

SECTION 400

400. STORMWATER MANAGEMENT FACILITIES (SMF) AND SANITARY SEWER

410. General

- A. The City of Hillsboro has adopted the Clean Water Services Design and Construction Standards (CWS Standards). All sanitary sewer, closed storm conveyance, treatment, and stormwater management facilities (SMF) must at a minimum meet the CWS Standards, and when the City standard is higher, the requirements of this section.
- B. Public sewer facilities shall be designed to allow the logical service of all parcels or tracts of land within the basin. Sewer lines shall be extended, at owner's or developer's expense, to adjacent parcels to facilitate future development. Sewer facilities shall be designed to accommodate all future (full build-out) flows from upstream development.
- C. Manufactured tees shall be utilized during the construction of new public storm and connections to existing sanitary sewer lines with a diameter of 15 inches or less. Inserta-Tees shall not be used when building new sanitary systems.
- D. Permanent compression style (Cherne) plugs are not allowed. Compression plugs may be used for testing purposes only. Permanent plugs for the ends of mainlines and laterals shall be rigid pipe plugs or caps. Cleanouts shall end with a threaded cap fitting. All fittings shall be watertight and conform to the specifications of the host pipe material. The pipe trench shall be properly compacted to ensure that the plug or cap is sufficiently restrained. This requirement applies to sewer lines proposed to be extended with later phases of development as well.
- E. Manhole components shall conform to the following requirements:
 - 1. Standard manholes require a minimum of one 2-inch concrete grade ring. Flat top manholes require a minimum of 4 inches of concrete grade rings.
 - 2. No metal grade rings shall be used on new manholes. A maximum of one metal grade ring may be allowed on existing manholes for pavement overlays.
 - 3. Up to 12 inches of concrete grade rings may be used for adjusting the elevation of manhole castings. Elevation adjustments greater than 12 inches require an additional section of manhole be installed.
 - 4. All manholes shall use standard 7-inch castings.
 - 5. To prevent manhole lids from rocking and clanging, the contractor shall ensure the following requirements are met prior to inspection and acceptance by the City:
 - a) All new manholes must use a Screw Adjustable System for cast iron manhole cover rings. Use standard detail COH 410-0.
 - b) The lid sits flat within the frame and attain a true bearing all around.
 - c) Bearing surfaces have been machine planed or ground by the manufacturer prior to delivery to the jobsite.

d) All lids shall be test fit to frame prior to installation.

6. Manholes lids shall not encroach into the wheel-path, as defined in Figure 410.1.

7. Manholes in roadways having a speed limit of 30 MPH or higher require a bolt-down lid. See Std. Drg. No. 410-1.

8. Defective manhole channels shall be corrected by removing and replacing the defective channel in its entirety.

9. All new inside drop manholes must be at least 60 inches in diameter, or be an equivalently sized rectangular structure approved by the City.

10. Inside drop manholes shall use drop bowls. The maximum slope of the pipe entering the drop bowl is 2 percent.

11. Manholes that are in a flood plain or may be inundated require an EJ 4 lock Composite Manhole Casting/Lid or City of Hillsboro Engineer approved equal. These frames and castings are to gasketed and watertight.

12. Unless approved by the City through a design exception process section 160, all manhole frames and lids on projects shall be new.

F. Prior to acceptance, all new public sewer lines shall be thoroughly cleaned, tested, and then inspected by the contractor in accordance with CWS standards. Work shall be completed by the contractor and approved by the City prior to paving. An electronic and paper copy of the video inspection report in NASSCO PACP format, produced by a certified NASSCO operator, shall be submitted to the City.

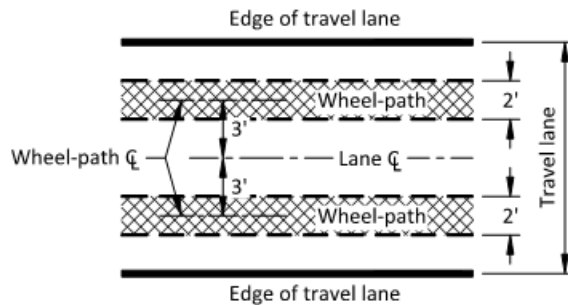
1. SMF associated with the development shall have all accumulated sediment deposited during construction removed and surface condition restored to as designed conditions.

