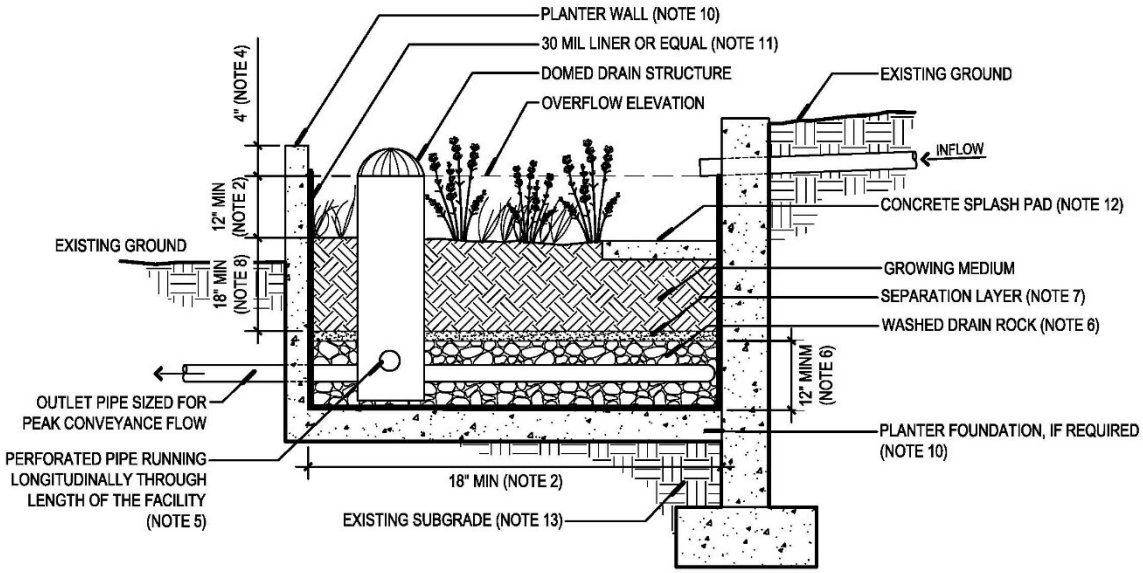
Appendix C: Stormwater Typical Drawings and Standard Details

Dwg #	Drawing Description
BMP SIZING TOOL FACILITY DRAWINGS	
SWM-01	PLANTER FILTRATION
SWM-02	PLANTER INFILTRATION
SWM-03	RAIN GARDEN FILTRATION
SWM-04	RAIN GARDEN INFILTRATION
SWM-05	VEGETATED SWALE FILTRATION
SWM-06	VEGETATED SWALE INFILTRATION
SWM-07	FILTER STRIP
SWM-08	SIMPLIFIED DESIGN APPROACH DRYWELL
SWM-09	SIMPLIFIED DESIGN APPROACH INFILTRATION TRENCH
SWM-10	DETENTION POND
SWM-11	DETENTION POND FLOW CONTROL STRUCTURE
SWM-12	PERVIOUS PAVEMENT
SWM-13	GREEN ROOF
STANDARD DETAILS	
SWM-14	CB CURB AND GUTTER DETAIL
SWM-15	CB CURB INLET
SWM-16	CB DITCH INLET
SWM-17	CB FRAME AND GRATE
SWM-18	CB STANDARD GB2
SWM-19	DETENTION TANK DIAGRAM
SWM-20	POND DIAGRAM
SWM-21	SHEAR GATE AND ORIFICE
SWM-22	FLOW STRUCTURE TYPE 1
SWM-23	FLOW STRUCTURE TYPE 2

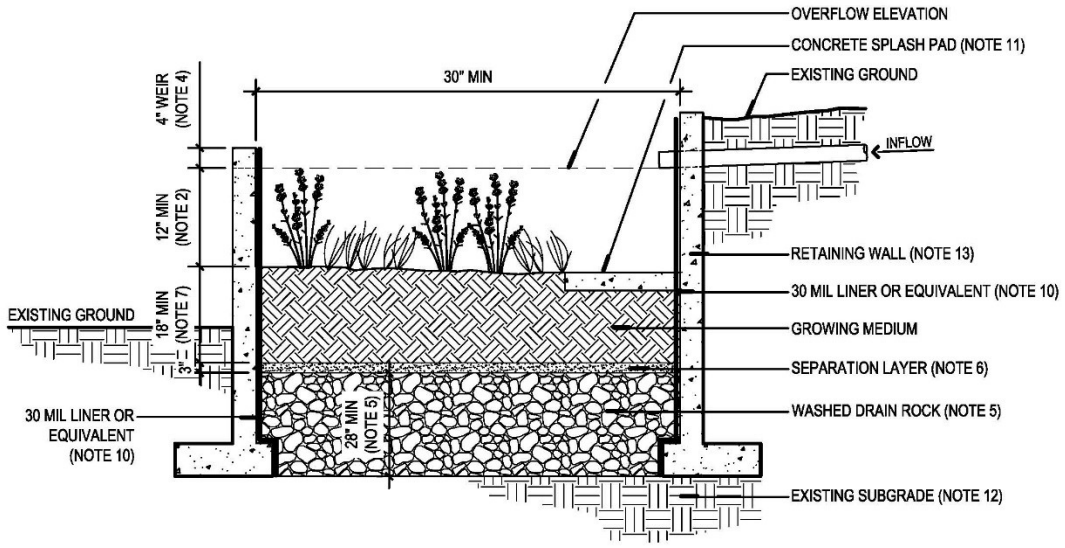
Dwg #	Drawing Description
STANDARD DETAILS (cont.)	
SWM-24	FLOW STRUCTURE TYPE 3
SWM-25	MANHOLE BASE
SWM-26	MH CHANNEL AND RING EXTENSION
SWM-27	MH DRYWELL
SWM-28	MH ENERGY DISSIPATOR
SWM-29	MH FLEXIBLE CONNECTION
SWM-30	MH FLOW CONTROL
SWM-31	MH OVAL GRATE DETAIL
SWM-32	MH SHALLOW PRECAST
SWM-33	MH STANDARD
SWM-34	MH STEP
SWM-35	MH STANDARD FRAME & COVER
SWM-36	MH SUBURBAN FRAME & COVER
SWM-37	ANCHOR WALL
SWM-38	TRENCH RESTORATION
SWM-39	TRENCH RESTORATION WITH CDF
SWM-40	COLLECTION SYSTEM DIAGRAM
SWM-41	MH LOCATION DIAGRAM
SWM-42	CURB CUT OPENING
SWM-43	CURB STAMP DETAIL
SWM-44	INSERTA TEE
SWM-45	OUTFALL RIP RAP
SWM-46	OUTFALL RIP RAP SIZING
SWM-47	REMOVABLE BOLLARD
SWM-48	ROOF DOWNSPOUT SYSTEM
SWM-49	SERVICE CONNECTION



GENERAL NOTES:

1. PROVIDE PROTECTION FROM ALL VEHICLE TRAFFIC, EQUIPMENT STAGING, AND FOOT TRAFFIC IN PROPOSED INFILTRATION AREAS PRIOR TO, DURING AND AFTER CONSTRUCTION.
2. DIMENSIONS:
   - WIDTH: 18" MINIMUM
   - DEPTH OF PLANTER (FROM TOP OF GROWING MEDIUM TO OVERFLOW ELEVATION): 12"
   - SLOPE OF PLANTER: 0.5% OR LESS
3. SETBACKS:
   - PLANTERS MUST BE MINIMUM OF 5 FEET FROM PROPERTY LINE.
4. OVERFLOW:
   - INLET ELEVATION MUST ALLOW FOR 4" OF FREEBOARD, MINIMUM.
   - PROTECT FROM DEBRIS AND SEDIMENT WITH STRAINER OR GRATE.
5. PIPING:
   - PERFORATED UNDERDRAIN PIPING: SHALL BE ABS SCH. 40, DUCTILE IRON, OR PVC SCH.40, 6" MINIMUM DIAMETER. PIPING MUST HAVE 1% GRADE AND FOLLOW THE UNIFORM PLUMBING CODE. PVC NOT ALLOWED ABOVE GROUND.
   - OVERFLOW PIPING: SHALL BE ABS SCH.40, DUCTILE IRON, OR PVC SCH.40 AND SHALL NOT BE PERFORATED. MIMIMUM DIAMETER IS 6". PIPING MUST HAVE 1% GRADE AND FOLLOW THE UNIFORM PLUMBING CODE. PVC NOT ALLOWED ABOVE GROUND.
6. DRAIN ROCK:
   - SIZE FOR FLOW-THROUGH PLANTER: 1 1/2" - 3/4" WASHED
   - DEPTH: 12" MINIMUM
7. SEPARATION BETWEEN DRAIN ROCK AND GROWING MEDIUM: SHALL BE A 3" LAYER OF 3/4" - 1/4" OPEN GRADED AGGREGATE.
8. GROWING MEDIUM:
   - DEPTH: 18" MINIMUM
   - FACILITY SURFACE AREA MAY BE REDUCED BY 20% WHEN GROWING MEDIA DEPTH IS INCREASED TO 30" OR MORE.
9. VEGETATION: FOLLOW LANDSCAPE PLANS OR REFER TO PLANTING REQUIREMENTS IN APPENDIX F.
10. PLANTER FOUNDATION AND WALLS:
    - MATERIALS SHALL BE 4" REINFORCED CONCRETE, STONE, BRICK, OR OTHER DURABLE MATERIAL.
    - CONCRETE, BRICK, OR STONE WALLS SHALL BE INCLUDED ON FOUNDATION PLANS.
    - INSTALL INVERTED CURB AS NEEDED BETWEEN PLANTER AND ROAD SUBGRADE.
    - WALL HEIGHTS GREATER THAN 24" ABOVE GRADE REQUIRE HANDRAIL.
11. WATERPROOF LINER (IF REQUIRED):
    - LINER SHALL BE 30 MIL PVC OR EQUIVALENT, FOR FLOW THROUGH FACILITIES.
    - A WATERPROOF LINER IS NOT REQUIRED IF THE FOUNDATION OR WALL MATERIAL IS WATERPROOF REINFORCED CONCRETE OR APPROVED EQUAL.
12. INSTALL CONCRETE SPLASH PAD TO TRANSITION FROM INLET TO GROWING MEDIUM. SIZE OF PAD SHALL BE 1 FT. x 1 FT.
13. SEASONAL HIGH GROUNDWATER SEPARATION:
    - SEPARATION DISTANCE AS REQUIRED BY THE WES.
14. SUBMIT RETAINING WALL DESIGN IN ACCORDANCE WITH APPLICABLE STRUCTURAL CODES FOR REVIEW AND APPROVAL.
15. SEE WES STANDARD DRAWINGS FOR LOCATING PLANTERS IN THE PUBLIC RIGHT-OF-WAY.

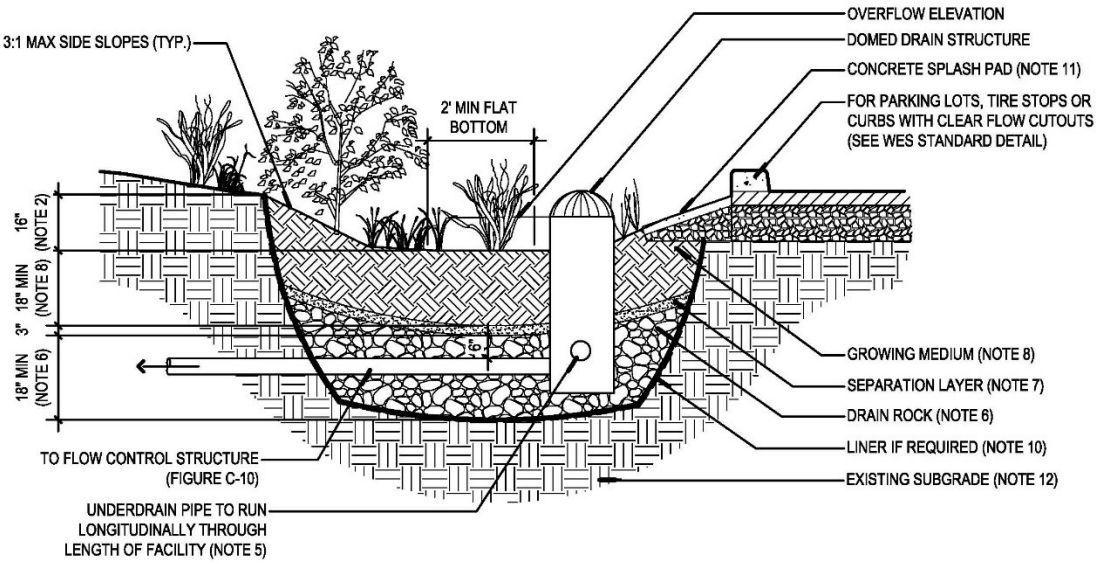
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	DATE: July, 2022 SCALE: NTS PLANTER FILTRATION	STANDARD DRAWING SWM -01



GENERAL NOTES:

1. PROVIDE PROTECTION FROM ALL VEHICLE TRAFFIC, EQUIPMENT STAGING, AND FOOT TRAFFIC IN PROPOSED INFILTRATION AREAS PRIOR TO, DURING AND AFTER CONSTRUCTION.
2. DIMENSIONS:
   - WIDTH: 30" MINIMUM
   - DEPTH OF PLANTER (FROM TOP OF GROWING MEDIUM TO OVERFLOW WEIR ELEVATION): 12"
   - SLOPE OF PLANTER: 0.5% OR LESS
3. SETBACKS:
   - PLANTERS MUST BE MINIMUM OF 5 FEET FROM PROPERTY LINE.
4. OVERFLOW:
   - WEIR ELEVATION MUST ALLOW FOR 4" OF FREEBOARD, MINIMUM.
   - SIZE OVERFLOW WEIR FOR THE 100 YEAR DESIGN STORM. IDENTIFY EMERGENCY OVERFLOW ROUTE ON THE STORMWATER MANAGEMENT PLAN.
5. DRAIN ROCK:
   - SIZE: 1 1/2" - 3/4" WASHED
   - DEPTH: 28" MINIMUM
6. SEPARATION BETWEEN DRAIN ROCK AND GROWING MEDIUM: SHALL BE A 3" LAYER OF 3/4" - 1/4" OPEN GRADED AGGREGATE.
7. GROWING MEDIUM:
   - DEPTH: 18" MIMIMUM
   - FACILITY SURFACE AREA MAY BE REDUCED BY 20% WHEN GROWING MEDIA DEPTH IS INCREASED TO 30" OR MORE.
8. VEGETATION: FOLLOW LANDSCAPE PLANS OR REFER TO PLANTING REQUIREMENTS IN APPENDIX F.
9. PLANTER WALLS:
   - MATERIALS SHALL BE STONE, BRICK, CONCRETE OR OTHER DURABLE MATERIAL.
   - CONCRETE, BRICK, OR STONE WALLS SHALL BE INCLUDED ON FOUNDATION PLANS.
   - INSTALL INVERTED CURB AS NEEDED BETWEEN PLANTERS AND ROAD SUBGRADE.
   - WALL HEIGHTS GREATER THAN 24" ABOVE GRADE REQUIRE HANDRAIL.
10. WATERPROOF LINER:
    - LINER SHALL BE 30 MIL PVC OR EQUIVALENT.
    - A WATERPROOF LINER IS NOT REQUIRED IF THE WALL MATERIAL IS WATERPROOF REINFORCED CONCRETE OR APPROVED EQUAL.
11. INSTALL CONCRETE SPLASH PAD TO TRANSITION FROM INLET TO GROWING MEDIUM. SIZE OF PAD SHALL BE 1 FT. x 1 FT.
12. SEASONAL HIGH GROUNDWATER SEPARATION:
    - SEPARATION DISTANCE AS REQUIRED BY WES.
13. SUBMIT RETAINING WALL DESIGN IN ACCORDANCE WITH APPLICABLE STRUCTURAL CODES FOR REVIEW AND APPROVAL.
14. SEE WES STANDARD DRAWINGS FOR LOCATING PLANTERS IN THE PUBLIC RIGHT-OF-WAY.

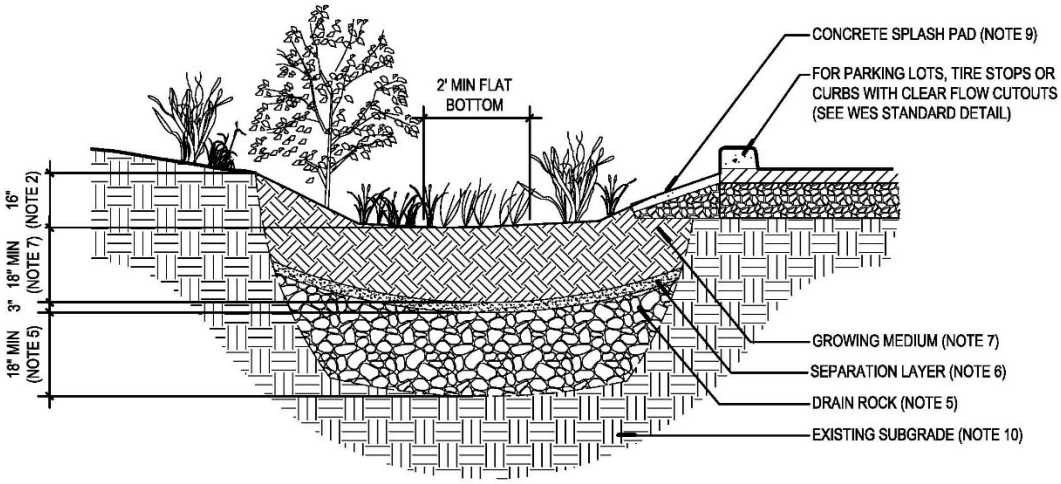
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	DATE: July, 2022 SCALE: NTS PLANTER INFILTRATION	STANDARD DRAWING SWM -02



GENERAL NOTES:

1. PROVIDE PROTECTION FROM ALL VEHICLE TRAFFIC, EQUIPMENT STAGING, AND FOOT TRAFFIC IN PROPOSED INFILTRATION AREAS PRIOR TO, DURING AND AFTER CONSTRUCTION. UNLESS REQUIRED BY SITE CONDITIONS, UNLINED RAIN GARDENS ARE PREFERRED TO MAXIMIZE ONSITE INFILTRATION.
2. DIMENSIONS:
   - DEPTH OF BASIN (FROM TOP OF GROWING MEDIUM TO OVERFLOW ELEVATION): 12"
   - FLAT BOTTOM WIDTH: 2' MINIMUM
   - SIDE SLOPES OF BASIN: 3:1 MAXIMUM
   - SLOPE OF RAIN GARDEN: 0.5% OR LESS
3. SETBACKS:
   - FILTRATION RAIN GARDEN MUST BE 10' FROM FOUNDATIONS AND 5' FROM PROPERTY LINES UNLESS APPROVED BY BUILDING OFFICIAL.
4. OVERFLOW:
   - OVERFLOW REQUIRED. INLET ELEVATION MUST ALLOW FOR 4" OF FREEBOARD, MINIMUM.
   - PROTECT FROM DEBRIS AND SEDIMENT WITH STRAINER OR GRATE.
5. PIPING:
   - PERFORATED UNDERDRAIN PIPING: SHALL BE ABS SCH. 40, DUCTILE IRON, OR PVC SCH.40. MINIMUM DIAMETER IS 6". PIPING MUST HAVE 1% GRADE AND FOLLOW THE UNIFORM PLUMBING CODE. PVC NOT ALLOWED ABOVE GROUND.
   - OVERFLOW PIPING: SHALL BE ABS SCH. 40, DUCTILE IRON, OR PVC SCH. 40 AND SHALL NOT BE PERFORATED. MINIMUM DIAMETER IS 6". PIPING MUST HAVE 1% GRADE AND FOLLOW THE UNIFORM PLUMBING CODE. PVC NOT ALLOWED ABOVE GROUND.
6. DRAIN ROCK:
   - SIZE: 1 1/2" to 3/4"-0 WASHED
   - DEPTH: 18" MINIMUM
7. SEPARATION BETWEEN DRAIN ROCK AND GROWING MEDIUM: SHALL BE A 3" LAYER OF 3/4" - 1/4" OPEN GRADED AGGREGATE.
8. GROWING MEDIUM:
   - DEPTH: 18" MINIMUM
   - FACILITY SURFACE AREA MAY BE REDUCED BY 20% WHEN GROWING MEDIA DEPTH IS INCREASED TO 30" OR MORE.
9. VEGETATION: FOLLOW LANDSCAPE PLANS OR REFER TO PLANTING REQUIREMENTS IN APPENDIX A.
10. WATERPROOF LINER (IF REQUIRED): SHALL BE 30 MIL PVC OR EQUIVALENT.
11. SPLASH PAD TO TRANSITION FROM INLETS TO GROWING MEDIUM.
12. SEASONAL HIGH GROUNDWATER SEPARATION:
    - SEPARATION DISTANCE AS REQUIRED BY WES.
13. SEE WES STANDARD DRAWINGS FOR LOCATING PLANTERS IN THE PUBLIC RIGHT-OF-WAY.

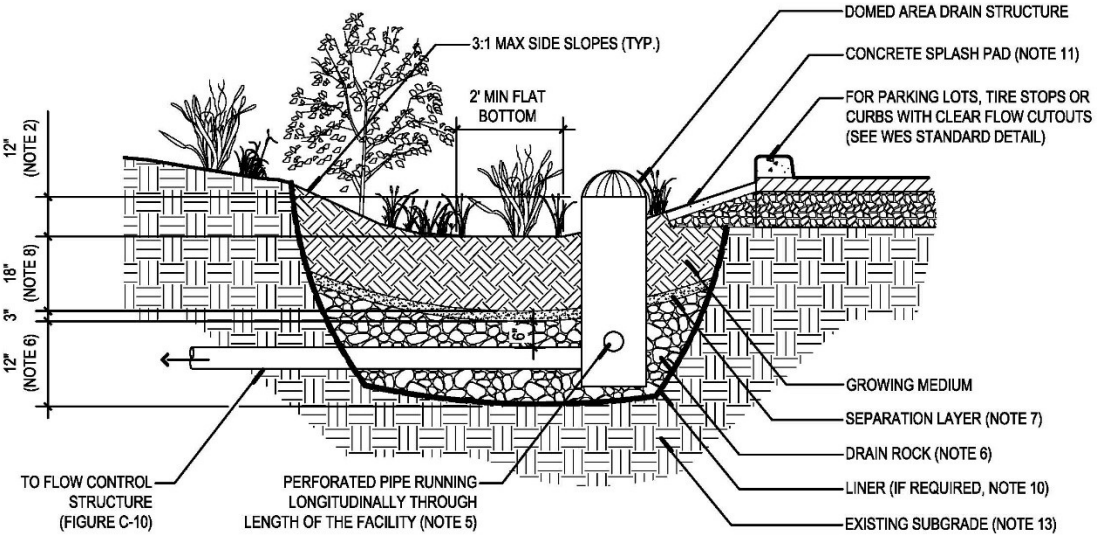
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	DATE: July, 2022 SCALE: NTS RAIN GARDEN FILTRATION	STANDARD DRAWING SWM -03



GENERAL NOTES:

1. PROVIDE PROTECTION FROM ALL VEHICLE TRAFFIC, EQUIPMENT STAGING, AND FOOT TRAFFIC IN PROPOSED INFILTRATION AREAS PRIOR TO, DURING AND AFTER CONSTRUCTION.
2. DIMENSIONS:
   - DEPTH OF BASIN (FROM TOP OF GROWING MEDIUM TO OVERFLOW ELEVATION): 16"
   - FLAT BOTTOM WIDTH: 2' MINIMUM
   - SIDE SLOPES OF BASIN: 3:1 MAXIMUM
   - SLOPE OF RAIN GARDEN: 0.5% OR LESS
3. SETBACKS:
   - INFILTRATION RAIN GARDEN MUST BE 10' FROM FOUNDATIONS AND 5' FROM PROPERTY LINES.
4. OVERFLOW:
   - EMERGENCY OVERFLOW PATH FOR THE 100 YEAR DESIGN STORM SHALL BE IDENTIFIED IN THE STORMWATER MANAGEMENT PLAN.
5. DRAIN ROCK:
   - SIZE: 1 1/2" TO 3/4"- WASHED
   - DEPTH: 18"
6. SEPARATION BETWEEN DRAIN ROCK AND GROWING MEDIUM: SHALL BE A 3" LAYER OF 3/4" - 1/4" OPEN GRADED AGGREGATE.
7. GROWING MEDIUM:
   - DEPTH: 18" MINIMUM
   - FACILITY SURFACE AREA MAY BE REDUCED BY 20% WHEN GROWING MEDIA DEPTH IS INCREASED TO 30" OR MORE.
8. VEGETATION: FOLLOW LANDSCAPE PLANS OR REFER TO PLANTING REQUIREMENTS IN APPENDIX A.
9. SPLASH PAD TO TRANSITION FROM INLETS TO GROWING MEDIUM.
10. SEASONAL HIGH GROUNDWATER SEPARATION:
    - SEPARATION DISTANCE AS REQUIRED BY WES.
11. SEE WES STANDARD DRAWINGS FOR LOCATING RAIN GARDENS IN THE PUBLIC RIGHT-OF-WAY.

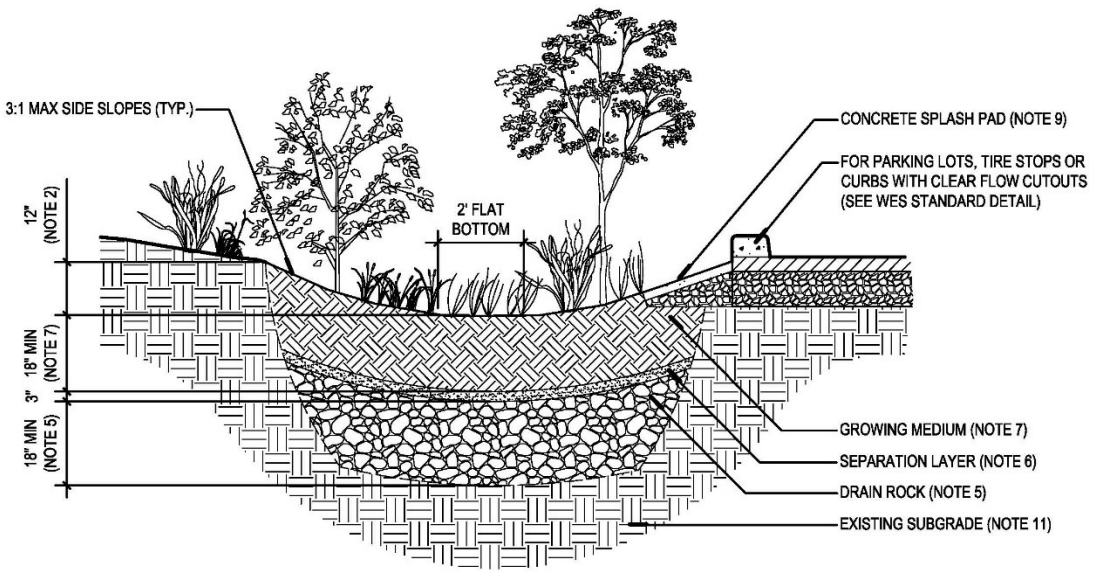
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	DATE: July, 2022 SCALE: NTS RAIN GARDEN INFILTRATION	STANDARD DRAWING SWM -04



GENERAL NOTES:

1. PROVIDE PROTECTION FROM ALL VEHICLE TRAFFIC, EQUIPMENT STAGING, AND FOOT TRAFFIC IN PROPOSED INFILTRATION AREAS PRIOR TO, DURING AND AFTER CONSTRUCTION. UNLESS REQUIRED BY SITE CONDITIONS, UNLINED SWALES ARE PREFERRED TO ALLOW MAXIMUM INFILTRATION.
2. DIMENSIONS:
   - DEPTH OF SWALE (FROM TOP OF GROWING MEDIUM TO OVERFLOW ELEVATION): 12"
   - LONGITUDINAL SLOPE OF SWALE: 6.0% OR LESS. INSTALL CHECK DAM IF OVER 4.0%. SEE NOTE 12.
   - FLAT BOTTOM WIDTH: 2' MINIMUM
   - SIDE SLOPES OF SWALE: 3:1 MAXIMUM
3. SETBACKS:
   - FILTRATION SWALES MUST BE 10' FROM FOUNDATIONS AND 5' FROM PROPERTY LINES UNLESS APPROVED BY BUILDING OFFICIAL.
4. OVERFLOW:
   - INLET ELEVATION MUST ALLOW FOR 4" OF FREEBOARD, MINIMUM.
   - PROTECT FROM DEBRIS AND SEDIMENT WITH STRAINER OR GRATE.
5. PIPING:
   - PERFORATED UNDERDRAIN PIPING: SHALL BE ABS SCH. 40, DUCTILE IRON, OR PVC SCH.40. MINIMUM DIAMETER IS 6". PIPING MUST HAVE 1% GRADE AND FOLLOW THE UNIFORM PLUMBING CODE. PVC NOT ALLOWED ABOVE GROUND.
   - OVERFLOW PIPING: SHALL BE ABS SCH. 40, DUCTILE IRON, OR PVC SCH. 40 AND SHALL NOT BE PERFORATED. MINIMUM DIAMETER IS 6". PIPING MUST HAVE 1% GRADE AND FOLLOW THE UNIFORM PLUMBING CODE. PVC NOT ALLOWED ABOVE GROUND.
6. DRAIN ROCK:
   - SIZE: 1 1/2" - 3/4" WASHED
   - DEPTH: 12"
7. SEPARATION BETWEEN DRAIN ROCK AND GROWING MEDIUM: SHALL BE A 3" LAYER OF 3/4" - 1/4" OPEN GRADED AGGREGATE.
8. GROWING MEDIUM:
   - 18" MINIMUM
   - FACILITY SURFACE AREA MAY BE REDUCED BY 20% WHEN GROWING MEDIA DEPTH IS INCREASED TO 30" OR MORE.
9. VEGETATION: FOLLOW LANDSCAPE PLANS OR REFER TO PLANTING REQUIREMENTS IN APPENDIX F.
10. WATERPROOF LINER (IF REQUIRED): SHALL BE 30 MIL PVC OR EQUIVALENT.
11. SPLASH PAD TO TRANSITION FROM INLETS TO GROWING MEDIUM.
12. CHECK DAMS: SHALL BE REQUIRED FOR OVER 4% SLOPE, SHALL BE SPACED AT A MAXIMUM 2-FOOT ELEVATION INTERVALS. MAINTAIN 4 - 10 INCH DEEP ROCK CHECK DAMS AT DESIGN INTERVALS.
13. SEASONAL HIGH GROUNDWATER SEPARATION:
   - SEPARATION DISTANCE AS REQUIRED BY WES.
14. SEE WES STANDARD DRAWINGS FOR LOCATING SWALES IN THE PUBLIC RIGHT-OF-WAY

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	DATE: July, 2022 SCALE: NTS VEGETATED SWALE FILTRATION	STANDARD DRAWING SWM -05

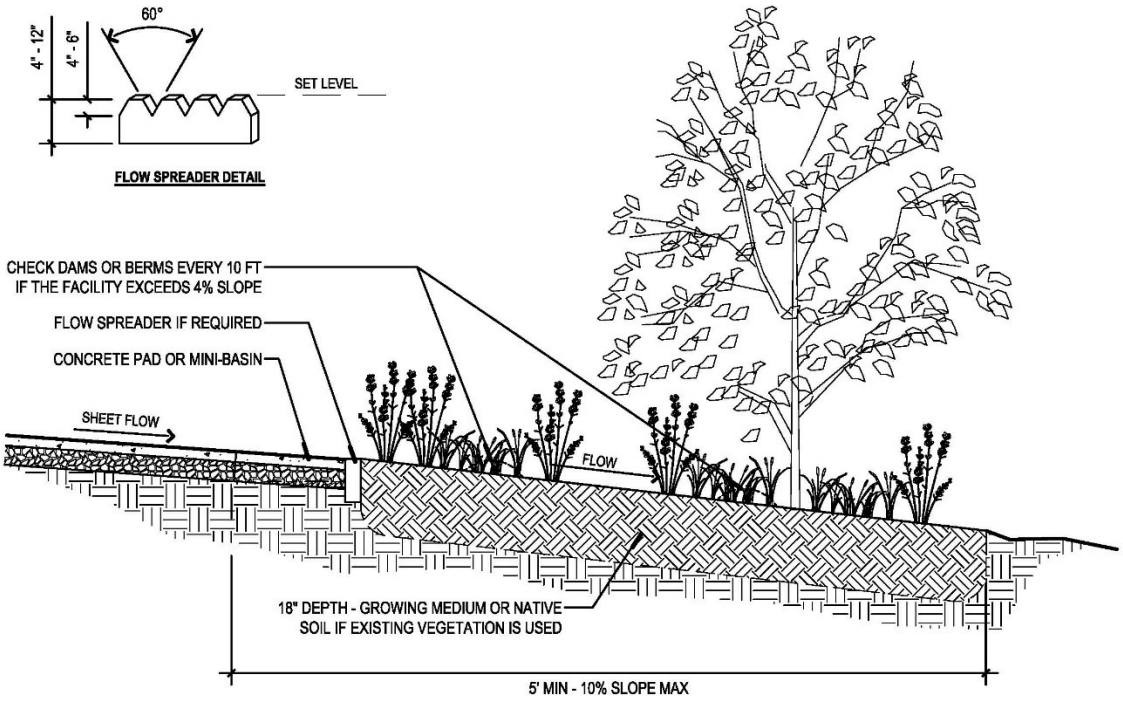


GENERAL NOTES:

1. PROVIDE PROTECTION FROM ALL VEHICLE TRAFFIC, EQUIPMENT STAGING, AND FOOT TRAFFIC IN PROPOSED INFILTRATION AREAS PRIOR TO, DURING AND AFTER CONSTRUCTION.
2. DIMENSIONS:
   - DEPTH OF SWALE (FROM TOP OF GROWING MEDIUM TO OVERFLOW ELEVATION): 12"
   - LONGITUDINAL SLOPE OF SWALE: 6.0% OR LESS
   - FLAT BOTTOM WIDTH: 2'
   - SIDE SLOPES OF SWALE: 3:1 MAXIMUM
3. SETBACKS:
   - INFILTRATION VEGETATED SWALES MUST BE 10' FROM FOUNDATIONS AND 5' FROM PROPERTY LINES.
4. OVERFLOW:
   - EMERGENCY OVERFLOW PATH FOR THE 100 YEAR DESIGN STORM SHALL BE IDENTIFIED ON THE STORMWATER MANAGEMENT PLAN.
5. DRAIN ROCK:
   - SIZE: 1 1/2" - 3/4"- WASHED
   - DEPTH: 18"
6. SEPARATION BETWEEN DRAIN ROCK AND GROWING MEDIUM: SHALL BE A 3" LAYER OF 3/4" - 1/4" OPEN GRADED AGGREGATE.
7. GROWING MEDIUM:
   - 18" MINIMUM
   - FACILITY SURFACE AREA MAY BE REDUCED BY 20% WHEN GROWING MEDIA DEPTH IS INCREASED TO 30" OR MORE.
8. VEGETATION: FOLLOW LANDSCAPE PLANS OR REFER TO PLANTING REQUIREMENTS IN APPENDIX F.
9. SPLASH PAD TO TRANSITION FROM INLETS TO GROWING MEDIUM.
10. CHECK DAMS: REQUIRED FOR OVER 4% SLOPE, SHALL BE SPACED AT A MAXIMUM 2-FOOT ELEVATION INTERVALS. MAINTAIN 4 - 10 INCH DEEP ROCK CHECK DAMS AT DESIGN INTERVALS.
11. SEASONAL HIGH GROUNDWATER SEPARATION:
    - SEPARATION DISTANCE AS REQUIRED BY WES.
12. SEE WES STANDARD DRAWINGS FOR LOCATING PLANTERS IN THE PUBLIC RIGHT-OF-WAY.

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	DATE: July, 2022 SCALE: NTS VEGETATED SWALE INFILTRATION	STANDARD DRAWING SWM -06

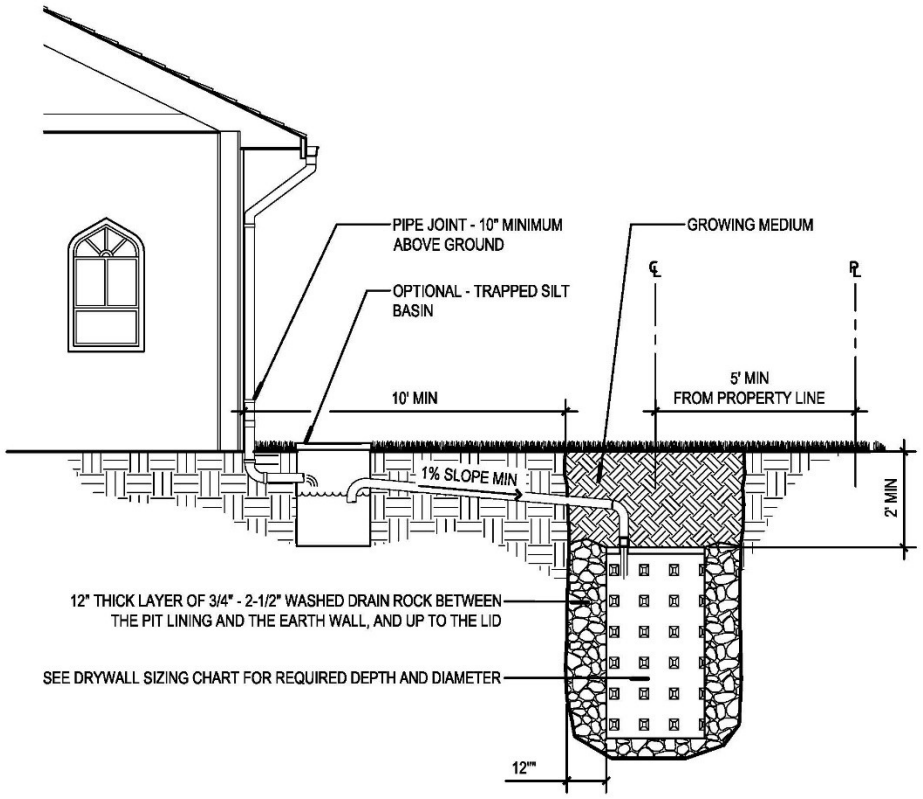
FLOW SPREADER DETAIL



GENERAL NOTES:

1. PROVIDE PROTECTION FROM ALL VEHICLE TRAFFIC, EQUIPMENT STAGING, AND FOOT TRAFFIC IN PROPOSED INFILTRATION AREAS PRIOR TO, DURING AND AFTER CONSTRUCTION.
2. DIMENSIONS:
   - LENGTH: 5' MINIMUM
   - SLOPE OF PLANTER: 0.5% -10%
3. SETBACKS:
   - FILTER STRIP MUST BE MINIMUM OF 5 FEET FROM PROPERTY LINE, 10 FT FROM BUILDINGS, 50 FT FROM WETLANDS, RIVERS, STREAMS, AND CREEKS.
4. OVERFLOW:
   - COLLECTION AND CONVEYANCE TO APPROVED DISCHARGE POINT MAY BE REQUIRED DEPENDING ON DESIGN.
   - WHERE REQUIRED, COLLECTION FROM FILTER STRIP SHALL BE SPECIFIED ON PLANS TO APPROVED DISCHARGE POINT ACCORDING TO WES STANDARDS.
5. GROWING MEDIUM:
   - UNLESS EXISTING VEGETATED AREAS ARE USED FOR THE FILTER STRIP, GROWING MEDIUM SHALL BE USED WITHIN THE TOP 18".
   - USE SAND/LOAM/COMPOST 3-WAY MIX OR APPROVED MIX THAT WILL SUPPORT HEALTHY PLANTS.
6. VEGETATION:
   - THE ENTIRE FILTER STRIP MUST HAVE 100% COVERAGE BY NATIVE GRASSES, NATIVE WILDFLOWER BLENDS, NATIVE GROUND COVERS, OR ANY COMBINATION THEREOF.
12. FLOW SPREADERS: A GRADE BOARD OR SAND/GRAVEL TRENCH MAY BE REQUIRED TO DISPERSE THE RUNOFF EVENLY ACROSS THE FILTER STRIP TO PREVENT A POINT OF DISCHARGE. THE TOP OF THE LEVEL SPREADER MUST BE HORIZONTAL AND AT AN APPROPRIATE HEIGHT TO PROVIDE SHEETFLOW DIRECTLY TO THE SOIL WITHOUT SCOUR. LEVEL SPREADERS SHALL NOT HOLD A PERMANENT VOLUME OF RUNOFF. GRADE BOARDS CAN BE MADE OF ANY MATERIAL THAT WILL WITHSTAND WEATHER AND SOLAR DEGRADATION. TRENCHES USED AS LEVEL SPREADERS CAN BE FILLED WITH WASHED CRUSHED ROCK, PEA GRAVEL, OR SAND.
13. CHECK DAMS: REQUIRED FOR OVER 4% SLOPE, SHALL BE SPACED AT A MAXIMUM 2-FOOT ELEVATION INTERVALS. MAINTAIN 4 TO 10 INCH DEEP ROCK CHECK DAMS AT DESIGN INTERVALS.

