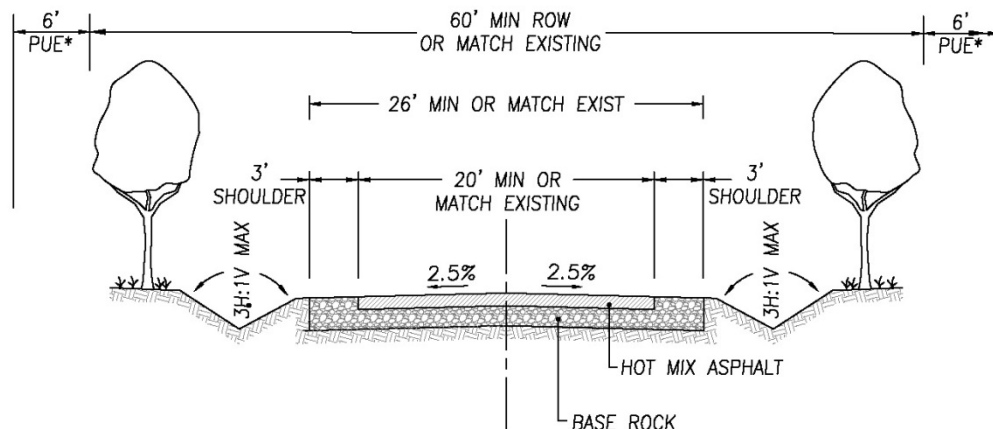
In situations where the Director finds that other pending or approved unconstructed developments on the same street frontage would cause the calculation in 3.10C to exceed fifty percent (50%) or where other recorded covenants requiring frontage improvements exist, or where it is determined that deferral will cause an adverse impact or create dangerous or hazardous conditions, the Director may require half-street frontage improvements.

In situations where the applicant is required to match the existing characteristic/condition of the existing non-arterial, the minimum frontage shall resemble the following:

Figure 3-12: Minimum Street Improvement

Street trees shall be selected from the Street Tree List.

A street tree may be planted within a bioretention BMP when bioretention is placed in the right-of-way to manage stormwater runoff in accordance with Chapter 2.



- E. To allow for reasonable development, half-street improvements may be approved by the Director. Whenever a half-street improvement is approved, it shall conform to the following:
1. Street section design and construction shall be in conformance with the KEDM.
 2. Minimum pavement width shall be 24 feet for arterial, collector and industrial streets, and 20 feet for residential streets.
 3. Intersectional improvements shall be adequate to provide turn lanes.

- a. Arterials, collectors and industrials: 40 feet paved width, or the required width for the street (whichever is less), for 250 feet as measured from centerline of the intersecting street
 - b. Residential: 36 feet paved width, or the required width for the street (whichever is less), for 150 feet as measured from centerline of the intersecting street.
- F. The following minimum standards shall apply to the development of single family residential dwelling units on an unimproved right of way (existing plats), and private roads:
 1. The existing right-of-way width, HMA width, and sidewalk status shall be extended to match the nearest paved street. Minimum surfacing of all local private access streets shall be 3" of compacted HMA over 3" of compacted 5/8"-0" crushed top course, 4" of compacted 1-1/4"-0" crushed base rock. Compacted depths shall meet or exceed existing subgrade depth.
 2. An improved turn-around shall be provided in accordance with Section 3.12 of the KEDM if the lot to be developed is located at the end of any road that is over 150 feet in length.
 3. All utilities which have not already been installed to serve the site shall be constructed to full City standards as set forth in the KEDM. The list of affected utilities shall include but not be limited to water, sanitary sewer, storm drainage, electrical and communications.
 4. The grades shall be established by the applicant's engineer. The HMA matching width shall be a minimum of twenty (20) feet and must meet these standards.
 5. If the applicant does not or cannot bear the cost of connectivity and if the latecomers agreement does not apply, Council will form an LID if improvements are required as a health and safety issue. Otherwise development will not be allowed.
 6. The intent of the exception for a singular lot development is to allow a private party to build and access a single family residence without the financial burden of completely developing the facilities to all the lots. Should the private party acquire an interest in the intermediate lots, he will be considered as a developer and the above exception shall not be allowed.

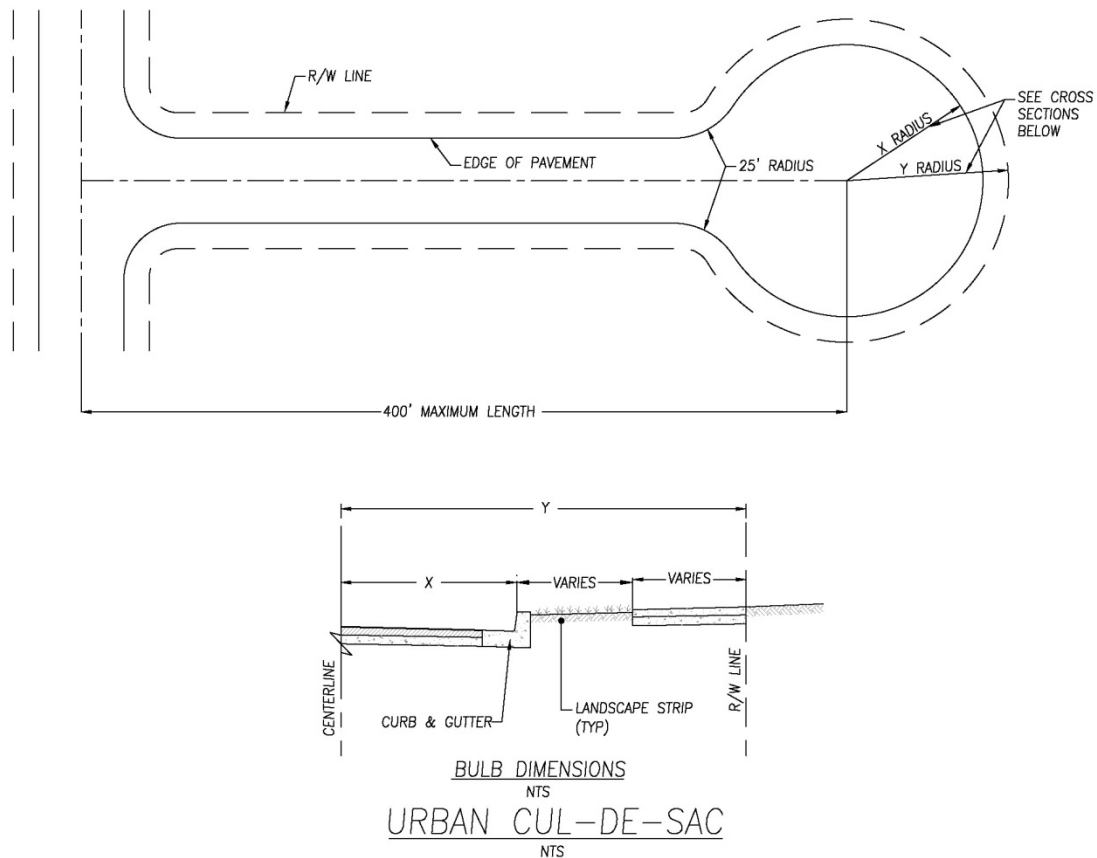
3.12 Street Ends

A. Cul-de-sacs:

Cul-de-sacs shall be provided at all public and private street ends on all streets that are longer than one-hundred fifty (150) feet and up to four-hundred (400) feet in length, measured from the centerline of the intersecting road to the center of the cul-de-sac. The cul-de-sac may include a planting circle in the center.

1. No dead end street shall be allowed that obstructs public street circulation.
2. All street ends shall be paved and signed “No Parking.”
3. All requirements for utility/landscape strips and sidewalk for the adjacent street section shall apply.
4. The minimum curb radius for transitions into cul-de-sac bulbs shall be twenty-five (25) feet, and the right-of-way radius shall be sufficient to maintain the same right-of-way to curb spacing as in the adjacent portion of the road.
5. The minimum distance from center of a cul-de-sac to the subdivision boundary is one-hundred fifty (150) feet.

Figure 3-13: Cul-de-Sac Dimensions



- X. 40' for residential areas
60' for commercial and industrial areas
- Y. 50' for local streets and minor arterials
75' for commercial and industrial areas

B. Hammerheads:

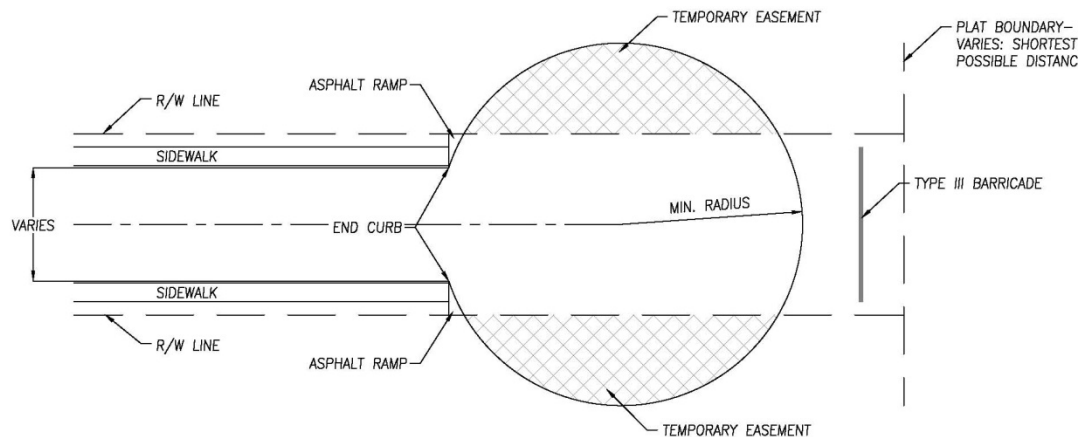
Hammerheads may be used on private streets in lieu of a cul-de-sac. The hammerhead shall be signed "No Parking." A driveway shall not be used as part of the hammerhead.

C. Temporary Dead Ends:

Where a street is temporarily dead ended, turn around provisions must be provided where the road serves more than one (1) lot or is greater than one-hundred fifty (150) feet in length.

1. A cul-de-sac with a minimum radius forty (40) feet for residential areas and sixty (60) feet for commercial industrial areas shall be provided.

Figure 3-14: Temporary Cul-de-Sac



NOTES:

1. BARRICADE REQUIRED AT END OF BULB.
 2. ALTERNATIVE DESIGNS FOR TEMPORARY TURN-AROUNDS MAY BE APPROVED THROUGH THE ROAD MODIFICATION PROCESS.
2. All temporary dead ends shall have a Type III barricade with signage denoting a future street extension and "No Parking."
 3. All temporary dead ends shall be removed by the applicant responsible for extending the road.
- D. Cul-de-sacs, eyebrows, and turnaround areas shall be allowed only on local streets and commercial/industrial streets.
- E. An eyebrow corner may be used on a local street where expected ADT will not exceed five-hundred (500) vehicles per day or as otherwise approved by the Director. Minimum curb radius on the outside of an eyebrow corner is forty-one (41) feet; minimum right-of-way radius is forty-nine (49) feet. Eyebrow geometry shall be evaluated on the basis of turning requirements for Fire Department vehicles.
- F. The final plat shall contain a notation that the easement outside of normal right-of-way shall be void at such time the street is continued and the paved turning radius is removed.

3.13 Medians

A median shall be in addition to, not part of, the specified road width. Where raised medians are allowed, the following criteria must be met:

- A. Landscaping and irrigation shall be required. Plans shall be prepared by a qualified Landscape Architect.
- B. Shall be designed so as not to limit turning radius or sight distance at intersections.
 - 1. The raised median shall be set back at least two (2) feet from the median lane on both sides.
 - 2. Street lighting shall be sufficient to provide illumination of the raised median.
 - 3. Objects, such as trees, shrubs, signs, and light poles shall not physically or visually interfere with vehicle or pedestrian traffic in the travel way.
 - 4. The style and design of the raised median shall be site specific. The raised median shall be safe for the design speed, and shall be subject to approval by the Director.
- C. Shall be maintained by the homeowners association unless otherwise approved.

3.14 Sight Obstruction Requirements

- A. Sight distance should be maintained at all driveways, buildings, or garage entrances where structures, wing walls, etc. are located adjacent to, or in close proximity to, a pedestrian walkway.
- B. Sight lines to traffic control devices (signs, signals, etc.) should not be obscured by landscaping, street furniture, marquees, awnings, or other obstructions. Refer to AASHTO for required sightlines.
- C. Sight Triangles for All Uses in All Zones. The corner areas of lots adjacent to street intersections as well as the corner areas adjacent to road approaches and other access easements shall be kept clear of all obstructions, as denoted below.
 - 1. All corner building sites shall maintain a clear triangle at the intersection with the street rights-of-way to assure traffic safety. No building, structure, object or growth over thirty-six inches in height, measured from the mean grade of the intersecting street, shall be allowed within this triangle. The triangle shall be computed as follows: Starting at the apex of the intersecting street rights-of-way, measuring down the triangle legs thirty feet; the base of the triangle shall be found by drawing a straight line connecting the triangle legs. The land inside the triangle shall be regulated for visibility.

