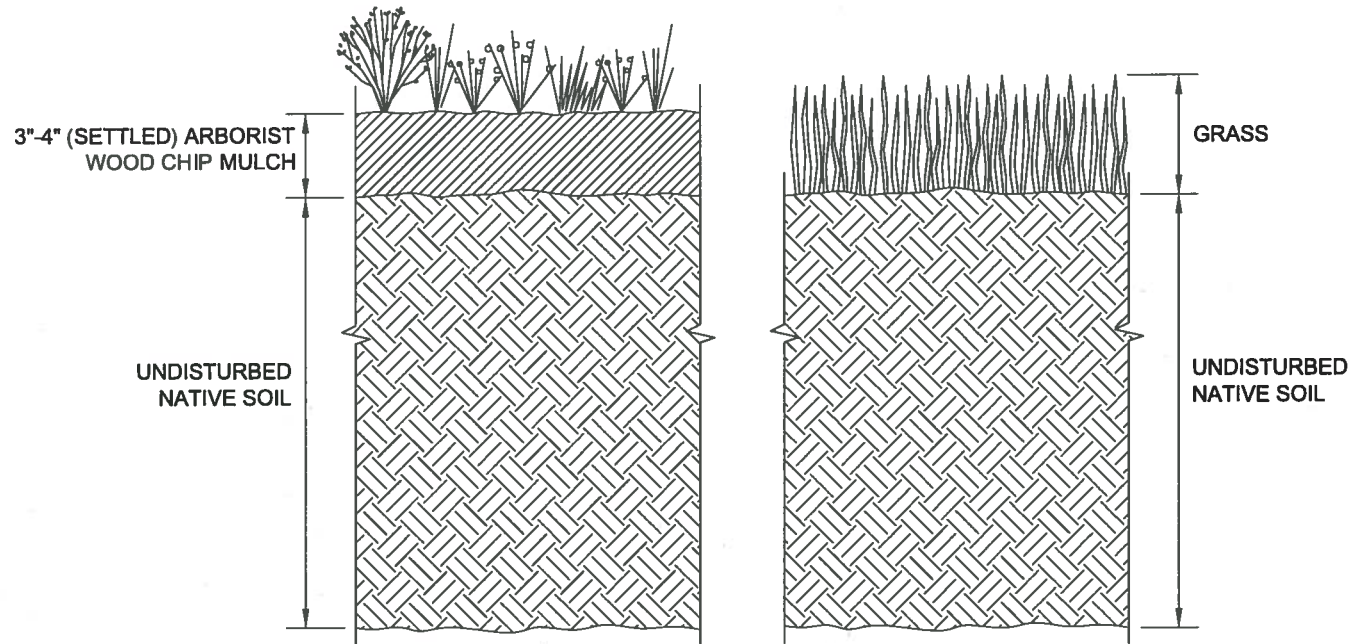


### PLANTING BEDS

### TURF (LAWN) AREAS



OPTION 1: Leave native vegetation and soil undisturbed, and protect from compaction during construction. Identify areas of the site that will not be stripped, logged, graded or driven on, and fence off those areas to prevent impacts during construction. If neither soils nor vegetation are disturbed, these areas do not require amendment.

See SWMM BMP L613 for additional information.

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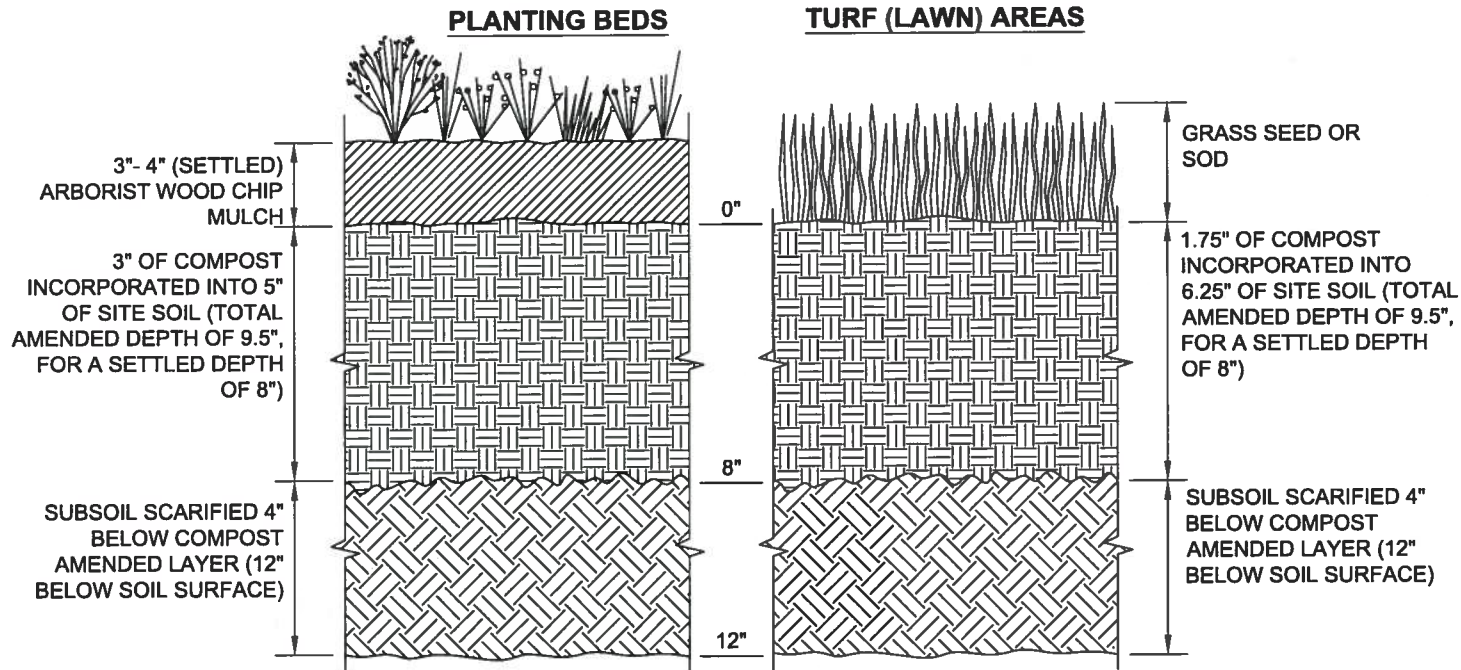
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DATE

CITY OF TACOMA  
BMP L613 POST-CONSTRUCTION  
SOIL QUALITY AND DEPTH  
OPTION 1 - NO DISTURBANCE

STANDARD PLAN NO. GSI-01a



**OPTION 2:** Amend existing site topsoil, or subsoil, either at preapproved rate or at calculated rate based on tests of the soil and amendments. All soil areas disturbed or compacted during construction, and not covered by buildings or pavement, shall be amended with compost as described below.

**Scarification:** Scarify or till subgrade to 8 inches depth (or to depth needed to achieve a total depth of 12 inches of uncompacted soil after calculated amount of amendment is added). Entire surface should be disturbed by scarification. Do not scarify within drip line of existing trees to be retained or where scarification would damage tree roots or as determined by the engineer.

#### A. Planting Beds

1. **PREAPPROVED RATE:** Place 3 inches of composted material and rototill into 5 inches of existing site soils (a total amended depth of about 9.5 inches, for a settled depth of 8 inches).

2. **CALCULATED RATE:** Place calculated amount of composted material or approved organic material and rototill into depth of soil needed to achieve 8 inches of settled soil at 10% organic content.

Rake beds to smooth and remove surface rocks larger than 2 inches diameter. Mulch planting beds with 3" - 4" of organic mulch or stockpiled duff.

#### B. Turf (Lawn) Areas

1. **PREAPPROVED RATE:** Place 1.75 inches of composted material and rototill into 6.25 inches of existing site soils (a total amended depth of about 9.5 inches, for a settled depth of 8 inches).

2. **CALCULATED RATE:** Place calculated amount of composted material or approved organic material and rototill into depth of soil needed to achieve 8 inches of settled soil at 5% organic content.

Water or roll to compact to 85% of maximum dry density. Rake to level and remove surface rocks larger than 1 inch diameter.

**Setbacks:** to prevent uneven settling, do not compost-amend soils within 3 feet on center of utility infrastructure (poles, vaults, meters etc.). Within one foot of pavement edge, curbs and sidewalks; soil should be compacted to approximately 90% max. modified proctor density (ASTM D1557) to ensure a firm surface. Do not compact within the tree protection zone. See Std. Plan LS-08 and LS-09.

See SWMM BMP L613 for additional information.

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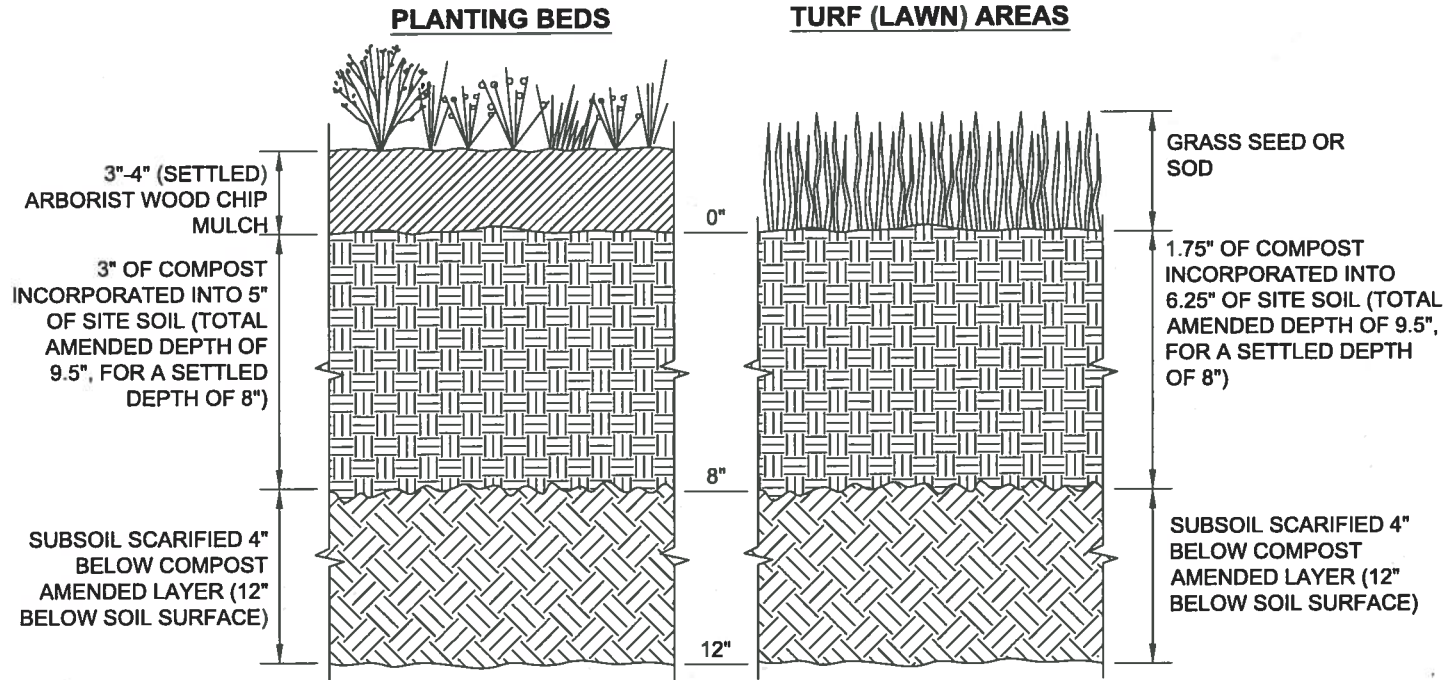
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DATE

**CITY OF TACOMA**  
**BMP L613 POST CONSTRUCTION SOIL**  
**QUALITY AND DEPTH**  
**OPTION 2 - AMEND IN PLACE**

**STANDARD PLAN NO. GSI-01b**



**OPTION 3:** Stockpile existing topsoil during grading. Stockpile and cover soil with weed barrier material that sheds moisture yet allows air transmission, in approved location, prior to grading. Replace stockpiled topsoil prior to planting. Stockpiled topsoil shall be tested and amended if needed to meet the organic matter or depth requirements either at preapproved rate or calculated rate. All soil areas disturbed or compacted during construction, and not covered by buildings or pavement, shall be amended with compost as described below.

**Scarification:** If placed topsoil plus compost or other organic material will amount to less than 12 inches, scarify or till subgrade to depth needed to achieve 12 inches of loosened soil after topsoil and amendment are placed. Entire surface should be disturbed by scarification. Do not scarify within drip line of existing trees to be retained.

A. Planting Beds	B. Turf (Lawn) Areas
1. <b>PREAPPROVED RATE:</b> Place 3 inches of composted material and rototill into 5 inches of replaced soil (a total amended depth of about 9.5 inches, for a settled depth of 8 inches).	1. <b>PREAPPROVED RATE:</b> Place 1.75 inches of composted material and rototill into 6.25 inches of replaced soil (a total amended depth of about 9.5 inches, for a settled depth of 8 inches).
2. <b>CALCULATED RATE:</b> Place calculated amount of composted material or approved organic material and rototill into depth of replaced soil needed to achieve 8 inches of settled soil at 10% organic content.	2. <b>CALCULATED RATE:</b> Place calculated amount of composted material or approved organic material and rototill into depth of replaced soil needed to achieve 8 inches of settled soil at 5% organic content.
Rake beds to smooth and remove surface rocks larger than 2 inches diameter. Mulch planting beds with 3" - 4" of organic mulch or stockpiled duff.	Water or roll to compact to 85% of maximum dry density. Rake to level and remove surface rocks larger than 1 inch diameter.

**Setbacks:** to prevent uneven settling, do not compost-amend soils within 3 feet on center of utility infrastructure (poles, vaults, meters etc.). Within one foot of pavement edge, curbs and sidewalks; soil should be compacted to approximately 90% max. modified proctor density (ASTM D1557) to ensure a firm surface. Do not compact within the tree protection zone. See Std. Plans LS-08 and LS-09.

See SWMM BMP L613 for more information.

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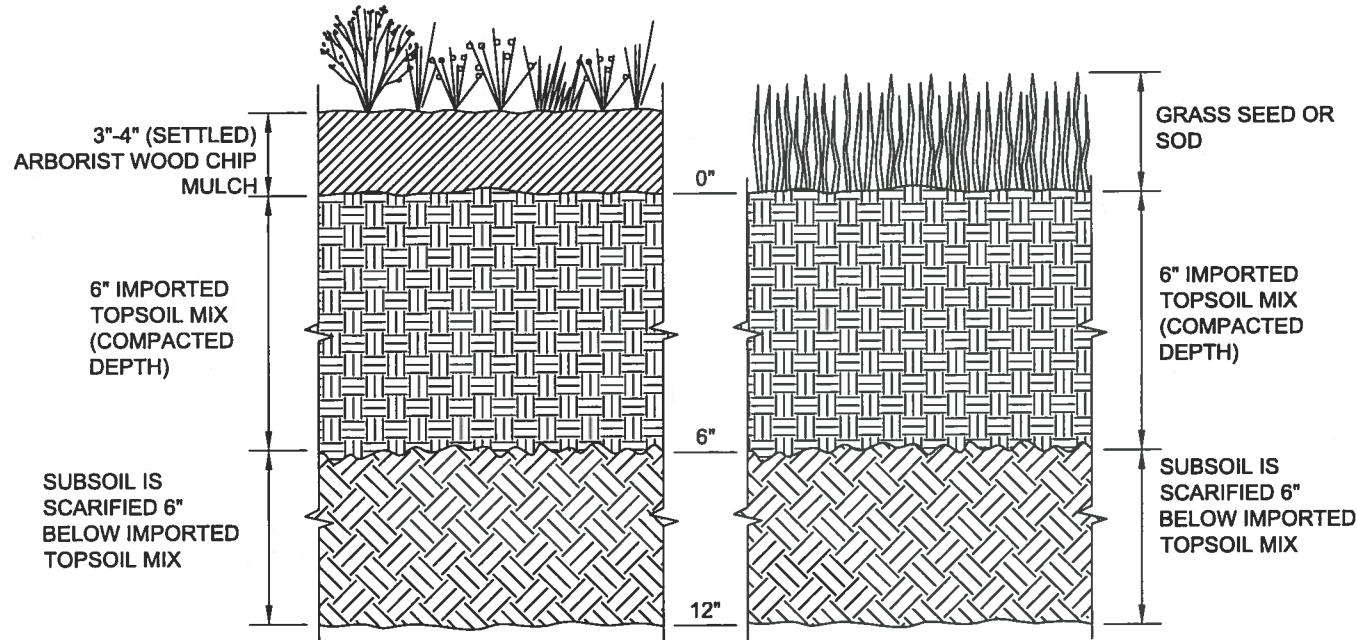
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**CITY OF TACOMA**  
**BMP L613 POST CONSTRUCTION SOIL**  
**QUALITY AND DEPTH**  
**OPTION 3 - STOCKPILE AND AMEND**  
**STANDARD PLAN NO. GSI-01c**



### PLANTING BEDS

### TURF (LAWN) AREAS



**OPTION 4:** Import topsoil mix of sufficient organic content and depth to meet the requirements. All soil areas disturbed or compacted during construction, and not covered by buildings or pavement, shall be restored as described below.

Scarification: scarify or till subgrade in two direction to 6 inches depth. Entire surface shall be disturbed by scarification. Do not scarify within drip line of existing trees to be retained.

#### A. Planting Beds

Use imported topsoil mix containing 10% organic matter (typically around 40% compost). Soil portion must be sand or sandy loam as defined by the USDA. Place 3 inches of imported topsoil mix on surface and till into 2 inches of soil. Place 3 inches of imported topsoil mix on surface and till into 2 inches of soil. Place second lift of 3 inches topsoil mix on surface.

Rake beds to smooth and remove surface rocks larger than 2 inches diameter. Mulch planting beds with 3" - 4" of organic mulch or stockpiled duff.

#### B. Turf (Lawn) Areas

Use imported topsoil mix containing 5% organic matter (typically around 25% compost). Soil portion must be sand or sandy loam as defined by the USDA. Place 3 inches of imported topsoil mix on surface and till into 2 inches of soil. Place second lift of 3 inches topsoil mix on surface.

Water or roll to compact to 85% of maximum dry density. Rake to level and remove surface rocks larger than 1 inch diameter.

Setbacks: to prevent uneven settling, do not compost-amend soils within 3 feet on center of utility infrastructure (poles, vaults, meters etc.). Within one foot of pavement edge, curbs and sidewalks; soil should be compacted to approximately 90% max. modified proctor density (ASTM D1557) to ensure a firm surface. Do not compact within tree protection zone. See Std. Plans LS-08 and LS-09.

See SWMM BMP L613 for additional information.

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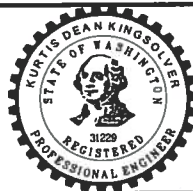
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CITY OF TACOMA  
BMP L613 POST CONSTRUCTION SOIL  
QUALITY AND DEPTH  
OPTION 4 - IMPORTED TOPSOIL  
STANDARD PLAN NO. GSI-01d

CAST IRON FRAME, COVER AND CONCRETE COLLAR PER COT STANDARD PLAN SU-24 WITH LETTERS "MP" ON THE COVER WITH LOCKING COVER

FINISHED GRADE

DEPTH AS SPECIFIED TO BOTTOM OF PERVIOUS PAVEMENT SUBBASE SECTION OR BIORETENTION SOIL MEDIA OR AS SPECIFIED

6" WATER QUALITY TREATMENT LAYER OR 18" OF SUITABLE NATIVE SOIL FOR PERVIOUS PAVEMENT

12"

PREPARED SUBGRADE

INVERT ELEV PER PLAN

CL

12"

THREADED PLUG

CEMENT CONCRETE COLLAR (NOT REQUIRED IN NON-TRAFFIC AREAS)

PAVEMENT SECTION / SURFACING PER PLAN

12" DIA PVC PIPE, SDR 35

6" DIA PVC PIPE, SDR 35

BENTONITE OR CDF

6" DIA PERFORATED PVC PIPE PER WSDOT 9-05.2(6)

CONSTRUCTION GEOTEXTILE BOTTOM, SIDES AND TOP PER WSDOT 9-33.2(1) TABLES 1 AND 2

GRAVEL BACKFILL FOR DRYWELLS PER WSDOT 9-03.12(5) OR AGGREGATE PER WSDOT 9-03.12(4) GRAVEL BACKFILL FOR DRAINS

PVC FOOT PLATE

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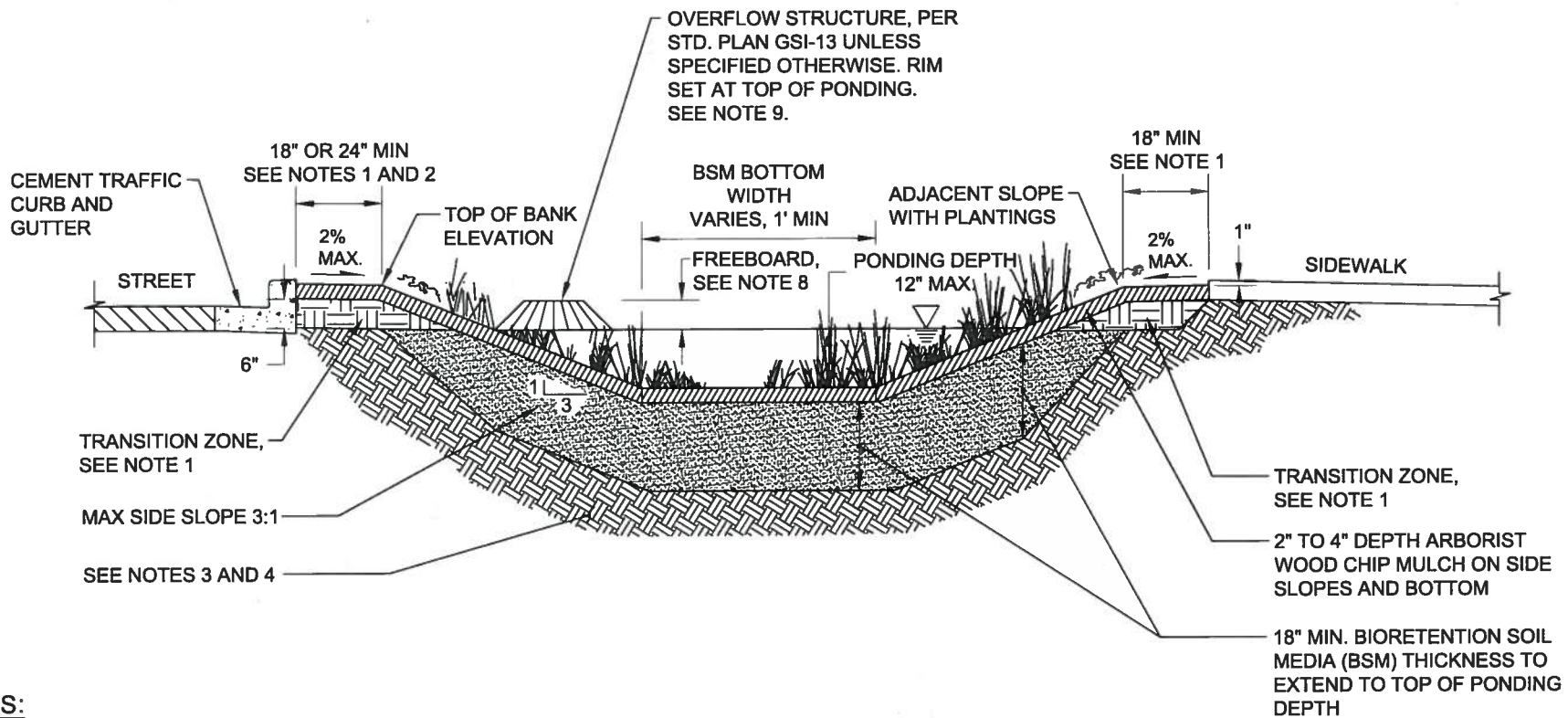
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CITY OF TACOMA  
OBSERVATION / MONITORING  
PORTS FOR STORMWATER  
FACILITIES

STANDARD PLAN NO. GSI-02



#### NOTES:

1. See Std. Plans GSI-05a and b for plan view. See Std. Plan GSI-04 for transition zone requirements.
2. 24-inch minimum required where adjacent to parking.
3. Avoid compaction of existing subgrade below facility.
4. Scarify subgrade 3-inches minimum before bioretention soil media installation.
5. Plantings per Std. Plan GSI-20a and plans.
6. Plantings adjacent to parking shall be selected and spaced to allow pedestrian access to vehicles.
7. Sizing and design of facility per SWMM BMP L630.
8. Freeboard depth varies (2-inches or 6-inches) depending upon size of drainage area. For freeboard, ponding and overflow depth, see SWMM BMP L630.
9. Overflow type depends on project design. See Std. Plans GSI-13 or GSI-14. Alternate overflow type may be allowed.
10. Side slopes steeper than 3:1 may be approved if overall facility depth is less than 3 feet from top of mulch to top of facility.
11. Inlet elevation to be above freeboard elevation.