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	DATE: July, 2022 SCALE: NTS FILTER STRIP	STANDARD DRAWING SWM -07



GENERAL NOTES:

1. PROVIDE PROTECTION FROM ALL VEHICLE TRAFFIC, EQUIPMENT STAGING, AND FOOT TRAFFIC IN PROPOSED INFILTRATION AREAS PRIOR TO, DURING AND AFTER CONSTRUCTION.
2. SITING CRITERIA: GRAVELLY SAND, GRAVELLY LOAMY SAND OR OTHER EQUALLY POROUS MATERIAL MUST OCCUR IN A CONTINUOUS 5' DEEP STRATUM WITHIN 12' OF THE GROUND SURFACE. DRYWELL SHALL NOT BE PLACED WHERE BASE OF FACILITY HAS LESS THAN 5' OF SEPARATION TO WATER TABLE.
3. SIZING: DRYWELL SIZING CHART IS USED TO SIZE THE DRYWELL(S) BASED ON IMPERVIOUS AREA.
4. TOP OF DRYWELL MUST BE BELOW LOWEST FINISHED FLOOR.
5. SETBACKS: DRYWELL MUST BE 10' FROM FOUNDATIONS, 5' FROM PROPERTY LINES, AND 20' FROM CESSPOOLS.
6. PIPING MUST BE CAST IRON, ABS OR PVC. 3" PIPE REQUIRED FOR FACILITIES DRAINING UP TO 1500 SF, OTHERWISE 4" MINIMUM PIPE. UNIFORM PLUMBING CODE ALSO APPLIES.
7. TRAPPED SILT BASIN: OPTIONAL FOR ROOF RUNOFF OR PEDESTRIAN ONLY PAVED AREAS.

DRYWELL SIZING CHART

ONCE APPROVAL HAS BEEN GIVEN FOR ON-SITE INFILTRATION OF STORMWATER, THE FOLLOWING CHART SHALL BE USED TO SELECT THE NUMBER AND SIZE OF DRYWELLS. GRAY BOXES ARE ACCEPTABLE.

IMPERVIOUS AREA (SQ-FT)	28" DIAMETER DRYWELL DEPTH				48" DIAMETER DRYWELL DEPTH			
	5'	10'	15'	20'	5'	10'	15'	20'
1000								
2000								
3000								
4000								
5000								
6000								
7000								
8000								
9000								
10000								

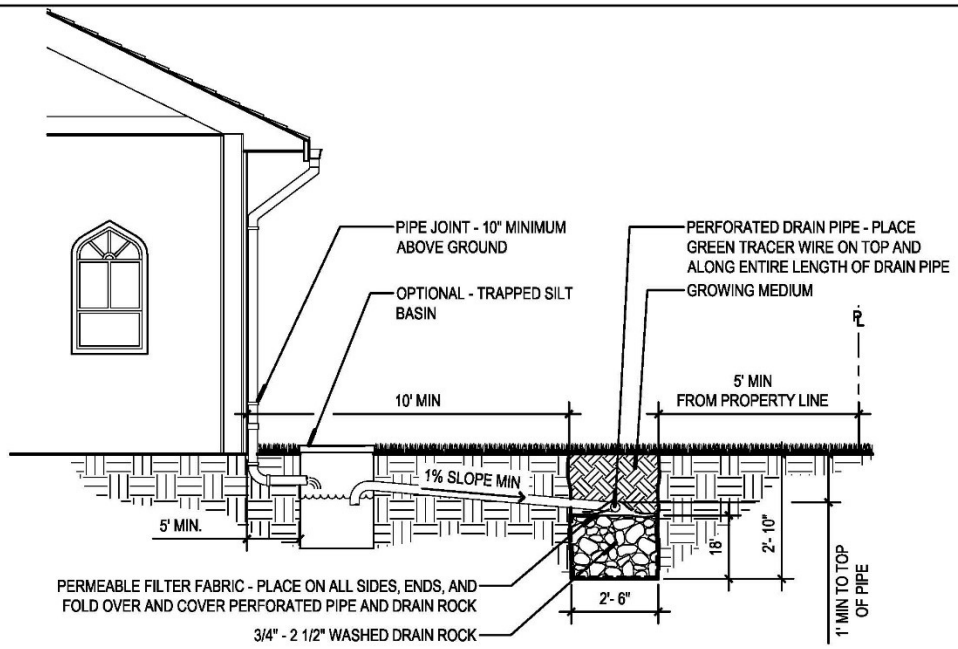
CLACKAMAS WATER ENVIRONMENT SERVICES

CLACKAMAS WES
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

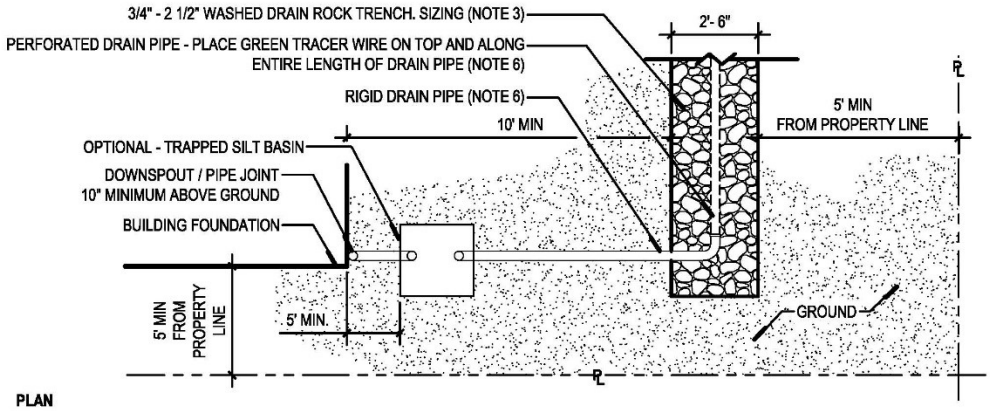
DATE: July, 2022 SCALE: NTS

SIMPLIFIED DESIGN APPROACH DRYWELL

STANDARD DRAWING
SWM -08



SECTION

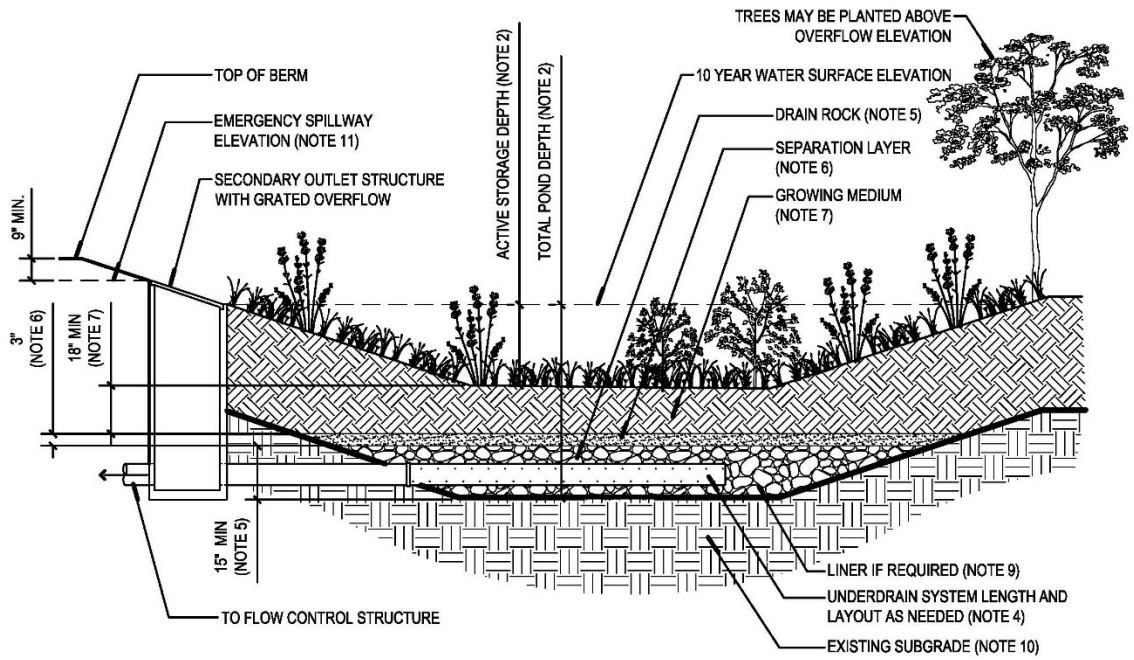


PLAN

GENERAL NOTES:

1. PROVIDE PROTECTION FROM ALL VEHICLE TRAFFIC, EQUIPMENT STAGING, AND FOOT TRAFFIC IN PROPOSED INFILTRATION AREAS PRIOR TO, DURING AND AFTER CONSTRUCTION.
2. SITING CRITERIA: INFILTRATION RATE MUST BE 2" PER HOUR MINIMUM. INFILTRATION TRENCH SHALL NOT BE PLACED WHERE BASE OF FACILITY HAS LESS THAN 5' SEPARATION TO WATER TABLE.
3. SIZING: 2'-6" WIDE X 1'-6" TALL X 20' LONG PER 1000 SQUARE FEET OF IMPERVIOUS SURFACE.
4. SETBACKS: SOAKAGE TRENCH MUST BE 10' FROM FOUNDATIONS, 5' FROM PROPERTY LINES, AND 20' FROM CESSPOOLS.
6. PIPING MUST BE CAST IRON, ABS OR PVC. 3" PIPE REQUIRED FOR FACILITIES DRAINING UP TO 1500 SF, OTHERWISE 4" MINIMUM PIPE. UNIFORM PLUMBING CODE ALSO APPLIES.
7. TRAPPED SILT BASIN: OPTIONAL FOR ROOF RUNOFF OR PEDESTRIAN ONLY PAVED AREAS.

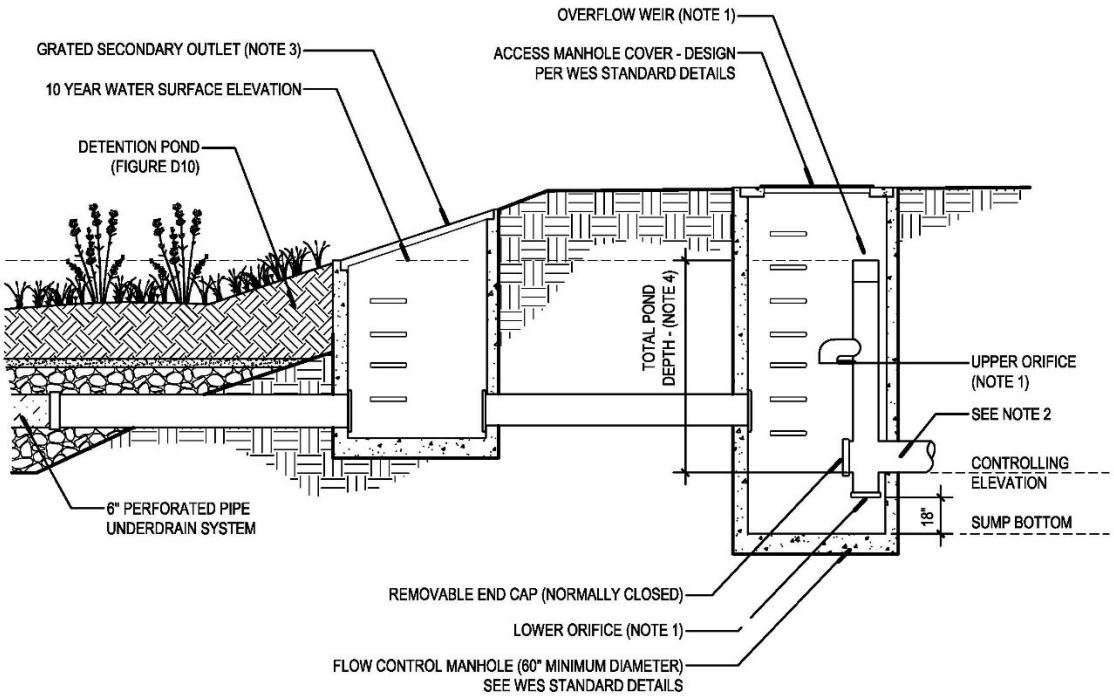
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	DATE: July, 2022 SCALE: NTS SIMPLIFIED DESIGN APPROACH INFILTRATION TRENCH	STANDARD DRAWING SWM -09



GENERAL NOTES:

1. PROVIDE PROTECTION FROM ALL VEHICLE TRAFFIC, EQUIPMENT STAGING, AND FOOT TRAFFIC IN PROPOSED INFILTRATION AREAS PRIOR TO, DURING AND AFTER CONSTRUCTION. UNLESS REQUIRED BY SITE CONDITIONS, UNLINED PONDS ARE PREFERRED TO ALLOW MAXIMUM INFILTRATION.
2. DIMENSIONS:
   - ACTIVE STORAGE DEPTH (FROM TOP OF GROWING MEDIUM TO OVERFLOW ELEVATION): PER FACILITY SIZING MODEL
   - TOTAL POND DEPTH: 4' MINIMUM, PER FACILITY SIZING MODEL
   - BOTTOM SLOPE: 2.0% OR LESS
   - SIDE SLOPES OF DETENTION POND: 3:1 MAXIMUM
3. SETBACKS:
   - DETENTION POND MUST BE 10' FROM FOUNDATIONS AND 5' FROM PROPERTY LINES UNLESS APPROVED BY BUILDING OFFICIAL.
4. PIPING:
   - PERFORATED UNDERDRAIN PIPING: SHALL BE ABS SCH. 40, DUCTILE IRON OR PVC SCH. 40. 6" MINIMUM DIAMETER. PIPING MUST HAVE 1% GRADE AND FOLLOW THE UNIFORM PLUMBING CODE. PVC NOT ALLOWED ABOVE GROUND.
5. DRAIN ROCK:
   - SIZE: 1 1/2" - 3/4" WASHED
   - DEPTH: 15" MINIMUM
6. SEPARATION BETWEEN DRAIN ROCK AND GROWING MEDIUM: SHALL BE A 3" LAYER OF 3/4" - 1/4" OPEN GRADED AGGREGATE.
7. GROWING MEDIUM:
   - 18" MINIMUM
8. VEGETATION: FOLLOW LANDSCAPE PLANS
9. WATERPROOF LINER (IF REQUIRED): SHALL BE 30 MIL PVC OR EQUIVALENT FOR DETENTION POND.
10. SEASONAL HIGH GROUNDWATER SEPARATION:
    - SEPARATION DISTANCE AS REQUIRED BY WES.
11. EMERGENCY SPILLWAY SIZED TO CONVEY THE 100 - YEAR DESIGN STORM. PROVIDE 6" MINIMUM FREEBOARD ABOVE THE 100 - YEAR DESIGN STORM.