2. All other lots not identified as corner lots shall be considered as mid-lots for the purpose of sight line development and regulation. The mid-lot sight line setback area shall be computed as follows: Starting at the intersection of the driveway centerline and the fronting street lot line, measure fifteen feet in opposite directions. From these points draw a straight forty-five-degree line back to the driveway centerline. The land inside the triangle shall be regulated for visibility. No building, structure, object or growth over thirty-six inches in height, as measured from the mean grade of the fronting street, shall be allowed in this triangle.

3.15 Survey Monuments

At least one monument shall be placed for every intersection or every thirty (30) lots, whichever is less. Monuments shall be placed at all subdivision boundary angle points, points of curvature in streets, and such intermediate points required by the Director. Monuments shall be of concrete filled pipe or tile weighing at least 50 pounds, capped with a brass marker or radioactive marker along with the brass marker, and bearing the surveyor's registration number. Street monuments shall be set between two (2) and four (4) inches below finished street grade with a casing as set forth in the Standard Specifications.

3.16 Sidewalks

- A. All sidewalks shall be designed and constructed in accordance with the Kelso/Longview Standard Plans and Specifications.
- B. All sidewalks shall maintain the full design width around obstructions that cannot be relocated. Additional right-of-way (or easement) may be required to either relocate the obstruction or meander the sidewalk.
- C. Sidewalks shall meander no more than six (6) feet from the curb at all pedestrian crossings and at driveways.
- D. Where a sidewalk is adjacent to a bioretention BMP or a sheet flow dispersion best management practice (BMP) proposed in accordance with Chapter 2 of the KEDM, then the sidewalk shall slope laterally to the bioretention or the sheet flow dispersion BMP. Otherwise, the sidewalk shall slope toward the street.

3.17 Multi-Use Trails

- A. Multi-use trails shall be a minimum of ten (10) feet wide. Access easements shall comply with Section 3.08C.
- B. Surfacing shall be HMA. Crushed rock, concrete pavers, or porous concrete may be used at the discretion of the Director.

- C. Multi-use trails shall be a minimum of six (6) feet from the edge of the vehicular travel way unless no practicable alternative exists and when approved by the Director.
- D. Maximum grade shall be dictated by the classification of the multi-use trail. Trails shall be classified as:
 - 1. Urban Access. Urban access trails shall be constructed in accordance with the current ADA Guidelines and provide safe access between points of interest.
 - 2. Urban Recreation. Urban recreation trails shall have a maximum grade not to exceed fifteen percent (15%). Minimum curve radius is ten (10) feet. Maximum grade may be increased to twenty percent (20%) for a maximum of one-hundred and fifty (150) feet with additional surfacing requirements and the approval of the Director.
- E. Access easement termination (Type II Barricades) shall be installed as directed by the Director. A temporary connection shall be provided to the street.

3.18 Bridges

- A. A bridge shall be defined by the National Bridge Inspection Standards published in the Code of Federal Regulations (23CFR650, Subpart C). The most current definition shall be utilized at the time of application. As of May 2007 a bridge is:

“A structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads , and having an opening measured along the center of the roadway of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.”

- B. Design Principles.

All bridges, whether on public or private roadways and driveways, shall meet the minimum requirements set forth in the latest addition of "Standard Specifications for Highway Bridges," adopted by AASHTO.

- C. Geometrics.

In the general case, the bridge shall comprise the full width and configuration of the road being served (traveled way plus curb, sidewalk, walkway, bike lane, and/or shoulder on one or both sides). Provisions for utilities shall be required unless approved otherwise by the Director. Traffic and pedestrian railings or combination traffic-pedestrian railings shall meet AASHTO specifications. Overhead vertical

clearances on the traveled street or under overpasses shall be sixteen and one-half (16.5) feet minimum.

New and replacement bridges over natural, perennial channels shall be designed to pass the one-hundred year peak discharge from the tributary area assuming full build out. Vertical clearance between the one-hundred (100) year water surface elevation and the bottom of any part of the bridge shall be two (2) feet. All bridges shall be design in accordance with WAC 220-110-070 when applicable.

3.19 Landscaping in the Right-of-Way, Easements, and Access Tracts

- A. Plantings established in the right-of-way, including street trees, landscape strips, and bioretention facilities, shall be maintained by the abutting property owner; except, plants within a bioretention curb extension in the parking lane shall be maintained by the City.
- B. Any existing planting areas within the right-of-way that are disturbed by construction activity shall be restored to their original condition by the applicant.
- C. Any plantings or other improvements placed within the right-of-way (by abutting property owners) are subject to removal when the right-of-way is needed for public use. The property owner is responsible for removing any landscaping or other improvements upon official notice. The property owners shall be responsible for the relocated plantings.
- D. Plantings within the right-of-way shall comply with the following provisions:
 - 1. All landscaping shall comply with the sight distance provisions of the KEDM, unless otherwise approved by the Director. No trees shall be planted within thirty (30) feet of an intersection measured from the closest curb.
 - 2. All street trees shall be from Table 3.9 below.

Table 3.9
Street Tree List

Scientific Name	Common Name
<i>Acer buergeranum</i>	Trident Maple
<i>Acer circinatum</i>	Vine Maple
<i>Acer ginnala</i> 'Flame'	Flame Maple
<i>Acer griseum</i>	Paperbark Maple
<i>Acer negundo</i> 'Flamingo'	Flamingo Box Elder
<i>Acer palmatum</i>	Japanese Maple
<i>Acer platanoides</i> 'Globosum'	Globe Norway Maple
<i>Acer tataricum</i>	Tataricum Maple
<i>Arbutus menziesii</i>	Madrone
<i>Arbutus unedo</i>	Strawberry Tree
<i>Carpinus betulus</i> 'Fastigiata'	Pyramidal European Hornbeam
<i>Cercis Canadensis</i>	Eastern Redbud
<i>Clerodendron trichotomum</i>	Harlequin Glorybower Tree
<i>Cornus florida</i>	Flowering Dogwood
<i>Cornus kousa</i>	Korean Dogwood
<i>Crataegus x lavalleyi</i>	Lavalle Hawthorn
<i>Crataegus phaenopyrum</i> 'Washington'	Washington Hawthorn
<i>Fraxinus excelsior</i> 'Aureafolia'	Golden Desert Ash
<i>Fraxinus pennsylvanica</i> 'Johnson'	Leprechaun Ash
<i>Fraxinus oxycarpa</i> 'Raywood'	Raywood Ash
<i>Ginkgo biloba</i> 'Princeton Sentry'	Princeton Sentry Ginkgo
<i>Koelreuteria paniculata</i> 'Fastigiata'	Pyramidal Goldenrain Tree
<i>Laburnum</i> sp.	Goldenchain Tree
<i>Liquidambar styraciflua</i> 'Gold Dust'	Gold Dust Sweetgum
<i>Nyssa sylvatica</i> *	Tupelo*
<i>Oxydendrum arboretum</i>	Sourwood
<i>Prunus x blireiana</i>	Bliereana Plum
<i>Prunus cerasifera</i> 'Newport'	Newport Plum
<i>Prunus cerasifera</i> 'Thundercloud'	Thundercloud Plum
<i>Pyrus calleryana</i> 'Glen's Form'	Chanticleer Pear
<i>Quercus alba</i> x <i>Q. robur</i> 'Crimschmidt'	Crimson Spire Oak
<i>Sorbus Americana</i> 'Dwarfscrown'	Red Cascade Mountain Ash
<i>Styrax japonica</i>	Japanese Snowbell
<i>Syringa reticulata</i>	Ivory Silk Japanese Tree Lilac
<i>Zelkova serrata</i> Schmidtlow	Wireless Zilkova

* Tupelo (*Nyssa sylvatica*) may only be used as a street tree within a bioretention BMP. See Table 3.10 for the Bioretention Plant List.

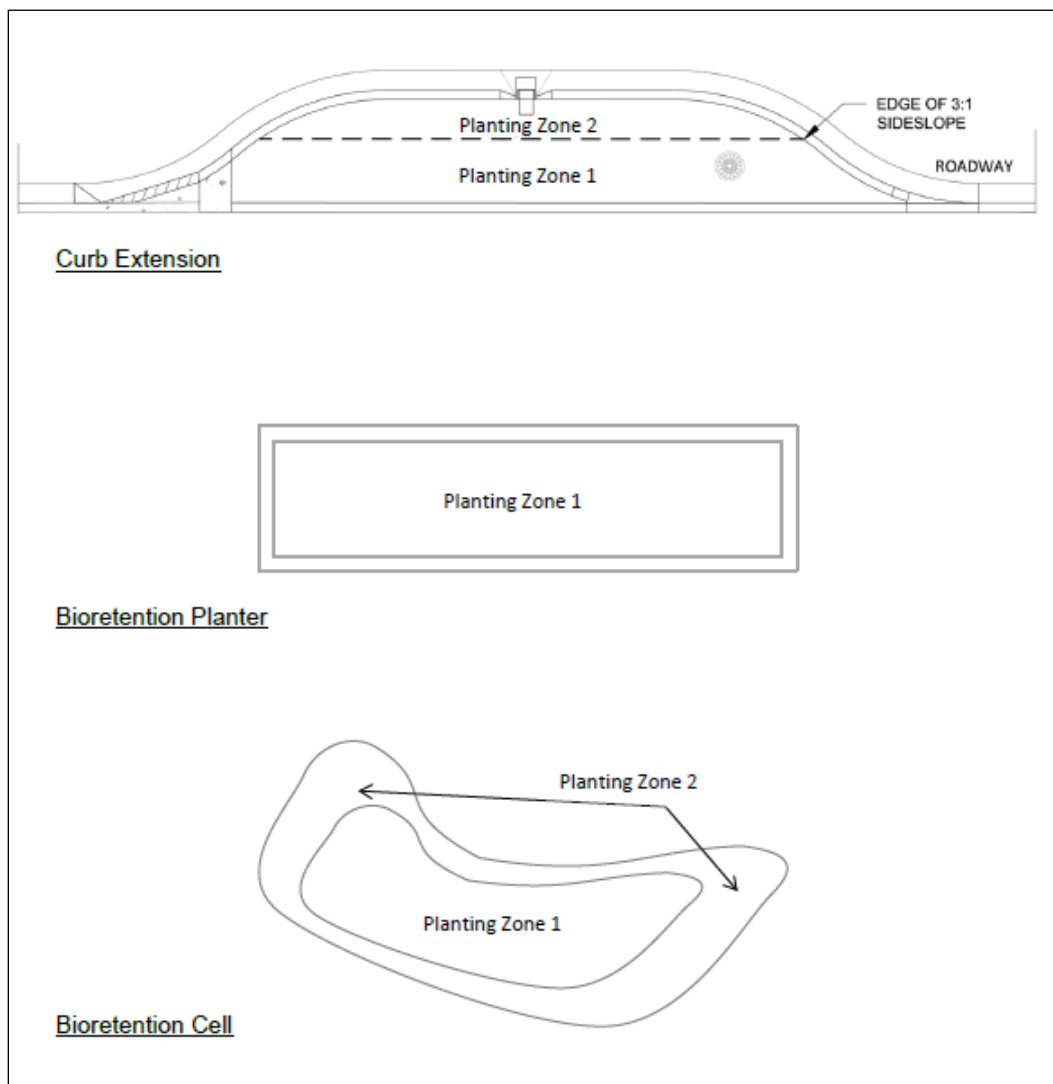
3. Where existing landscaping maintained by the City exists, every effort shall be taken to protect and preserve the existing vegetation during construction. Plants shall be relocated or removed only upon approval of the Public Works Department. Damaged landscape areas shall be restored prior to issuing a final occupancy permit.
4. In areas where an existing landscaping concept or pattern has been established or approved, all new landscaping shall conform to the intent of the concept. Plantings shall be of a similar variety, size, and spacing to those already established and/or approved for the area.
5. All trees planted in areas with adjacent pedestrian usage shall maintain seven (7) feet of clearance to the lowest branches, be at least six (6) feet in height at the time of planting, mature to a height less than thirty (30) feet, be centered between curb & sidewalk if located within the utility/landscape strip, and be installed and maintained in accordance with the WSDOT Standard Specifications.
6. No low growing vegetation is to extend beyond the curb. Trees must have no limbs or other vegetation extending beyond the curb line or edge of asphalt for a distance of ten (10) feet above the road surface.
7. Approval from the Engineering Department must be received before trees are planted in or adjacent to sidewalk sections.
8. Cut and fill embankments shall be seeded to provide a soil holding vegetative cover or otherwise protected against erosion.
9. Prior to final plat approval the applicant shall plant the landscape strip and/or bioretention in the right-of-way as follows:
 - a. Grass strips. For grass strips, seed in grass or sod in accordance with the WSDOT Standard Specification the landscape strip;
 - b. Bioretention.
 - i. For bioretention in the right-of-way, plants shall be selected from the Bioretention Plan List (Table 3.10), and planting shall be installed in accordance with the approved landscaping/planting plan.
 - ii. Bioretention in the right-of-way shall be irrigated for the first two years. Plans for irrigation shall be identified on the landscaping/planting plan. If there will be in-ground irrigation, show typical details in the plans. If manual watering is proposed instead, describe the watering schedule and the method on the plans.
 - c. ‘As-builts’ of the landscaping and in ground sprinkling system must be submitted after the last inspection but before final occupancy is granted.