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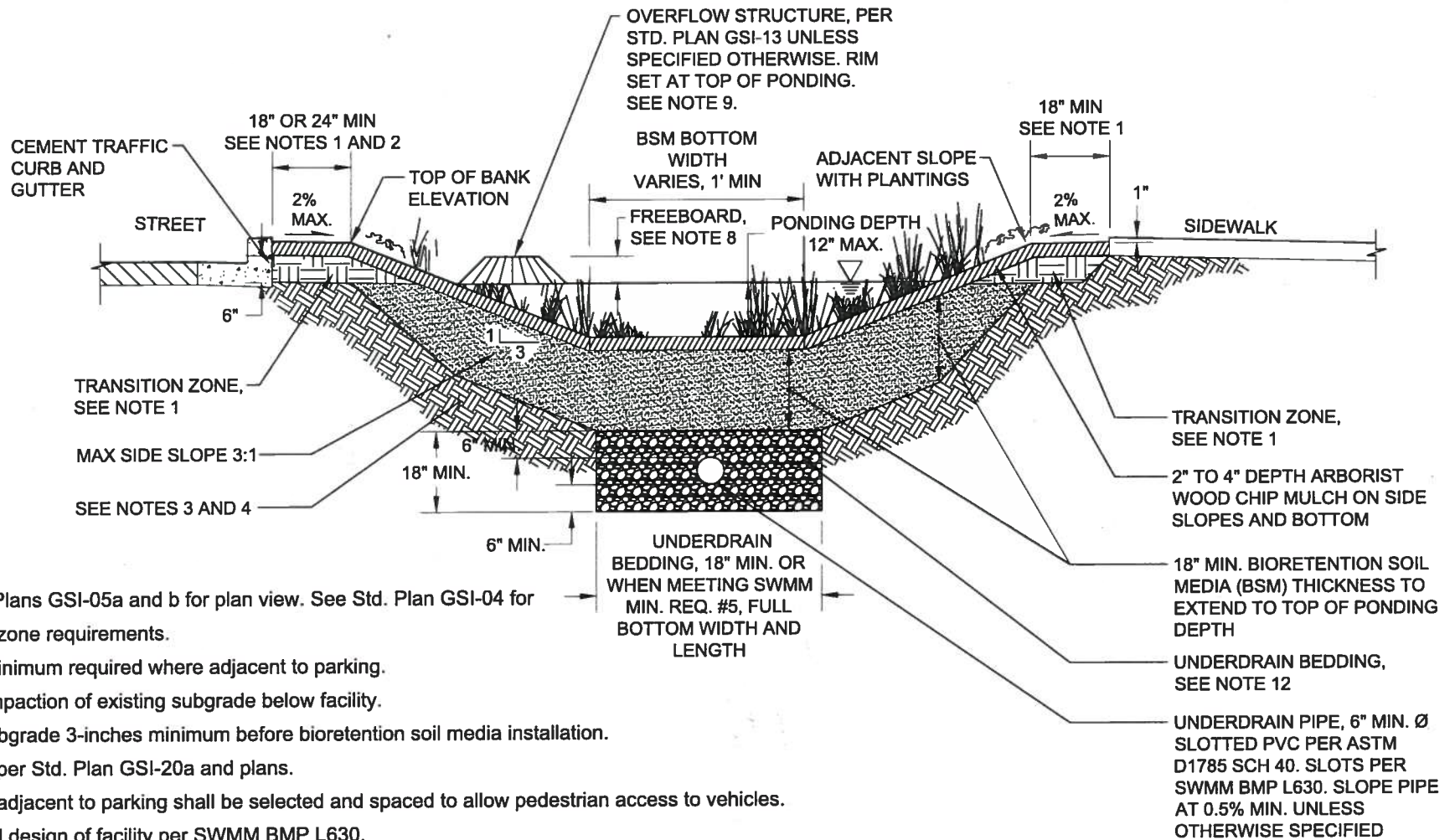
CITY ENGINEER

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CITY OF TACOMA

BIORETENTION SECTION

STANDARD PLAN NO. GSI-03a



#### NOTES:

1. See Std. Plans GSI-05a and b for plan view. See Std. Plan GSI-04 for transition zone requirements.
2. 24-inch minimum required where adjacent to parking.
3. Avoid compaction of existing subgrade below facility.
4. Scarify subgrade 3-inches minimum before bioretention soil media installation.
5. Plantings per Std. Plan GSI-20a and plans.
6. Plantings adjacent to parking shall be selected and spaced to allow pedestrian access to vehicles.
7. Sizing and design of facility per SWMM BMP L630.
8. Freeboard depth varies (2-inches or 6-inches) depending upon size of drainage area. For freeboard, ponding and overflow depth, see SWMM BMP L630.
9. Overflow type depends on project design. See Std. Plans GSI-13 or GSI-14. Alternate overflow type may be allowed.
10. Side slopes steeper than 3:1 may be approved if overall facility depth is less than 3 feet from top of mulch to top of facility.
11. Inlet elevation to be above freeboard elevation.
12. Underdrain bedding per WSDOT 9-03.12(4) Gravel Backfill for Drains.

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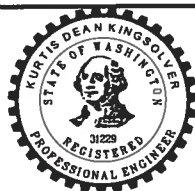
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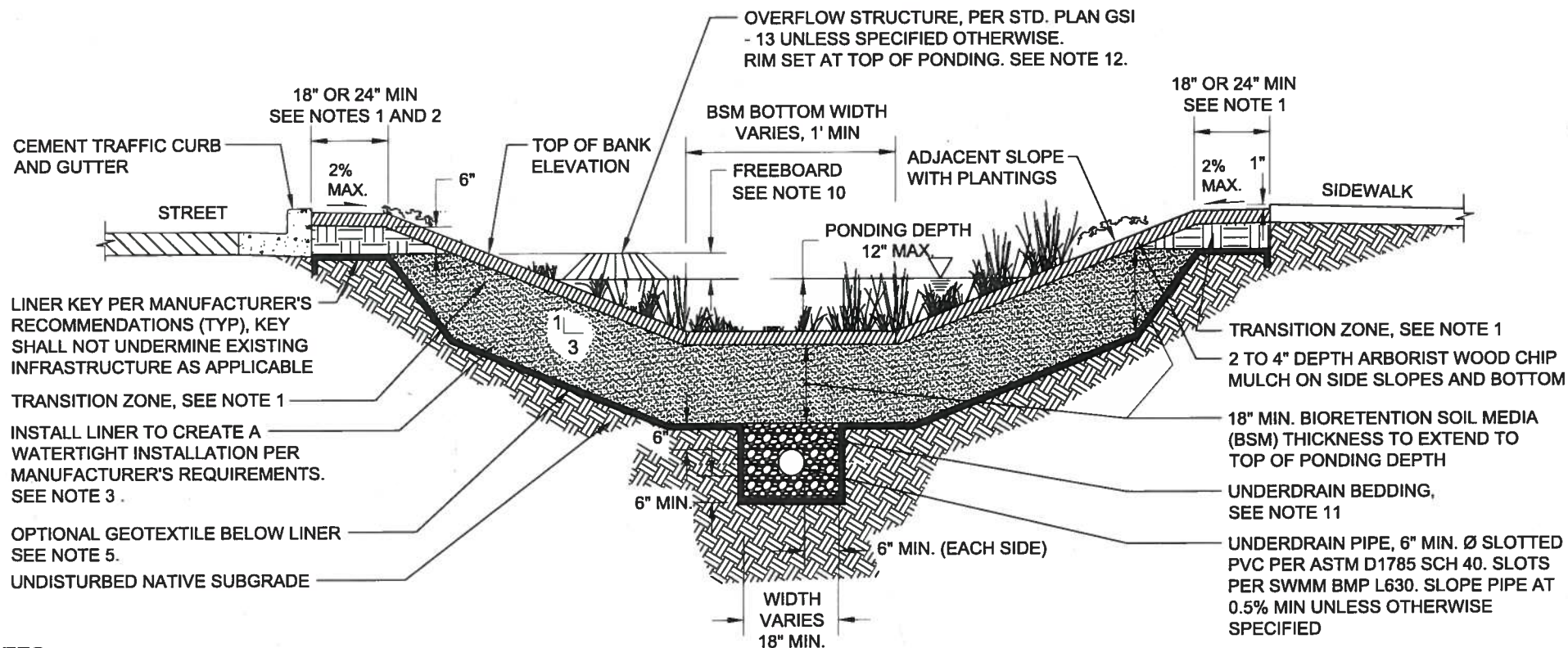
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CITY OF TACOMA

BIORETENTION SECTION  
WITH UNDERDRAIN

STANDARD PLAN NO. GSI-03b





#### NOTES:

- See Std. Plans GSI-05a and b for plan view. See Std. Plan GSI-04 for transition zone requirements.
- 24-inch minimum required where adjacent to parking.
- Geomembrane liner per SWMM BMP L630 and shall be PVC with a minimum thickness of 30 mils and in accordance with ASTM D7176. Seams shall be waterproof. Liner to create a watertight installation to top of freeboard. Prepare subgrade for liner per Engineer. Liner specification may vary based on site conditions.
- Penetrations through facility liner shall be watertight and shall prevent preferential flow into utility trenches (e.g. water stop, trench block, or trench collar), as appropriate.
- Provide geotextile under PVC liner to protect liner from sharp rocks if recommended by liner manufacturer. Geotextile per liner manufacturer.
- Liner secured at top and/or keyed per manufacturer. All seams to be sealed and waterproof per manufacturer and all penetrations to be booted. Liner shall be installed and seamed to create a watertight installation to top of freeboard.
- Plantings per Std. Plan GSI-20a and plans.
- Plantings adjacent to parking shall be selected and spaced to allow pedestrian access to vehicles.
- Sizing and design of facility per SWMM BMP L630.
- Freeboard depth varies (2-inches or 6-inches) depending upon size of drainage area. For freeboard, ponding and overflow depth, see SWMM BMP L630.
- Underdrain bedding per WSDOT 9-03.12(4) Gravel Backfill for Drains.
- Overflow type depends on project design. See Std. Plan GSI-13 or GSI-14. Alternate overflow type may be allowed.
- Side slopes steeper than 3:1 may be approved if overall facility depth is less than 3 feet from top of mulch to top of facility.
- Inlet elevation to be above freeboard elevation.

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CITY ENGINEER

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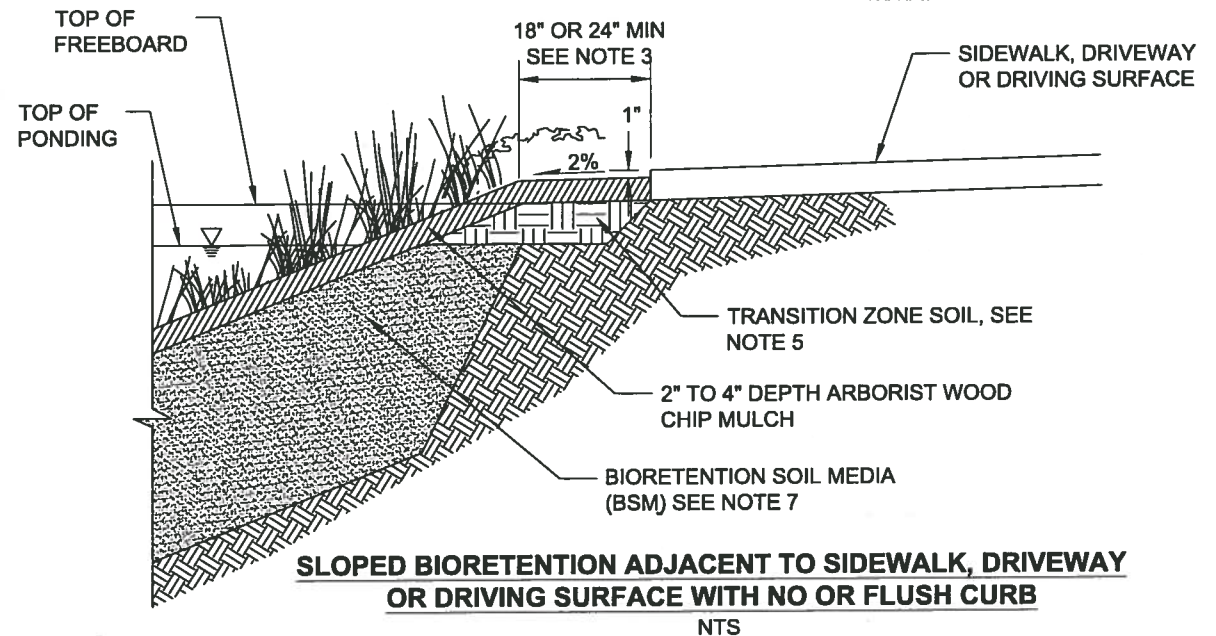
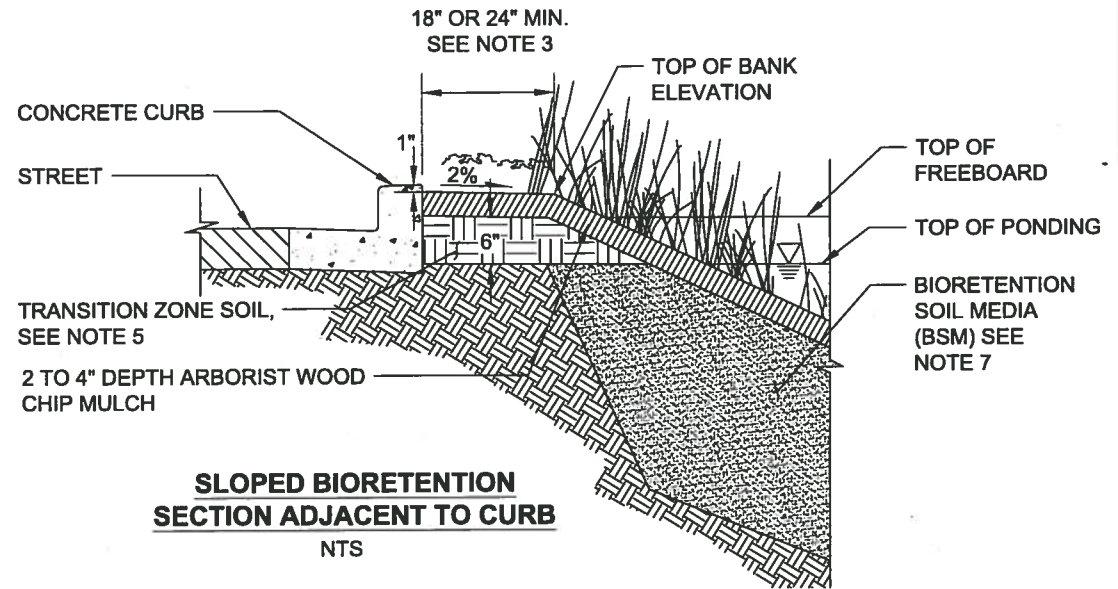
CITY OF TACOMA  
BIORETENTION SECTION  
WITH LINER AND UNDERDRAIN

STANDARD PLAN NO. GSI-03c



# **NOTES:**

1. 1-inch grade change from edge of sidewalk, curb and/or other hard surface.
2. 2% max. slope for shoulder / level area.
3. Shoulder / level area width to be 24-inches minimum when adjacent to driveway, on street parking or driving surface with flush or no curb. Plantings adjacent to parking shall be selected and spaced to allow access to vehicles.
4. Compact transition zone soil to 90% max. modified proctor density (ASTM D1557).
5. Transition zone soil shall be per BMP L613 option 2 or 4 (Std. Plan GSI-01) as applicable or per Note 6.
6. Soil amendment: scarify or till subgrade to 3-inch depth. Place 3-inches of topsoil on surface and till into 5-inches of site soil. Install 3-inches woodchip mulch or as specified on plans. Scarification does not apply to lined facilities. Topsoil shall have a minimum organic matter content of 10% dry weight in planting beds, and 5% in turf areas and a pH from 6.0 to 8.0 or matching the pH of the original undisturbed soil.
7. 18" minimum bioretention soil media (BSM) to top of ponding depth.
8. See Std. Plan GSI-03a, b, and c for bioretention cross sections and Std. Plans GSI-05a and b for plan views.
9. See Std. Plan GSI-09a for curb cuts or Std. Plan GSI-10a for trench drain inlets.
10. For facilities with liners, provide liner anchor per manufacturer's recommendations, see Std. Plan GSI-03c.



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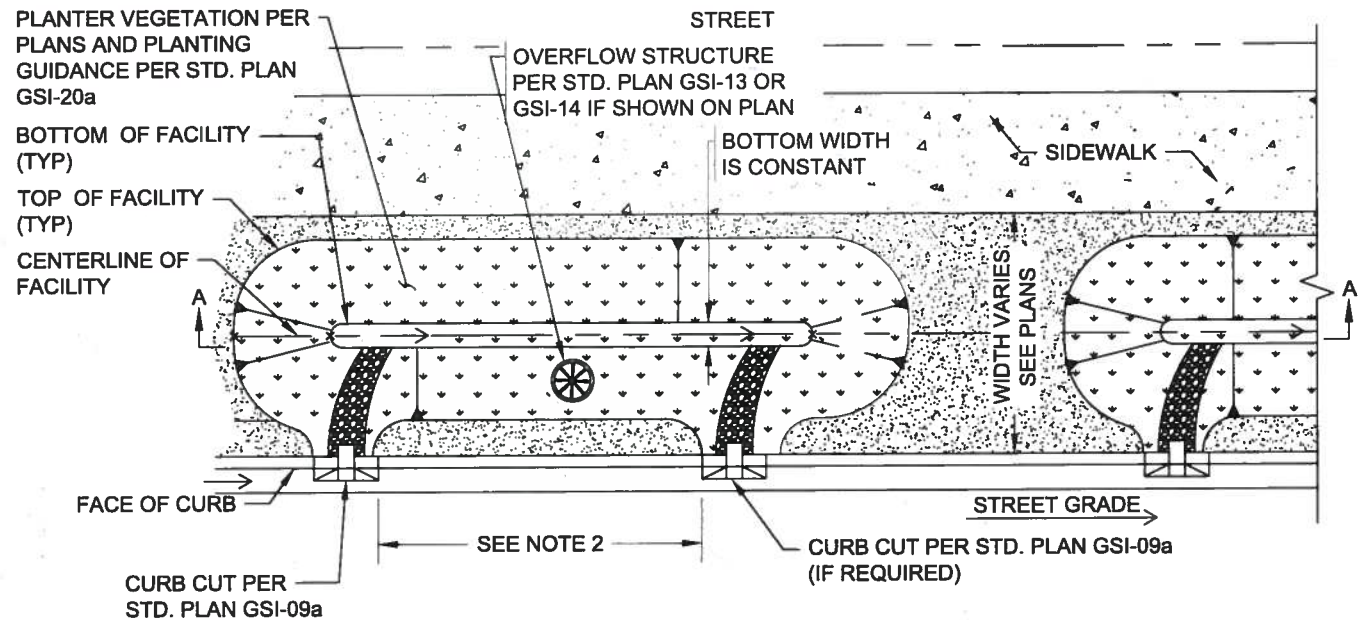


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DATE 4/7/12

CITY OF TACOMA  
BIORETENTION  
TRANSITION ZONE SECTIONS

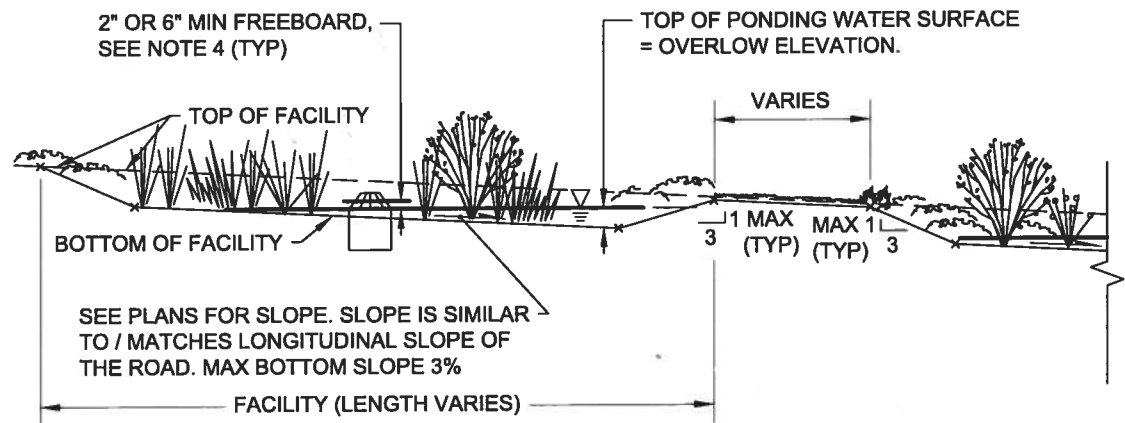
STANDARD PLAN NO. GSI-04



**NOTES:**

1. Plantings per Std. Plan GSI-20a and plans.
2. Location, distance between curb cuts, and number of curb cuts vary with facility length and road slope. See plan for location.
3. Inlet and overflow elevation per plans.
4. Freeboard depth varies (2-inches to 6-inches) depending upon size of drainage area. See SWMM BMP L630. Freeboard depth per plans.
5. Weirs or terracing may also be used, see plans.
6. See Std. Plan GSI-04 for transition zone beyond top of facility.
7. See Std. Plans GSI-03a, b and c for section view.