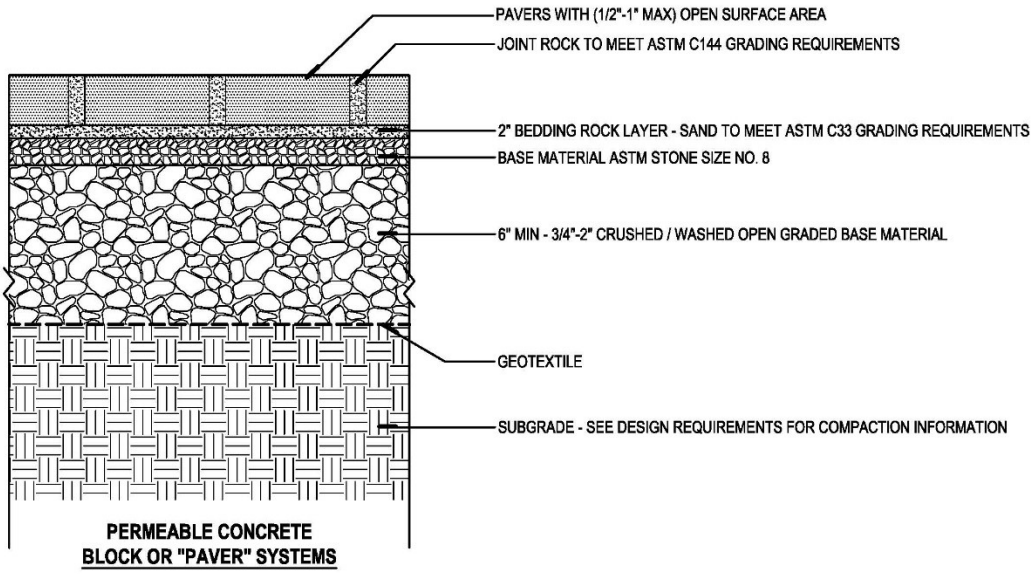
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	DATE: July, 2022 SCALE: NTS DETENTION POND	STANDARD DRAWING SWM -10



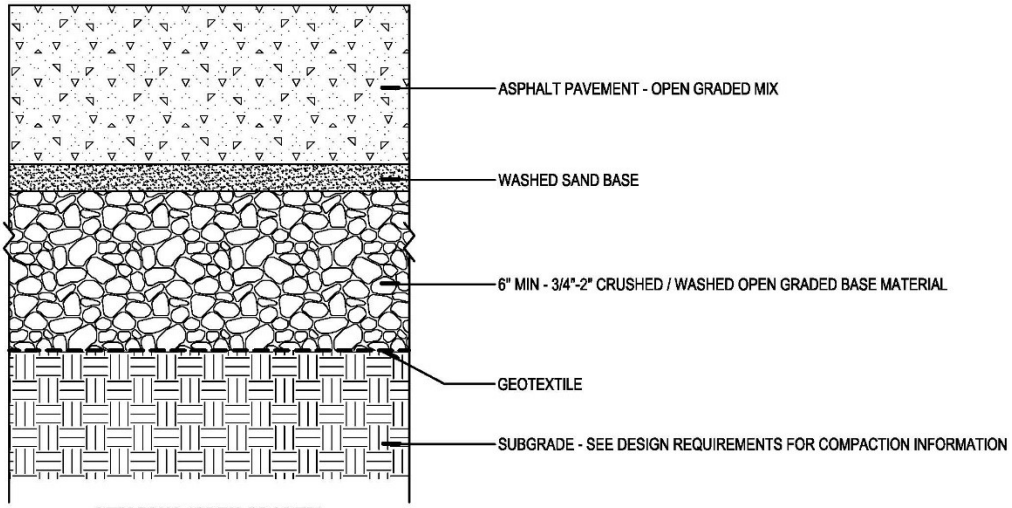
GENERAL NOTES:

1. ORIFICE AND WEIR DIMENSIONS AND ELEVATION DETERMINED THROUGH FACILITY SIZING MODEL.
2. PIPE SIZING DETERMINED BY ENGINEER.
3. SECONDARY OUTLET SIZED FOR PEAK DESIGN STORM.
4. TOTAL POND DEPTH - PER FACILITY SIZING MODEL, INCLUDES GROWING MEDIA, SEPARATION LAYER, AND DRAIN ROCK AS SHOWN ON FIGURE D1.

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	DATE: July, 2022 SCALE: NTS DETENTION POND FLOW CONTROL STRUCTURE	STANDARD DRAWING SWM -11



PERMEABLE CONCRETE BLOCK OR "PAVER" SYSTEMS

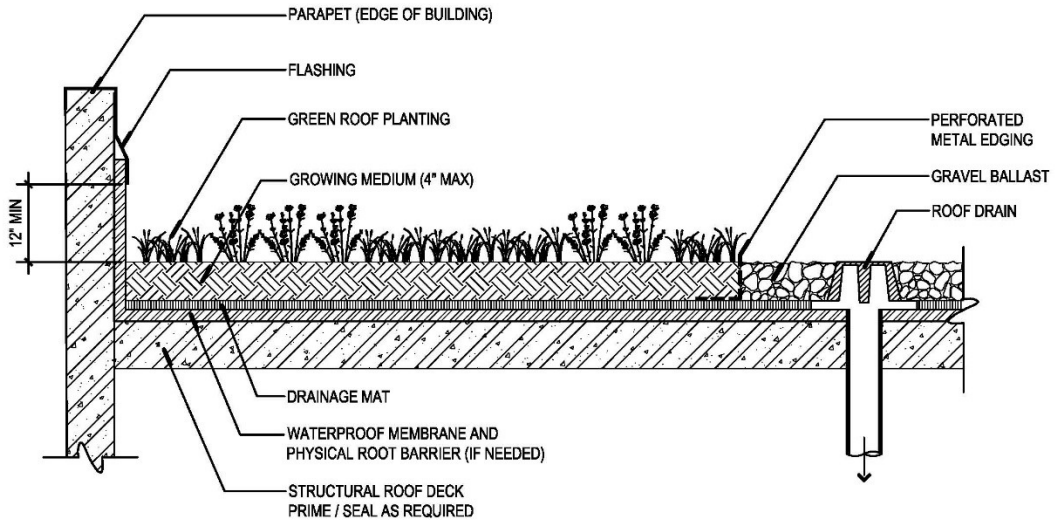


PERVIOUS (OPEN GRADED) CONCRETE SYSTEMS

GENERAL NOTES:

1. DESIGN ENGINEER SHALL SUBMIT PERVIOUS PAVEMENT DESIGN AND SPECIFICATIONS IN CONFORMANCE WITH INDUSTRY STANDARDS.
2. PAVERS SHALL HAVE AN AVERAGE COMPRESSIVE STRENGTH OF 8,000 PSI. - NO INDIVIDUAL UNIT LESS THAN 7,200 PSI. MINIMUM 80 MM THICKNESS.
3. PAVERS SHALL BE BANDED BY CONCRETE EDGE RESTRAINTS.
4. MANHOLE COLLARS PER WES STANDARD DETAIL.

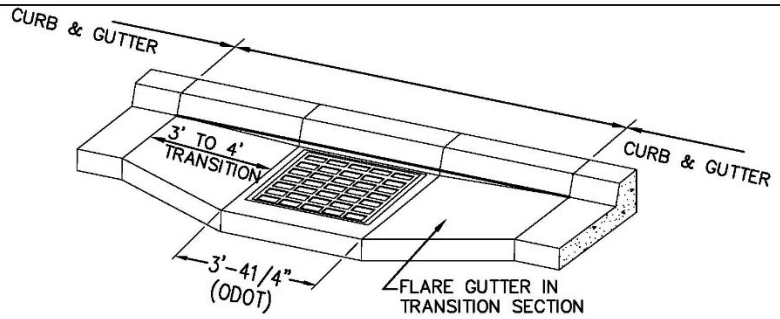
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	DATE: July, 2022 SCALE: NTS PERVIOUS PAVEMENT	STANDARD DRAWING SWM -12



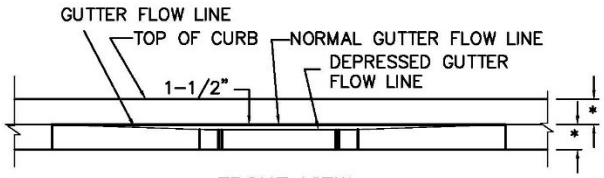
GENERAL NOTES:

1. DESIGN ENGINEER OR LANDSCAPE ARCHITECT SHALL SUBMIT GREEN ROOF DESIGN AND SPECIFICATIONS IN CONFORMANCE WITH INDUSTRY STANDARDS.

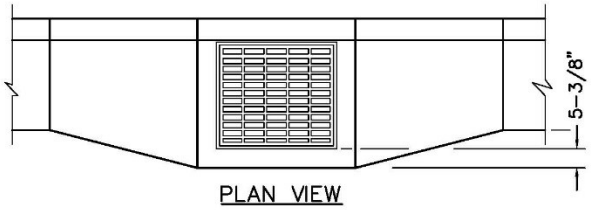
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	DATE: July 2022 SCALE: NTS GREEN ROOF	STANDARD DRAWING SWM -13



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

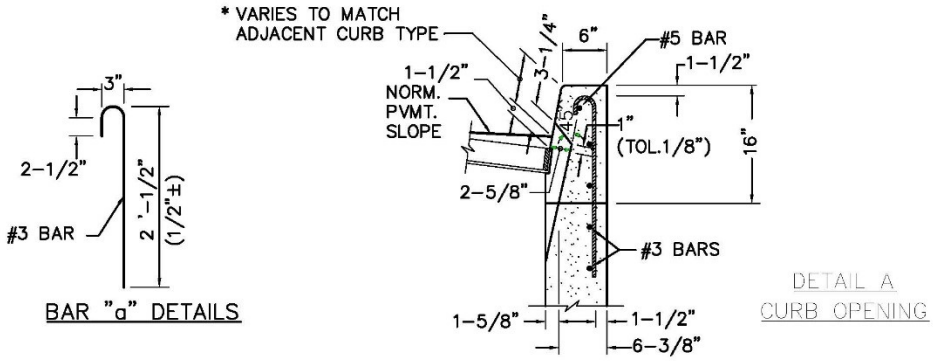


FRONT VIEW

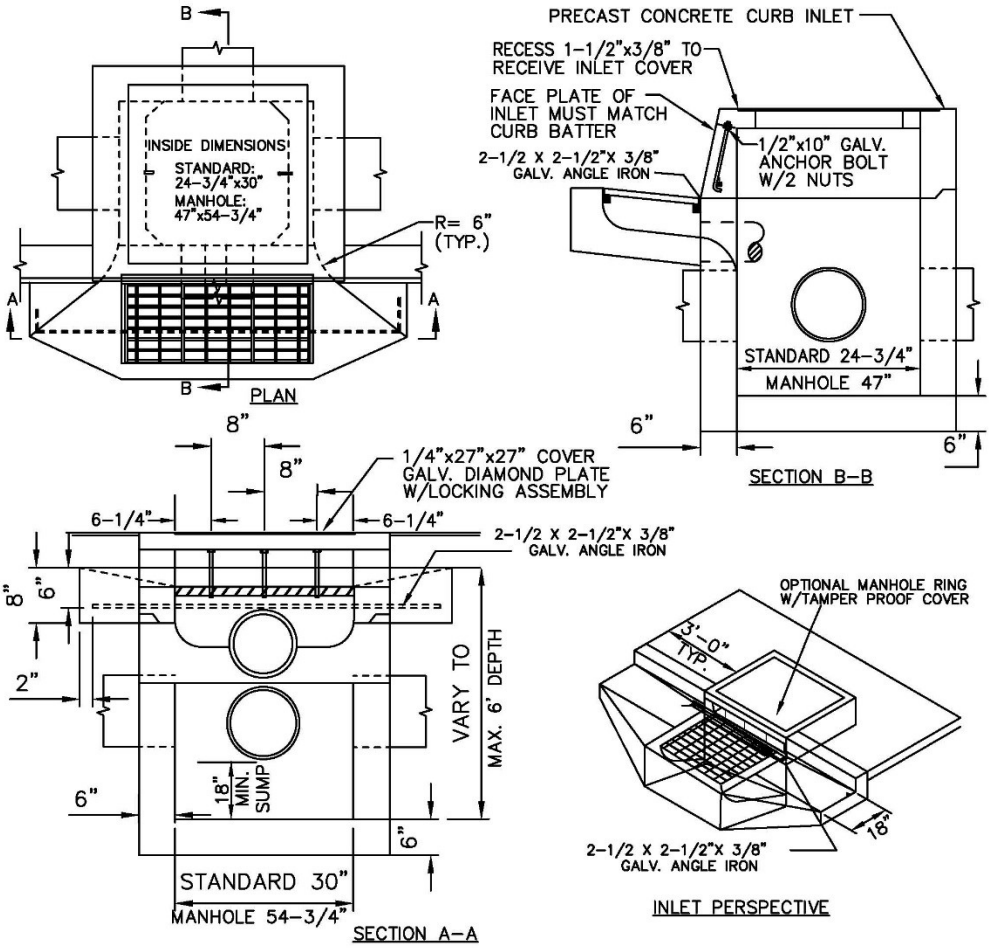


PLAN VIEW

CURB AND GUTTER TRANSITION SECTION



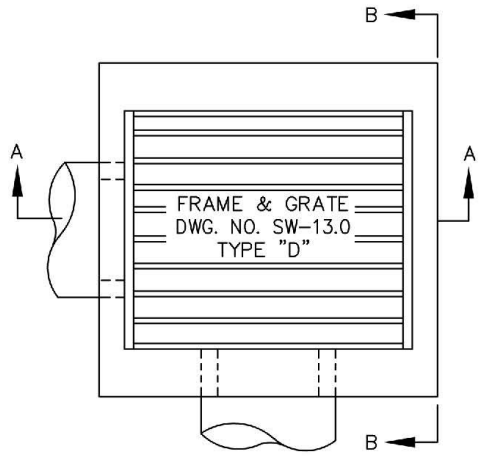
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July 2022 *SCALE:* N.T.S. **CB CURB AND GUTTER DETAIL**	*STANDARD DRAWING* **SWM -14**