G. Prior to acceptance of new infrastructure at the conclusion of the maintenance warranty period the following will be performed by the responsible party (owner, developer, or builder):

1. All public stormwater and sanitary sewer infrastructure created and used by the associated development shall be thoroughly cleaned, then video inspected. An electronic and paper copy of the video inspection report in NASSCO PACP format, produced by a certified NASSCO operator, shall be submitted to the City for review and approval prior to release of the maintenance assurance.

2. All City streets used and associated with the development shall be cleaned and all accumulated debris shall be removed.

Figure 410.1 – Wheel-path



3. SMF associated with the development shall have all accumulated sediment deposits removed.
 4. SMF shall be replanted or restored to new or like new condition.
- H. Prior to final approval of any building associated with new subdivisions the following shall be performed by the responsible party (owner, developer, or builder):
1. All City streets used and associated with the development shall be cleaned and accumulated debris shall be removed.
 2. SMF associated with the development shall have all accumulated sediment deposits removed.
 3. SMF shall be replanted or restored to new or like new condition.
- I. See Figure 210.7 in Subsection 210.2.C for standard storm and sanitary sewer locations.
- J. Type CG-2 inlets shall not be used on public streets with standard curbs. Type CG-2 inlets may be used when mountable curbs are proposed.
- K. Wye connections shall be installed for all sanitary laterals between the top of line manhole and next downstream manhole.

420. Stormwater Management Facilities (SMF)

A. SMF Order of Precedence

1. The following table lists the various types of SMF by order of precedence. Prior to receiving City approval, the Engineer must demonstrate that the preceding facility types aren't feasible.

Table 420.1 – SMF Order of Precedence

Order	Facility Type	Remarks
1 st	Enhancement and/or Expansion of an Existing Public Vegetated SMF	See Subsection 420.B
2 nd	New Public Vegetated SMF Serving Multiple Tax Lots and/or Public Streets	Requires recorded storm and access easements if located on private property.
3 rd	Private Vegetated SMF Serving a Single Tax Lot	Located on private property. Privately owned and maintained by property owner.
4 th	Street-side Infiltration Planter in the Public ROW	See Subsection 420.1.A.4
5 th	Public/Private Proprietary Treatment Facility	Requires a recorded access easement if located on private property. The selection of proprietary treatment facility types must be in accordance with CWS 4.05.8.
6 th	Fee-in-lieu	See Subsection 190

B. Use of Existing SMF

1. Use of an existing SMF to meet treatment and/or detention requirements is allowed subject to the following conditions:
 - a) The existing facility must meet current standards and be functioning correctly. Existing facility deficiencies or deferred maintenance may need to be corrected by the developer proposing to use the existing facility.
 - b) Expansion of existing facilities for treatment of new development may require additional enhancement to the remainder of the facility, in addition to the expansion.
 - c) Enhancement of facilities may qualify for a partial or full SDC and fee-in-lieu reduction of charges.
 - d) Existing facilities shall not be removed until a new facility has been constructed and accepted by the City. The new facility shall have a minimum treatment capacity equal to the facility being removed.

420.1. Stormwater Management Facilities

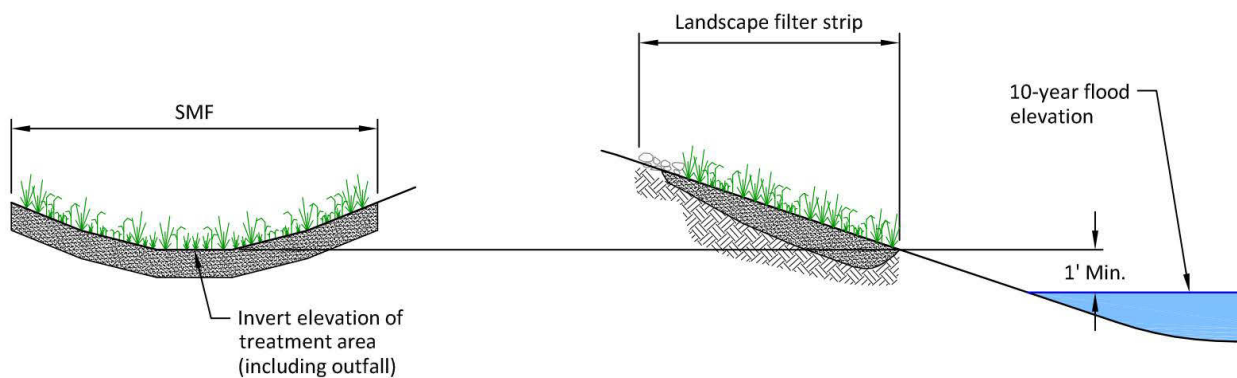
A. General Requirements

1. SMF, including side slopes, retaining walls, perimeter fencing and all associated structures, shall not be installed within a PUE, sanitary sewer, water, or other incompatible public or private easement.