**PLAN**  
NTS



**SECTION A-A**  
NTS

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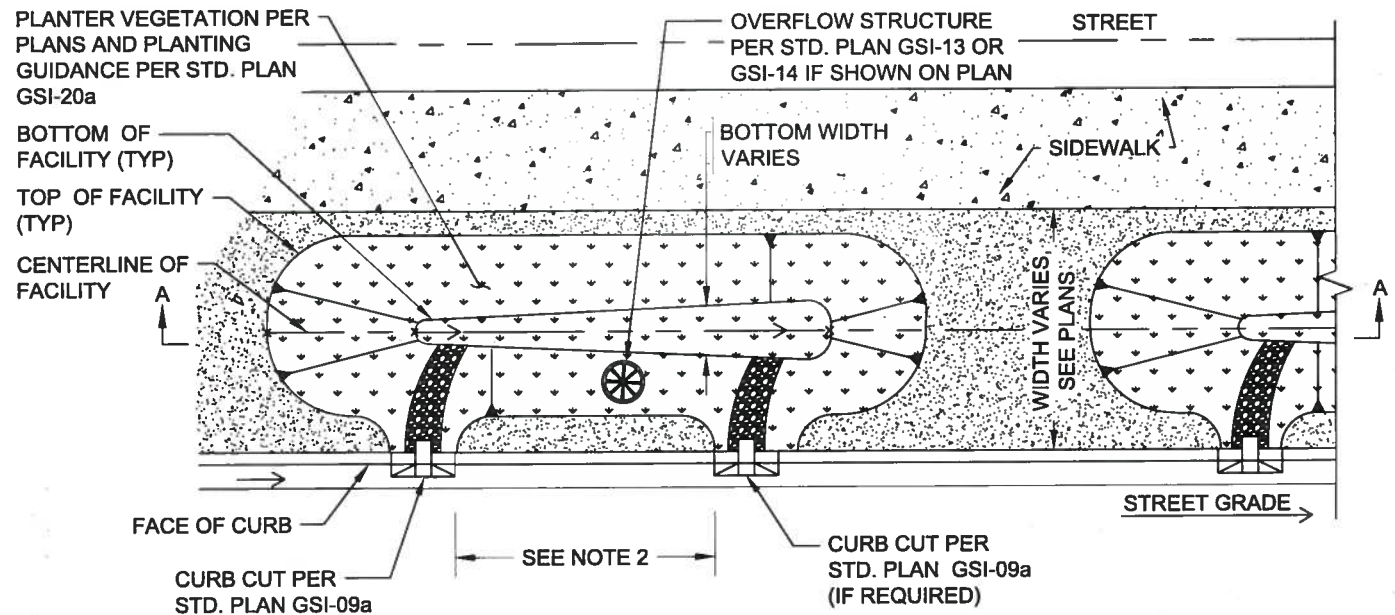
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*4/4/12*  
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**CITY OF TACOMA  
BIORETENTION WITH SLOPED SIDES  
AND SLOPED BOTTOM  
PLAN AND LONGITUDINAL SECTION**

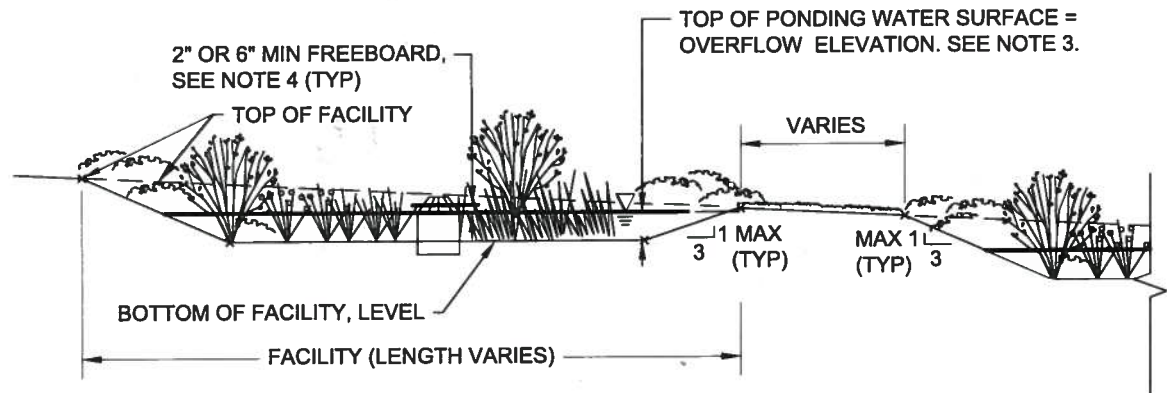
STANDARD PLAN NO. GSI-05a



#### NOTES:

1. Plantings per Std. Plan GSI-20a and plans.
2. Location, distance between curb cuts, and number of curb cuts vary with facility length and road slope. Provide a minimum one curb cut per facility. See plan for location.
3. Inlet and overflow elevation per plans.
4. Freeboard depth varies (2-inches to 6-inches) depending upon size of drainage area. See SWMM BMP L630. Freeboard depth per plans.
5. See Std. Plan GSI-04 for transition zone beyond top of facility.
6. Weirs or terracing may also be used, see plans.
7. See Std. Plans GSI-03a, b and c for section view.

#### PLAN NTS



#### SECTION A-A NTS

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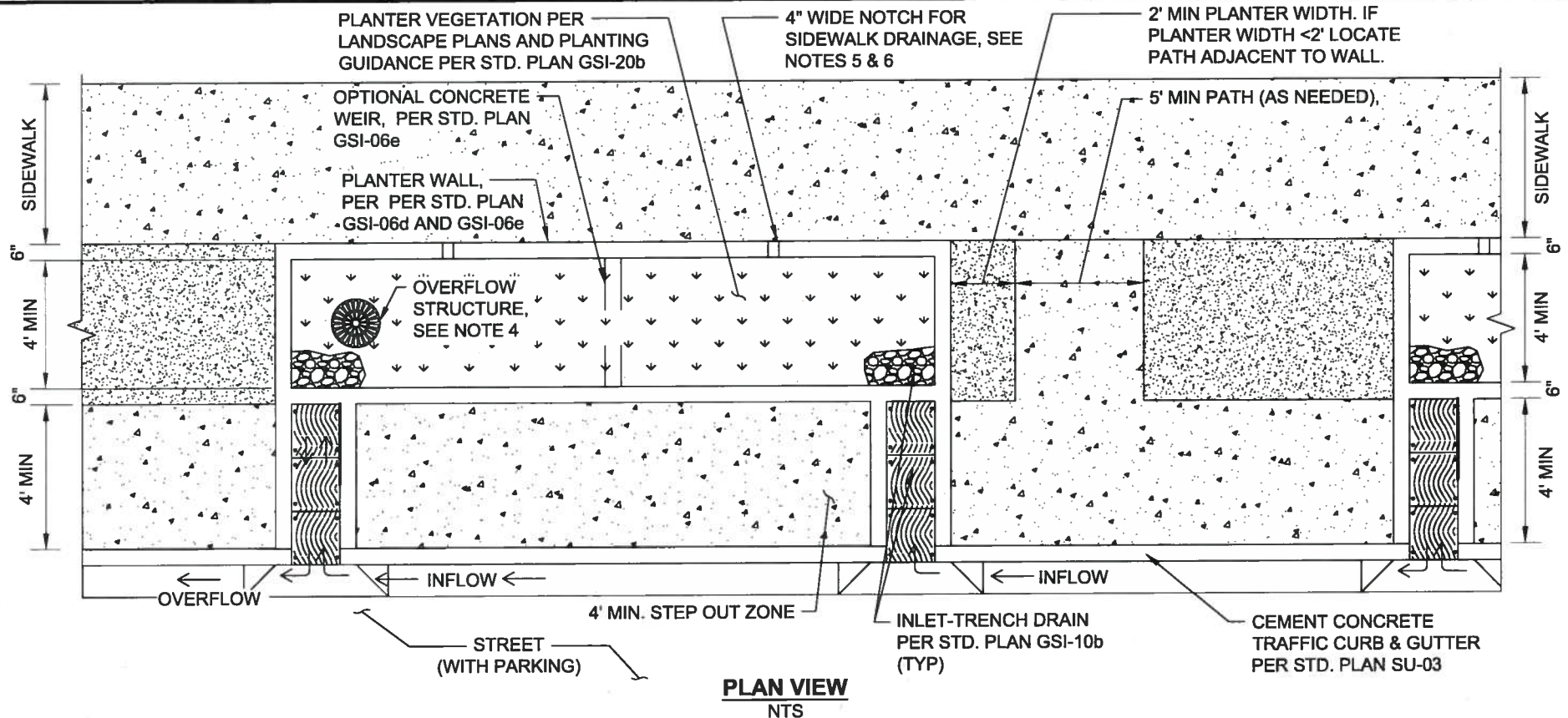
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CITY OF TACOMA  
BIORETENTION WITH SLOPED SIDES  
AND LEVEL BOTTOM  
PLAN AND LONGITUDINAL SECTION

STANDARD PLAN NO. GSI-05b





# NOTES:

- Existing and proposed utility lines shall be located outside of facility footprint unless otherwise approved by City of Tacoma.
- Abandoned utilities within footprint of facility shall be removed as needed. Coordinate with utility provider and City of Tacoma.
- Penetrations through facility wall shall be watertight and shall prevent preferential flow into utility trenches (e.g. water stop, trench block, or trench collar), as appropriate.
- Alternate overflow may be allowed. Pipe from overflow structure not shown for clarity. See Std. Plans GSI-13 and GSI-14.
- Sidewalk elevation and 4" notch invert elevation must be set above street, top of freeboard, and inlet invert elevations.
- Provide a minimum of one notch in wall at sidewalk to avoid ponding along walk. Grade sidewalk to drain to notches.
- See Std. Plan GSI-06a(2) for section view.
- Step out zone shall be a minimum 4 feet wide. If 4 feet minimum cannot be obtained, contact Traffic Engineering for possible options. All alternatives must have written approval from Traffic Engineering.
- Skateboard stops or wall notch stops may be required based on facility location and size. Wall notch stops shall be 3" wide and 3" deep.

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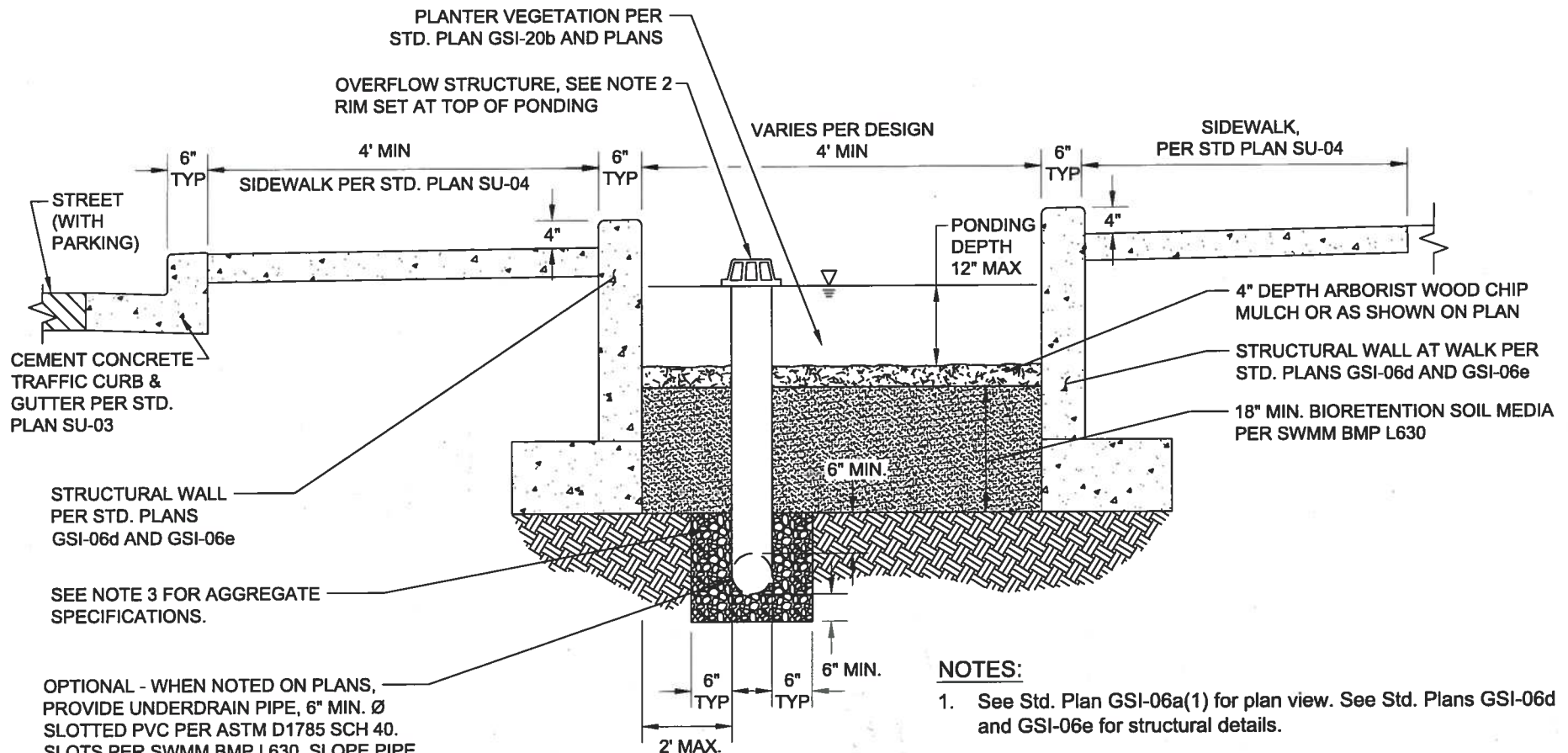
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CITY OF TACOMA  
WALLED BIORETENTION WITH  
PARKING - PLAN VIEW

STANDARD PLAN NO. GSI-06a(1)



#### NOTES:

1. See Std. Plan GSI-06a(1) for plan view. See Std. Plans GSI-06d and GSI-06e for structural details.
2. Overflow type depends on project design. See Std. Plan GSI-13 or GSI-14. Alternate overflow type may be allowed.
3. Underdrain bedding per WSDOT 9-03.12(4) Gravel Backfill for Drains.
4. Expansion joints per SU-04 to be provided between sidewalks and walls.
5. Optional waterproof liner may be provided. See Std. Plan GSI-06c(2) Notes 3, 4, and 5 for additional liner requirements.

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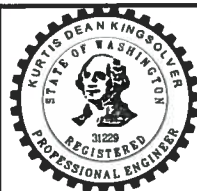
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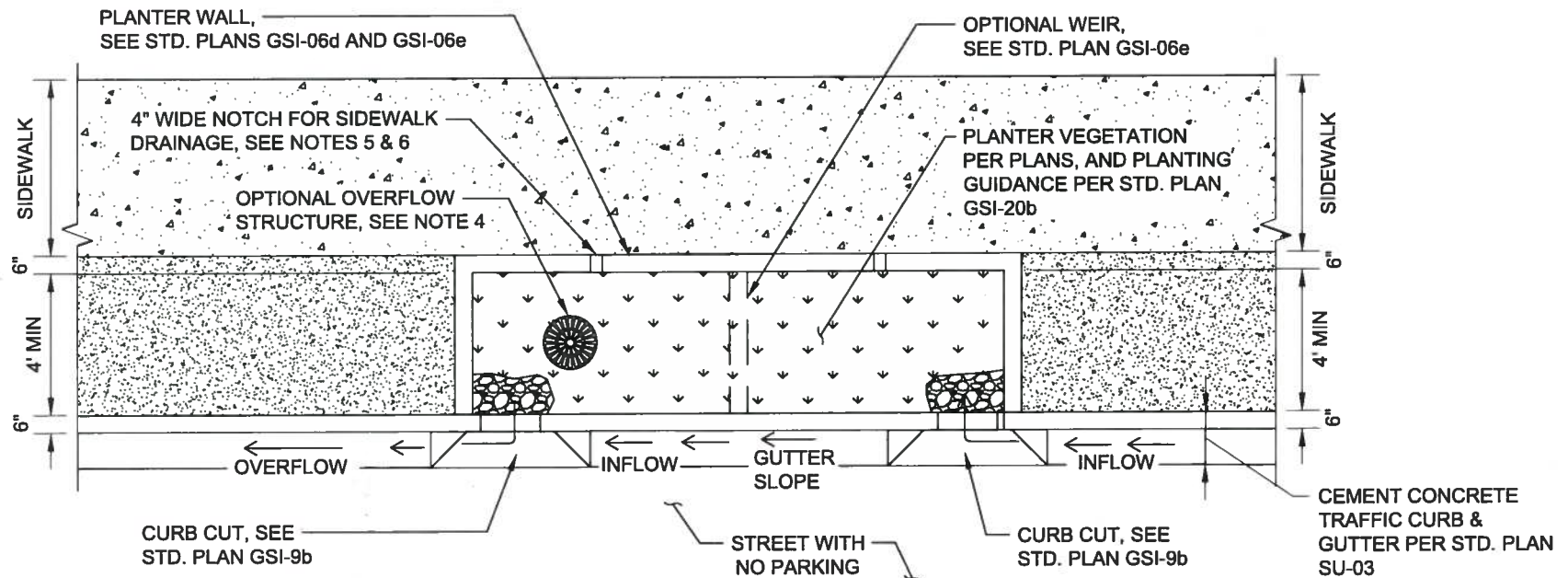
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CITY OF TACOMA  
WALLED BIORETENTION WITH  
PARKING - SECTION VIEW

STANDARD PLAN NO. GSI-06a(2)



PLAN VIEW  
NTS

**NOTES:**

- Existing and proposed utility lines shall be located outside of facility footprint unless otherwise approved by City of Tacoma.
- Abandoned utilities within footprint of facility shall be removed as needed. Coordinate with utility provider and City of Tacoma.
- Penetrations through facility wall shall be watertight and shall prevent preferential flow into utility trenches (e.g. water stop, trench block, or trench collar), as appropriate.
- Alternate overflow type may be allowed. Overflow pipe from overflow structure not shown for clarity. See Std.
- Plans GSI-13 and GSI-14.
- Sidewalk elevation and 4" notch invert elevation must be set above street, top of freeboard and inlet invert elevations.
- Provide a minimum of one notch in wall at sidewalk to avoid ponding along walk. Grade sidewalk to drain to notches.
- See Std. Plan GSI-06b(2) for section view.
- Skateboard stops or wall notches may be required based on facility location and size. Wall notches shall be 3" wide and 2" deep.

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CITY OF TACOMA  
WALLED BIORETENTION WITHOUT  
PARKING - PLAN VIEW

STANDARD PLAN NO. GSI-06b(1)



PLANTER VEGETATION PER STD. PLAN  
GSI-20b AND PLANS

OVERFLOW STRUCTURE RIM SET AT  
TOP OF PONDING. SEE NOTE 2

CEMENT CONCRETE TRAFFIC  
CURB & GUTTER PER STD. PLAN  
SU-03

STREET (NO PARKING)

STRUCTURAL WALL AT  
CURB PER STD. PLANS  
GSI - 06d AND GSI - 06e

SEE NOTE 3 FOR AGGREGATE  
SPECIFICATIONS

OPTIONAL - WHEN NOTED ON PLANS,  
PROVIDE UNDERDRAIN PIPE, 6" MIN. Ø  
SLOTTED PVC PER ASTM D1785 SCH 40.  
SLOTS PER SWMM BMP L630. SLOPE PIPE  
AT 0.5% MIN. UNLESS OTHERWISE  
SPECIFIED

VARIES PER DESIGN  
4' MIN.

PONDING  
DEPTH 12"  
MAX

6" MIN.

6" TYP 6" TYP 6" MIN.  
2' MAX.

SIDEWALK,  
PER STD. PLAN SU-04

4" MIN.