NOTES

1. CURB INLET CATCH BASIN SHALL CONFORM TO CURRENT ODOT/APWA SPECIFICATION. THE INLET SHALL HAVE AN 8" CURB EXPOSURE AT THE GRATE.
2. GRATED INLET SHALL BE POURED IN PLACE, A SHALLOW PRECAST INLET, OR A COMBINATION INLET GUTTER PLATE WITH LID (NEENAH R-3335-B CURB PIECE OR APPROVED EQUAL.)
3. CONNECT THE GRATED INLET TO THE CATCH BASIN BY A MINIMUM 12" DIAMETER CONCRETE PIPE GROUTED INTO BOTH SECTONS. A SLOT MAY BE USED IF THE CURB INLET SECTION IS PRECAST AND DESIGNED TO CARRY THE LOADING. A METAL CURB PIECE MAY BE USED.
4. THE CURB INLET CATCH BASIN MAY USE A GB INLET WITH A SINGLE GRATE.
5. AN 18" SUMP IS REQUIRED.
6. ALL METAL PARTS MUST BE HOT DIPPED GALVANIZED AFTER FABRICATION.
7. THE LATCH SPRING MUST HAVE 50 LB. OF COMPRESSIVE STRENGTH.
8. SPECIFICATIONS FOR CONCRETE AND MISC. MATERIALS USED IN CONSTRUCTION SHALL CONFORM TO THE CURRENT ODOT/APWA STANDARD SPECIFICATIONS.
9. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3300 PSI IN 28 DAYS.

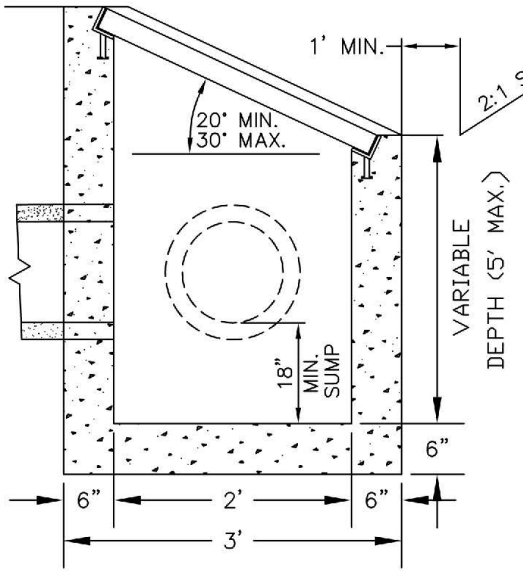
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. CB CURB INLET	*STANDARD DRAWING* SWM -15



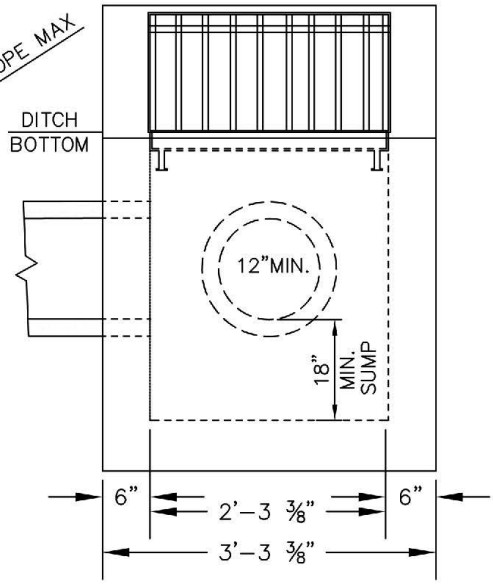
PLAN

NOTES

1. SPECIFICATIONS FOR CONCRETE AND MISC. MATERIALS USED IN CONSTRUCTION SHALL CONFORM TO THE CURRENT APWA STANDARD SPECIFICATIONS.
2. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3300 PSI IN 28 DAYS.
3. REFER TO ODOT STANDARD DRAWING RD370 FOR MORE INFORMATION.



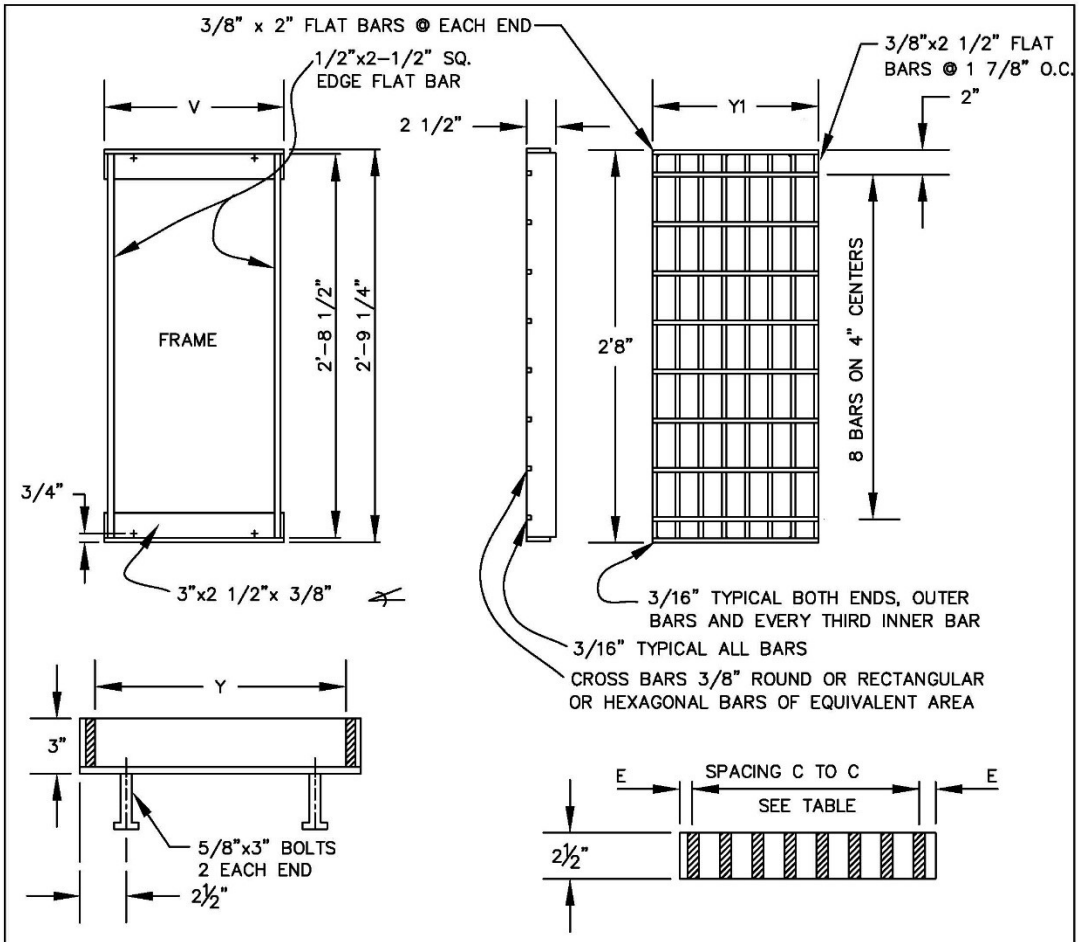
SECTION A–A



SECTION B–B

NOTE: PROVIDE 6" OF COMPACTED CRUSHED ROCK BELOW STRUCTURE

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. CB DITCH INLET	*STANDARD DRAWING* SWM -16

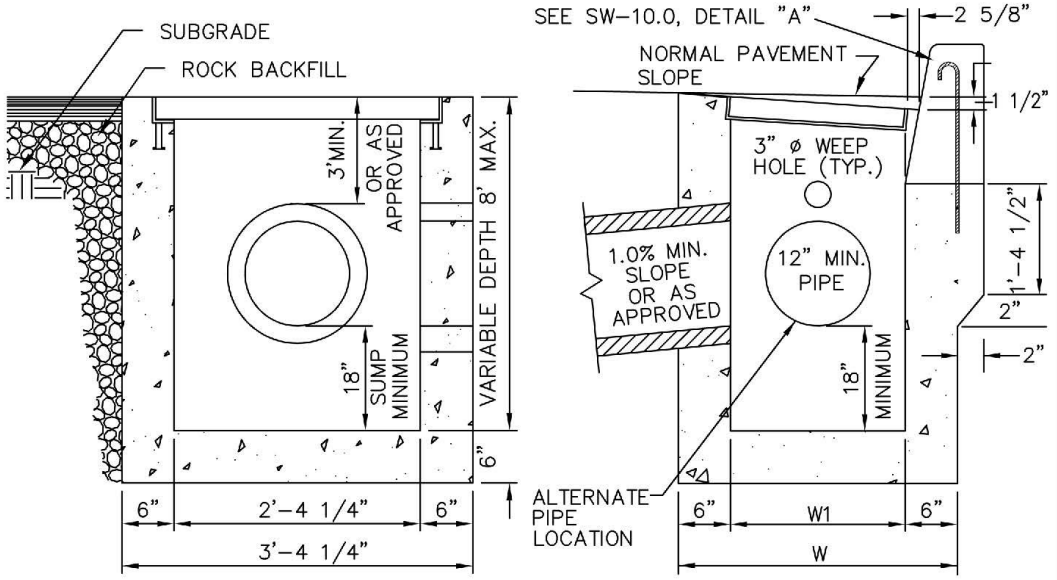


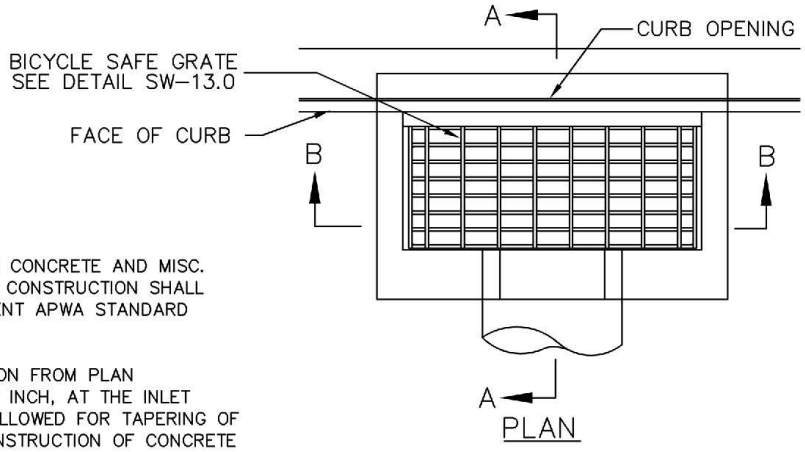
CATCH BASIN TYPE	V	Y	Y1	E	SPACING C TO C	NO. OF BARS PER GRATE	REMARKS
GB–2	2'–4 3/4"	2'–3 3/8"	1'–1 1/2"	5/8"	1 3/4"	8	2–GRATES
D	2'–4 3/4"	2'–3 3/8"	2'–3"	1 1/2"	3"	9	
GB	1'–3 1/4"	1'–1 7/8"	1'–1 1/2"	5/8"	1 3/4"	8	1–GRATE

NOTES

1. MATERIALS AND FABRICATION SHALL CONFORM TO THE CURRENT APWA STANDARD SPECIFICATIONS.
2. 3/8" CROSS BARS SHALL BE FLUSH WITH THE GRATE SURFACE AND MAY BE FILLET WELDED, RESISTANCE WELDED OR ELECTROFORGED TO BEARING BARS.
3. GB CATCH BASIN FOR USE WITH CURB INLET CATCH BASIN WITH GRATE ONLY.

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. CB FRAME AND GRATE	*STANDARD DRAWING* SWM -17





NOTES

1. SPECIFICATIONS FOR CONCRETE AND MISC. MATERIALS USED IN CONSTRUCTION SHALL CONFORM TO CURRENT APWA STANDARD SPECIFICATIONS.
2. A MAXIMUM DEVIATION FROM PLAN DIMENSIONS OF ONE INCH, AT THE INLET FLOOR, SHALL BE ALLOWED FOR TAPERING OF FORMS USED IN CONSTRUCTION OF CONCRETE INLETS.
3. REFER TO CURRENT ODOT/APWA OREGON STATE CHAPTER DRAWING RD 366.
4. THE OUTSIDE DIAMETER OF THE PIPE MATERIAL SHALL NOT EXCEED 28".
5. PROVIDE 6" OF COMPACTED CRUSHED ROCK BELOW STRUCTURE.