2. LIDA swales and infiltration planters shall be constructed with a perforated drain pipe underdrain system connected to a downstream public or private storm system unless the following is shown:
 - a) A geotechnical or drainage report concludes that infiltration at the proposed location is a minimum of 2 inches per hour during all times of year.
 - b) The drain rock of the facility can be installed above the elevation of the water table.
3. No utility lines shall be located under any type of facility with the exception that service lines may be installed under facilities within the ROW.
4. Private facilities constructed on individual single-family residential lots shall only be located within the front yard or street-side of the property and have a gravity connection to the public storm system, surface water body, or other approved point of discharge.
 - a) Private facilities located on single-family residential lots shall be accessible and maintainable by the property owner.
 - b) Private facilities located on single-family residential lots can be deferred by the developer to the builder to construct during the time of the single family residential construction. To defer construction, the developer shall show an outline of where to construct each facility on each individual lot including all upstream and downstream gravity connections on the Public Infrastructure Permit Plans. Plans shall include a note identifying that the builder is responsible to construct each facility during the time of construction on each residential lot.
 - c) The Builder shall obtain individual Building Department permits for each residential lot.
 - d) A Private Maintenance Agreement for each lot shall be signed and recorded prior to final approval for each facility.
 - e) Small improvements creating and/or modifying 1,000 square feet or more of new impervious surface which do not create the requirement for Public Infrastructure Plans/Site Development Plans shall provide the following to obtain a Building Permit:
 - i. LIDA facility sizing calculations based on CWS treatment requirements;
 - ii. Site plan showing an outline of where to construct each SMF including all upstream and downstream gravity connections
 - iii. Approved planting plan, maintenance plan, and detail for each facility created.
 - iv. A Private Maintenance Agreement with each lot shall be signed and recorded in order to sign off and final each facility at the completion of construction.

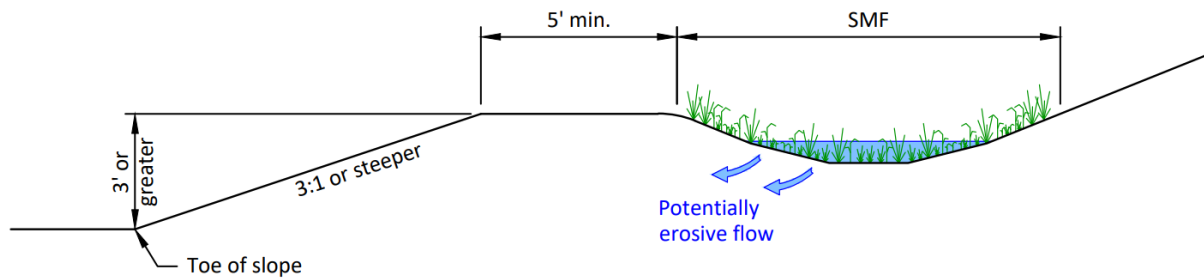
5. Installing a SMF that utilizes infiltration as a method for treatment or functionality will require proof of an infiltration rate of 2 inches per hour or greater. Onsite field testing must be completed and certification shall be provided in a drainage report that is stamped by a qualified civil engineer (PE). A factor of safety of 2 shall be used. The City reserves the right to request additional data to ensure infiltration rates are meeting requirements.
6. SMF shall be designed to prevent backwatering into the facility during storm events.
 - a) The invert elevation and the permanent pool elevation of the facility's treatment and detention area and all associated conveyance structures, excluding the outfall, must be constructed at least 1 foot in elevation above the 10-year storm event water surface elevation at the point of discharge. The outfall invert must be constructed no lower than the 10-year storm event water surface elevation at the point of discharge. This requirement applies to all types of facilities, including underground detention systems. Facilities designed at or below the 100-year flood elevation shall include additional analysis of backwater effects during the 10, 25, and 100 year storms, as applicable, and include a maintenance plan with more frequent routine maintenance by the owner.
 - b) Landscape filter strips must be constructed at least 1 foot above the 10-year flood elevation.