4" DEPTH ARBORIST WOOD CHIP  
MULCH OR AS SHOWN ON PLAN

STRUCTURAL WALL AT WALK PER STD.  
PLANS GSI - 06d AND GSI - 06e

18" MIN. BIORETENTION SOIL  
MEDIA PER SWMM BMP L630

#### NOTES:

1. See Std Plan GSI - 06b(1) for plan view. See Std. Plans GSI-06d and e for structural details.
2. Overflow type depends on project design. See Std. Plan GSI-13 or GSI-14. Alternate overflow type may be allowed.
3. Aggregate per WSDOT 9-03.12(4) Gravel Backfill for Drains.
4. Expansion joints per SU-04 to be provided between sidewalks and walls.
5. Optional waterproof liner may be provided. See Std. Plan GSI-06c(2) Notes 3, 4, and 5 for additional liner requirements.

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NA  
TACOMA POWER

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ENVIRONMENTAL  
SERVICES

NA  
TACOMA WATER



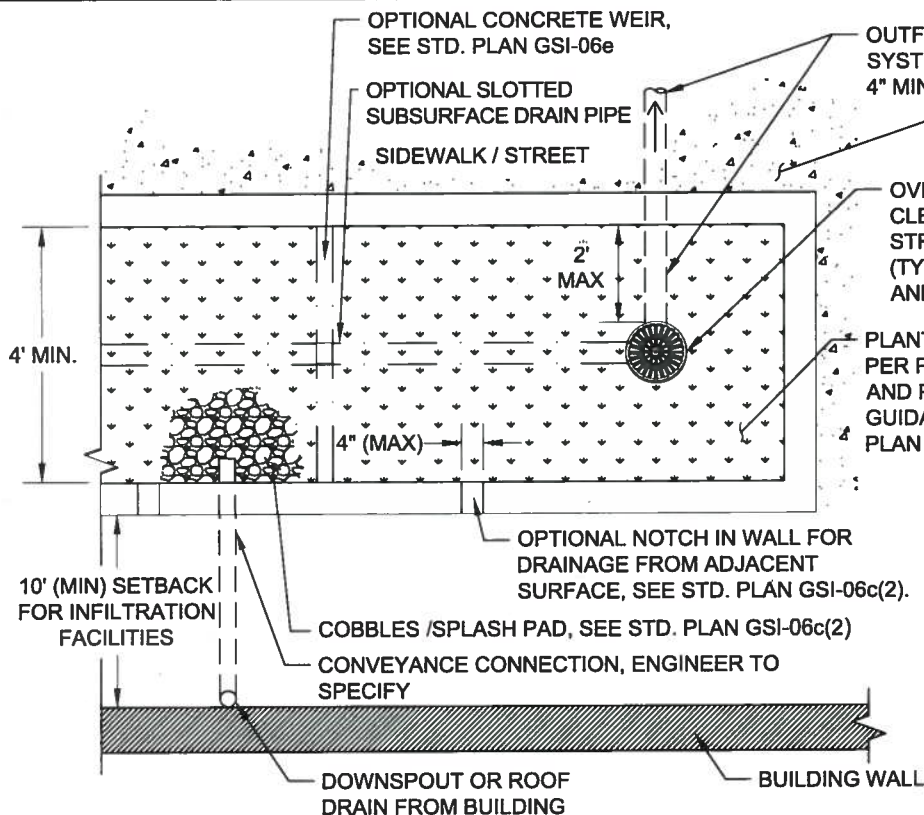
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CITY ENGINEER

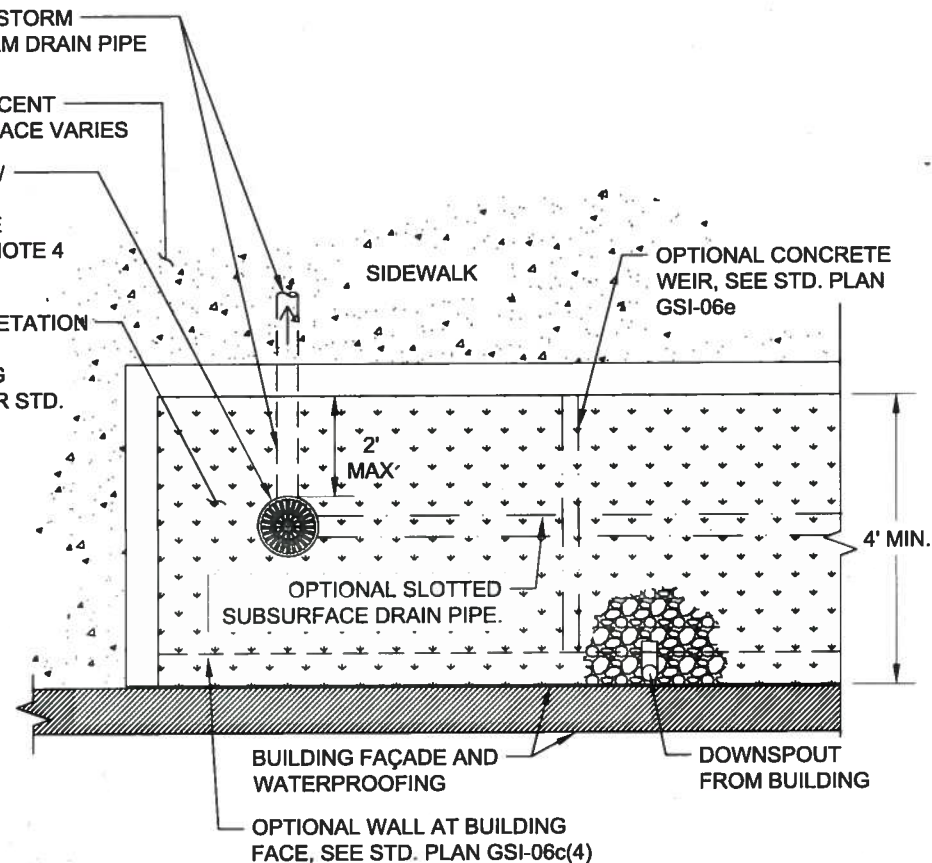
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CITY OF TACOMA  
WALLED BIORETENTION  
WITHOUT PARKING - SECTION VIEW

STANDARD PLAN NO. GSI-06b(2)



**WALLED BIORETENTION OFFSET FROM BUILDING**  
NTS



**WALLED BIORETENTION ADJACENT TO BUILDING**  
NTS

**NOTES:**

- Existing and proposed utility lines to be located outside of facility footprint unless otherwise approved by City of Tacoma.
- Abandoned utilities within footprint of facility and observed during construction shall be removed. Coordinate with utility provider and City of Tacoma.
- Penetrations through facility wall shall be watertight and shall prevent preferential flow into utility trenches (e.g. water stop, trench block, or trench collar), as appropriate.
- Alternate overflow may be allowed. Pipe from overflow structure not shown for clarity. See Std. Plans GSI-13 and GSI-14.
- See Std. Plans GSI-06c(2) and GSI-6c(4) for section view.
- Skateboard stops or wall notch stops may be required based on location and size. Wall notch stops shall be 3" wide and 2" deep.

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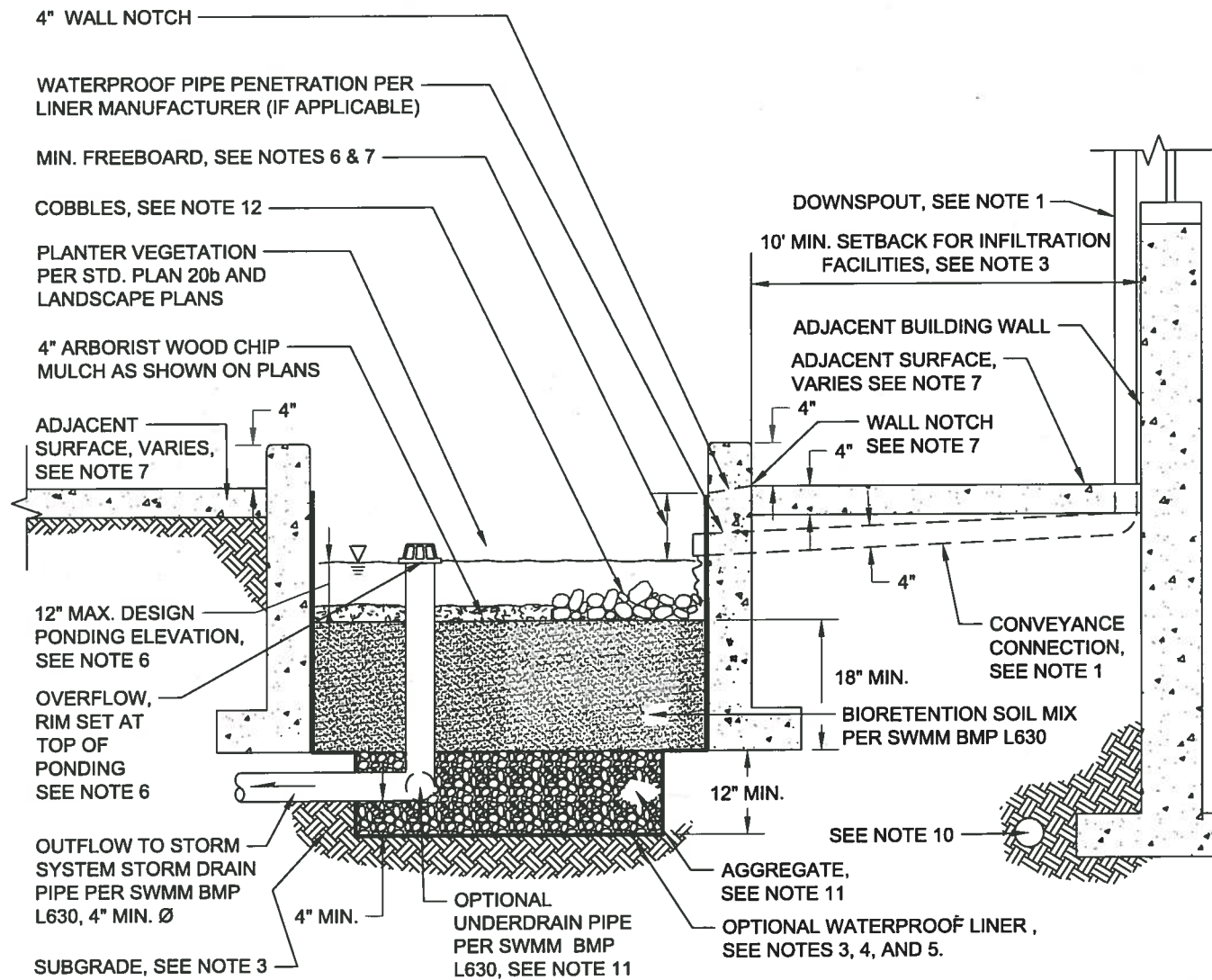
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CITY OF TACOMA  
WALLED BIORETENTION  
FOR BUILDING DOWNSPOUTS  
PLAN VIEW  
STANDARD PLAN NO. GSI-06c(1)

# NOTES:

For Notes See Std. Plan GSI-06c(3).



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CITY OF TACOMA  
WALLED BIORETENTION  
SECTION VIEW

STANDARD PLAN NO.

GSI-06c(2)



**NOTES:**

1. Install downspouts and other conveyance connections (e.g. scupper, channel, overhead runnel) from building to drain above design ponding elevation. Refer to applicable City building codes for conveyance connection requirements. Provide cobbles per Note 12 beneath discharge locations. Diffuser or other method of energy dissipation may be required based on drainage area.
2. Penetrations through facility wall shall be watertight and shall prevent preferential flow into utility trenches (e.g. water stop, trench block, or trench collar), as appropriate.
3. Facility Type:
  - A. Infiltrating facilities:
    - 1) See SWMM for site suitability.
    - 2) Avoid compaction of existing subgrade below planter.
    - 3) Scarify subgrade to a depth of 3 inches (min.) immediately prior to placement of gravel storage and bioretention soil mix for infiltration facilities in accordance with SWMM.
  - B. Non-infiltrating facilities:
    - 1) Geomembrane liner per SWMM BMP L630 and shall be PVC with a minimum thickness of 30 mils and in accordance with ASTM D7176. Seams shall be waterproof. Waterproof liner to extend to top of freeboard.
    - 2) Prepare subgrade for liner per Engineer.
4. Provide geotextile under PVC liner to protect liner from sharp rocks if recommended by liner manufacturer. Geotextile per liner manufacturer.
5. Liner secured at top per manufacturer. All seams to be sealed and waterproof per manufacturer and all penetrations to be booted. Liner shall be installed and seamed to create a watertight installation to top of freeboard.
6. Freeboard minimum (2" or 6") varies with tributary area. For freeboard, ponding, and overflow depth, see SWMM BMP L630. Overflow grate per plans, see Std. Plans GSI-13 or GSI-14.
7. Adjacent surface (e.g. wall notch at walkway) elevation must be set above top of freeboard, street and inlet elevation to allow for excess flow to drain through overflow structure.
8. Planter Walls:
  - A. Material shall be stone, brick, concrete, wood, or other durable material (no chemically treated wood).
  - B. Concrete, brick, or stone walls shall be included on foundation plans for new building construction.
  - C. Planter wall and footing design per Engineer/Architect and shall meet ACI 350 or 318.
  - D. See Std Plans GSI-06d and GSI-06e for structural details.
9. Expansion joints per SU-04 to be provided between sidewalks and walls.
10. This detail has been prepared for new construction (building foundation and footing drain are schematic). If project is a retrofit, Engineer shall review existing building conditions and modify accordingly.
11. Aggregate per WSDOT 9-03.12(4) Gravel Backfill for Drains. Underdrain pipe, 4" min. Ø slotted PVC per ASTM D1785 Sch. 40. Slots per SWMM BMP L630. Slope pipe at 0.5% min. unless otherwise specified.
12. Cobbles shall be 6" or 8" cobbles per WSDOT 9-03.11(2), 10" thick 12" X 12" pad.

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TACOMA WATER



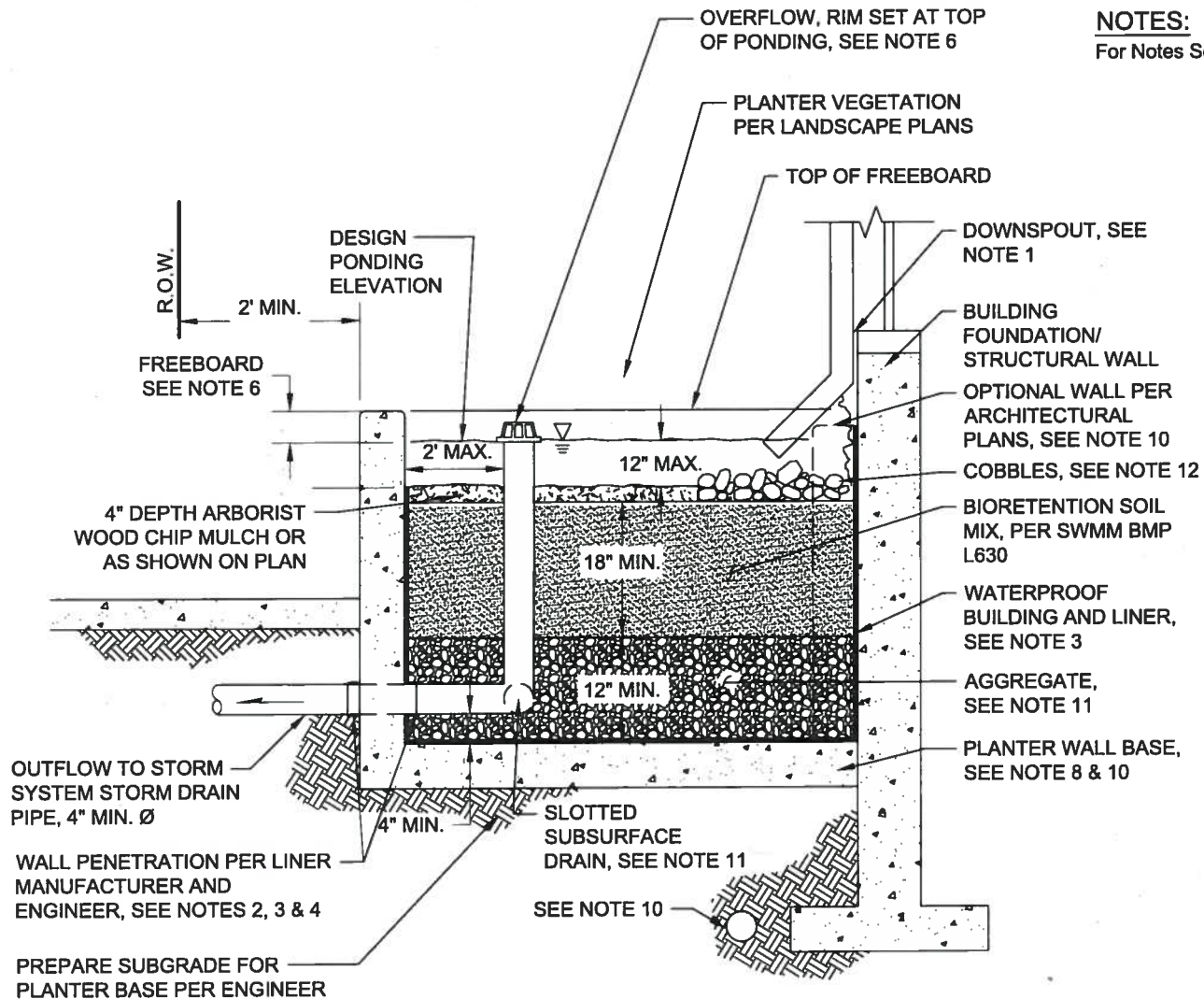
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DATE

CITY OF TACOMA  
WALLED BIORETENTION  
SECTION VIEW

STANDARD PLAN NO. GSI-06c(3)



# **NOTES:**

For Notes See Std. Plan GSI-06c(5).

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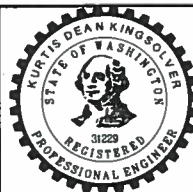
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CITY OF TACOMA  
BIORETENTION PLANTER ADJACENT  
TO BUILDING - SECTION VIEW

STANDARD PLAN NO. GSI-06c(4)

**NOTES:**

1. Install downspouts and other conveyance connections (e.g. scupper, channel, overhead runnel) from building to drain above design ponding elevation. Refer to applicable City building codes for conveyance connection requirements. Diffuser or other method of energy dissipation may be required based on drainage area.
2. Penetrations through facility wall shall be watertight and shall prevent preferential flow into utility trenches (e.g. water stop, trench block, or trench collar), as appropriate.
3. Geomembrane liner per SWMM BMP L630 and shall be PVC with a minimum thickness of 30 mils and in accordance with ASTM D7176. Seams shall be waterproof. Waterproof liner to extend to top of freeboard / overflow elevation. Waterproofing at buildings per Architect / Engineer.
4. Liner secured at top per manufacturer. All seams to be sealed and waterproof per manufacturer and all penetrations to be booted. Liner shall be installed and seamed to create a watertight installation to top of freeboard.
5. Provide geotextile under PVC liner to protect liner if recommended by liner manufacturer. Geotextile per liner manufacturer.
6. Freeboard minimum (2" or 6") varies with tributary area. For freeboard, ponding depth, and overflow requirements, see SWMM BMP L630. Overflow grate per plans, see Std. Plan GSI-13 or GSI-14.
7. See Std. Plan GSI-06c(1) for Plan View. See Std. Plans GSI-06d and GSI-06e for structural details.
8. Planter Walls:
  - A. Material shall be stone, brick, concrete, wood, or other durable material (no chemically treated wood).
  - B. Concrete, brick, or stone walls shall be included on foundation plans for new building construction.
  - C. Planter wall design per Engineer/Architect and shall meet ACI 350 or 318.
  - D. Provide wall at building face in cases where gap is required between wall and planter or where building facade is incompatible with planter configuration.
9. Expansion joints per SU-04 to be provided between sidewalks and walls.
10. This detail has been prepared for new construction (building foundation and footing drain are schematic). If project is a retrofit, Engineer to review existing building conditions and modify accordingly.
11. Aggregate per WSDOT 9-03.12(4) Gravel Backfill for Drains. Underdrain pipe, 4" min. Ø slotted PVC per ASTM D1785 Sch. 40. Slots per SWMM BMP L630. Slope pipe at 0.5% min. unless otherwise specified.
12. Cobbles shall be 6" or 8" cobbles per WSDOT 9-03.11(2). Cobbles 10" thick, 12" x 12" min. pad.
13. See Std. Plan GSI - 06c(1) for Plan View.