Table 3.10
Bioretention Plant List

Common Name	Botanical Name	Ht.	Exposure	Size	Qty / Spacing	Remarks
Select plants based on zone. See Figure 3-15 for illustration of zones.						
ZONE 1: PONDING AREAS / WET TO MOIST						
TREES						
Trees optional in Zone 1. Use only in 6' width minimum facilities						
Tupelo	<i>Nyssa sylvatica</i>	30'	Sun/Part Shade	1 1/2" Gal	1 per 100 sf	Brilliant and varied fall color
SHRUBS						
Shrubs optional in Zone 1. Use only in 6' width minimum facilities						
Redtwig Dogwood	<i>Cornus sericea</i>	6'	Sun to Shade	#1 Cont.	4 per 100 sf	
Clustered Wild Rose	<i>Rosa pisocarpa</i>	6'-8'	Sun/Part Shade	#1 Cont.	4 per 100 sf	Adaptable to drought and inundation. Fruit persists.
Hardhack	<i>Spiraea douglasii</i>	4'-7'	Sun/Part Shade	#1 Cont.	4 per 100 sf	Purple spiked flowers in summer.
EMERGENTS (GRASSES)						
Sough Sedge	<i>Carex obnupta</i>	1'-5'	Sun/Part Shade	#1 Cont.	1' O.C., triangular	Very successful bioretention plant. Adaptable to drought and inundation.
Sawbeak Sedge	<i>Carex stipata</i>	10"-3'	Sun/Part Shade	#1 Cont.	1' O.C., triangular	
Orange Sedge	<i>Carex testacea</i>	20"	Sun/Part Shade	#1 Cont.	1' O.C., triangular	Orange-brown leaves provide color variation. Useful adjacent to curb or sidewalk where shorter plants are desired.
Fox Sedge	<i>Carex vulpinoidea</i>	24"	Sun/Part Shade	#1 Cont.	1' O.C., triangular	
Soft Rush	<i>Juncus effusus var. pacificus</i>	1'-2'	Sun/Part Shade	#1 Cont.	1' O.C., triangular	
Dagger-leaf Rush	<i>Juncus ensifolius</i>	12"-18"	Sun/Part Shade	#1 Cont.	1' O.C., triangular	Useful adjacent to curb or sidewalk where shorter plants are desired. Seed heads provide interest.
Spreading Rush	<i>Juncus patens</i>	36"	Sun/Part Shade	#1 Cont.	1' O.C., triangular	
Slender Rush	<i>Juncus tenuis</i>	6"-2.5'	Sun/Part Shade	#1 Cont.	1' O.C., triangular	
Small fruited Bullrush	<i>Scirpus microcarpus</i>	24"	Sun/Part Shade	#1 Cont.	1' O.C., triangular	

Common Name	Botanical Name	Ht.	Exposure	Size	Qty / Spacing	Remarks
BULBS						
Great Camas Lily	<i>Camassia leichtlinii</i>	12"	Sun/Part Shade	1/2" bulb	group of 3 bulbs, 4" O.C.	
Common Camas	<i>Camassia quamash</i>	24"	Sun/Part Shade	1/2" bulb	group of 3 bulbs, 4" O.C.	
ZONE 2: SIDESLOPES / MOIST TO DRY						
TREES						
Tupelo	<i>Nyssa sylvatica</i>	30'	Sun/Part Shade	1 1/2" CAL	30'	Brilliant and varied fall color
Vine Maple	<i>Acer circinatum</i>					
SHRUBS, GRASSES, HERBACEOUS						
Kelsey Redtwig Dogwood	<i>Cornus sericea</i>	20"	Sun/Part Shade	#1 Cont.	3' O.C.	
Tufted Hairgrass	<i>Deschampsia cespitosa</i>	36"	Sun/Part Shade	#1 Cont.	2' O.C.	Use where not adjacent to curb or sidewalk
Autumn Glory Hebe	<i>Hebe 'Autumn Glory</i>	18"	Sun/Part Shade	#1 Cont.	2' O.C.	
Dull Oregon Grape	<i>Mahonia nervosa</i>	24"	Part Sun/Part Shade	#1 Cont.	2' O.C.	
Creeping Oregon Grape	<i>Mahonia repens</i>	12"	Sun/Part Shade	#1 Cont.	1' O.C.	
Birchleaf Spirea	<i>Spiraea betulifolia</i>	24"	Sun/Part Shade	#1 Cont.	2' O.C.	
Snowberry	<i>Symphoricarpos albus</i>	36"	Sun/Part Shade	#1 Cont.	3' O.C.	
BULBS						
Great Camas Lily	<i>Camassia leichtlinii</i>	12"	Sun/Part Shade	1/2" bulb	group of 3 bulbs, 4" O.C.	
Common Camas	<i>Camassia quamash</i>	24"	Sun/Part Shade	1/2" bulb	group of 3 bulbs, 4" O.C.	
GROUND COVER						
Kinnikinnick	<i>Arctostaphylos uva-ursi</i>	6"	Sun/Part Shade	#1 Cont.	2' O.C.	
Creeping Raspberry	<i>Camassia quamash</i>	6"	Sun/Part Shade	#1 Cont.	2' O.C.	

Figure 3-15: Bioretention Planting Zones



3.20 Street Illumination

Street lighting is required for all public streets and at the intersections of public and private streets. A complete street lighting system includes: conduits, wiring, concrete bases, poles, junction boxes, meter base, service cabinets, and luminaries. The street lighting design shall be submitted, reviewed, and approved by the Director, Cowlitz Public Utility District, and the State Electrical inspector prior to final plat approval. The installation cost of all street lighting shall be paid for by the applicant.

Street lighting is not required on private streets within a plat. The City does not install or maintain private street lighting systems. On private streets, all street light maintenance and power cost shall be paid by the applicant, homeowner, or homeowners association.

Streetlights shall be located two and one half (2.5) feet from face of curb and be installed in accordance with the State Standard Plans for Road and Bridge Construction and the Standard Specifications.

Street lighting is required on all public street frontages. The applicant is responsible for design, installation, or relocation of new or existing lighting. Developments shall replace existing lighting systems on power poles with a new lighting system serviced by underground power if the system will not conflict with essential distribution lines.

All public street light designs shall be prepared by a licensed engineer experienced in lighting design. Design will be submitted to Cowlitz PUD for review and approval.

All public street light systems shall be accessible for public maintenance by a wheeled vehicle weighing twenty-thousand pounds (20,000 lbs.).

All street light installations including wiring, conduit, and power connections shall be located underground. Exceptions include existing residential areas with existing above ground utilities may have street lighting installed on the existing power poles, with the approval of the Director.

3.21 Traffic Control and Signing

A. Traffic Control Devices.

All traffic control devices shall conform to the "Manual on Uniform Traffic Control Devices" (M.U.T.C.D.) and be reviewed and approved by the Director.

B. Signing.

In new plats, the applicant shall install all traffic control signs, which shall include but not be limited to street name, parking, stop, dead end, and pedestrian signing. Signs shall be located two and one half (2.5) feet from face of curb. The applicant will be responsible for supplying and installing the required signs, posts, and hardware in accordance with the Kelso/Longview Standard Plans and Specifications.

C. Pavement Marking:

1. In new plats or commercial developments, pavement markings, including buttons, paint, thermoplastics, and delineators will be required for roadway safety within, but not limited to, one hundred fifty (150) feet of an intersection. Such markings shall be provided and installed by the applicant.
2. All materials shall conform to the WSDOT Standard Specifications.
3. All markings shall conform to the current "Manual on Uniform Traffic Control Devices" (M.U.T.C.D.).

D. Temporary Traffic Control:

1. It is the responsibility of the applicant to provide adequate temporary traffic control to ensure traffic safety during construction activities.
2. Plans meeting the requirements of Section 1-10 of the Standard Specifications shall be reviewed and approved by the Director prior to any temporary traffic control being installed.
3. All traffic control devices shall conform to the "Manual on Uniform Traffic Control Devices" (M.U.T.C.D.).

E. Traffic Signal Modification. Traffic signal modification designs shall be prepared by a licensed engineer experienced in traffic signal design.

F. All traffic control devices, posts, foundations, hardware, signs, and markers are to be installed by the applicant.

G. Special service sign. Special service sign shall be a guide sign providing road users with business identification and directional information for services and for eligible attractions.

1. Application for Special Service Sign. Any entity wishing to obtain a special service sign within the city limits of the City of Kelso must be a legal owner of a business that is a going concern located in the City of Kelso and make application for a special service sign with the Director on a form provided by the City. The application shall state the owner of the business, identify the business by its official corporate name or name under which it is doing business, state the directional information for services or attractions provided by the business, state the arterial or state route within the confines of city limits upon which the sign is requested to be placed and otherwise comply with the requirements of the Manual for uniform Traffic Control Devices, Section 2F.01. Failure to provide the required information shall result in a denial of the application.
2. Fees and Maintenance Costs. Each application shall be accompanied with payment of five hundred dollars which shall be used by the City for application, processing, sign fabrication and sign installation fee. One half of the application fee will be refunded if an application is denied. In addition, the applicant shall pay an annual two hundred dollar maintenance fee. The fee is to be paid to the department of Public Works on the anniversary of the installation of the special service sign. Failure to make timely payment of said annual fee may result in the removal of the special service sign.
3. Limitations on Special Service Signs. Each business owner shall be limited to two special service signs per business. Special service signs shall be placed only along arterial roadways in the city limits.

3.22 Appurtenances

- A. All appurtenances shall be located a minimum of two and one half (2.5) feet behind the face of the curb to the face of the object. Where no curb exists the distance from the edge of the travel way to the face of the object shall be at least six (6) feet.
- B. All breakaway objects shall be located a minimum of two and one half (2.5) feet behind the face of curb to the face of the object. All objects having properties up to that of a four inch by four inch (4"x 4") wooden post shall be considered breakaway.
- C. Appurtenances shall be located outside of the sidewalk area except when the sidewalk is widened around the appurtenance to the satisfaction of the Director.

3.23 Franchise Utilities

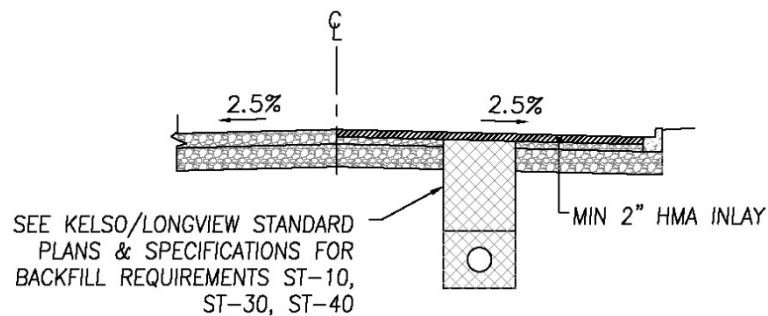
- A. Non-City owned franchise utilities are required to relocate existing facilities at their own expense when a conflict results between their facilities and public street improvements. The improvement work must be required by the non-City owned utility in order for the relocation work to be the financial responsibility of the utility; otherwise all costs shall be the responsibility of the applicant. Any relocation of a utility shall be underground.
- B. All utility distribution or collection systems including, but not limited to, power, telephone, communications, natural gas, sewer, water, and T.V. cable in or along the frontage of a development shall be installed or reinstalled underground prior to paving. Surface mounted transformers, switching facilities, connection boxes, meter cabinets, temporary utility facilities, high capacity transmission lines, substations, cable amplifiers, telephone pedestals, cross-connect terminals, repeaters, warning signs or traffic control equipment are exempt from this requirement.
- C. As a minimum on all new single-family plats and short plats, a minimum six (6) foot wide common or individual non-exclusive perpetual utility easement shall be provided to serve each and every lot. Easements for existing or future utility lines, which do not lie along rear or side lot lines, shall be of a width specified by the serving utility. Additional easements for major distribution and transmission lines or utility facilities may be required.
- D. It is the responsibility of the applicant to make necessary arrangements with utility providers or other appropriate persons for underground installations.