Figure 420.1 – Minimum Elevations for Stormwater Management Facilities



7. Any SMF designed into a slopes steeper than 3:1 and exceeding 3 feet in height shall be designed with a 5 foot minimum setback as shown in Figure 420.2.

Figure 420.2 – Minimum Setback on Slopes



B. Requirements for SMF constructed within the ROW.

1. When private development creates new, or alters existing, impervious surface within the ROW and no other treatment options are available, construction of new public SMF within the ROW will be allowed. The facilities shall be designed to the City public standards and the City will own and maintain each public facility.
2. No trees may be planted within the defined facility boundary.
3. Utility service lines must be installed below the facility's drain rock.
4. Franchise utilities such as conduit, pedestals, vaults, or junction boxes shall not be allowed within the defined facility boundary.
5. Water meters, fire hydrants, street signs, street lights, and other City utility infrastructure shall only be installed in the upland slope opposite the curb (if present) and not within the defined treatment area of the facility. Installation of such equipment shall not damage subgrade components of the facility.
6. Street-side Infiltration Planters:
 - a) Require adjacent maintenance vehicle access, without closing a travel lane, on streets with a posted speed of 35 mph or higher. Maintenance vehicle access shall be a minimum of 10 feet in width and 30 feet in length.
 - b) Require a 3-foot or wider step-out zone for access to parked car doors when adjacent to on-street parking.