CATCH BASIN TYPE	W	W1
GB-2	3' 3-3/8"	2' 3-3/8"

GB-1 NOT ALLOWED

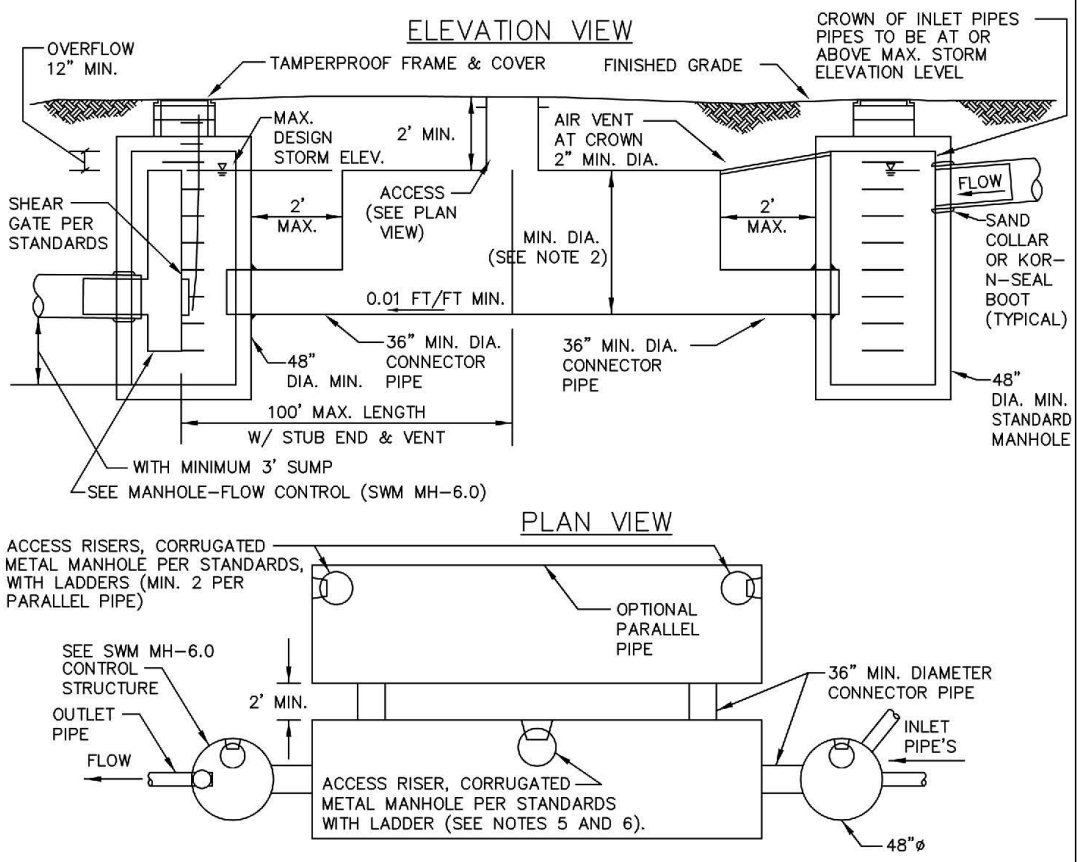
CLACKAMAS WATER ENVIRONMENT SERVICES

CLACKAMAS WES
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

APPROVAL DATE: July, 2022 *SCALE:* N.T.S.

CB STANDARD GB2

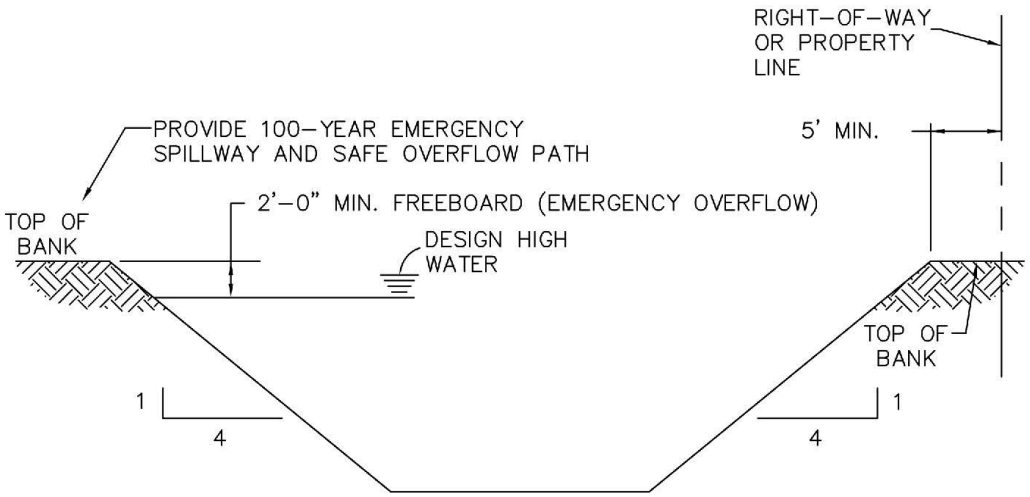
STANDARD DRAWING
SWM -18



NOTES:

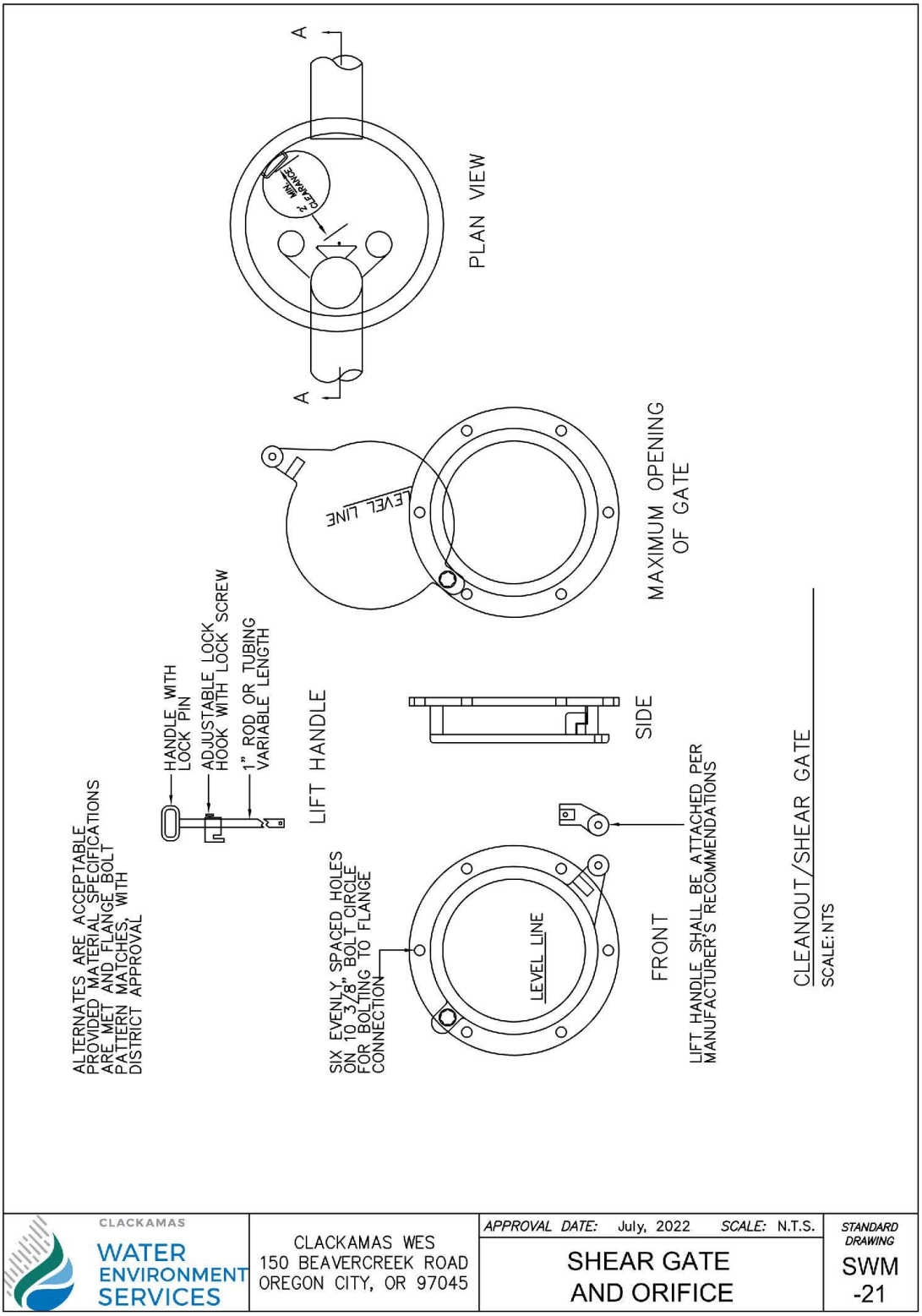
1. NEOPRENE GASKETS REQUIRED AT ALL CMP AND CPE PIPE JOINTS.
2. 36" MINIMUM PIPE DIAMETER. PROVIDE 48"ø MANHOLES AT EACH END OF PIPE (CONC. PUBLIC, CMP WITH DISTRICT APPROVAL).
3. ALL METAL PARTS AND SURFACES SHALL BE CORROSION RESISTANT. STEEL HARDWARE SHALL BE GALVANIZED. PIPE SHALL BE ALUMINIZED. COMPLETE CORROSION PROTECTION MUST BE ASSURED.
4. CAPACITY OF OUTLET PIPE MUST BE EQUAL TO OR GREATER THAN ALL INLET PIPES COMBINED.
5. ACCESS RISERS REQUIRED CENTERED OVER EVERY 100' OF DETENTION PIPE WHEN 48"ø MANHOLES ARE PROVIDED ON EACH END, OR AT EITHER END OF A 100' LONG PARALLEL PIPE AS SHOWN ABOVE.
6. IN AREAS WITH VEHICULAR TRAFFIC, PROVIDE TRAFFIC BEARING ACCESS (HS-20) OVER CORRUGATED METAL MANHOLE.
7. PENETRATE CARRIER PIPE THROUGH VAULT WALL.
8. USE APPROVED WATERTIGHT STRUCTURE ADAPTOR.
9. NO FLOW CONTROL JOINT OUTSIDE OF STRUCTURE.

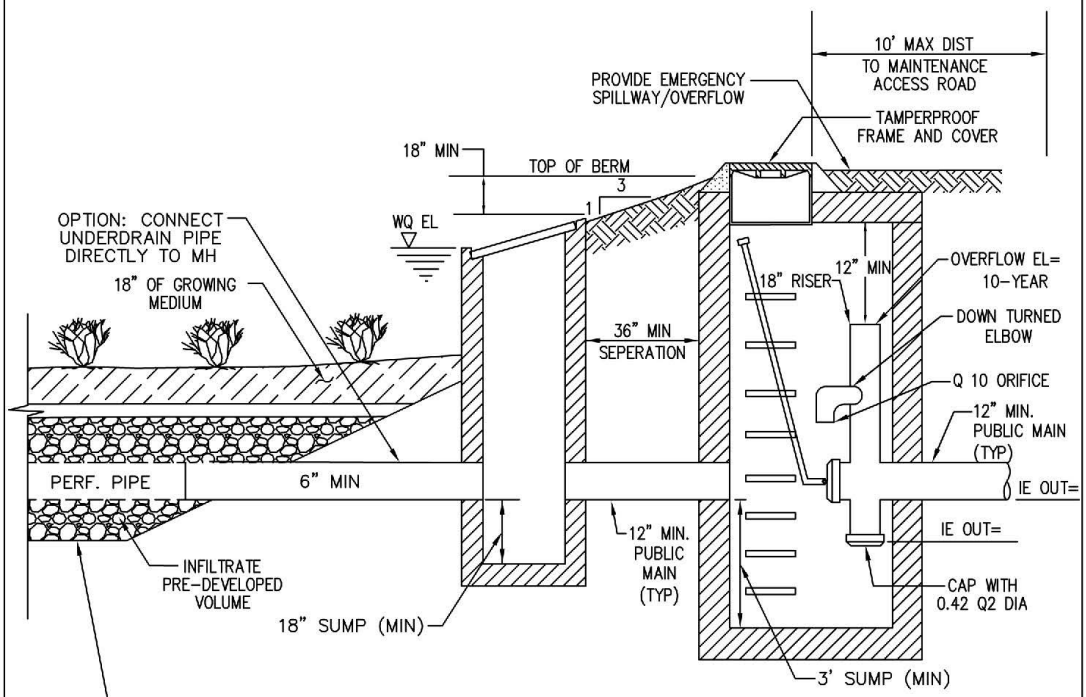
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. DETENTION TANK DIAGRAM	*STANDARD DRAWING* SWM -19



STANDARD DETENTION POND

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. POND DIAGRAM	*STANDARD DRAWING* SWM -20


A
A
2" MIN. CLEARANCE
PLAN VIEW
LEVEL LINE
MAXIMUM OPENING OF GATE
HANDLE WITH LOCK PIN
ADJUSTABLE LOCK HOOK WITH LOCK SCREW
1" ROD OR TUBING VARIABLE LENGTH
LIFT HANDLE
SIDE
ALTERNATES ARE ACCEPTABLE PROVIDED MATERIAL SPECIFICATIONS ARE MET AND FLANGE BOLT PATTERN MATCHES, WITH DISTRICT APPROVAL
SIX EVENLY SPACED HOLES ON 10 3/8" BOLT CIRCLE FOR BOLTING TO FLANGE CONNECTION
LEVEL LINE
FRONT
LIFT HANDLE SHALL BE ATTACHED PER MANUFACTURER'S RECOMMENDATIONS
CLEANOUT/SHEAR GATE
SCALE: NTS
CLACKAMAS
WATER ENVIRONMENT SERVICES
CLACKAMAS WES
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
APPROVAL DATE: July, 2022
SCALE: N.T.S.
SHEAR GATE AND ORIFICE
STANDARD DRAWING
SWM -21



WATER QUALITY MEDIA UNDERDRAIN AND INFILTRATION STORAGE NOT REQUIRED IF FACILITY IS DESIGNED FOR FLOW CONTROL ONLY.
IE OUT PIPE SHALL BE SIZED TO CONVEY 25-YEAR STORM.