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SERVICES

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*4/4/12*  
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CITY OF TACOMA  
BIORETENTION PLANTER ADJACENT  
TO BUILDING - SECTION VIEW

STANDARD PLAN NO. GSI-06c(5)

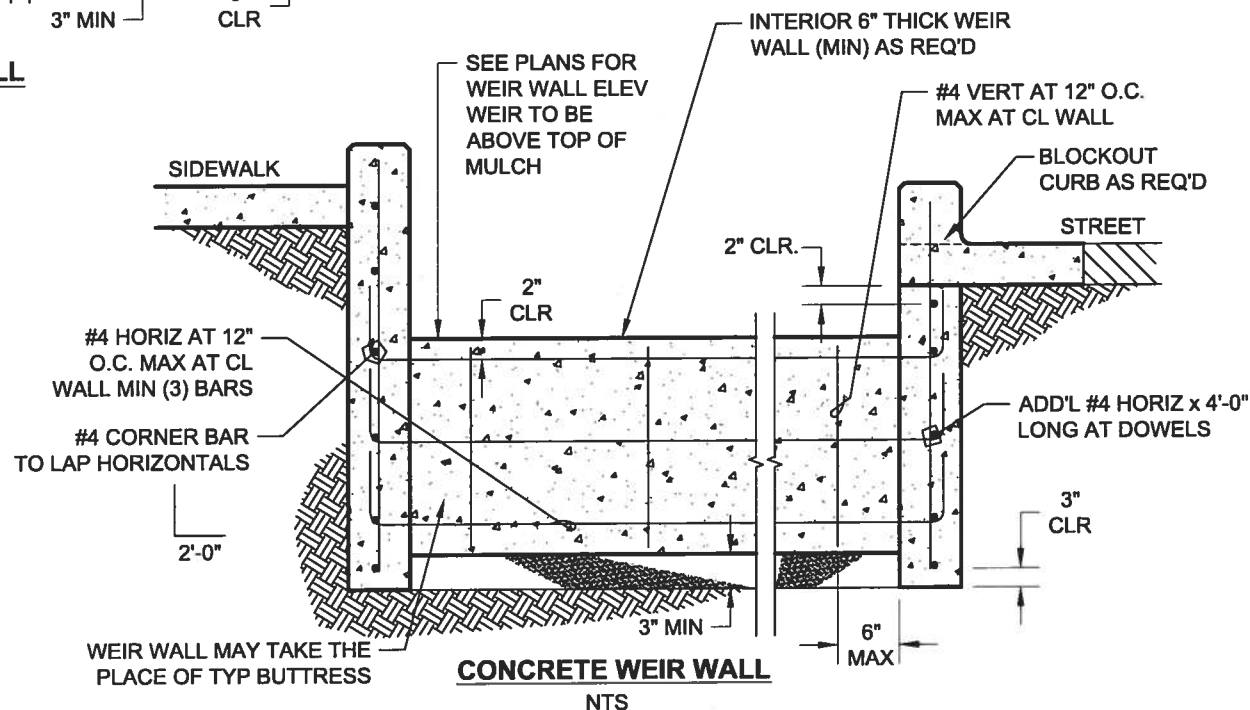




1. Footings may be omitted if buttress is provided per Std. Plan GSI-06e.
2. Foundation subgrade shall consist of undisturbed native soils or compacted structural fill.
3. Retaining wall backfill shall consist of gravel backfill for walls per WSDOT 9-03.12(2).
4. Minimum concrete compressive strength ( $f_c$ ) shall be 3000 psi.
5. Steel reinforcing shall be A615 Grade 60 (60 ksi minimum yield strength).
6. See Std. Plan GSI-06a, GSI-06b, and GSI-06c for plan and section views.
7. Structural design per this sheet may only be used with Std. Plan GSI-06 series with no modifications.
8. Provide corner bars shown at all horiz. reinf. in walls and footings. Lap 2'-0" with horiz. reinf. typ.

STANDARD PLAN NO. GSI-06d

1. Footings per Std. Plan GSI-06d required if buttress is omitted.
2. Foundation subgrade shall consist of undisturbed native soils or compacted structural fill.
3. Retaining wall backfill shall consist of Gravel Backfill for Walls per WSDOT 9-03.12(2).
4. Minimum concrete compressive strength ( $f_c$ ) shall be 3000 psi.
5. Steel reinforcing shall be A615 Grade 60 (60 ksi minimum yield strength).
6. See Std. Plans GSI-06a, GSI-06b, and GSI-06c for plan and section views.
7. Structural design per this sheet may only be used with Std. Plan GSI-06 series with no modifications.
8. Buttress width to be omitted from area modeled for bioretention area.
9. Provide corner bars shown at all horiz. reinf. in walls and footings. Lap 2'-0" with horiz. reinf. typ.



DLS

## PUBLIC WORKS

NA

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TACOMA WATER



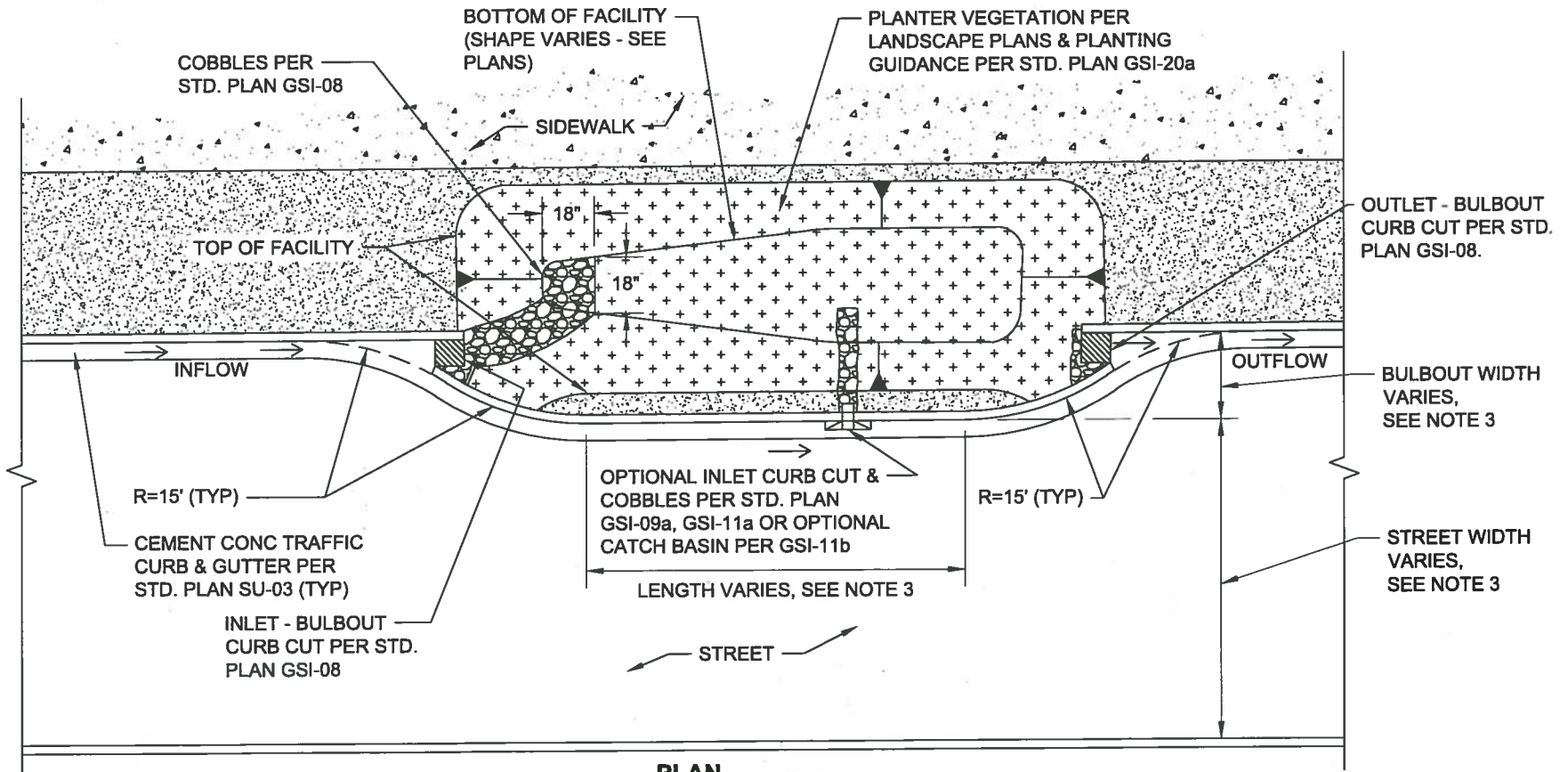
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DATE \_\_\_\_\_

**CITY OF TACOMA  
WALLED BIORETENTION  
STRUCTURAL BUTTRESS / WEIR**

STANDARD PLAN NO. GSI-06e



**PLAN**  
NTS

**NOTES:**

1. Existing and proposed utility lines shall be located out of facility unless otherwise approved by Engineer.
2. Abandoned utilities within footprint of facility shall be removed as needed. Coordinate with utility provider and Engineer.
3. Curb bulbout width and street width varies with street type (e.g. arterial vs. residential). Maximum widths and lengths to be determined by City based on street.
4. See Standard Plans GSI-03a, GSI-03b, GSI-03c for section.
5. Overflow structure per Standard Plan GSI-13 or GSI-14, if shown on plans. Both curb cuts may be inlets if shown on plans and alternate overflow is provided.

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SERVICES

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CITY ENGINEER

DATE

CITY OF TACOMA  
CURB BULBOUT BIORETENTION  
WITH SLOPED SIDES

STANDARD PLAN NO. GSI-07



**GSI-08**

MODIFIED CONC CURB & GUTTER PER STD. PLAN SU-03

MATCH EXISTING

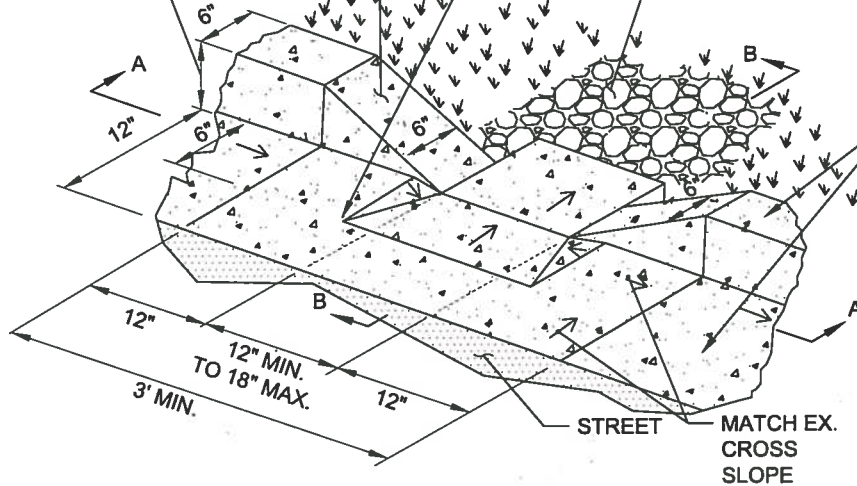
GRADE BREAK FOR DEPRESSION (TYP.)

COBBLES PER NOTE 2

CONCRETE CURB & GUTTER PER STD. PLAN SU-03 (TYP)

### NOTES:

1. For curb cuts into bioretention see SWMM BMP L630.
2. Cobbles shall be 6" cobbles per WSDOT 9-03.11(2). Cobble pad to be 8" thick by the width of the concrete pad plus 6 inches on either side (width 24" min. to 30" max.) for 12" from opening then taper to 12" wide.



**INLET CURB CUT OPENING**  
NTS

TYPICAL GUTTER ELEVATION  
FLOW LINE REFERENCE  
LOCATION

SEE STD.  
PLAN GSI-04

TOP OF BANK  
ELEVATION

STREET

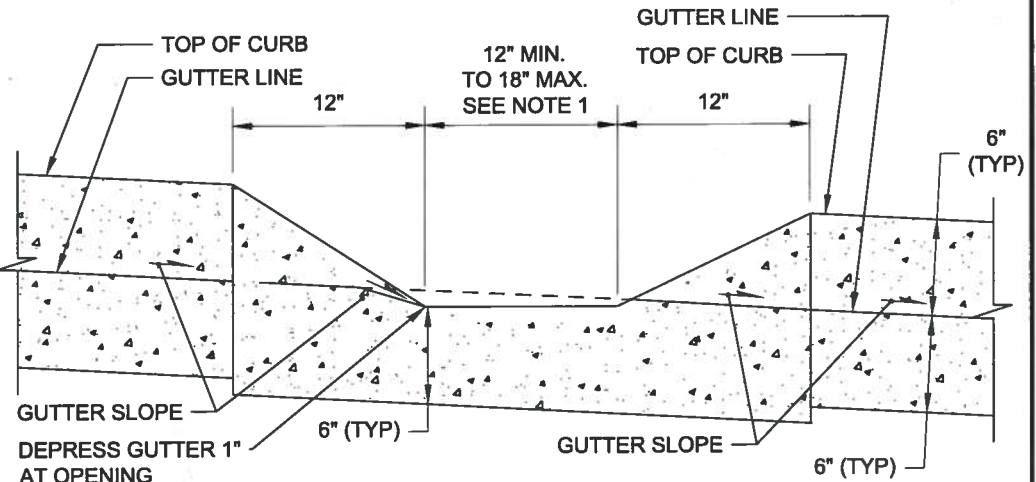
4" CSTC

MODIFIED CONC CURB  
& GUTTER

DEPRESS GUTTER 1"

PROVIDE 2" MIN. TOTAL ELEVATION  
DIFFERENCE FROM TYPICAL  
GUTTER ELEVATION TO TOP OF  
ROCK AT END OF CONCRETE PAD

**SECTION B-B**  
NTS



**SECTION A-A**  
NTS

COBBLES, SEE NOTE 2

COMPACT BIORETENTION SOIL MIX  
UNDER COBBLES TO 90% MAX.  
MODIFIED PROCTOR DENSITY (ASTM  
D1557)

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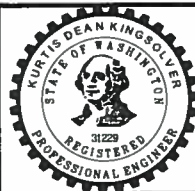
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SERVICES

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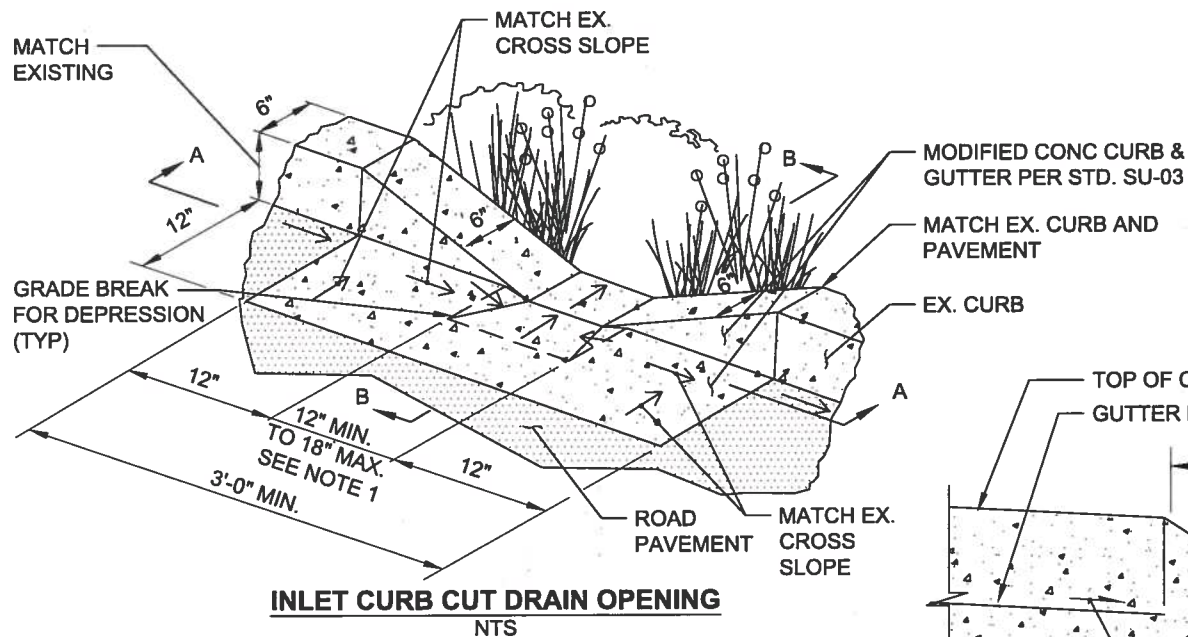
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CITY OF TACOMA  
CURB CUT FOR FACILITY  
WITH GRADED SIDE SLOPES

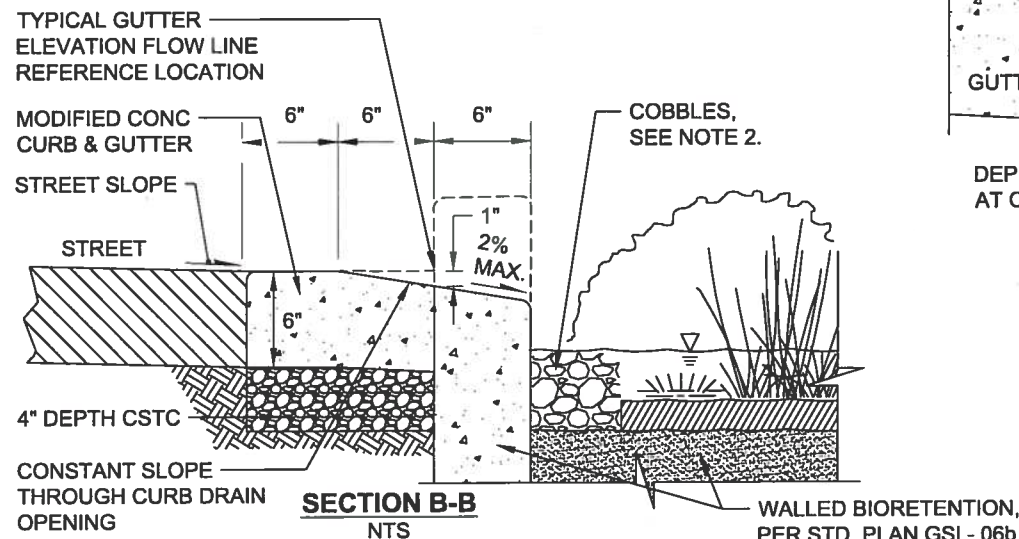
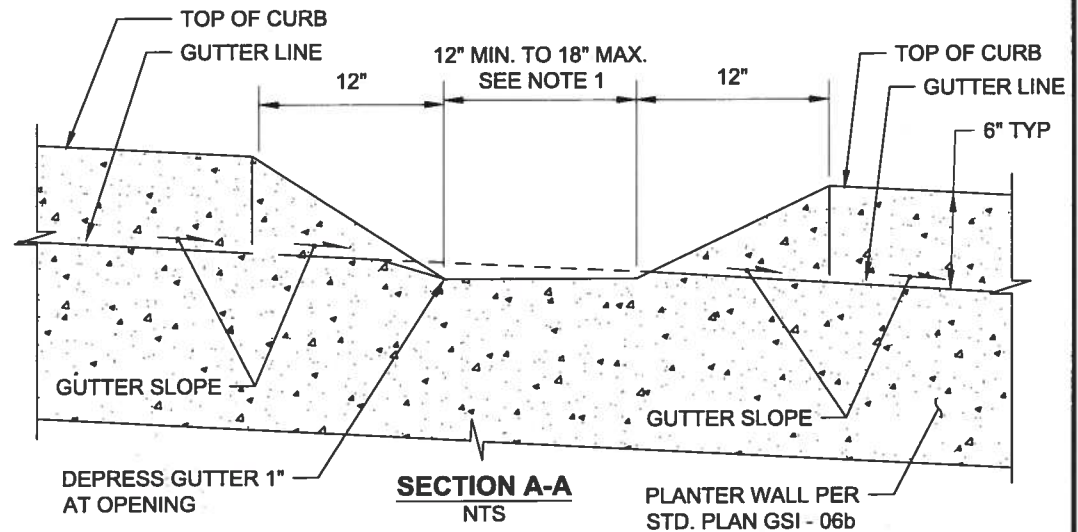
STANDARD PLAN NO.

GSI-09a



# **NOTES:**

1. See SWMM BMP L630 for curb cut sizing. 12" min. to 18" max. opening.
2. Cobbles shall be 6" cobbles per WSDOT 9-03.11(2). Cobble pad to be 8" thick by the width of the curb opening plus 6 inches on either side (width 24" min. to 30" max) x 12" min.



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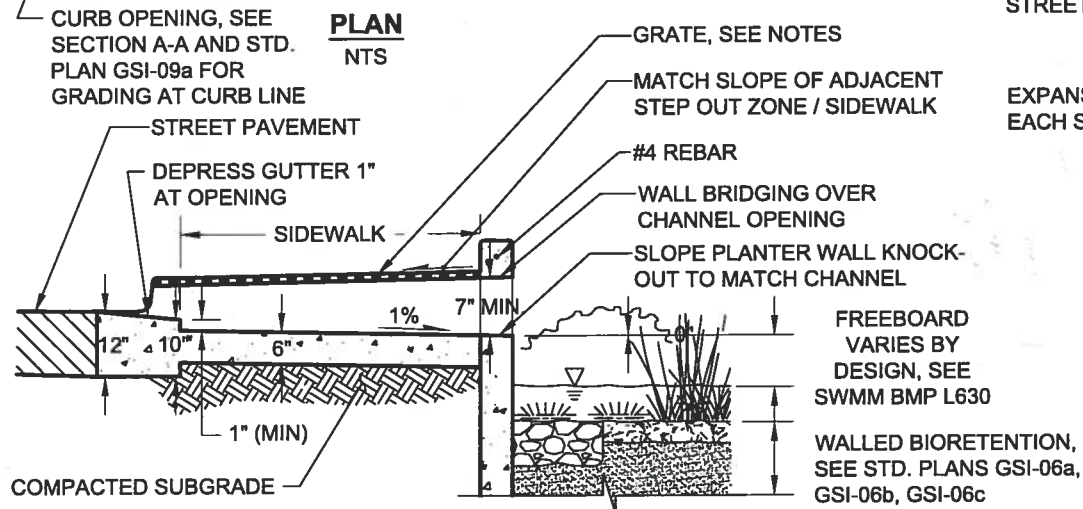
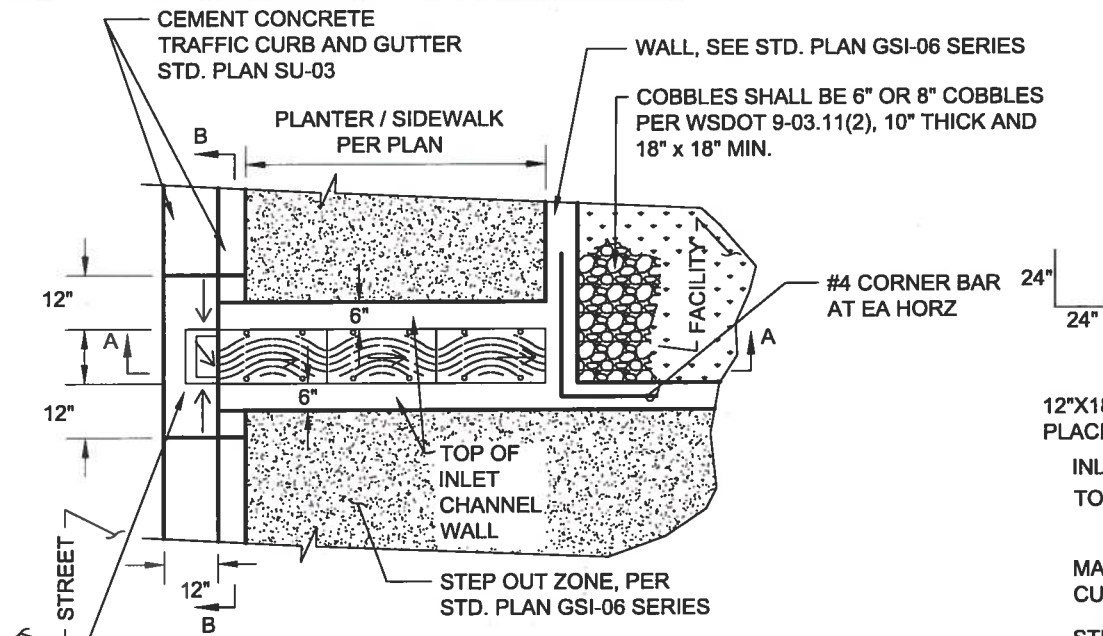
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DATE