3.24 Trench Backfill and Restoration

All materials and workmanship shall be per the KEDM, the Kelso/Longview Standard Plans and Specifications and in accordance with the WSDOT Standard Specifications

except where otherwise noted in the KEDM. A two (2) inch inlay (grind and then pave) of the streets half width shall be completed for all trench restorations.

Figure 3-15: Trench Patch



3.25 Speed Humps

The City of Kelso shall provide for the installation of speed humps on city streets subject to the following policy and approval process:

A. Where Speed Humps May Be Installed

Speed humps may be installed only on streets having all of the following characteristics:

1. No more than two travel lanes
2. Overall pavement width not greater than 40 feet;
3. In street sections having grades of 8 percent or less at the location of each hump;
4. On streets where the speed limit is 30 miles per hour or less;
5. The street is functionally classified as local or collector;
6. The street is residential in nature;
7. The street has an average daily traffic volume of 5,000 vehicles or less at the location of the humps;
8. In street sections where the minimum safe stopping sight distance can be provided at the posted speed limit

9. Where 50% of the vehicles during a 24-hour period are traveling at a speed of 5 mph or greater over the speed limit.
10. On existing streets only with the documented approval of at least fifty-one percent (51%) of the residential households within the approval area, which is defined as adjacent to the series of speed humps or within 500 lineal feet of the outermost speed humps as measured along each roadway centerline, including connecting roadways;
11. In new developments or on new streets at the direction of the Director during the development review process; and
12. On critical or frequent emergency vehicle response routes that meet all of the above criteria, only a modified speed hump, referred to as a speed cushion that reduces emergency vehicle delay, may be installed.

B. Deviation from Speed Hump Criteria

Deviations from the criteria under Where Speed Humps may be Installed may be made by the Director upon completion of a site-specific traffic study and consultations with the Fire Department and Police Department

C. Where Speed Humps may not be installed

Speed humps shall not be placed within a severe horizontal or vertical curve; wherever possible, speed humps shall be placed on tangent rather than curved sections of the roadway.

Speed humps shall not be placed on streets where long wheel-base trucks constitute greater than 5% of the total vehicle volume.

Speed humps shall not be placed at locations or in streets where there are other traffic safety factors that discourage the use of speed humps, as determined by the Transportation Engineer, who, together with the Director, shall have the sole discretion to deny requests for speed humps.

Speed humps shall not be placed at or near locations where previously existing speed humps were removed by the petition method defined in this Resolution, within a preceding three year period.

D. Placement and Location of Speed Humps

The Director shall have the sole discretion to determine the number, exact locations, and specific profile of the speed humps needed for the requested area.

E. Cost of and Payment for Speed Humps

The cost of all materials, including but not limited to, asphalt, concrete, signs, and pavement markings, shall be paid by the applicant and/or supporters from the approval area. The cost of materials is subject to market pricing fluctuations and shall be determined by the Director at the time the approval petition is prepared for circulation.

In the case of new developments or new streets, the developer shall be responsible for the entire cost of the speed humps, including material, equipment, and labor. The costs of the speed humps shall be determined by the Director at the time the improvement plans are approved by the City, and payment shall be received by the City prior to final plat approval, project acceptance, or issuance of the certificate of occupancy.

All speed humps shall be installed and maintained by City staff after the request process or development review process has been completed and payment received.

F. Process for Speed Hump Installation

1. Requests for speed humps shall be submitted to the Director.
2. The Director shall review the request to determine if the proposed location(s) for the speed humps meet the speed hump policy.
3. If the policy criterion appears to be met, the Director shall meet with the applicant to determine the precise locations and number of speed humps. In addition, the Director shall determine the area requiring resident approval (approval area), typically at least 500 feet beyond the outermost speed humps, including residents on connecting roadways who reside within 500 lineal feet of the speed humps, as measured along the roadway centerlines.
4. The Director shall review and/or gather traffic data for the requested location, including vehicle speeds, traffic volume, and crash history.
5. If traffic data supports the request for speed humps and the criteria of this policy is met, the Director shall prepare a petition identifying all of the developed property owners in the approval area, and provide the petition to the applicant. The petition shall also identify the cost of materials for the proposed speed humps.
6. The applicant shall then circulate such petition and obtain signatures from all property owners of the approval area. The petition shall contain a check box or other method for an owner to indicate their support or opposition to the installation of speed humps. Only one signature is required from each property ownership, and that signature shall be presumed to represent the entire property. Fifty-one percent (51%) or more of the property owners of the

approval area must support installation of the proposed speed humps for the process to continue.

7. If fifty-one percent (51%) or more of the property owners of the approval area have indicated on the petition their support for installation of speed humps, the applicant shall be responsible for paying to the City the funds identified on the petition to purchase all the materials required for installation of the speed humps. The applicant may pay the entire cost identified, or may submit checks from one or more petitioners. All payments shall be processed through the Director to ensure the total funds required are received.
8. After a successful petition has been received and money collected, materials shall be purchased and the speed humps installed using the Small Works Roster. The schedule for installation of the speed humps shall be determined at the sole discretion of the Public Works Department, contingent upon weather, staff workload, traffic considerations, and availability of the required materials.
9. In the case of new developments or new streets, after the streets have been constructed and payment received from the developer or project proponent, the speed humps shall be installed using the Small Works Roster. The schedule for installation of the speed humps shall be determined at the sole discretion of the Public Works Department, contingent upon weather, staff workload, traffic considerations, and availability of the required materials.

G. Speed Hump Removal

Speed humps must be in place for at least twelve months before they become eligible for removal through the petition process.

Speed humps shall be removed with the documented approval of such removal request by at least sixty (60%) of the property owners of the approval area, as defined previously in this Resolution.

Speed humps shall be removed by the City as traffic volume increases and exceeds an average traffic volume of 5,000 vehicles per day, or the street's functional classification is changed from residential or collector street, at the location of the speed humps.

After a speed hump is installed, applicants or petitioners who paid for installation of the speed hump shall not be eligible for any refund of their monies paid, regardless of the reason for removal of the speed hump(s).

H. Process for Speed Hump Removal

1. Requests for speed hump(s) removal shall be submitted to the Director.

2. The Director shall determine the area requiring property owner approval of the removal request (approval area), as defined previously in this Resolution.
3. The Public Works Department shall prepare a petition identifying all of the developed properties in the approval area, and provide the petition to the applicant.
4. The applicant shall then circulate such petition and obtain signatures from all of the owners of the approval area. Sixty percent (60%) or more of the property owners of the approval area must support removal of the speed humps for the process to continue.
5. If sixty percent (60%) or more of the owners of the approval area sign the petition in support of removing the speed hump(s), the City shall remove the speed hump(s), signs, and pavement markings. Removal of speed hump(s) shall be at the City's expense.

3.26 Parking Facilities

A. Access Standards

1. Unless otherwise approved by the City, only a single access to public right-of-way is allowed for an individual lot. Joint use of required access ways may be permitted at the discretion of the City.
2. Parking lots shall have direct access to a street or road easement and shall provide unobstructed access driveways exclusive of the required parking areas.
3. With the exception of single-family and duplex buildings on individual lots accessing non-arterial streets, access and parking spaces shall be designed so that no backing movement by a vehicle shall be allowed onto a public right-of-way.
4. No parking space may block access to other parking spaces. Tandem parking may be approved for a single residence, individual dwelling units of a multifamily structure or in limited single-tenant office-type applications.

B. Design Standards

1. All driveways and other parking areas shall be hard surfaced with permanent materials such as asphalt, concrete or unit pavers, and shall be designed to dispose of surface water and pollutants from motor vehicles in accordance with the provisions of the Kelso Municipal Code and the Kelso Engineering Design Manual. Use of permeable pavement is encouraged for commercial driveways where feasible.

2. All parking areas must comply with the applicable provisions of the Americans with Disabilities Act, as determined by the City.
3. Please note that the Downtown Design Overlay and the West Kelso Overlay contain additional parking design standards unique to those specific areas.
4. Parking lots shall be designed according to the following table. Space depth shall be measured exclusive of access drives and aisles, and car overhangs.

Table 3.11: Parking Stall and Aisle Dimensions

Parking Angle	Curb Length	Space Width	Space Depth	Paved Aisle Width	Direction of Travel
0 degrees	20 feet	8.5 feet	N/A	24 feet	Two-way
45 degrees	12 feet	8.5 feet	18 feet	13 feet	One-way
45 degrees	13 feet	8.5 feet	18 feet	24 feet	Two-way
60 degrees	9.8 feet	8.5 feet	18 feet	18 feet	One-way
60 degrees	9.8 feet	8.5 feet	18 feet	24 feet	Two-way
90 degrees	8.5 feet	8.5 feet	18 feet	24 feet	Two-way

5. Where parking spaces are designated, grades shall not exceed six percent. Driveways and driving lanes between separate groups of parking shall not exceed fourteen percent. Parking areas on sloping lots shall be laid out so that parked cars lie perpendicular to the slope. Where existing grades on property proposed for a parking lot exceed ten percent, the City may require a topographic survey to show existing and proposed grades. In no case shall grades be less than one-half of one percent.
6. All parking spaces and driving aisles serving adjacent parking spaces, except those serving single-family residences, shall not be located within required front, rear or side yards. This restriction does not include access aisles.
7. Driveways and parking lots may be provided with lighting that is mounted on poles or building surfaces with lamp position not exceeding twenty feet in height. All light sources shall be hooded or shielded so that the lamp is not visible from adjacent properties or public rights-of-way.

8. Where properties abut lots with a dissimilar use ie: industrial next to a single family home, a sight obscuring fence shall be installed. The fence must either be blocked on the more intensive use side with vegetation and or a solid fence must be installed. The vegetation element is not required for fencing between similar uses such as industrial next to industrial unless required elsewhere in the code.
9. Parking and loading areas within the LI and GI zones shall comply with the following additional standards:
 - a. On-street parking or staging of trucks, equipment or goods on public streets is prohibited.
 - b. Where practicable, primary vehicular access shall avoid streets or easements that primarily serve residential uses.
 - c. No new curb cuts shall be allowed onto public streets if it is possible for a development to share an access drive with an existing facility.
 - d. Entrances and exits to and from parking and loading facilities shall be clearly marked with appropriate directional signage where multiple access points are provided.
 - e. Internal circulation shall be designed for safety and efficiency by reducing conflicts between vehicular and pedestrian traffic, combining circulation and access areas where possible, providing adequate truck maneuvering, stacking, and loading areas and accommodating emergency vehicle access.
 - f. To reduce noise and visual conflicts with neighboring properties and public streets, loading facilities shall be located internal to the site or where conflict with neighboring properties will be reduced. Loading facilities shall not face nonindustrial properties.
 - g. Loading docks and doors facing a public street shall be offset from the access drive and shall be screened from the street.
10. Circulation and Walkways in Multifamily and Nonresidential Development.
 - a. Parking lots and driveways shall provide well-defined, safe and efficient circulation for motor vehicles, bicycles and pedestrians.
 - b. Landscaped islands with raised curbs shall be used to define entrances from public rights-of-way, define pedestrian walkways from the public rights-of-way to all buildings, define ends of parking aisles and indicate the pattern of circulation. Raised curbs may be cut to allow runoff to enter bioretention facilities where used in the landscape design.
 - c. Pedestrian walkways shall be provided around buildings to the extent necessary to assure safe access to the building from parking areas and the public right-of-way. Where appropriate, as determined by the approving

body, pedestrian walkways may be required to assure safe access to adjacent properties.

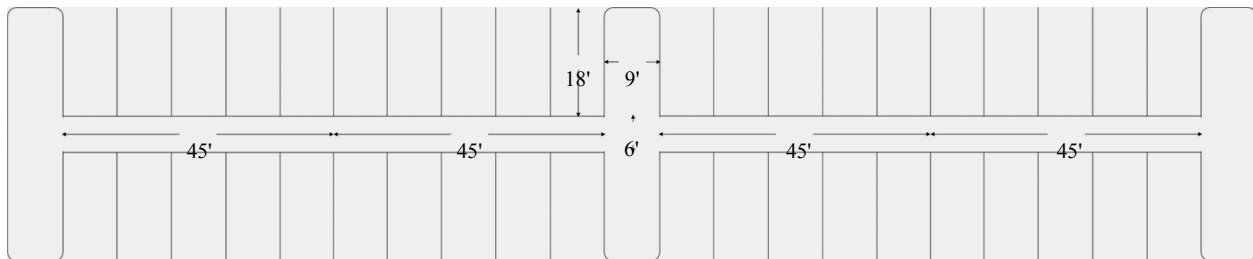
- d. Internal walkways shall be surfaced with nonskid hard surfaces, meet accessibility requirements and be designed to provide a minimum of five feet of unobstructed width. Where walkways cross vehicular driving lanes, the walkways shall be constructed of contrasting materials or with maintained painted markings. Walkways shall be curbed and raised six inches above adjacent vehicular surface grade, except where the walkway crosses vehicular driving lanes or is required to meet accessibility standards.