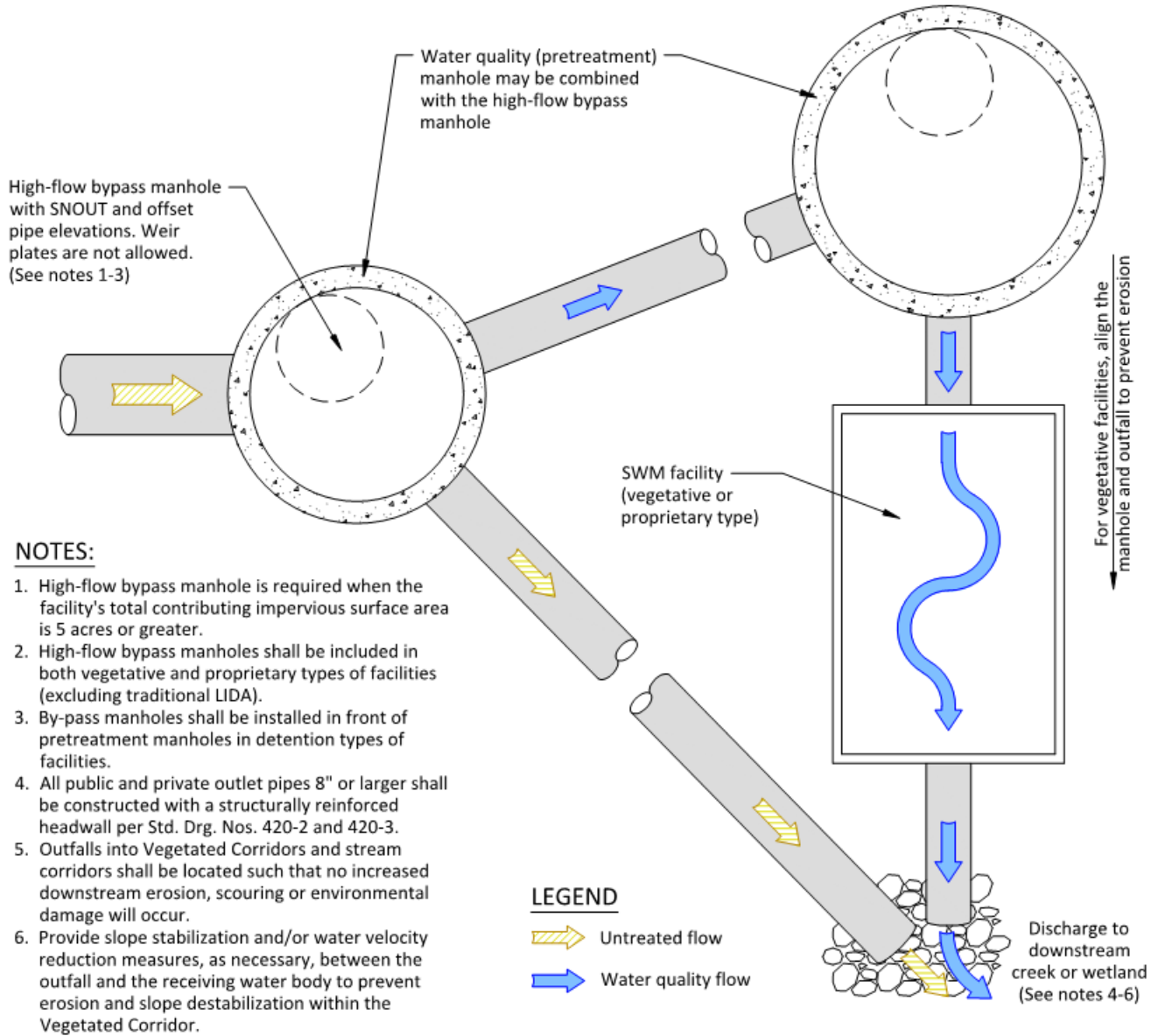
C. Pretreatment

1. Water quality manhole (WQMH) shall be installed in locations that require minimal traffic control to access.

D. High-Flow Bypass

1. Treatment facilities shall include a system to bypass flows larger than the stormwater management facility's flow if the facility's total contributing impervious surface area is 5 acres or larger.
2. High-flow bypass systems shall be installed for all end of pipe type of facilities. Facilities that directly receive sheet flow do not require a bypass system.
3. High flows shall be diverted upstream of pretreatment manholes.
4. The bypass shall be constructed with a stilling basin at the outfall.