CITY OF TACOMA  
CURB CUT AT  
WALLED FACILITY

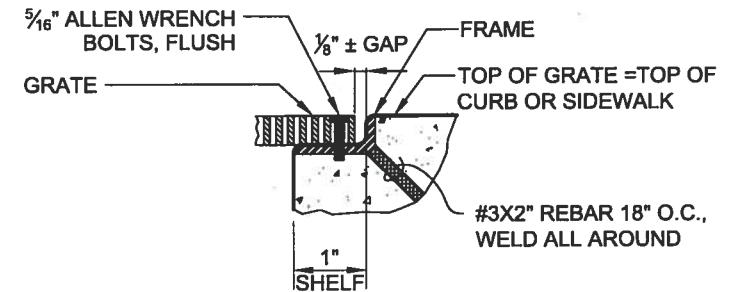
STANDARD PLAN NO. GSI-09b



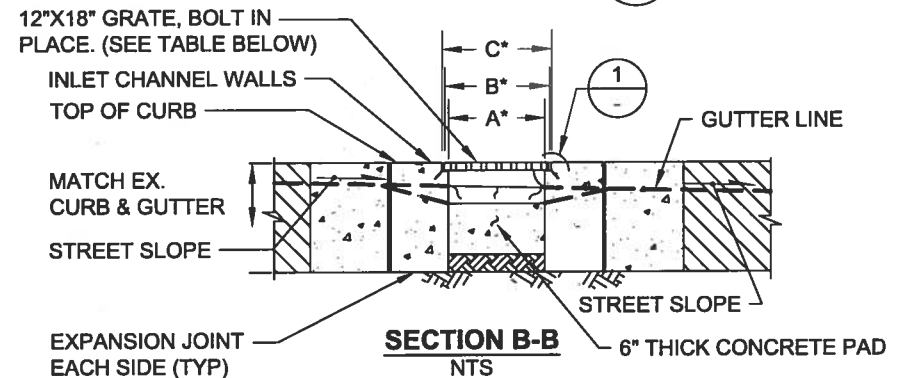




**SECTION A-A**  
NTS



**GRATING & FRAME**  
NTS



**\*TRENCH GRATING DIMENSIONS**

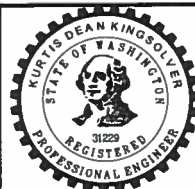
A	B	C
TRENCH WIDTH	GRATE WIDTH	FRAME WIDTH
10"	11 <sup>7</sup> / <sub>8</sub> "	12 <sup>1</sup> / <sub>8</sub> "

**NOTES:**

1. Maximum grate hole width (open)  $\frac{1}{4}$ ". Grate shall be Urban Accessories 12"x18" title wave trench grate and 12" wide type "S" pedestrian duty trench grate frame, or approved equal.
2. Grate finish shall be raw or powder coated to achieve a minimum coefficient of friction of 0.60. Use of powder coating and color in public right of way shall be approved in writing by the City of Tacoma.

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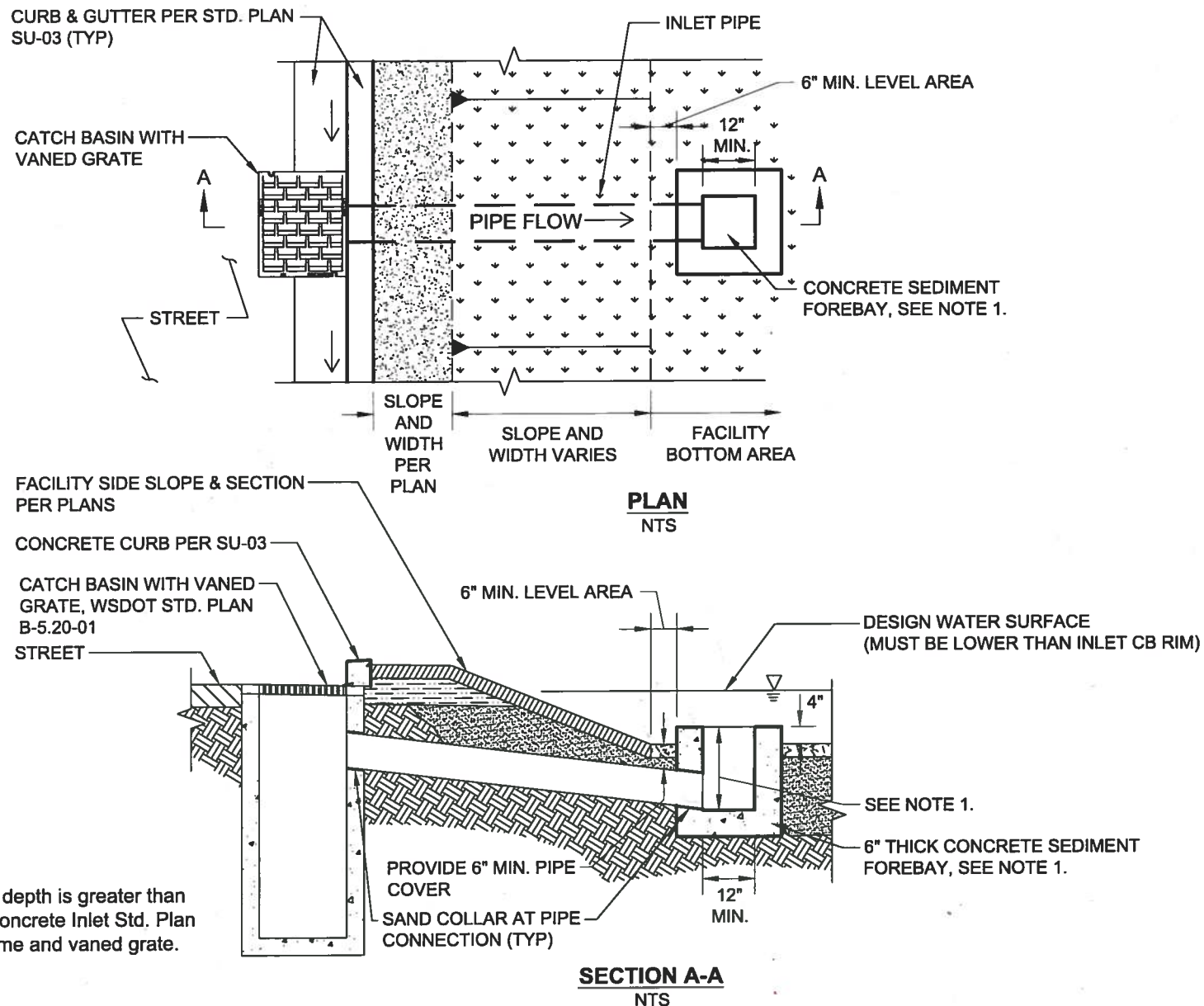
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CITY OF TACOMA  
TRENCH DRAIN INTO  
WALLED BIORETENTION

STANDARD PLAN NO. GSI-10b







**NOTES:**

1. If sediment forebay depth is greater than 12", use WSDOT Concrete Inlet Std. Plan B-25.60-00 with frame and vaned grate.

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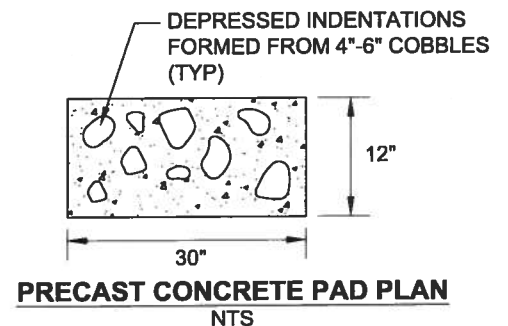
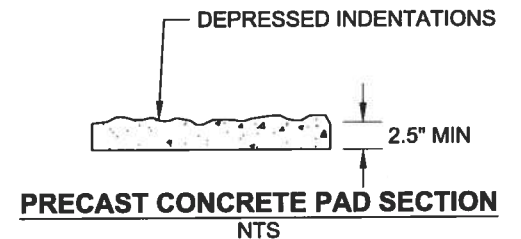
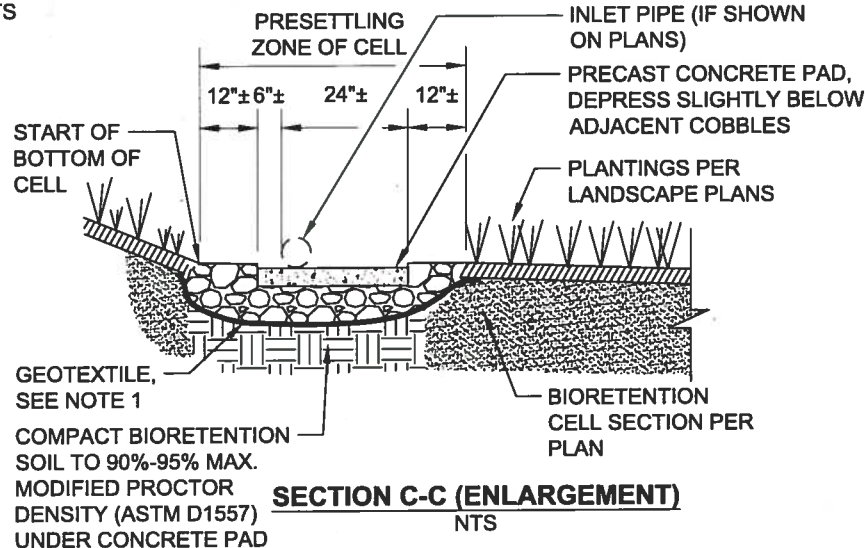
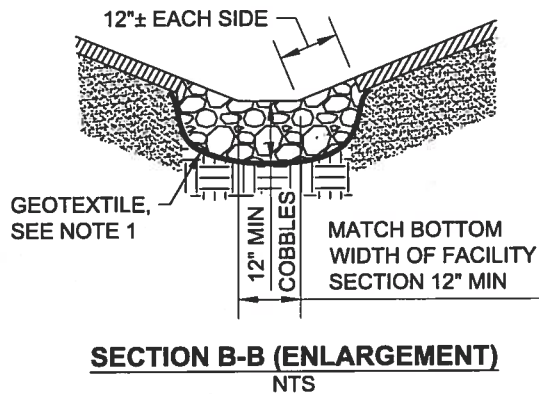
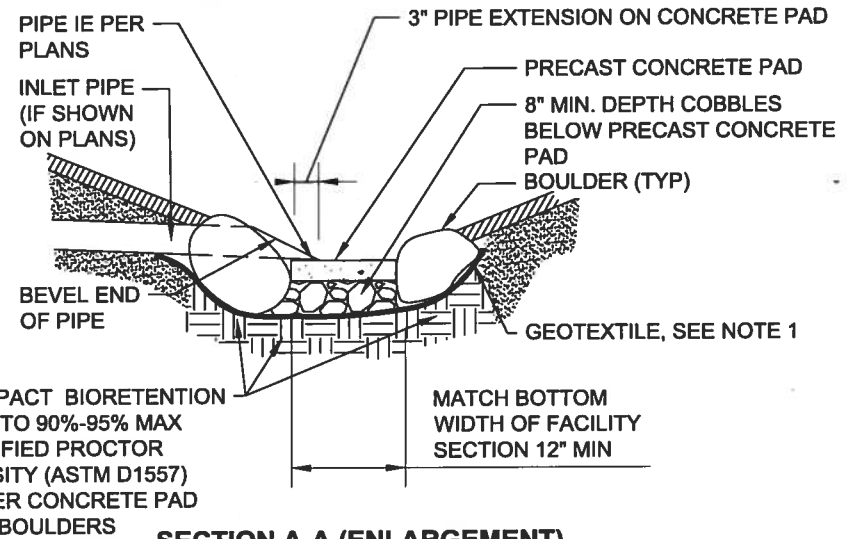
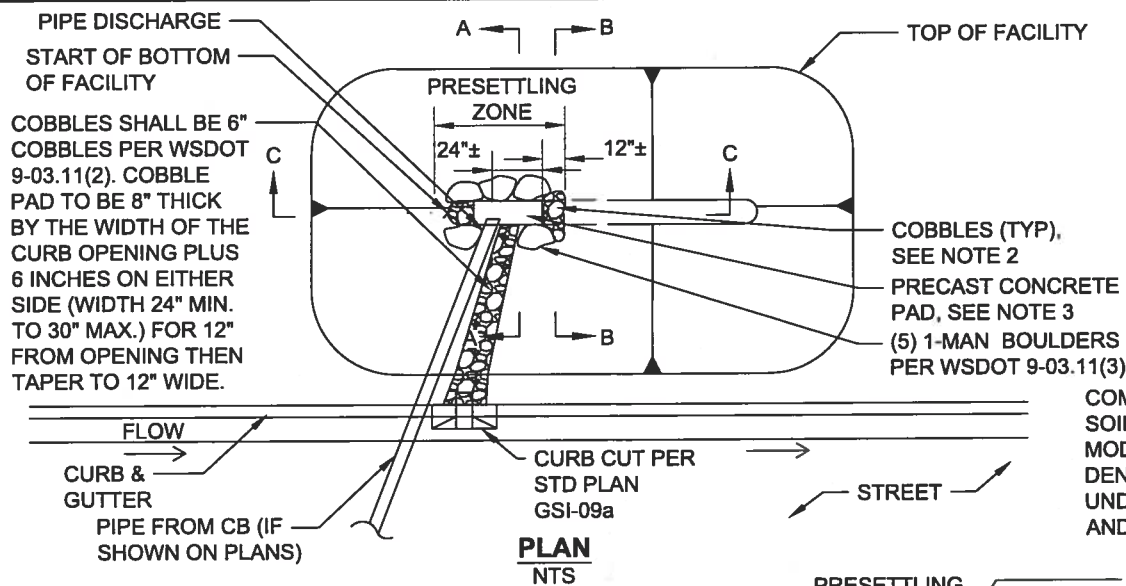
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DATE

CITY OF TACOMA  
STORMWATER ENERGY DISSIPATOR  
WITH PIPED INLET

STANDARD PLAN NO. GSI-11b

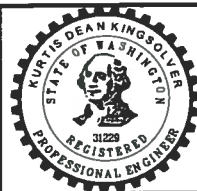


**NOTES:**

1. Geotextile shall be non-woven, moderate survivability per WSDOT 9-33.2(1), Tables 1 and 2.
2. Cobbles shall be 6" cobbles per WSDOT 9-03.11(2).
3. Purchased concrete pad with dimensions of similar size may be used.

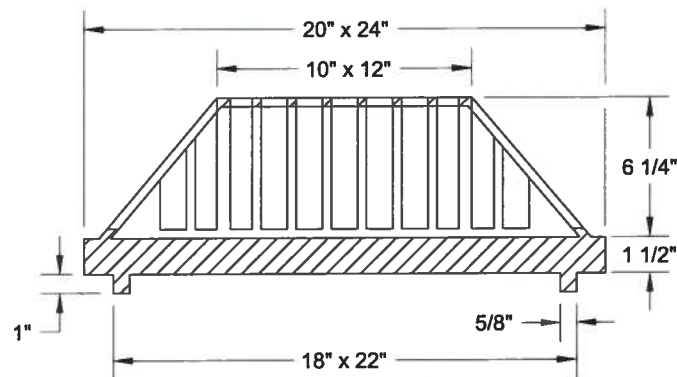
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TACOMA WATER

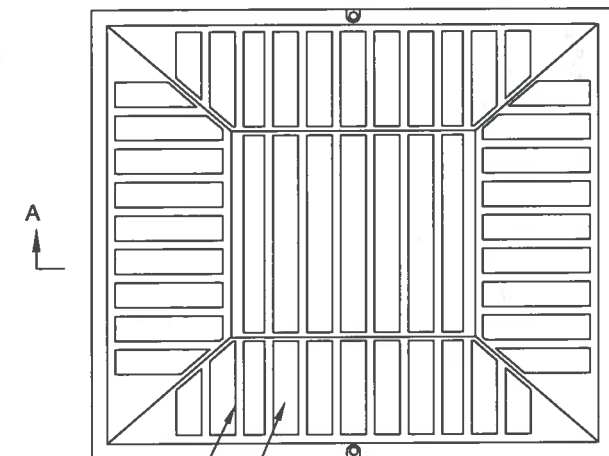


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CITY OF TACOMA  
PRESETTLING CELL  
WITH PIPE OR CURB CUT  
STANDARD PLAN NO. GSI-12

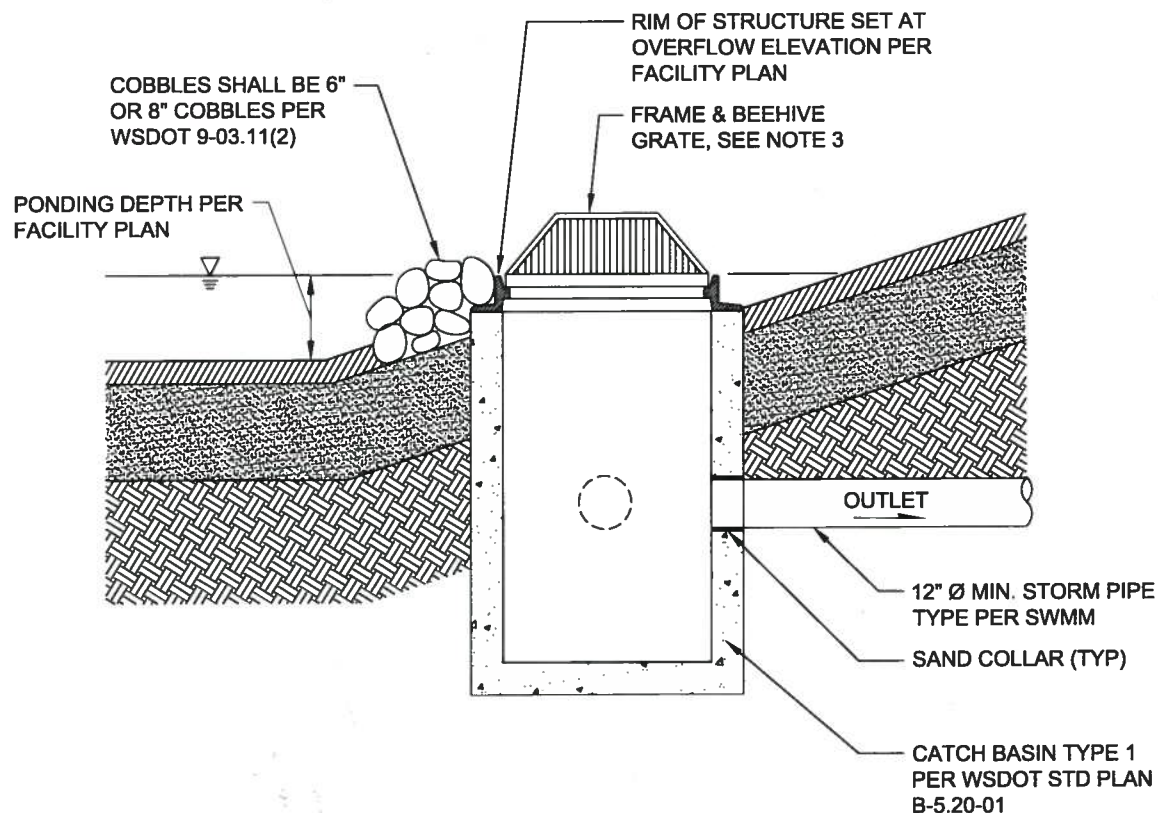


**SECTION A-A**  
NTS



ALL BARS  $\frac{5}{8}$ "  
ALL SLOTS 1"  
SLOT FOR LOCKING BOLT

**PLAN**  
NTS



**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. Plant spacing within facility to allow maintenance access to structure.

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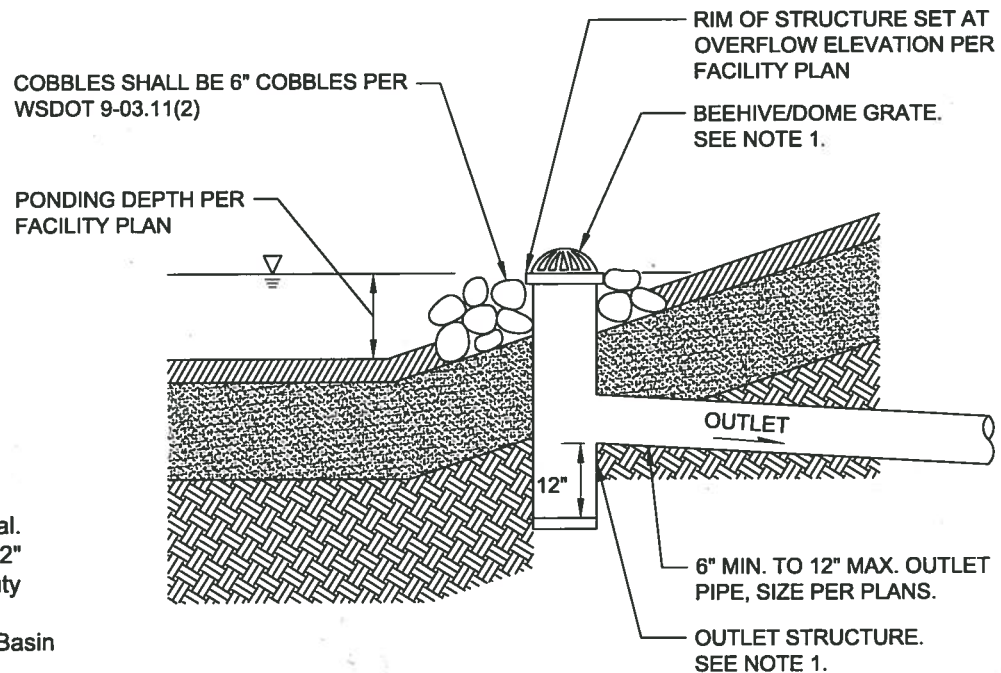
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4/28/10  
DATE

**CITY OF TACOMA  
OVERFLOW OUTLET  
STRUCTURE**

STANDARD PLAN NO. GSI-13





**NOTES:**

1. Beehive/Dome grate and drain basin shall be Nyloplast as noted below or an approved equal.
  - 1.1. Beehive/Dome grate shall be Nyloplast 12" Dome (Part #1299CGD), locking, light duty ductile iron (ASTM A536).
  - 1.2. Drain basin shall be Nyloplast 12" Drain Basin (Part #2812AG\_\_X).
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. Sump depth may be less than 12" in lined facilities. City approval required.