C. Landscape Standards. Onsite parking areas shall be landscaped in accordance with the following provisions:

1. All parking area landscaping will be designed in accordance with the provisions of the Kelso Municipal Code and the Kelso Engineering Design Standards and may contribute to the required landscaped area requirement.
2. All required landscaping for the parking lot may be used to manage on-site stormwater with bioretention facilities or dispersion BMPs, if feasible in accordance with the Chapter 2 of the KEDM. Where bioretention is used, required tree and plant spacing may be relaxed to accommodate the facilities so long as public safety is not compromised.
3. Parking area landscaping will be designed in such a manner so as to:
 - a. Divide and break up large expanses of paving;
 - b. Guide traffic flow and direction;
 - c. Promote pedestrian and vehicular safety;
 - d. Preserve existing trees and vegetation, when practical.
4. Landscape islands shall be installed to break up the parking area into rows of not more than 20 contiguous parking spaces or 10 spaces in one row.
 - a. Each end of each row of parking spaces shall require a landscape island unless the end of such row of parking spaces is adjacent to a perimeter landscape.
 - b. The minimum width for a landscape island that is parallel to a parking space shall be equivalent to the area of one parking space (e.g. 90 degree stalls are required to be a minimum of 9' x 18', therefore the landscape island shall be at least 9' x 18'). Each landscape island or peninsula shall contain a minimum of one (1) shade tree and a combination of five (5) deciduous and evergreen shrubs or groundcover.

- c. Each row of parking spaces shall be separated from one another by a minimum six (6) foot landscape island that extends the entire length of the row of parking spaces. Such landscape island shall contain two (2) shade trees and ten (10) shrubs distributed per 45 linear feet. Additionally, six (6) foot wide pedestrian walkways, running parallel or perpendicular to the landscape islands shall be provided for convenient pedestrian access to the building entry(s) and throughout the parking lot.

Figure 3-16: Interior Parking Area Layout Example (without pedestrian walkways)



- d. Within the Industrial Zones (LI and GI), the parking row landscape island / walkway requirements may be waived if necessary to prevent interference with truck maneuverability or other factors.
5. All parking areas, drives, or other vehicular areas shall be surrounded by a continuous five (5') foot landscape border minimum. The landscape border shall provide breaks, as necessary, to allow for access to the site and sidewalk by pedestrians via pathways. The landscaped border shall consist of at least one (1) shade tree or one (1) ornamental tree and ten shrubs distributed per 25 linear feet of perimeter or 1 evergreen tree and 5 shrubs distributed per 25 linear feet of perimeter.
 - a. For parking areas and drives or other vehicular areas that extend to within 50 feet of a public right-of-way shall provide a landscape screen between the parking area, drive, or other vehicular area and the right-of-way shall be a minimum of ten (10') feet in width and shall contain a minimum of one (1) shade tree and ten (10) shrubs distributed per 25 linear feet of street frontage or 1 evergreen tree and 5 shrubs distributed per 25 linear feet of street frontage.
 6. In accordance with Kelso Municipal Code Title 17, Low Impact Development stormwater facilities may be located in required landscaping where feasible.

Chapter 4

Vacant

Chapter 5

Water

City of Kelso
Engineering Design Manual
June 2008
City Engineer: Sharon Zimmerman, P.E.

Chapter 5
Water
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CHAPTER 5 - WATER

5.00 Utility Easements and Tracts

All public utilities (storm, water, and sewer) shall be in public right-of-way, utility easements or tracts. Easement and tract width shall be a minimum twenty (20) feet. No obstructions including but not limited to fences or retaining walls are to be located within the easement or tract.

5.01 General Design Considerations

- A. In all developments water main extensions and looping are required to assure orderly development of the water utility system. Where applicable, water main extensions shall conform to the requirements of the City's latest approved Water System Plan. Where the proposed extension is not addressed in the Water System Plan, the Applicant shall pay the cost for any Water System Plan amendments required by the Washington State Department of Health, or City Engineer. All proposed water main extensions must comply with the City's requirements for development, water quality and pressure zones, and fire protection requirements of the City. The proposed main extension shall be designed by a licensed engineer and be approved by the city engineer and appropriate governmental authorities. The design shall be in conformance with the city standards and shall be designed by the use of a hydraulic analysis considering pipe size, restrictions, peak demand, length of run, elevation differences, the availability of water in the existing mains, reservoir capacity, pressures in the area, other local conditions and other factors as may be pertinent. If the extension is considered feasible, then the pipe diameter and other conditions shall be determined by the analysis. A meeting with the City Engineer shall be required prior to acceptance of the hydraulic analysis to help determine minimum requirements for the hydraulic analysis report.
- B. Design and construction of water mains, including but not limited to, mainlines, valving, fire hydrants, fire sprinkler connections with backflow devices, domestic and irrigation services, pump stations, pressure reducing stations, telemetry and other appurtenances shall be in compliance with the City ordinances, special requirements of the City, these Standards, and the Standard Details.
- C. All service laterals, 2" and smaller, shall be copper type K. All water mains and service laterals larger than 2" shall be Ductile Iron.,
- D. The applicant is responsible for designing the proposed water system(s). The system(s) must be designed by a licensed engineer and approved by the City.
- E. Water mains shall be extended through and to the extremes of the property being developed for gridding or future development, as determined by the City.
- F. The City discourages dead end water main extensions. Unless specifically approved by

the City Engineer, all water main extensions shall be looped to other water mains within the pressure zone of that water main extension. Generally, looping of water main extensions is required for all extensions serving twenty (20) or more equivalent residential units.

- G. The City discourages water main extensions for service to pressure zones different from the pressure zone from which the extension is made. Unless specifically approved by the City Engineer, booster pump stations or pressure reducing valve stations shall not be permitted.
- H. Water mains parallel to a sewer shall be above and separated by a distance of ten feet horizontally.

Under unusual circumstances, the horizontal spacing may be adjusted subject to the approval of the director of public works. Water mains crossing sewers should not be less than three feet above the sewer. Where it is necessary for a sewer to cross within eighteen (18) inches or over the water main, the sewer shall be constructed of ductile iron for a distance of ten feet on either side of the water main as approved by the director of public works. At no time shall the water main design not be in accordance with the DOE Orange Book.

- I. Rights-of-way or easements shall be provided to the City for access and maintenance of all conveyance systems, or other facilities as deemed appropriate by the City Engineer, within the development site, which are to be maintained by the City. The minimum widths of rights-of-way or easements shall be as follows, although the City Engineer may require increased widths when necessary to insure adequate area for equipment access and maintenance:
 - 1. Pipes with an inside diameter less than or equal to thirty-six (36) inches: twenty (20) feet;
 - 2. Pipes with an inside diameter greater than thirty-six (36) inches: twenty (20) feet or larger as required by the City;
 - 3. Pipes shall be centered within the right-of-way or easement;
 - 4. Pipes with more than a seven (7) foot depth to the invert shall require wider easements. A slope of one (1) horizontal to one (1) vertical from the storm drain invert to the ground surface shall be used in determining easement width.

No buildings or other structures that prevent access are permitted within rights-of-way or easements. Fences crossing rights-of-way shall provide gates of sufficient width to provide access by maintenance vehicles.

When possible, easements for apartment complexes or commercial/industrial developments shall be in parking lots, private drives, or similar areas that allow unobstructed vehicle access for maintenance.

5.02 Sizing and Pressure Requirements

- A. In areas where gridding or fire flow is a requirement, 8-inch diameter pipe will normally be required. 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. The Applicant shall be required to pay the cost of all oversizing. Reimbursement for oversizing will be in accordance with the KMC.
- B. An adequate grid for eight (8) inch pipe shall measure no more than six hundred feet on one side and the sum of two sides shall not exceed nine hundred feet. Necessary fire flow, as recommended by the fire department, shall be considered and pipes shall be sized to meet these requirements. Where a grid is not established, pipe size shall be of a diameter suitable to carry the peak daily demand plus the required fire flow.
- C. Dead end mains normally shall not be allowed. When they are permitted, a blow off assembly will be required. In the event that the "dead end" finishes where there is risk of a vacuum being created due to water shut down, then a Combination Air and Vacuum Release Valve shall be installed in accordance with the Standard Drawings.
- D. All water system installation shall be designed to provide a pressure range at the residence of thirty (30) psi to ninety (90) psi at all times, including during peak demand, unless specifically approved.
- E. An approved screen shall be located in the pressure reducing valve vault at a location upstream of the pressure-reducing valve. Pressure reducing valves may be required at the discretion of the City on individual services. Such valves will be installed after the meter and will be the responsibility of the homeowner to install and maintain.
- F. Water service size shall be evaluated by the applicant's engineer. The requirements of this section shall be met and shall be no smaller than 1-inch. Booster pumps shall not be allowed on meter service lines in order to meet this requirement, unless specifically approved by the City Engineer.
- G. Where requested by the City Engineer, the applicant's engineer shall provide a "pressure available" chart on the water system plan sheet of the construction plans. This sheet shall indicate the calculated pressures theoretically available to each lot during static and peak demand periods. In such cases it shall be the Applicant's engineer's responsibility to determine pressures based upon an analysis of the system. All work associated with the analysis shall be paid for by the Applicant.

5.03 Shut-off Valves

- A. Valves shall be located, whenever possible, at intersections (one (1) valve per each line radiating from the intersection). In general, sufficient valves should be provided to permit shutting down any section of the line, not exceeding five-hundred (500) feet, with valve operations in not more than three (3) locations.
- B. Valves shall be installed in clusters at pipeline intersections.
- C. Valves 8-inches and smaller shall be resilient seat gate valves.
- D. Valves 10-inches and greater shall be butterfly valves.

5.04 Air-release Valves

At high points in the water system, combination air and vacuum release valves (CARV) shall be installed as required by the City Engineer. All Air-Vac, Air Evacuation, and Vacuum Prevention Valves of sizes two (2) inches and larger shall vent to the outside of the vault. If construction of the valve does not permit the venting of leakage to the outside of the vault, a screened drain to daylight of at least the supply line size must be provided at a level that will prevent cross connection and/or backflow problems. This decision will be made by the City Engineer prior to the plan approval.

5.05 Hydrants

- A. The number and locations of fire hydrants, fire flow requirements, and fire sprinkler components will be recommended by the Cowlitz Fire Department District #2. Following are general requirements for fire hydrant locations:
 - 1. **Commercial Buildings:** Fire hydrants shall be located so that no part of a commercial building is more than two-hundred and fifty (250) feet from a fire hydrant measured along a route accessible to fire department vehicles. When a fire department connection (FDC) is installed in conjunction with an automatic sprinkler system, it is required to have a fire hydrant located within seventy (70) feet of the FDC.
 - 2. **Non-Commercial Buildings:** Fire hydrants shall be placed at a minimum at each street intersection. The Fire Marshall may request additional hydrants per Fire Code requirements.
 - 3. Intermediate hydrants are required when the distances to any part of noncommercial buildings exceeds five-hundred (500) feet measured along a route accessible to fire department vehicles.
- B. Fire hydrants shall not be connected to mains less than 8-inches, or 6-inches in diameter where the length of 6-inch main is less than two-hundred (200) feet. As per the IFC,

fire hydrants shall be located to allow a 5-foot clear space surrounding the hydrant. For example, street lights, sign posts, protective posts, or retaining walls shall be no closer than five (5) feet from the nearest portion of a hydrant. There shall also be no obstructions directly in line with any of the ports of the hydrant.

- C. Fire hydrants shall have Storz fittings (or approved equal).
- D. Fire hydrants subject to possible vehicular damage shall be adequately protected with guard posts in accordance with Uniform Fire Code Section 8001.11.3. For marking, see Section 901.4.3. For obstruction, see Section 1001.7.