Figure 420.3 – SMF Design Diagram



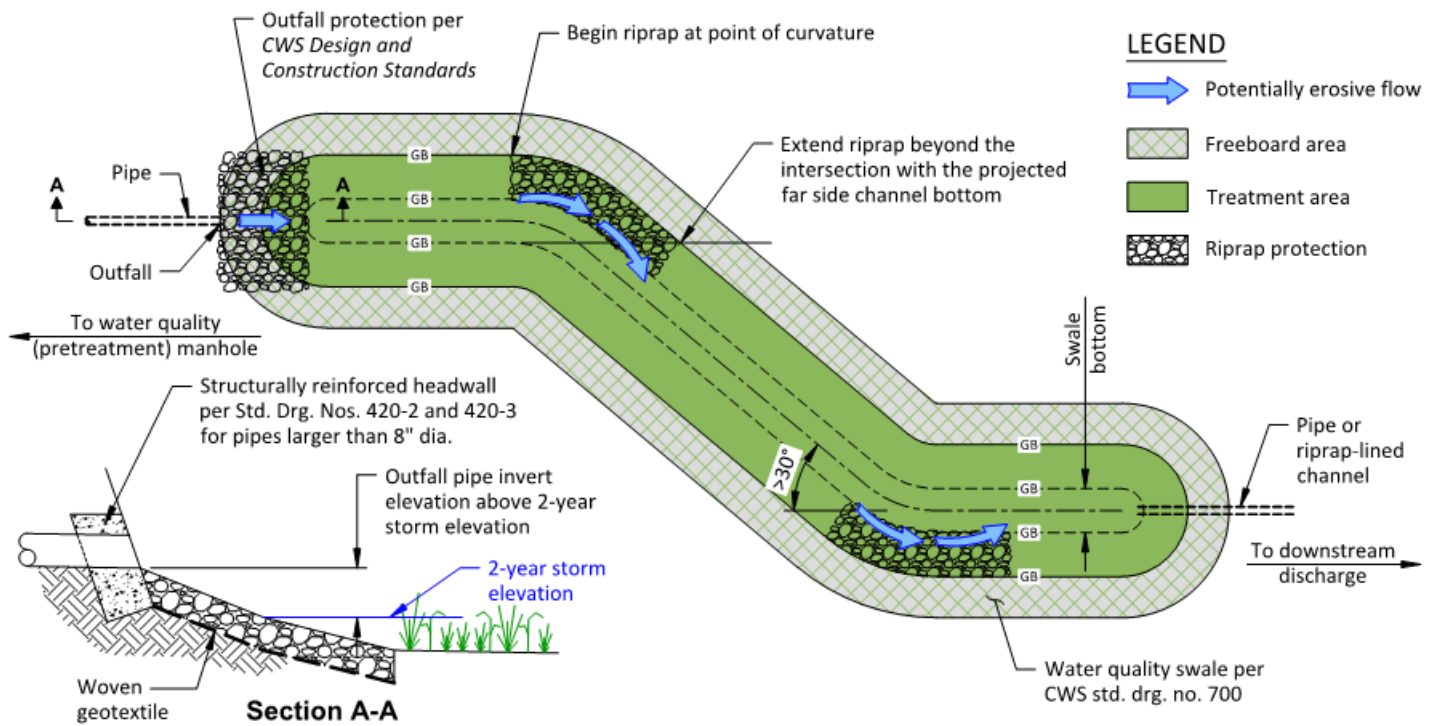
E. Outfalls

1. When required, headwalls shall be constructed per Std. Drg. No. 420-2 or 420-3.
2. SMF Outfalls into Vegetated Corridors and stream corridors shall be located such flows are evenly dispersed using appropriate velocity reduction methods and are not concentrated prior to discharge into the vegetated corridor.
3. Outfall inverts in detention facilities shall be located above the 2-year storm event surface elevation.
4. Outfalls into SMF shall be aligned and orientated according to the following:
 - a) Linear facilities: Outfall should direct flows parallel to the centerline of the treatment channel.
 - b) Pond facilities: Outfall should direct flows to the center of the pond.
 - c) Outfalls shall not be located in close proximity to a facility's outlet which may reduce retention time and treatment efficiency. The storm drainage report must demonstrate that flow from each outfall location will receive the required treatment and detention time within the facility prior to discharge.
5. Provide slope stabilization and/or water velocity reduction measures, as necessary, between the outfall and the receiving water body to prevent erosion and slope destabilization within the Vegetated Corridor.

F. Riprap

1. For facilities with no high-flow bypass manhole, riprap armoring is required on the outside corners within the treatment channel anywhere the channel changes direction more than 30 degrees as shown in Figure 420.4.
2. Outfall riprap pads must be constructed above the permanent pool elevation of all proposed or repaired outfalls to provide energy dissipation.

Figure 420.4 – Riprap Protection at Vegetative SMF



G. Facility Elevation Details

1. Plans shall include Standard Details Nos. 1 through 3, as applicable for each facility type, in order to identify the design elevations of the facility. The information shown on the detail must match the design shown in the plans and the stormwater report.

H. Vegetation

1. All trees planted within any vegetative SMF shall be located within the freeboard area and not within the treatment or mid-slope areas.
2. Public SMF shall not be planted with fruit bearing vegetation or vegetation types that contain thorns. Vegetation deemed by the City that becomes excessively large when mature will not be allowed within the limits of the facility.
3. Planting plans shall include Standard Detail No. 4, listing all plants in the facility. Plant size, quantity, and species shall meet CWS requirements.
4. All facility vegetation must meet sizing requirements at final inspection. 100 percent of all required plant stock must be correctly planted and alive to receive a final approval and move the facility into the warranty period.

5. A minimum of 80 percent survival of each plant community is required in order to release the 2-year maintenance assurance (warranty bond).
 - a) If 80 percent survival has not been achieved by the end of the warranty period, replant and add the necessary vegetation to meet the survival requirement. Replanting will extend the maintenance assurance period up to an additional 2 years.

I. Filter Vaults

1. Filter vaults should be located in non-traffic or light traffic locations and require maintenance vehicle access without closing a travel lane. Vault location needs to include sufficient access for the City's vacuum cleaning truck.
2. Filter vault access hatches need to provide sufficient maintenance access. Standard manhole lids do not provide sufficient access. Vault access hatches should be rated for the appropriate traffic loading. Large hatches should be equipped with a spring assist system for easy opening. Hatches located within sidewalks require a non-skid walking surface.
3. A water quality manhole is required for pretreatment upstream of all filter vaults per Section 420.1.6.C and 420.1.6.D.

420.2. SMF Access and Maintenance

- A. All SMF shall provide vehicle access to within 10 feet of all outfalls and stilling basins within the facility.
- B. All SMF shall be maintained in accordance with CWS standards and Table 420.2. until accepted by the City.