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SERVICES

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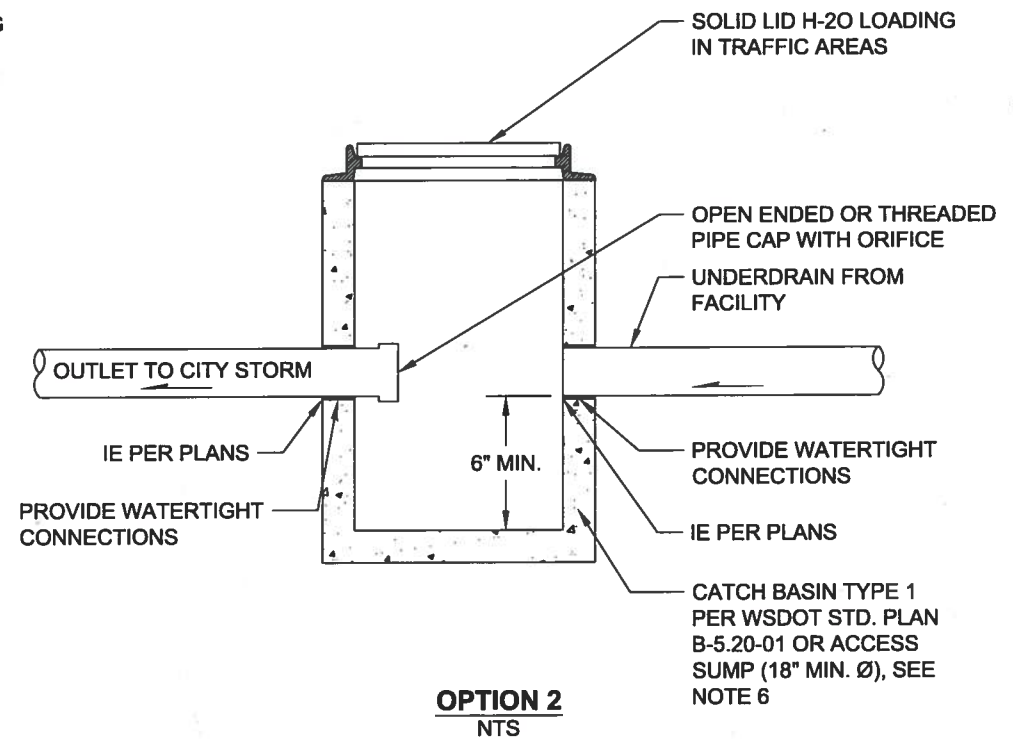
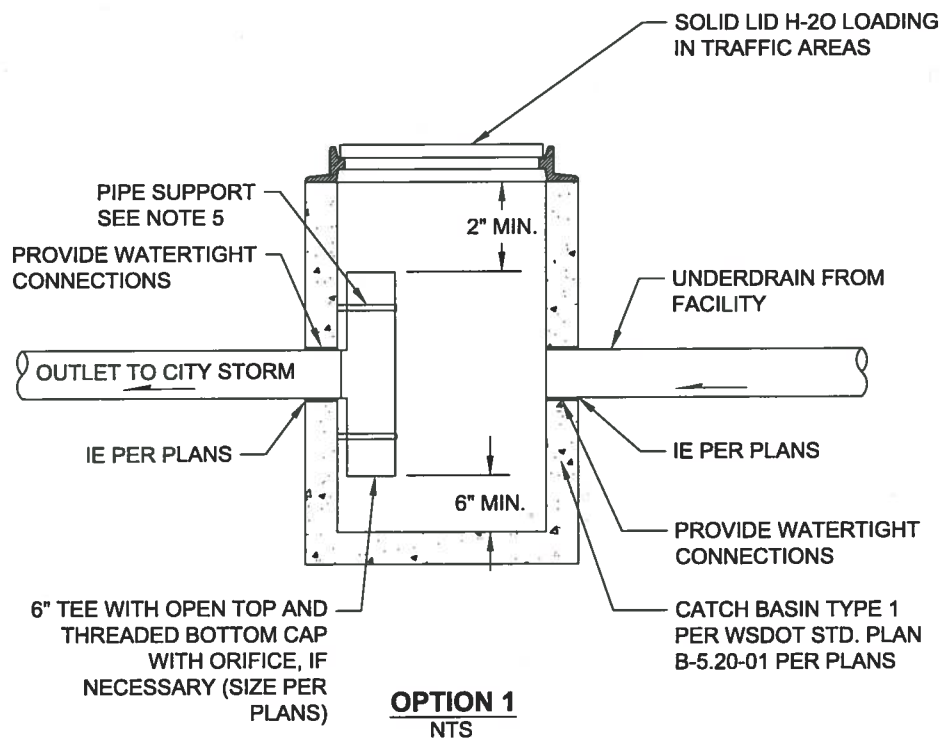
CITY ENGINEER

DATE

CITY OF TACOMA  
OVERFLOW OUTLET  
STRUCTURE FOR SMALLER FACILITIES

STANDARD PLAN NO.

GS1-14



#### NOTES:

1. See plans for invert elevations.
2. Outlet control structure may be combined with overflow structure.
3. Total depth of structure shall not exceed 4 feet.
4. Tee shall be located to allow a 12 inch clear area between tee and catch basin wall for the entire depth of structure.
5. Provide at least 3" X .090 gage corrosion resistant support bracket anchored to concrete wall (maximum 3'-0" vertical spacing).
6. Access sump shall be Nyloplast as noted below or an approved equal:
  - 6.1. Nyloplast 18" Drain Basin (Part #2818AG\_\_X)
  - 6.2. Nyloplast Solid Cover (Part #1899CGC)

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TACOMA WATER



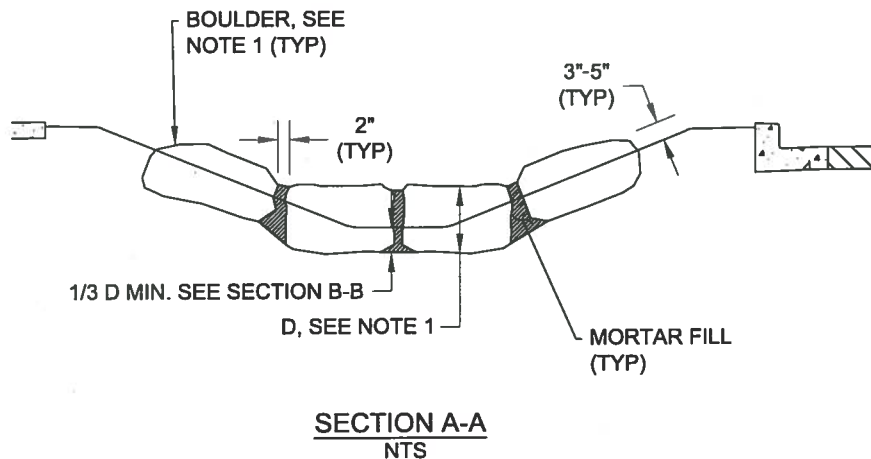
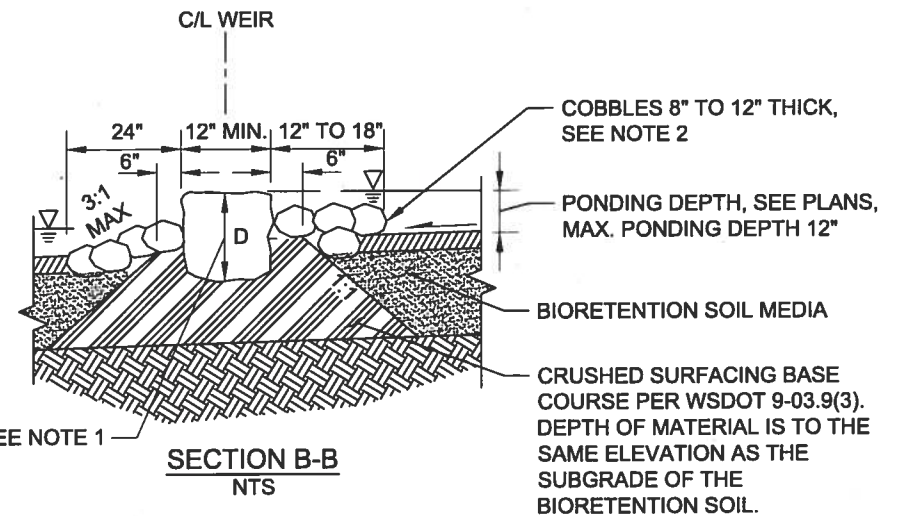
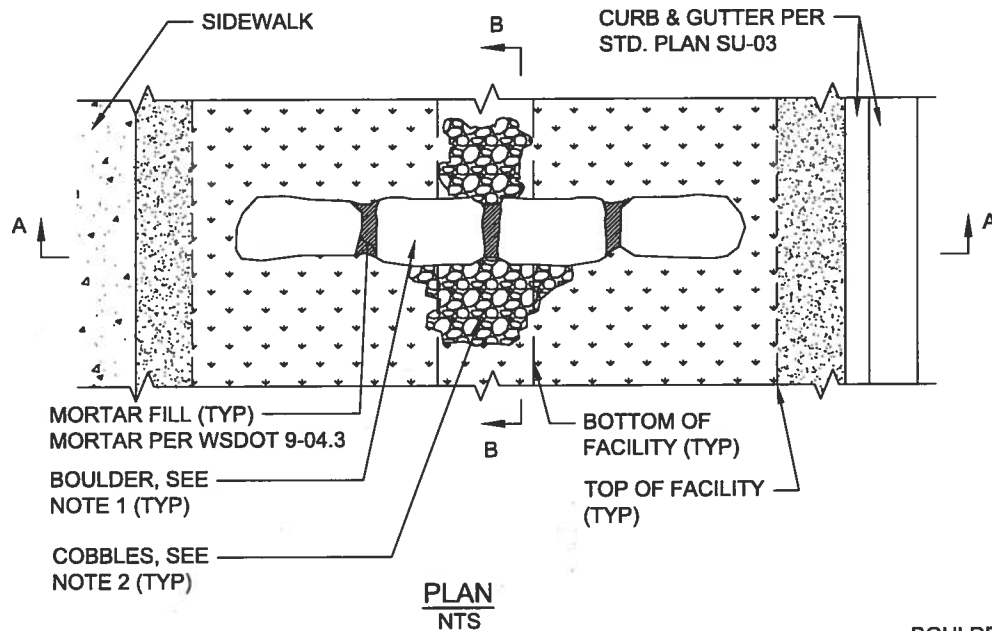
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CITY ENGINEER

DATE

CITY OF TACOMA  
GREEN STORMWATER  
INFRASTRUCTURE  
OUTLET CONTROL

STANDARD PLAN NO. GSI-15



#### NOTES:

1. Boulder shall be 1-2 man per WSDOT 9-03.11(3). Height of boulder (D) per designer given facility's ponding depth and grade change across weir. Exposed boulder faces shall be smooth, clean breaks.
2. Cobbles shall be 8" cobbles per WSDOT 9-03.11(2).

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CITY OF TACOMA

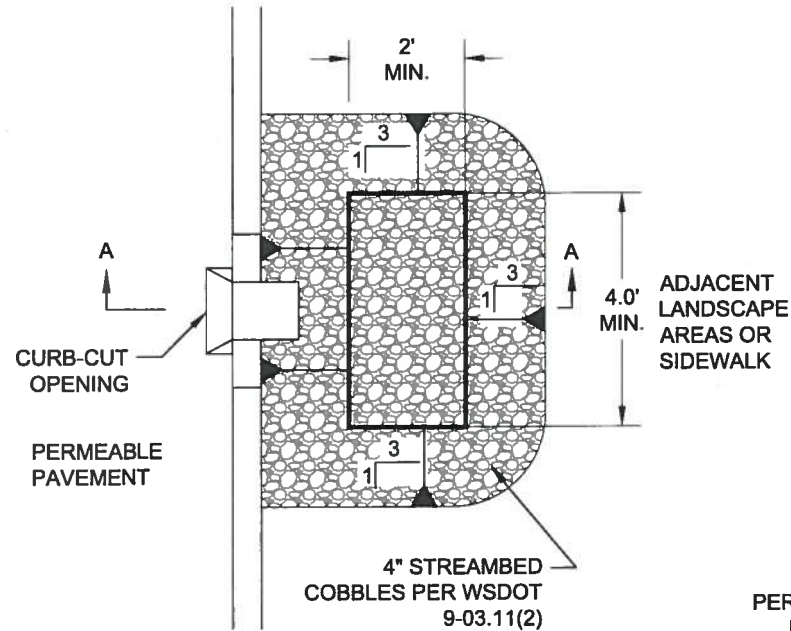
BOULDER WEIR

STANDARD PLAN NO. GSI-16

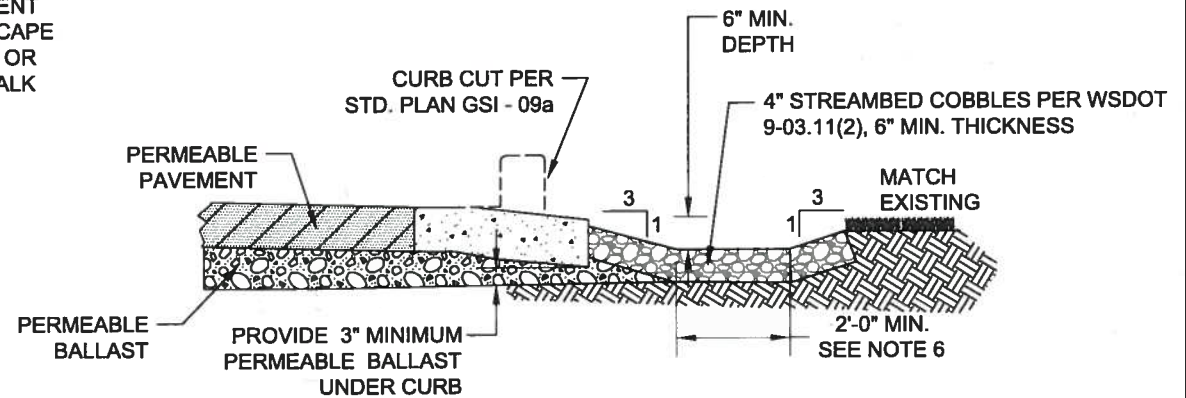


# NOTES:

1. Overflow infiltration gallery may be used adjacent to low points in permeable pavements.
2. Dimensions shown are minimums. Design conditions may warrant larger dimensions.
3. Location and spacing of overflow infiltration gallery per plans.
4. See Std. Plan GSI - 09a for curb cut.
5. See SWMM BMP L633 and Std. Plans SU-31a, b, c for permeable pavements.
6. For use in planter strips, minimum bottom width may be adjusted to 1.5 feet if needed.



**PLAN**  
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**SECTION A-A**  
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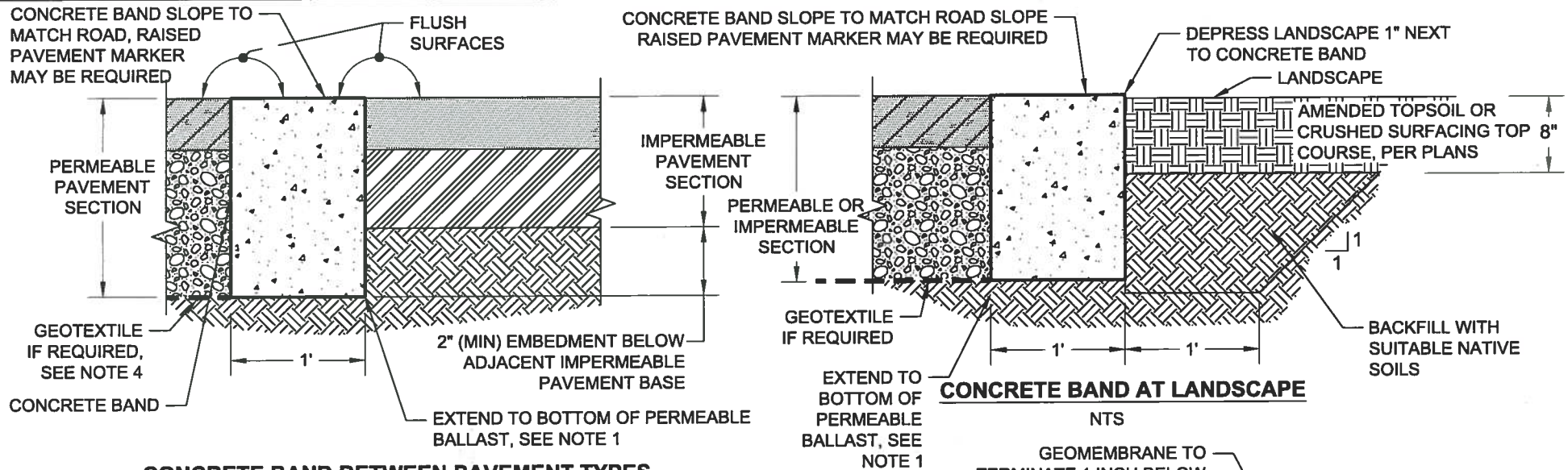
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DATE

CITY OF TACOMA  
PERMEABLE PAVEMENT  
OVERFLOW INFILTRATION GALLERY

STANDARD PLAN NO. GSI-17



### CONCRETE BAND BETWEEN PAVEMENT TYPES

NTS

#### NOTES:

- When used as a visual separation or to stabilize surfacing material, edge treatment is not required to extend more than 12 inches below top of wearing course unless the permeable pavement section is adjacent to a standard pavement section. When permeable pavement is adjacent to a standard pavement section, edge treatment shall extend to the bottom of the permeable pavement section or 2 inches below the impermeable pavement section, whichever is deeper and as approved by the geotechnical engineer.

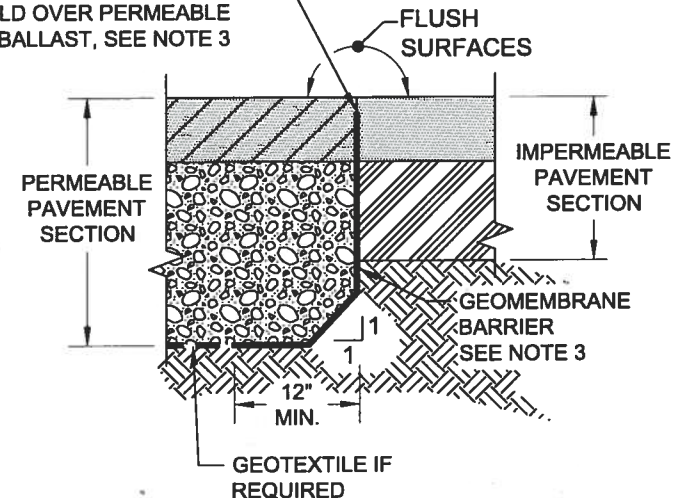
When used as a barrier to lateral water flow, edge treatment depth shall be 12 inches minimum or to the bottom of the permeable pavement section, whichever is deeper or deeper as recommended by the geotechnical engineer.

- Expansion joint in band spaced @ 15' max.
- Geomembrane barrier shall provide an impermeable barrier between standard and permeable section. It shall be installed 1" below finished grade of surfacing, as shown. Alternatively, the liner shall fold over the permeable ballast a minimum of 6" or further if recommended by the geotechnical engineer.

Geomembrane barrier seams shall overlap at least 18" or per manufacturer's recommendations. Geomembrane barrier shall extend the linear length of the permeable section when adjacent to standard pavement.

- Geotextile for separation per WSDOT 9.33.2(1), woven, Table 3.
- All joints shall be cleaned and edged. External edges shall be 1/2" radius. Internal joints shall be 1/2" radius.
- All expansion joints shall be full depth with 3/8" premolded joint filler.
- All soft and yielding foundation material beneath band shall be removed and replaced with crushed surfacing top course (CSTC) per WSDOT Section 9-03.9(3).
- Maximum depth of concrete band shall be 30 inches.
- A combination of geomembrane liner and concrete band may be used, if required. Liner to be placed between permeable section and concrete band.
- Concrete band shall not be used perpendicular to the flow of traffic.