5.06 Water Meters

- A. Water meters sized ¾-inch and 1-inch shall be furnished and set by the City. The owner is required to make application and pay meter fees prior to the installation. The City will install meters and lock off meter setters and turn on as requested by the owner after acceptance by the City.
- B. Meters 1 ½ -inch and larger will be installed by the owner as part of the construction project and provided to the City Operations for testing and approval prior to installation. After testing and approval the applicant's contractor shall install.
- C. Water meters will be set only after curb stop and box are at proper finished grade, an approved sanitary sewer or septic has been installed and accepted, a water use questionnaire has been approved, and all fees have been paid. All meters shall remain the property of the city.
- D. Meters shall be located outside of the sidewalk and/or driveway at the edge of public right-of-way, in the landscape strip or as otherwise approved by the City Engineer. Meters and services shall be relocated if a driveway or crossing is to be constructed over the existing service.
- E. Meters located within county right-of-way shall be within the county right-of-way and within two (2) feet of the property line nearest the customer's premises.
- F. In situations in which the above meter locations do not apply, or if locating the meter according to the above standards pose a risk to public safety or creates an undue hardship, the location of the meter(s) shall be approved by the City Engineer
- G. All irrigation systems require the installation of state certified backflow devices.

All irrigation meters will be set and turned on after acceptance of the water system by the City. The City will not accept a water system until all the requirements of the Extension Agreement have been completed and all the fees have been paid.

- H. Adjustments, repairs, or replacement of the service line, meter box, or setter shall be the responsibility of the property owner.
- I. Water services are to be single runs from the main line to each meter. Manifolds with multiple meters shall be allowed in multi-family units with a single property owner or on commercial/industrial sites with a single owner as approved by the City Engineer. The location of all water services crossing curbs shall be indicated by a “W” stamped into the concrete curb.

5.07 Fees and Charges

All fees and charges related to development shall be in accordance with the latest requirements of the KMC.

5.08 Cross Connection Control

- A. All water system connections to serve buildings or properties with domestic water, fire sprinkler systems, or irrigation systems shall comply with the minimum backflow requirements as established by the Department of Health (DOH), WAC 246-290-490, and the City.
- B. Backflow devices shall be installed in accordance with the requirements of the "Accepted Procedure and Practice in Cross Connection Control" manual, the Uniform Plumbing Code, Chapter 6 Washington State Amendments 603.0.

5.09 Contract for Reimbursement (Latecomer Agreements)

Should the Applicant deem that the utility extension is an undue hardship and will significantly benefit other property owners, the Applicant may request a latecomer agreement, in accordance with the KMC.

5.10 Water Quality

The quality, taste, and odor of water drawn from new construction water mains shall be the same as the water in the existing facility classed as acceptable for use by the City. Should the water not be acceptable for use because of taste, required steps as approved by the City shall be accomplished to attain water quality acceptable for use. Sampling for such water quality testing shall be performed by the use of a Kupferle (model #88 Eclipse) sampling station installed permanently and specifically for such testing. A sampling station shall be required for every fifty (50) EDU's or as determined by the City Engineer. The location for said sampling stations will be determined by the City Engineer.

5.11 Plans and Specifications

All extensions to the water system shall conform to the most recent edition of the Standard Specifications for Road, Bridge, and Municipal Construction. The system shall be capable of future

expansion and be constructed of permanent materials.

The installation of water extensions shall be in accordance with construction plans and specifications prepared by the Applicant's engineer and reviewed and approved by the City. Where conflicts exist the more stringent specification shall apply as approved by the City.

5.12 Connections to Existing Pipelines

- A. Connections shall only be allowed to existing mains. Connections to existing mains will only be allowed after receiving approval from the City Engineer. Upon the presentation to the City Engineer of the treasurer's receipt for service charges and the execution of the agreement, the City Engineer shall cause the premises described in the application to be connected to the City's water main.
- B. Connections may be made to existing pipes under pressure with a tapping machine by determining the size and type of pipe and installing tapping sleeve to fit complete with tapping valve. Where cut-ins are permitted to be made in existing pipes, the work shall be conducted at such a time and in such a manner as to minimize the interruption of service. Cut-in time must be approved by the City. Necessary pipe, fittings, and gate valves shall be swabbed with chlorine and assembled at the site ready for installation prior to the shutting-off of water in the existing main. Once the water has been shut off, the work shall be performed vigorously, to minimize the interruption, and shall not be halted until the line is restored to service. Operation of all water main line valves shall be by the City. The City shall witness all wet taps and cut-in connections and requires forty-eight (48) hours notice and approval by the City.
- C. The Contractor shall have the responsibility of giving written notice to the City at least four (4) days and to affected customers at least 48-hours prior to disruption of service. Written notice to affected customers shall consist of, at a minimum, door hangers, as well as signs posted at the entrance to the customers streets of the impacted area.
- D. Pipes to be abandoned shall be removed or capped with mechanical couplings, as determined by the City Engineer.
- E. Service connections shall extend at right angles from the main to the property line. The city connection which shall include a ball corp stop, a ball valve, and an angle ball valve shall be placed within the curblin and the meter set assembly in conformance with these Standards and the Standard Details.

5.13 Roadway and Railway Crossing

The owner shall use the method, which has been designed on the plans and is acceptable to the City and the government or private agency having control of the road. Permits are required and a copy shall be provided to the City.

5.14 Trench Excavation

- A. Clearing and grubbing where required shall be performed within the easement or public right-of-way and as permitted by the property owner and/or governing agencies. Debris resulting from the clearing and grubbing shall be disposed of by the Applicant.
- B. Trenching for water mains shall be completed in accordance with the Standard Specifications.
- C. Trenching and shoring operations shall not proceed more than one-hundred (100) feet in advance of pipe laying without written approval of the City.
- D. Where a utility crosses under an existing asbestos cement water main or where a trench alters the bedding of an existing asbestos cement water main, the existing A.C. pipe shall be cut three (3) feet minimum from each side of the trench wall and replaced with a corresponding size ductile iron pipe Class 52. The ductile iron pipe shall be connected to A.C. pipe with transition couplings.
- E. Contractor shall furnish a watertight plug of the appropriate size which shall be installed in the end of water main when work is delayed or stopped at the end of the work shift.

5.15 Pipe in Filled Areas

Where pipe is to be installed in filled areas, special treatment may be required at the discretion of the City. This treatment may consist of compacting the backfill in 6-inch layers, careful choice of backfill materials, use of Mechanical Joint Ductile Iron Pipe in short lengths, or such other reasonable method or combinations as may be necessary or as required by the City.

5.16 Pipe Installation for Water Mains

The work necessary to excavate, bed, and backfill water pipelines shall conform to the requirements of the Standard Specifications and the Standard Drawings.

A. Pipe and Fittings

Use only Class 52 ductile iron pipe and fittings in accordance with the Standard Specifications.

B. Permissible Deflection of Joints

Wherever it is necessary to deflect pipe from a straight line either in a vertical or horizontal plane, or where long-radius curves are permitted, the amount of deflection allowed shall not exceed the values in the following Table 1 Section 5.18B:

Table 5.1
Maximum Deflection Permitted*
18-Foot Length Pipe

Dia. In.	Mechanical Joint** Maximum Deflection		Push-on Joint Maximum Deflection	
	Angle Degrees & Minutes	Deflection Inches	Angle Degrees	Deflection Inches
4	8-18	31	5	18
6	7-07	27	5	18
8	5-21	20	5	18
10	5-21	20	5	18
12	5-21	20	5	18

* The maximum deflection shall be whichever is less; the table or that recommended by the pipe manufacturer.

** Safe deflection for one hundred and fifty pounds (150 lbs.) pressure. For higher pressure, reduce tabulated deflection proportionally ten percent (10%) for each one hundred and fifty pounds (150 lbs.) added pressure.

5.17 Bedding and Backfill

Use imported bedding for all water main pipe installed under pavement, curbs, sidewalks, or usable shoulder. Bed and backfill pipe and appurtenances in accordance with the Standard Specifications.

5.18 Hydrostatic Tests

The Contractor shall make pressure and leakage tests on all newly laid pipe. Test to be made at two hundred and fifty (250) psi for 2-hour with acceptable loss in accordance with WSDOT standard specifications. Test at higher pressures may be required depending upon installation. Furnish all necessary equipment and material, make all taps in the pipe as required, and conduct the tests. The City shall witness the test; if the test does not pass inspection for any reason, additional trips required to witness the test shall be at the owner's expense.

A. Correction of Excessive Leakage

Should any test of pipe laid disclose leakage greater than that allowed, locate and repair the defective joints or pipe until the leakage of a subsequent test is within the specified allowance. The leakage allowed during a test shall be in accordance with the Standard Specifications.

B. Isolation of Existing Systems Prior to Testing

Existing water pipelines shall be protected from contamination during the testing process for new construction. The newly installed water line shall only be connected after it has passed pressure and dechlorination tests. Use of special "blind flanges" will be necessary if the line being tested cannot be adequately separated from existing systems. The Applicant's engineer shall submit shop drawings and proposed procedures to the City prior to installing any special testing device.

5.19 Sterilization and Flushing of Water Mains

Pipeline intended to carry potable water shall be sterilized before placing in service. Sterilizing procedures shall conform to the standard specifications as hereinafter modified or expanded.

A. Disposal of Sterilizing Water

Dispose of sterilizing water in an approved manner. Do not allow sterilizing water to flow into a waterway without adequate dilution or other satisfactory method of reducing chlorine to a safe level. Dechlorination procedures are to be submitted in writing and approved by the City Engineer prior to flushing system.

5.20 Cross Connection Control and Backflow Assemblies

An approved backflow prevention assembly, as listed in "Backflow Prevention Assemblies for Installation in Washington State" (DOH PUB 331-137), is required on all fireline systems, domestic water service larger than 2-inches, and/or building in excess of thirty (30) feet above the water main.

The assembly shall be installed at the location normally established for water meters, usually at the property line. A water service shall not be turned on until all required backflow prevention assemblies are installed, inspected, tested, approved, and registered with the City of Kelso. Costs of all installations, including all costs of inspection and testing fees, shall be the responsibility of the customer. The backflow prevention assembly will remain the property of the customer. The customer will be responsible for all maintenance and testing of the assembly and vault for the life of the assembly.

When required, backflow prevention assemblies for protection of the public water system shall meet the requirements set forth in the current Washington State Department of Health regulations, Uniform Plumbing Code, and City ordinances. All installation shall meet AWWA Cross Connection Control Manual, May 1990, requirement.

The type of backflow prevention assembly required is determined by the aforementioned rules and codes, based on the type of premises to which water service is being provided. The approved types of assemblies are listed below with some of the types of premises that must be protected by each type of assembly. However, these lists are not complete, they are only intended to provide some basic guidelines.

A. Reduced Pressure Backflow Assembly

An approved Reduced Pressure Backflow Assembly shall be installed on the service connection above ground to the following:

1. Any parcel or building that has an auxiliary water supply on or available to it. This will include any above or below ground water source. (The most commonly encountered type of auxiliary water supply is a private well);
2. Buildings which are located within an industrial zone;
3. Hospitals, medical centers, and clinics;
4. Mortuaries and nursing homes;
5. Gas stations;
6. Car washes;
7. Sewage pump and lift stations;
8. Dry cleaners and commercial laundries;
9. Any water system which has a pump to supplement pressure; and
10. Irrigation systems, which are designed to use chemical injection.

B. Double Check Assembly or Double Check Detector Assembly

An approved double check assembly or an approved double check detector assembly shall be required (provided that all internal plumbing is installed and maintained in accordance with the Uniform Plumbing Code), on the service connection to premises where there is:

1. Any fire system or water line to a private fire hydrant;
2. Multi-story buildings which are in excess of thirty (30) feet above the water main at the service connection;
3. Shopping centers or large retail stores; and
4. Restaurants or fast food establishments.

C. Installation and Testing

Backflow prevention assemblies shall be installed at the water service connection on the customer side of the meter. Backflow prevention assemblies 1-inch and smaller shall be installed in a heated and/or insulated enclosure capable of providing year-round freeze protection, sized to meet the clearance requirements as shown in the Kelso/Longview Standard Plans and Specifications.

After installation, all backflow prevention assemblies that are installed must be tested upon installation by a State of Washington certified tester. The results of the testing shall be received by the City prior to issuance of "final occupancy."

Backflow prevention device assembly vaults shall be constructed in accordance with the standard drawings and requirements of this section. Backflow vaults shall be on private property and located outside of public easements.

5.21 Requirements for Water System Vault Installations

To ensure proper operation and accessibility of all assemblies, the following requirements shall apply to installation of these assemblies, unless otherwise approved by the City. Vaults shall be constructed per the Standard Details.