Table 420.2 – Required Warranty Period SMF Maintenance Actions

Category	1-Year Infrastructure Warranty Period Required Maintenance Actions
Infrastructure	At the end of the 1-year warranty period, all stormwater infrastructure shall be inspected and cleaned to remove all accumulated sediment and debris.
Sedimentation	At the end of the 1-year warranty period, all sediment and/or debris deposited within the stormwater management facility shall be removed.
Earth Movement	Prior to the end of the 1-year warranty period, all earth movement (e.g., sinkholes, slump, scour, rill, stripping, etc.) shall be investigated and repaired when required by the manager. Areas demonstrating such deterioration must be temporarily stabilized if a permanent repair cannot be immediately performed.
Proprietary Treatment	At the end of the 1-year warranty period, proprietary treatment systems containing filter cartridges or using other forms of mechanical or manufactured treatment shall be visually inspected and maintained per the manufacturers' specifications.
Underground Detention Pipe/Systems	At the end of the 1-year warranty period, underground detention pipe systems shall be visually inspected and maintained per the manufacturers' specifications.
Damage & Repairs	At the end of the 1-year warranty period, all damaged and failing stormwater and vegetative corridor infrastructure shall be repaired and/or restored to an equivalent or improved condition when required by the manager.
Category	2-Year Plant Establishment Warranty Period Required Maintenance Actions
Vegetation	<p>All planted stormwater management facility and vegetative corridor vegetation shall be maintained quarterly (4x annually) during the 2-year plant establishment warranty period to the following requirements:</p> <ol style="list-style-type: none"> 1. Remove all weeds, invasive, and volunteer vegetation quarterly and/or as required by the manager. 2. All vegetation quantities shall be replanted during the 2-year warranty period to maintain a minimum 80% survival rate for all plant types used. All replanting shall use plants species listed on the City's approved plant list or substituted when approved by the manager. 3. All vegetation shall be trimmed quarterly to prevent overgrowth and as required by the manager. 4. Irrigation shall occur at a minimum of 1-inch per week between May 1 – November 1, and outside this timeframe whenever outdoor temperatures exceed 75F. 5. The use of fertilizers, pesticides, herbicides, and insecticides is prohibited unless approved by the manager.
Trash	During the 2-year plant establishment warranty period, remove all trash accumulated within the stormwater management facility quarterly (4x annually).

420.3. Erosion Control Requirements

- A. Visible sediment and sediment laden water is prohibited from being discharged, conveyed, tracked or otherwise placed beyond the limits of all construction sites and shall not be discharged into any part of the existing public or private storm sewer system, wetlands, waters of the state or any other natural drainage within, adjacent or outside the limits of the construction site.
 - 1. With approval from the City, all sediment and sediment laden water hauled beyond the limits of the construction site to an approved disposal location shall utilize an appropriate transport method to adequately prevent prohibited spills, leaks and deposits during transport as identified in Section 420.3.A.
- B. Additional inlet protection measures may be required if any one measure of inlet protection begins to fail.
- C. A concrete washout location and detail shall be included in all projects involving concrete work, including single-family residential.
 - 1. Proposed concrete washout locations will not be placed within the existing or proposed right-of-way for linear projects and are required to be located behind the curb.
- D. A dewatering plan is required for all construction projects performing construction activities during the defined wet weather period where dewatering is anticipated by the Project Engineer or City and at any time during the year when mass grading and cut activities are below the calculated water table elevation. All construction projects meeting this requirement shall submit plans during the time of the initial grading and erosion control plan review and include a design using either passive or active treatment methods for approval.
 - 1. When passive treatment method designs are initially used the design shall support a potential upgrade to an active treatment method with minimal site plan changes.
 - 2. Projects with unanticipated dewatering must submit revised grading and erosion control plans with a dewatering plan and receive approval prior to any work requiring the dewatering activity.
 - 3. Dewatering systems may be required to be installed and ready for operational use prior to beginning mass grading and trenching activities during site development.
- E. Vegetative SMF shall not be planted until the completion of all mass grading, cut and fill work.
 - 1. Once a SMF has been planted, it may not be used as a temporary sediment basin, stilling basin or holding pond.
 - 2. Future SMF that are used as sediment or stilling basins and holding ponds shall have all excess material removed and returned to the final grade shown on the approved plans prior to the addition of topsoil and vegetation.