GEOMEMBRANE TO TERMINATE 1 INCH BELOW TOP OF SURFACING OR FOLD OVER PERMEABLE BALLAST, SEE NOTE 3



### GEOMEMBRANE BARRIER BETWEEN PAVEMENT TYPES

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TACOMA WATER



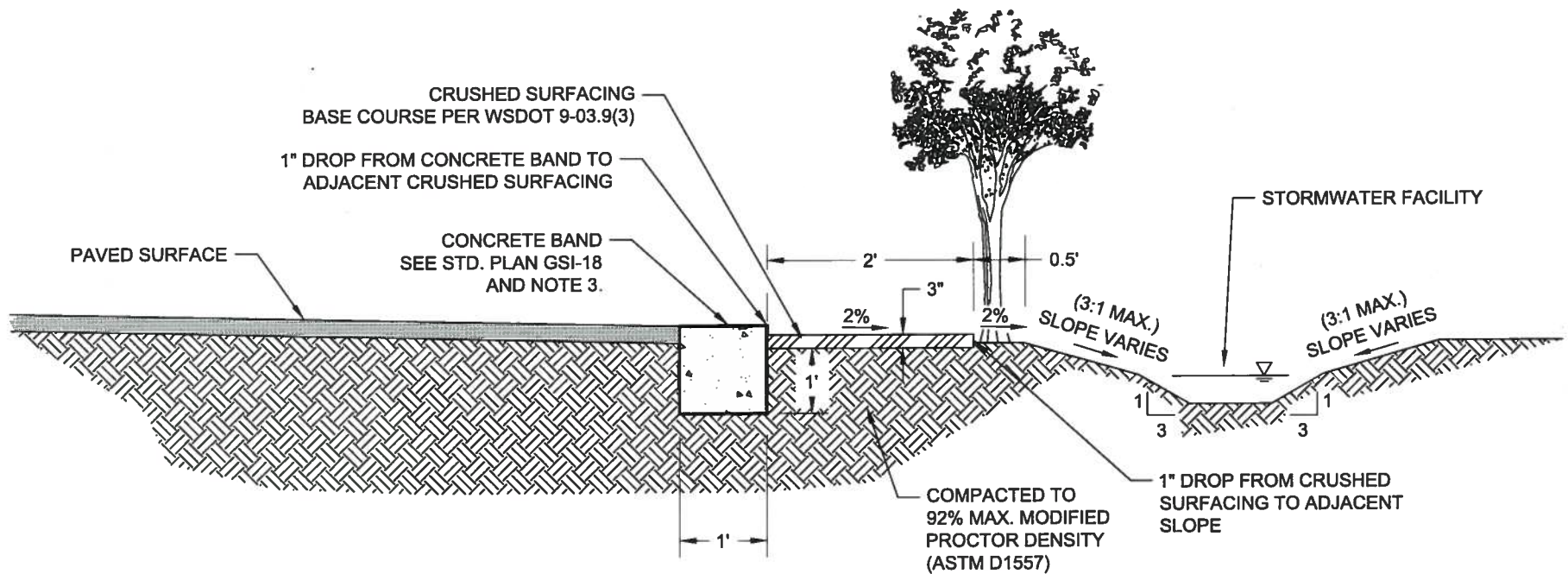
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4/1/14  
DATE

CITY OF TACOMA  
GREEN STORMWATER  
INFRASTRUCTURE  
EDGE TREATMENTS

STANDARD PLAN NO. GSI-18



**SECTION**  
NTS

**NOTES:**

1. Raised pavement markers or striping may be required on concrete band.
2. Stormwater facility per separate plan. Top of freeboard, where applicable, shall be below edge of crushed surfacing per SWMM.
3. Expansion joint per detail SU-04 @ 15' max.

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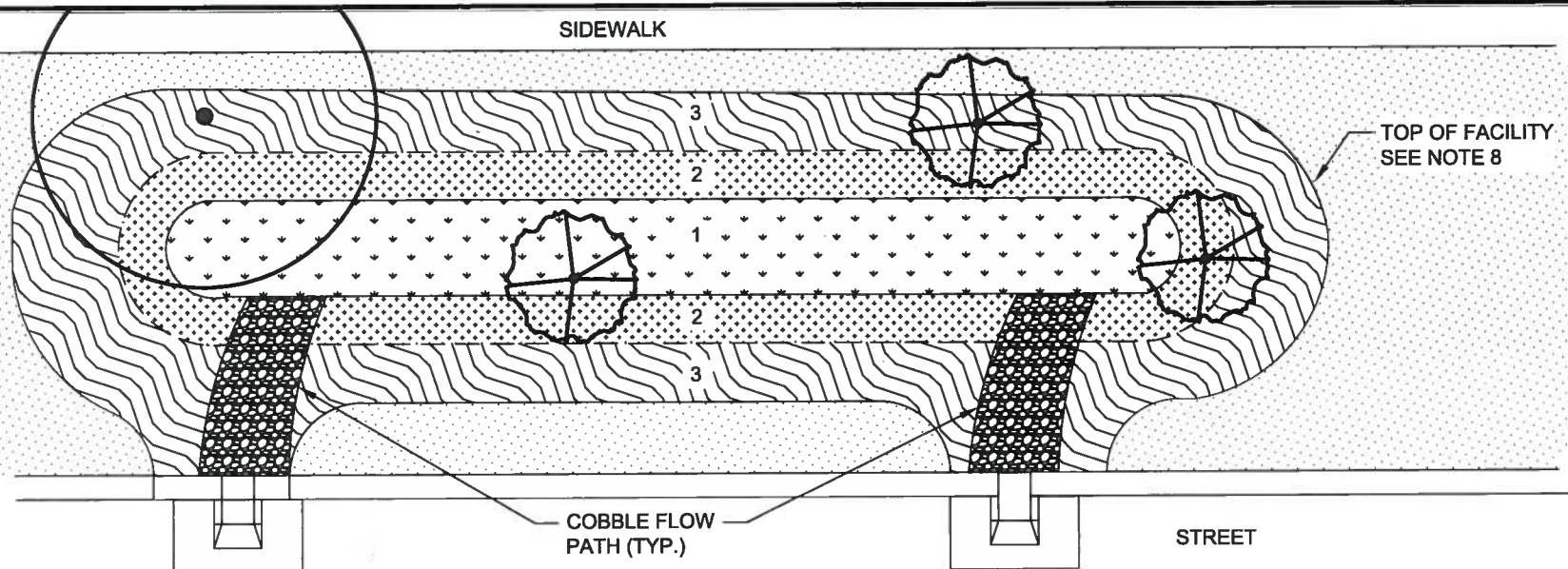
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DATE

CITY OF TACOMA  
PAVED SURFACE SHEET  
FLOW TO STORMWATER FACILITY

STANDARD PLAN NO. GSI-19





#### NOTES:

1. All plantings shall be selected with a maximum mature height not greater than 30 inches above the top of facility, with the exception of trees and accent shrubs.
2. See Std. Plans GSI-21a and GSI-21b, and Std. Plans GSI-03a, GSI-03b, or GSI-03c for plan and section views of bioretention with sloped sides.
3. See Rain Garden Handbook for Western Washington: A Guide for Design, Maintenance, and Installation for plant selection, spacing and densities.
4. Choose a minimum 50% evergreen plants.
5. Provide mulch per SWMM BMP L630 and Std. Plans GSI-03a, GSI-03b or GSI-03c.
6. Plantings adjacent to street, driveway or sidewalk shall be selected and spaced to allow access to vehicles and not impede pedestrians.
7. Plants shall be spaced to ensure clear access and unimpeded flow from inlets, outlets and overflows.
8. Continue mulch for a minimum of 2-feet past the top of bank elevation or install landscape edging if facility is adjacent to turf.

SYMBOL	ZONE	PLANT TYPE	LOCATION
	1	Emergents, Perennials & Low Shrubs (Plants that can tolerate standing water)	Facility Bottom
	2	Emergents, Perennials & Low Shrubs (Plants that can tolerate occasional standing water)	Lower Slope to top of ponding
	3	Groundcovers / Shrubs	Upper Slope / Sidewalk Grade
	1,2,3	Accent Shrub (Select appropriate shrub based on zone)	Sidewalk Grade / Lower Slope / Facility Bottom
	1,2,3	Tree	Upper Slope Locate trees to allow for pedestrian and vehicular clearances. Trees to be located outside of liner for lined facilities. See Std. Plans GSI-21a and GSI-21b.

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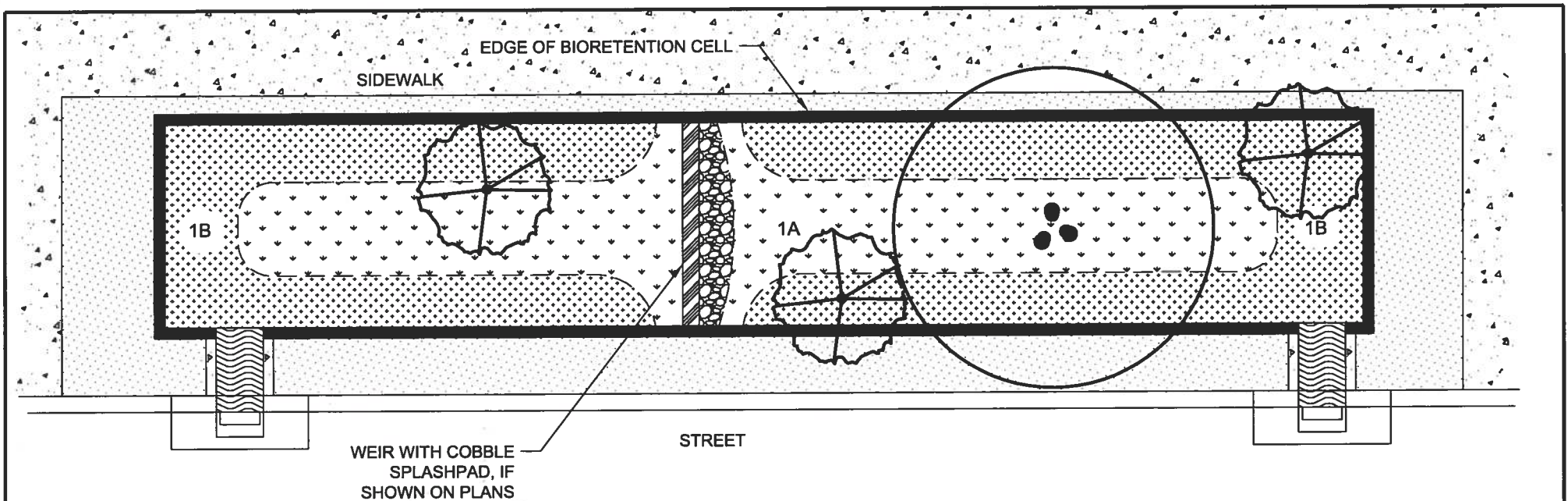
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CITY OF TACOMA  
PLANTING ZONE DIAGRAM  
BIORETENTION WITH SIDE SLOPES

STANDARD PLAN NO. GSI-20a



#### NOTES:

1. All plantings shall be selected with a maximum mature height not greater than 30 inches above top of facility, with the exception of trees and accent shrubs.
2. See Rain Garden Handbook for Western Washington: A Guide for Design, Maintenance, and Installation for plant selection, spacing and densities.
3. Choose a minimum 50% evergreen plants.
4. Provide mulch per SWMM BMP L630 and Std. Plans GSI-06a, GSI-06b or GSI-06c.
5. Plantings adjacent to street, driveway or sidewalk shall be selected and spaced to allow access to vehicles and not impede pedestrians.
6. Plants shall be spaced to ensure clear access and unimpeded flow from inlets, outlets and overflows.
7. See Std. Plans GSI-06a-e for plan and section view of walled bioretention facilities.

SYMBOL	ZONE	PLANT TYPE	LOCATION
	1A	Low Shrubs, Emergents & Perennials (Plants that can tolerate occasional standing water)	Facility Bottom (Center Areas)
	1B	Emergents & Perennials (Plants that can tolerate occasional standing water)	Facility Bottom (Edge Areas)
	1A / 1B	Tall Accent Shrub	Facility Bottom
	1A / 1B	Small Tree	Locate trees to allow for pedestrian and vehicular clearances. Trees to be utilized only in unlined facilities.

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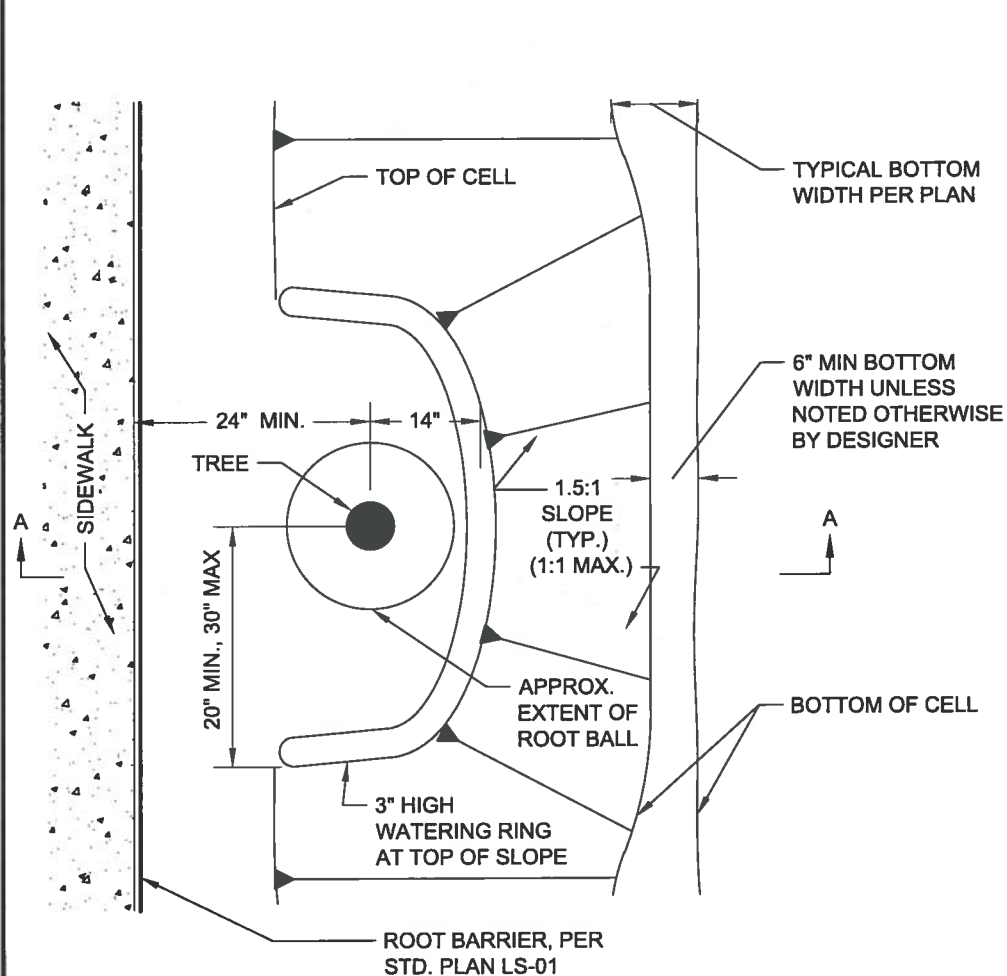
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DATE

CITY OF TACOMA  
PLANTING ZONE DIAGRAM  
BIORETENTION WITH VERTICAL WALLS

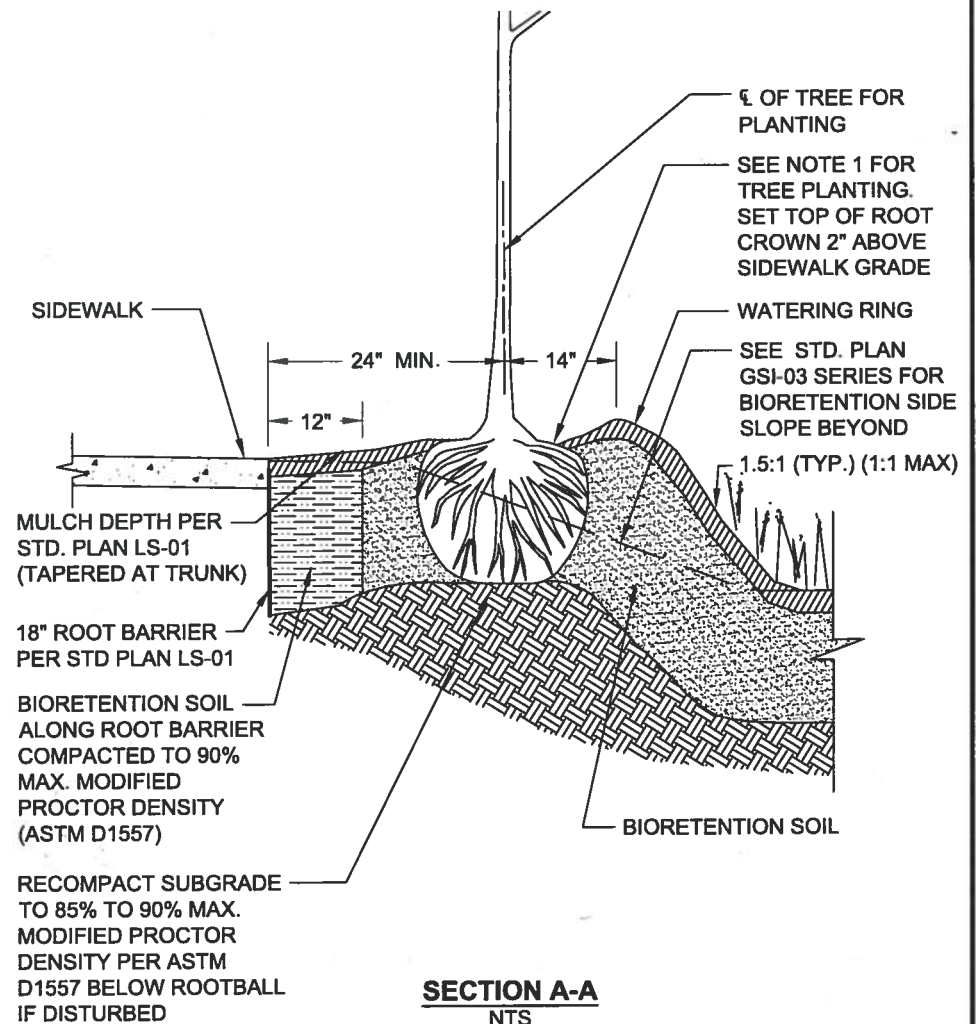
STANDARD PLAN NO. GSI-20b



**PLAN**  
NTS

**NOTES:**

1. Plant & stake tree per Std. Plan LS-01 unless shown otherwise in this detail.



**SECTION A-A**  
NTS

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CITY ENGINEER

DATE

CITY OF TACOMA  
TREE PLANTING ON BIORETENTION  
CELL EDGE ADJACENT TO SIDEWALK

STANDARD PLAN NO. GSI-21a

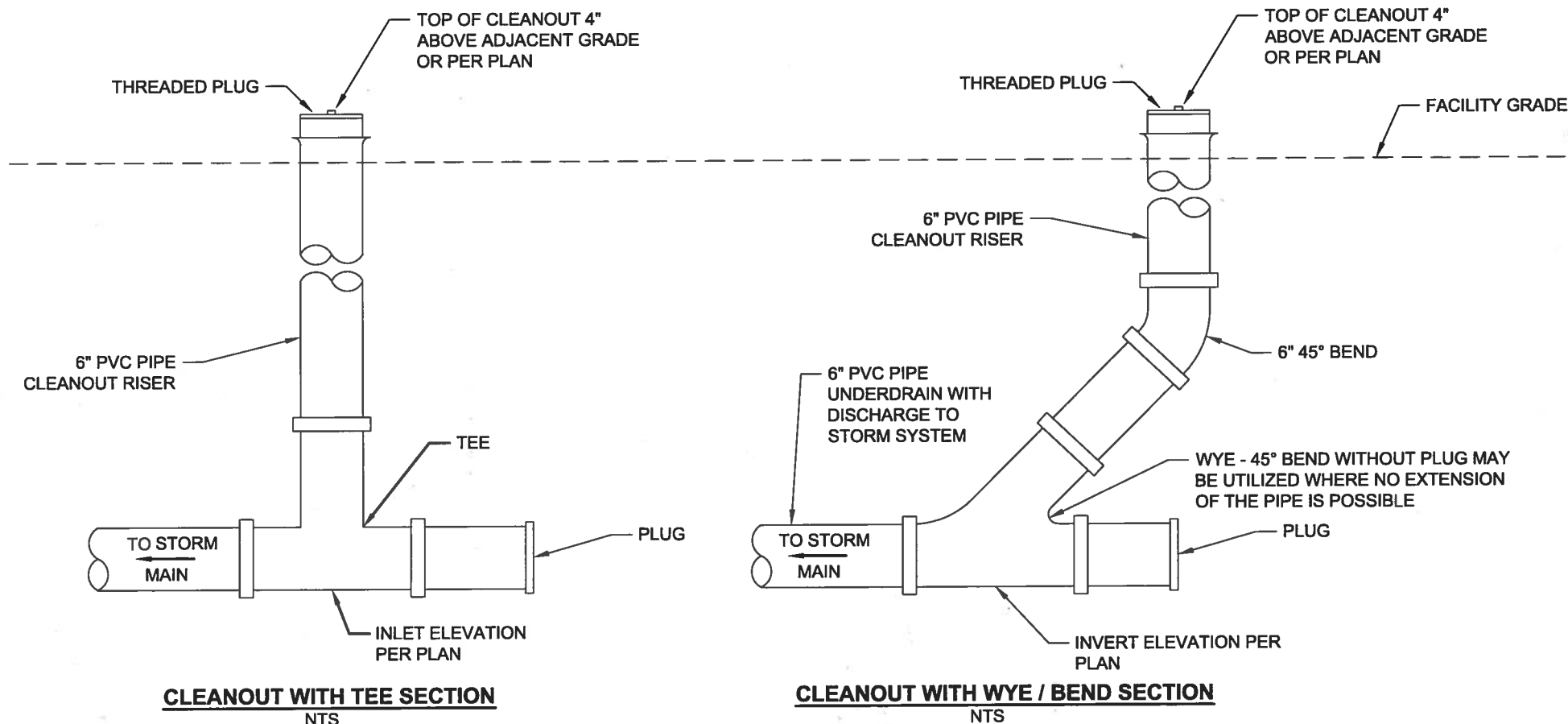




1. Plant & stake tree per Std. Plan LS-01 unless shown otherwise in this detail.



STANDARD PLAN NO. GSI-21b



**NOTES:**

1. 6" Ø shown as minimum. Larger diameter may be required based on facility design and flowrates.
2. Maximum depth for cleanout risers less than 12 inches in diameter shall be 4 feet to pipe invert from final grade.
3. Cleanouts less than 12 inches in diameter shall only be allowed when there is a straight run of pipe to the cleanout from a structure that will allow access by City maintenance equipment.
4. Cleanout with tee shall be utilized unless access to cleanout with a straight run of pipe from an accessible City structure to cleanout cannot be provided.
5. Cleanout riser top shall be located outside of ponding areas, where possible.

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 CITY ENGINEER  
 DATE 4/4/12

**CITY OF TACOMA  
 STORM CLEANOUT  
 IN VEGETATED FACILITY**  
 STANDARD PLAN NO. GSI-22