- A. The vault shall be sealed with an asphalt base foundation coating on the outside of the vault. Vault penetrations shall be sealed with non-shrink grout from the outside. Apply waterproof coating over grout. Backfill around vault per the manufacturer's specifications.
- B. Access shall be through an H-20 rated hydraulic assist locking hatch of minimum size 36" x 60" locking open at 90°. Hatch is to be leak proof, gasketed, double raise and made of aluminum.
- C. Provide approved ladder if the vault or chamber depth is 5'0" or greater and entry is through the vault or chamber roof. Ladders shall include a Model 1 Bilco LadderUP safety post or approved equal.
- D. Adequate drainage for the vault or chamber shall be provided. (Drainage to piped storm systems allowed with check valve).
- E. Vault must be equipped with a moisture proof light fixture if adequate lighting is not available.
- F. Vault is to have no other use, except for use described by these Standards.
- G. Vault shall be installed on undisturbed base or compacted 3/4"-0" gravel base.

- H. No piping shall be installed in excess of three (3) feet above the vault floor.
- I. Assembly is to be adequately supported from the floor, and suitably restrained from movement. Supports shall consist of steel supports or approved equal; no wood supports shall be used.
- J. All electrical wiring shall be inspected by the Washington State Electrical Inspector (Permit is required).
- K. The assembly shall be readily accessible with adequate room for maintenance.
- L. All new services are to be pressure tested and disinfected by the contractor and proven to be bacteriologically safe from the existing main to the vault.

5.22 Fire Services and Domestic Services

- A. No part of the backflow prevention assembly shall be submerged in water or installed in a location subject to flooding. In a vault or chamber, adequate drainage shall be provided; and test cocks shall be plugged. The plugs shall not be of dissimilar metals.
- B. The backflow assembly shall be protected from freezing and other severe weather conditions.
- C. All backflow assemblies shall have a minimum twelve (12) inch clearance on the backside, Twenty-four (24) inch clearance on the test-cock side and twelve (12) inches below the assembly.

Adequate clearance of at least six (6) inches must be maintained above gate-valve stem at full extension. Headroom of six (6) feet is required in vaults without a full opening top. Access to the device and to any vault or chamber shall remain clear at all times.

- D. No more than one (1) premises shall be served by any one (1) fire service.
- E. Fire services shall be metered at the expense of the owner. Detector check meters shall be installed on automatic fire sprinkler services which may include hose racks inside the building; size and type shall be approved by the City. Double Check Detector Assemblies shall be installed on all fire services where hydrants are installed.

5.23 Special for Fire Service Only

- A. Fire Service backflow prevention assemblies shall be installed at the property line or edge of the public water line easement. The fire service from the public main to the backflow assembly shall be publicly owned and meet all City's Standard Drawings.
- B. Only approved resilient seat indicating valves are allowed on fireline assemblies.

- C. Only approved Double Check Detector Valve Assemblies are to be used for system containment on fire line services in the City. The meter on the bypass detector shall read in cubic feet.
- D. Fire Line Flow and Tamper Switches installed, as required by UBC sec. 3803, must be connected to a monitored Fire Detection System approved by the Fire Marshal. The tamper switches are required on the rising stem gate valves in the vault, as well as any other indicating control valves on the fire protection system. Electrical inspection and permit is required.
- E. The remote reader (if allowed) shall be rigidly mounted on an exterior building wall (near the domestic meter), enclosed in a metal box with a slot opening which allows reading the remote without opening the box, and at an elevation of five (5) feet above the ground level.

The remote reader shall have the same number configuration as the metering device itself, and read in cubic feet. All wires to the remote reader shall be enclosed in a heavy plastic or rigid metal conduit. All wiring shall be in conformance with appropriate sections of the National Electric Code.

5.24 Water Meter Vaults

The vault is to be provided and installed by the Contractor, per Standard Drawings.

5.25 Pressure Reducing Valve Vaults

PRV vaults are unique to each situation. The engineer shall detail the vault on the plans and submit for review. The City will review the vault for size and compliance with the general requirements listed under this section.

5.26 Appurtenances

A. Air and Vacuum Release Valves

1. Air and vacuum release valves shall be APCO - Valve and Primer Corporation, "Heavy-Duty," combination air release valve, or equal.
2. Installation shall be as shown on the Standard Details.
3. Piping and fittings shall be copper or brass. Location of the air release valves as shown on the plans is approximate. The installation shall be set at the high point of the line. Water line must be constructed so the air release valve may be installed in a convenient location.

Chapter 6

Wastewater

City of Kelso
Engineering Design Manual
June 2008
City Engineer: Sharon Zimmerman, P.E.

Chapter 6
Wastewater
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CHAPTER 6 – WASTEWATER

6.00 Extension of the Sewer System and Service

A. General

Sewer main extensions are required to assure orderly and adequate extension of the sewer utility system. These extensions are to be in accordance with requirements of development and service availability as established by the City and the Washington State Department of Ecology.

B. Main Line Extensions

1. Design and construction of sewer mains and facilities, including but not limited to: sewer lift stations, telemetering facilities, and appurtenances shall be in compliance with the latest edition of the City's ordinances, these Standards, the Standard Details and the latest issue or revision of "Criteria for Sewage Works Design" published by the Washington State Department of Ecology, the current WSDOT Standard Specifications.
2. The minimum size sewer main to be installed shall be 8-inches. Larger sewer mains will be required where it is determined by the City that an 8-inch sewer is inadequate to handle the capacity of the users in the new or downstream facility, or for future service needs.
3. Minimum slopes of main lines shall be designed to provide a minimum velocity of two (2) feet per second. All dead end sewer mainline runs shall have a minimum of one percent (1%).
4. Manholes shall be placed at all angle points in the line, change in slope, and at the end of the line. Manhole shall be spaced no further than four-hundred (400) feet apart, unless authorized above by the city engineer. Manholes shall also have two tenths (2/10) of a foot slope from inflow to outflow unless otherwise approved by the City. The crown of all upstream pipes shall not be lower than the crown of the downstream pipe.
5. Sewers shall be located within public right-of-way whenever possible. All sewer mains designed on public utility tracts or easements shall have a minimum of one percent (1%) slope and shall be offset from the property line a minimum of five (5) feet with manhole accesses located on offsets ten (10) feet from property line and property corners.
6. Sewer mains shall be extended through and to the extremes of the property being developed, to provide connection points for future development of unserved

property as determined by the City. The depth of the main shall be determined by the Engineer. This shall be done by evaluating the feasible drainage basin that could contribute to that mainline and design the depth accordingly.

7. All manholes and cleanouts shall be constructed to finished grade. Any re-adjustment of finish grade by the Applicant or lot owner shall require that party to adjust the manhole and/or cleanout fixtures to the new finished grade.
8. All manholes in unimproved surfaces shall be two (2) feet higher than surrounding grade. All cleanouts in unimproved surfaces shall be constructed to finished grade. Further, a 3-foot diameter concrete pad is required around all cleanouts.
9. Rights-of-way or easements shall be provided to the City for access and maintenance of all conveyance systems, or other facilities as deemed appropriate by the City Engineer, within the development site, which are to be maintained by the City. The minimum widths of rights-of-way or easements shall be as follows, although the City Engineer may require increased widths when necessary to insure adequate area for equipment access and maintenance:
 - a. Pipes with an inside diameter less than or equal to thirty-six (36) inches: twenty (20) feet;
 - b. Pipes with an inside diameter greater than thirty-six (36) inches: twenty (20) feet or larger as required by the City;
 - c. Pipes shall be centered within the right-of-way or easement;
 - d. Pipes with more than a seven (7) foot depth to the invert shall require wider easements. A slope of one (1) horizontal to one (1) vertical from the storm drain invert to the ground surface shall be used in determining easement width.

No buildings or other structures that prevent access are permitted within rights-of-way or easements. Fences crossing rights-of-way shall provide gates of sufficient width to provide access by maintenance vehicles.

When possible, easements for apartment complexes or commercial/industrial developments shall be in parking lots, private drives, or similar areas that allow unobstructed vehicle access for maintenance.

C. Side Sewers

1. Side sewer permits for commercial and multifamily projects will be issued to owners as an extension agreement pre-construction requirement and shall be installed by a licensed, bonded and insured contractor. The Owner is required to make application and pay all necessary fees to obtain a permit. The side sewer can be installed as part of the mainline extension and put in use only after acceptance of the mainline system by the City.

2. A subdivider shall stub side sewers to the property line and terminate it in a cleanout. Side sewer permits for lots will be issued for installation only after the final plat is recorded. The lot owner or his licensed, bonded and insured contractor is required to make application and pay all necessary fees, obtain a side sewer permit and connect the side sewer from the mainline lateral to the house plumbing.
3. A separate and independent side sewer shall be provided for every building except where one building stands at the rear of another on an interior lot and no private sewer is available or can be constructed to the rear building through an adjoining alley, court, yard, or driveway, the side sewer from the front building may be extended to the rear building.
4. Where, because of physical complications the city engineer finds that it may be necessary or beneficial to allow two adjacent buildings to connect to the public sewer through a common side sewer; such connection will be allowed by written approval. Old side sewers may be used in connection with new buildings only when they are found, on examination or test to meet all requirements of the KEDM.
5. Pipe material for side sewers shall be the same as the pipe material used on the mainline in that area, unless otherwise approved by the City Engineer.
6. Side sewers shall have an internal diameter not less than six (6) inches. If more than one occupied building is attached, or the possibility to attach additional structures exists the diameter of the side sewer shall not be less than eight (8) inches.
7. Minimum slopes of side sewers shall be designed to provide a minimum velocity of two (2) feet per second. All dead end sewer mainline runs shall have a minimum of one percent (1%).
8. Side sewers shall be laid in straight horizontal alignments. Changes in horizontal alignment shall be made only with wye branches, bends, or a combination of wye branch and bend. Changes in horizontal alignments greater than twenty-two (22) degrees shall be made with a cleanout. No changes in horizontal alignment shall be allowed within right-of-way.
9. Cleanouts shall be placed at the property lines of all lots. Additional cleanouts including those for commercial and industrial properties shall be installed at locations designated by the City Engineer. In no case shall the distance between cleanouts exceed one-hundred (100) feet.
10. Test tees shall be installed at any required or other points to ensure that all portions of the side sewer can be tested. It is the responsibility of the permit holder to install all risers, cleanouts, castings, concrete blocks, etc. before the side sewer will be approved.

11. Minimum cover for all side sewers shall be eighteen inches, except; minimum cover for side sewers at property line shall be four feet below the crest of the right-of-way easement, and minimum cover for side sewers crossing a ditch in the right-of-way or easement shall be two (2) feet, six (6) inches.
12. Water mains parallel to a sewer will normally be above and separated by a distance of ten feet horizontally.

Under unusual circumstances, the horizontal spacing may be adjusted subject to the approval of the city engineer. Water mains crossing sewers should not be less than three feet above the sewer. Where it is necessary for a sewer to cross within eighteen (18) inches or over the water main, the sewer shall be constructed of ductile iron for a distance of ten feet on either side of the water main as approved by the city engineer. At no time shall the water main design not be in accordance with the DOE Orange Book

13. The location of all side sewers crossing curbs shall be indicated by an “S” stamped into the concrete curb.

D. Tracer Wire

Tracer wire shall be installed on all sanitary mains and side sewers.

E. Materials

1. Pipe material for side sewers shall be as follows:
 - a. Solid Wall PVC Sanitary Sewer Pipe: WSDOT Standard Specification 9-05.12(1);
 - b. Profile Wall PVC Sanitary Sewer Pipe: WSDOT Standard Specification 9-05.12(2);
 - c. Ductile Iron Sewer Pipe: WSDOT Standard Specification 9-05.13;
 - d. ABS Composite Sewer Pipe: WSDOT Standard Specification 9-05.14;
 - e. HDPE Pipe: WSDOT Standard Specification 9-05.21.
2. Pipe material for sewer mains shall be as follows:
 - a. Ductile iron pipe: ANSI A21.51 Thickness Class 51;
 - b. PVC pipe and fittings; ASTM 3034, SDR35 with Elastomeric Gasket
3. All joints and connections shall be airtight and watertight, as determined by the testing and inspection procedures outlined in this chapter. Joints for ductile iron pipe shall be push-on type or mechanical joint conforming to WSDOT standards specifications. Joints for concrete pipe shall be rubber gasketed coupling type conforming to the WSDOT standard specifications. Pipe and jointing shall be installed in accordance with the instructions furnished by the pipe manufacturer and

approved by the city engineer. Other jointing materials and methods may be used only with the approval of the city engineer.

F. Fees and Charges

All fees and charges related to development shall be in accordance with the latest requirements of the KMC.

G. Latecomer Agreements

Should the Applicant deem that the utility extension as an undue hardship and will benefit other property owners, the Applicant may request for a latecomer agreement, in accordance with the KMC.

6.01 Plans and Specifications

All extensions to the sewer system shall conform to the most recent design standards of the City and other requirements of the City. All work and materials shall be in accordance with this document and the WSDOT Standard Specifications. Where conflicts exist, the more stringent specification shall apply. The system must be capable of future expansion and be constructed of permanent materials.