- F. If a site is known to have existing underground drainage systems (field tiles), they shall be shown on the Grading and Erosion Control Plan and submitted to the City for approval. If they are unexpectedly encountered during construction, the systems shall be added to the Grading and Erosion Control Plan and resubmitted to the City for approval. Impacts to the drainage patterns of adjacent properties shall be addressed according to Subsection 420.4. The systems shall either be:
 - 1. Removed; or
 - 2. Left in place and connected to the storm system.
 - a) If left in place, the design documents, including the drainage report, shall be amended to account for the additional flow that the downstream SMF will receive while continuing to demonstrate compliance with all applicable design standards. Record drawings shall depict all field tile connections to the public storm system.
- G. Department of State Lands (DSL) and US Army Corps of Engineers (USACE) environmental permit requirements shall be integrated into the local grading and erosion control plans at the time of review. This includes the following:
 - 1. All associated in-water work as approved by DSL & USACE
 - 2. Required stream dewatering and by-pass systems
 - 3. Wetland removal, expansion and offsite mitigation
- H. Disturbance within a Vegetated Corridor, including plant removal, enhancement, and/or any other ground disturbing activity over 500 square feet, shall be shown in the erosion control plans with sediment control BMP's as required.

420.4. Grading Requirements

- A. Within a proposed development creating multiple tax lots, grading shall direct stormwater towards a public conveyance system or an existing natural drainage. Grading shall not direct stormwater onto, or across, a series of adjacent tax lots thereby inundating the lot at the lowest point.
- B. See the *ODOT Hydraulics Manual* for more information regarding Oregon drainage law.

420.4.1. Oregon Drainage Law

- A. Oregon drainage law, which originates from common law or case law, has developed without legislative action, and it is embodied in the decisions of the courts. Therefore, there are no Oregon Revised Statutes to cite pertaining to Oregon drainage law.

- B. Oregon has adopted the civil law doctrine of drainage. Under this doctrine, adjoining landowners are entitled to have the normal course of natural drainage maintained. The lower owner must accept water that naturally comes to his land from above, but he is entitled to not have the normal drainage changed or substantially increased. The lower landowner may not obstruct the runoff from the upper land if the upper landowner is properly discharging the water.
- C. For a landowner to drain water onto lands of another in the State of Oregon, one of two conditions must be satisfied initially: (1) the lands must contain a natural drainage course; or, (2) the landowner must have acquired the right of drainage supported by valuable consideration (i.e. a purchased drainage easement). In addition, because Oregon has adopted the civil law doctrine of drainage, the following three basic elements must be followed.
 - 1. A landowner may not divert water onto adjoining land that would not otherwise have flowed there. "Divert water" includes but is not necessarily limited to:
 - a) water diverted from one drainage area to another, and,
 - b) water collected and discharged which normally would infiltrate into the ground, pond, and/or evaporate.
 - 2. The upper landowner may not change the place where the water flows onto the lower owner's land. (Most of the diversions not in compliance with this element result from grading and paving work and/or improvements to water collection systems.)
 - 3. The upper landowner may not accumulate a large quantity of water, then release it, greatly accelerating the flow onto the lower owner's land. This does not mean that the upper landowner cannot accelerate the water at all; experience has found the drainage to be improper only when the acceleration and concentration were substantially increased.
- D. Subsurface waters which percolate to the surface can be intercepted and diverted for the protection of the highway without regard for the loss of these waters to the adjacent landowners. In those cases where wells and springs are involved, the right-of-way agent should contact the affected owner(s) to prevent any misunderstanding over damage that could be claimed.
- E. Drainage designs should satisfy Oregon drainage law to avoid claims or litigation resulting from improper drainage design. When it is apparent that the drainage design will not satisfy the law, then drainage easements should be obtained from the affected property owners. The legal staff should be consulted in those situations that appear to be unique and could result in litigation.
- F. Where certain drainage patterns have been established over long periods of time (i.e. in excess of at least 10 years), that are not the original natural drainage, there may be legal rights acquired which allow the continuance of the altered drainage pattern. Again, legal staff should be consulted in such situations.

430. Sanitary Sewer

- A. Manholes constructed outside of roadways and developed areas shall be constructed with a finished rim elevation 1 foot above the surrounding elevation.
- B. Lateral connections within 15 feet of the top of the system shall be made using an approved factory wye fitting. Other angled fittings shall be used as necessary to establish the required perpendicular angle at the mainline and at the right-of-way or property line. The pipe distance between fittings shall be minimized to establish the required *straight* line from the mainline to the ROW or easement boundary. Any wye connections shall be approved at the discretion of the City.
- C. Pipes buried to a depth of 20 feet or greater, as measured from ground surface to the pipe invert elevation, shall use pipe material type C900 or C905.
- D. At locations where a new manhole is constructed over an existing mainline for the purpose of connecting a new mainline or lateral, the manhole channel shall be constructed to smoothly transition the direction of incoming flows towards the pipe exiting the manhole.