The installation of sewer extensions shall be in accordance with construction plans and specifications prepared by the Applicant's engineer and reviewed and approved by the City.

6.02 Connection to Existing Systems

- A. Connection of new pipe lines to existing manholes shall be accomplished by using provided knock-outs. Where knock-outs are not available the manhole shall be core drilled for connection.

Connection to an existing manhole requires the installation of ¼ -inch mesh screen in the downstream line while making connection to eliminate debris from entering the existing system. Where a heavy flow exists in the connection manhole and when unable to use the ¼-inch mesh screen, due care should be used to keep debris out of the downstream line.

- B. Connection of a pipe line to a system where a manhole is not available shall be accomplished by pouring a concrete base and setting manhole sections. The existing pipe shall not be cut into until approval is received from the City.
- C. Connections to manholes using inside or outside drop structures shall be as approved by the City.
- D. Connection of new service laterals to existing mains shall be a minimum of 6-inches

and shall be accomplished by tapping the main where the lateral is to be installed using a 6" PVC tee, Romac saddle or approved equal. All taps shall be accomplished in the presence of a City inspector at the Owner's expense. The new service lateral shall be constructed of the same material as the main.

- E. Connection of a side sewer greater than six (6) inches in diameter shall require a manhole connection.

6.03 Roadway and Railway Crossing

The Owner shall use the method, which has been designed on the plans and is acceptable to the City and the governmental or private agency having control of the road or railway. Permits are required, shall be obtained, and written documentation provided to the City prior to the City granting construction approval.

6.04 Trench Excavation

- A. Trench excavation shall be completed in accordance with the WSDOT Standard Specifications.
- B. Trenching operations shall not proceed more than one-hundred (100) feet in advance of pipe laying except with written approval of the City.
- C. When trenching operations involve cutting through concrete pavement, the removal and reconstruction of the entire concrete panel shall be required.
- D. Where a sewer main crosses under an A.C. water main the Contractor shall replace the existing A.C. main over the excavation with Ductile Iron Pipe Class 52 to a point of bearing soil a minimum of three (3) feet each side of the excavation.

6.05 Pipe Laying

Pipe laying shall be in accordance with the WSDOT Standard Specifications.

6.06 Pipe Bedding

Imported bedding will be required of all sewer pipes and service pipe, located under pavement, curb, sidewalk, or usable shoulder. Bedding shall be compacted and tested every five-hundred (500) feet per the WSDOT Standard Specifications prior to placement of the next layer.

6.07 Pipe Backfilling

- A. Pipe installations shall be backfilled in accordance with the WSDOT Standard Specifications and the manufacturer's specifications.

- B. No backfill shall be placed over the pipe until the work has been inspected and approved by the City. Any portion of the sewer covered before inspection shall be uncovered at the owner's expense within two days after notice to do so has been issued by the City.
- C. Trenches shall be carefully backfilled by tamping to a depth of six inches above the pipe. All backfill shall be Class B in accordance with WSDOT Standard Specifications.

6.08 Pipe in Filled Areas

Where pipe is to be installed in filled areas, special treatment may be required at the discretion of the City. This treatment may consist of compacting the backfill in 6-inch layers, careful choice of backfill materials, use of Mechanical Joint Ductile Iron Pipe in short lengths, or such other reasonable method or combinations as may be necessary or as required by the City.

6.09 Cleaning and Flushing

Clean and flush per the WSDOT Standard Specifications.

6.10 Testing of Gravity Sewers

Test all sewers per the WSDOT Standard Specifications

6.11 Testing of Manholes

All manholes shall be hydrostatically tested. In substitution for hydrostatic testing all manholes may be vacuum tested.

6.12 Television Inspection

- A. Sanitary sewers shall be inspected by the use of a television camera before acceptance. The costs incurred in making the inspection shall be borne by the Applicant.
- B. Films shall be submitted to the City on DVD.
- C. The Applicant shall bear all costs incurred in correcting any deficiencies found during television inspection including the cost of any additional television inspection that may be required by the City to verify the correction of said deficiency.
- D. Test films will become the property of the City.

6.13 Testing of Pressure Sewer Mains

Test all pressure sewer mains per the WSDOT Standard Specifications.

6.14 Manholes

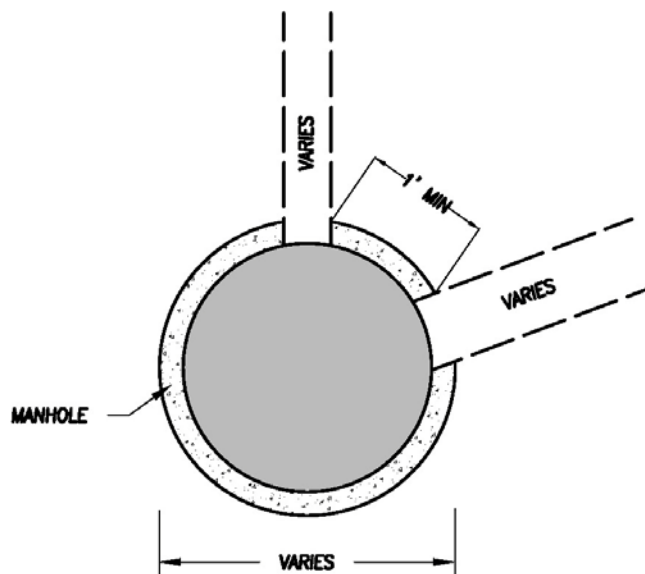
The Contractor is to grout and channel one manhole to prove proficiency in concrete work to City inspectors. Work may continue on remaining manholes (in an as good or better standard) after acceptance.

- A. Materials and construction shall be per the WSDOT Standard Specifications.
- B. Manhole sizing
 - 1. 48-inch Manhole
 - a. Two (2) connecting pipes, 8-inch to 12-inch diameter.
 - b. Three (3) connecting pipes, 8-inch to 10-inch diam., perpendicular.
 - c. Four (4) connecting pipes, 8-inch diam.
 - 2. 54-inch Manhole
 - a. Two (2) connecting pipes, 8-inch to 12-inch with more than forty-five degree (45°) deflection, 15-inch to 18-inch diam. with forty-five degree (45°) or more deflection.
 - b. Three (3) connecting pipes, 10-inch to 12-inch diam., perpendicular.
 - c. Four (4) connecting pipes, 10-inch to 12-inch diam., perpendicular.
 - 3. 72-inch Manhole
 - a. Two (2) connecting pipes, 15-inch to 18-inch diam. with less than forty-five degree (45°) deflection.
 - b. Three (3) connecting pipes, 15-inch diam., perpendicular.
 - c. Four (4) connecting pipes, 15-inch diam., perpendicular.
 - 4. In the above criteria "deflection" refers to the angle between any two (2) pipe channels in the manhole. Channels shall be centered in manhole with ladder rungs placed on side with larger shelf.

For other pipe configurations, the size of the manhole shall be approved by the City.

- C. Locking manhole covers shall be provided in areas outside of the public right-of-way.
- D. At all manhole connections where the groundwater level is above the invert of the connecting sewer or sewers, the Contractor shall install a Wrapid Seal on each connection in accordance with the written instructions of the seal manufacturer.
- E. The contractor shall furnish and install "Man Pan" (shallow dish) watertight manhole cover inserts, or an approved equal, in new manholes and in existing manholes as shown on the Plans.

Figure 6-1: Manhole Sizing



6.15 Side Sewers

A. General

Owners of properties located within the sanitary sewer services area with conventional service available shall be required to extend from the structure plumbing system to the main line side sewer connection.

Each premises shall have a separate sewer connection except where special conditions exist as delineated in this chapter. Any person desiring sewer service for any premise shall make application at the City Hall. The application shall be made on a printed form furnished by the city for that purpose.

B. Application for Side Sewer Permit

Before construction and connection of a side sewer on public or private property, the Owner is required to apply for and have a permit issued by the City.

- C.** All applicants that obtain or can obtain water from sources other than municipal supply may be required to supply the public works department with an inorganic analysis of the water from such other sources before application for sewer service will be approved.
- D.** Applicants for sewer service for industrial or commercial establishments shall be required to have an approved water meter installed if such meter is not already installed. Such meters shall be used by the city to determine sewer use charges.

- E. Applicants desiring to make a new connection to the public sewer for the purpose of discharging industrial wastes shall prepare and file with the city engineer a report that shall include actual or predicted data relating to the quantity and characteristics of the waste to be discharged and such other information as the city engineer may require.

6.16 Pump Stations

- A. Pump stations shall only serve those properties which cannot otherwise be served by conventional gravity sewers, as determined by the City Engineer.
- B. Unless otherwise authorized by the City Engineer, all pump stations shall be designed in accordance with the requirements of the latest edition of the City of Vancouver “General Requirements and Details for Sanitary Pump and Lift Stations,” with the following amendments:
 - 1. In all cases, the design shall conform to the requirements of the Washington State Department of Ecology;
 - 2. The installations of Romtech (or approved equal) prefabricated lift stations shall be installed unless otherwise approved by the City Engineer;
 - 3. Pumps shall be four-hundred and sixty (460) volt, three (3) phase Flygt pumps or approved equal;
 - 4. All check valves shall be Flygt ball check or approved equal;
 - 5. A yard hydrant shall be provided on the downstream end of the potable water service;
 - 6. Transducers shall be used in place of floats unless otherwise approved by the City Engineer;
 - 7. Telemetry shall be Mission RTU with US filter controller;
 - 8. Exterior lighting shall be installed;
 - 9. An approved lift station sign shall be installed;
 - 10. All pump stations shall be furnished with fixed on-site generation supplied with natural gas;
 - 11. City of Kelso Standard Details shall be used on the installation of water service, backflow preventer, and combination air valve with odor control;

12. An air discharge permit, naming the City of Kelso as the owner, shall be obtained from the Southwest Washington Clean Air Agency.

6.17 Mechanical Lifting Devices

- A. Mechanical lifting devices such as ejectors, pumps, or other equally efficient approved mechanical lifting devices shall be installed in any building, structure, or premises in which the elevation of plumbing fixtures is too low to permit gravity flow to the public sewer, or achieve the minimum slope requirement.
- B. When only the lower floor(s) of a structure is too low for gravity flow, the remaining floors must flow by gravity.
- C. The discharge line from the mechanical lifting device shall be provided with an accessible backwater valve and gate valve. The discharge line shall connect to the gravity side sewer at the crown through a wye fitting.
- D. When there is a possibility that the sewer may backup in the side sewer from the pressure, minimum elevations may be prescribed by which gravity flow may be obtained, and any fixture below the prescribed elevation a backwater valve shall be installed at the owner's expense.
- E. All pump or mechanical lifting device installations must meet pertinent building and plumbing codes and must be approved by the city engineer before installation

6.18 Pretreatment Facilities

- A. Where required, in the opinion of the city engineer to modify or eliminate wastes that are harmful to the structures, processes or operation of the sewage disposal works, the owner shall provide at their expense such pretreatment facilities as may be necessary to render their wastes acceptable for admission to the public sewers.
- B. All wastes containing soil, dirt, and/or sand shall be settled a minimum of two hours in an acceptable basin before discharge to a sewer.
- C. All industrial wastes shall be pre-treated in accordance with the KMC.
- D. Plans specifications and any other pertinent information relating to proposed pretreatment or processing facilities shall be submitted to the city engineer for review and comment if the effluent from such facilities is to be discharged into the public sewers. Any costs associated therewith shall be borne by the applicant.
- E. Where required by the city engineering, the owner of any property serviced by a sewer carrying industrial wastes shall install a suitable control manhole in each building sewer to facilitate observation, sampling, and measurement of the wastes. The manhole shall

be accessible and safely located and shall be constructed in accordance with plans approved by the city engineer. Any costs for pretreatment facilities shall be borne by the customer.

- F. Pretreatment facilities provided for any waters or wastes shall be maintained continuously in satisfactory and effective operation by the owner at their expense.
- G. Waste samples from pretreatment facilities shall be taken at a minimum of 50 samples per operating day. Other control variations will be acceptable if it can be demonstrated that the sampling procedure will result in a waste sample which is proportional to the waste flow; but in no case shall the daily collected sample be less than two quarts in volume. The flow measurement and sampling station shall be located and constructed in a manner acceptable to the city for approval prior to construction. The person discharging the waste shall keep flow records as required by the city and shall provide qualified personnel to properly maintain and operate the facilities.
- H. Waste samples will be analyzed at the regional wastewater treatment plant. Any cost connected with the testing shall be borne by the user. Laboratory procedures used in the examination of wastes shall be those set forth in "Standard Methods" However, alternate methods for certain analyses of industrial wastes may be used.