PIPE OUTLET STRUCTURE			
PIPE DIAMETER		STRUCTURE	
I.E. IN	I.E. OUT	TYPE	DRW
6" – 15"	6" – 15"	DI	SW-12.0
> 15"	> 15"	MH	SW-17.0

FLOW CONTROL MANHOLE			
PIPE DIAMETER		STRUCTURE	
I.E. IN	I.E. OUT	TYPE	SIZE
12" – 15"	12" – 15"	MH	48"
> 15"	> 15"	MH	60"

6"ø MIN. FOR PRIVATE MAINTAINED SYSTEMS
8"ø MIN. FOR PUBLIC MAINTAINED SYSTEMS

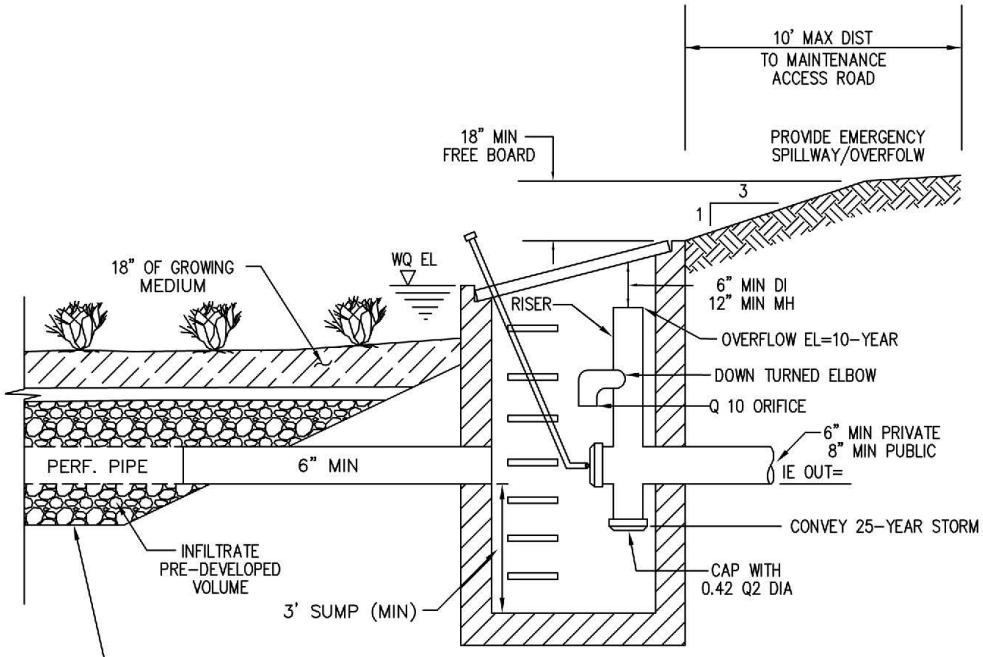
CLACKAMAS WATER ENVIRONMENT SERVICES

CLACKAMAS WES
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

APPROVAL DATE: July, 2021 *SCALE:* N.T.S.

FLOW CONTROL STRUCTURE TYPE 1

STANDARD DRAWING SWM -22

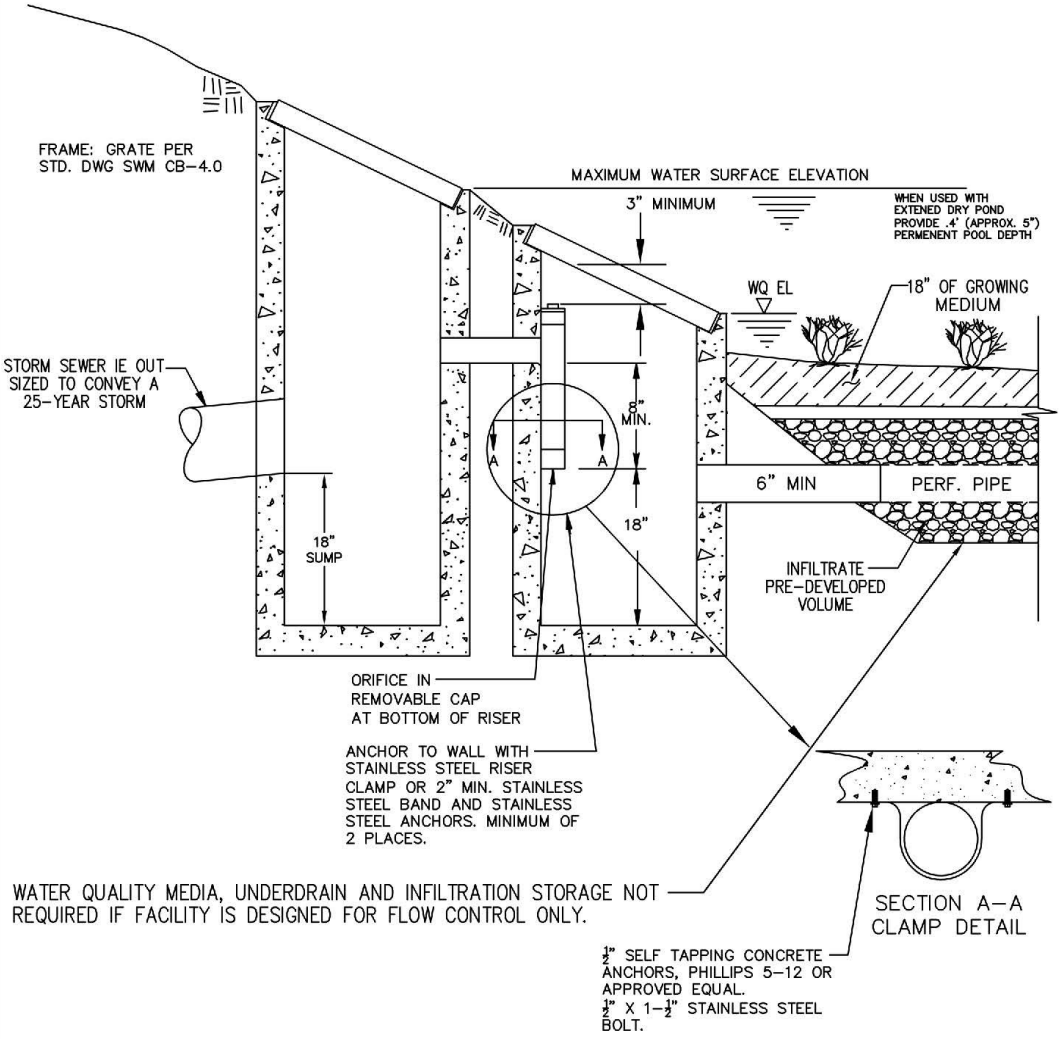


WATER QUALITY MEDIA UNDERDRAIN AND INFILTRATION STORAGE NOT REQUIRED IF FACILITY IS DESIGNED FOR FLOW CONTROL ONLY.
IE OUT PIPE SHALL BE SIZED TO CONVEY 25-YEAR STORM.

FLOW CONTROL STRUCTURE			
PIPE DIAMETER		STRUCTURE	
I.E. IN	I.E. OUT	TYPE	DRW
6" MIN	6" – 8"	DI	CB-3.0
6" MIN	> 8" MIN	MH	MH-6.0
6" MIN	> 15"	MH	MH-6.0

6"ø MIN. FOR PRIVATE MAINTAINED SYSTEMS
8"ø MIN. FOR PUBLIC MAINTAINED SYSTEMS

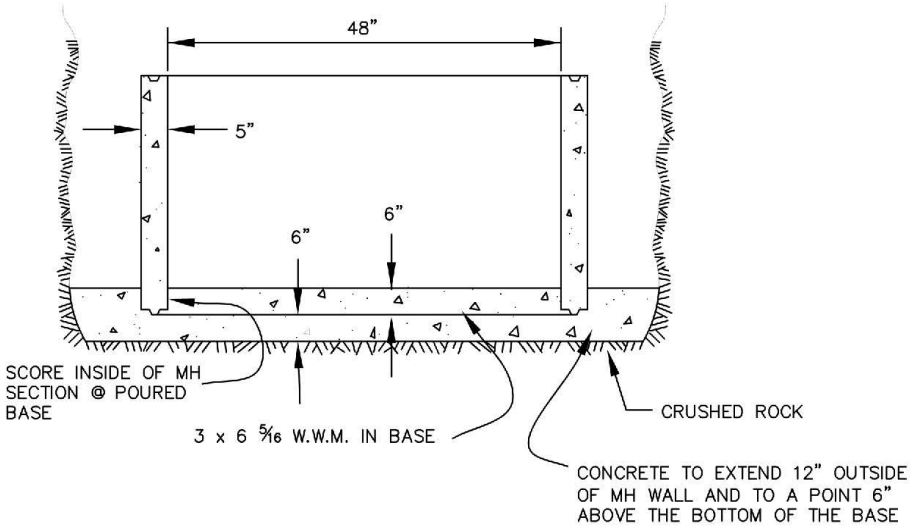
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. FLOW CONTROL STRUCTURE TYPE 2	*STANDARD DRAWING* SWM -23



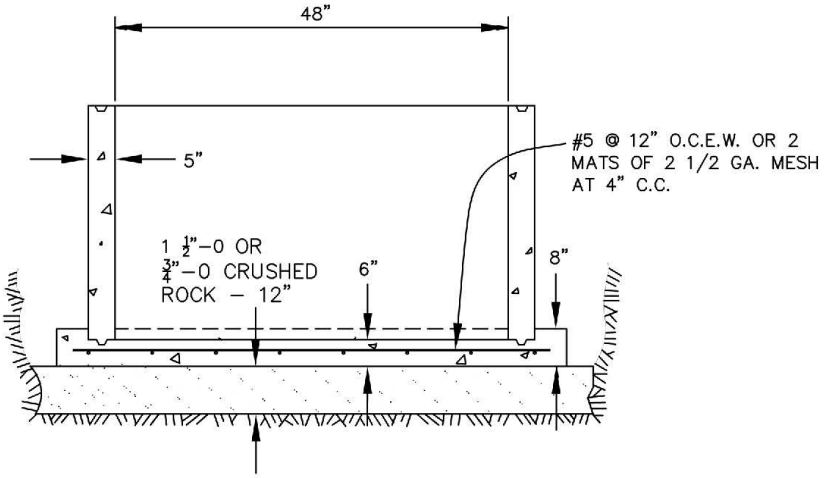
NOTES:

1. CONNECTING PIPE AND TEE SHALL BE 4", 6", OR 8" AWWA C-900 OR ASTM 3034 PVC, AND ONE SIZE LARGER THAN THE ORIFICE OPENING.
2. MAXIMUM ORIFICE OPENING SHALL BE 6" DIAMETER.
3. STRUCTURES TYPE AND SIZE SHALL CONFORM WITH DETAIL SWM FC-5.0.
4. FRAME AND GRATE SHALL CONFORM TO CATCH BASIN-FRAME AND GRATE (DETAIL SWM CB-4.0).
5. SUBMERGED ORIFICE AND RISER SHALL BE SECURED FLUSH AGAINST WALL OF STRUCTURE AS APPROVED.
6. MAINTAINANCE ACCESS REQUIRED TO WITHIN 10' OF CENTER OF BOTH STRUCTURES AND EDGE OF MAINTENANCE ACCESS ROAD.

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. FLOW CONTROL STRUCTURE TYPE 3	*STANDARD DRAWING* SWM -24



POURED IN PLACE MANHOLE BASE

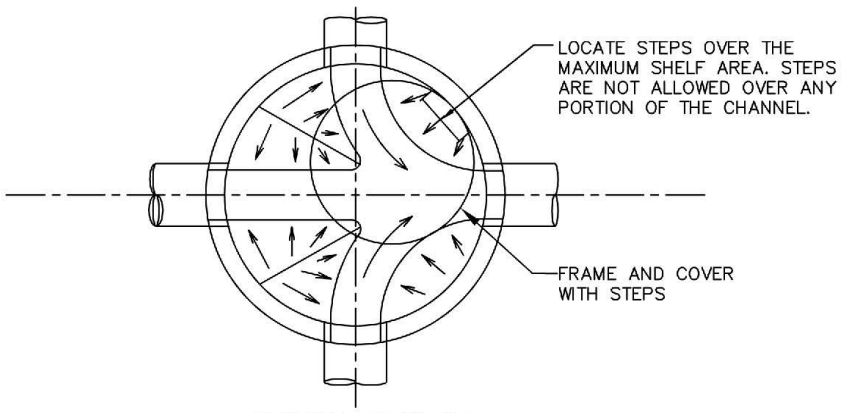


PRE-CAST MANHOLE BASE

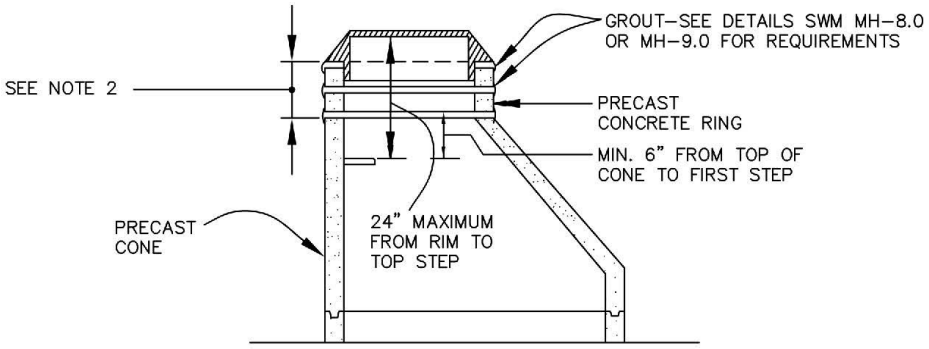
NOTES

1. SPECIFICATIONS FOR CONCRETE AND MISCELLANEOUS MATERIALS USED IN CONSTRUCTION SHALL CONFORM TO CURRENT ODOT/APWA STANDARD SPECIFICATIONS.

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. MANHOLE BASE	*STANDARD DRAWING* SWM -25



GENERAL PLAN OF CHANNEL INTERSECTION

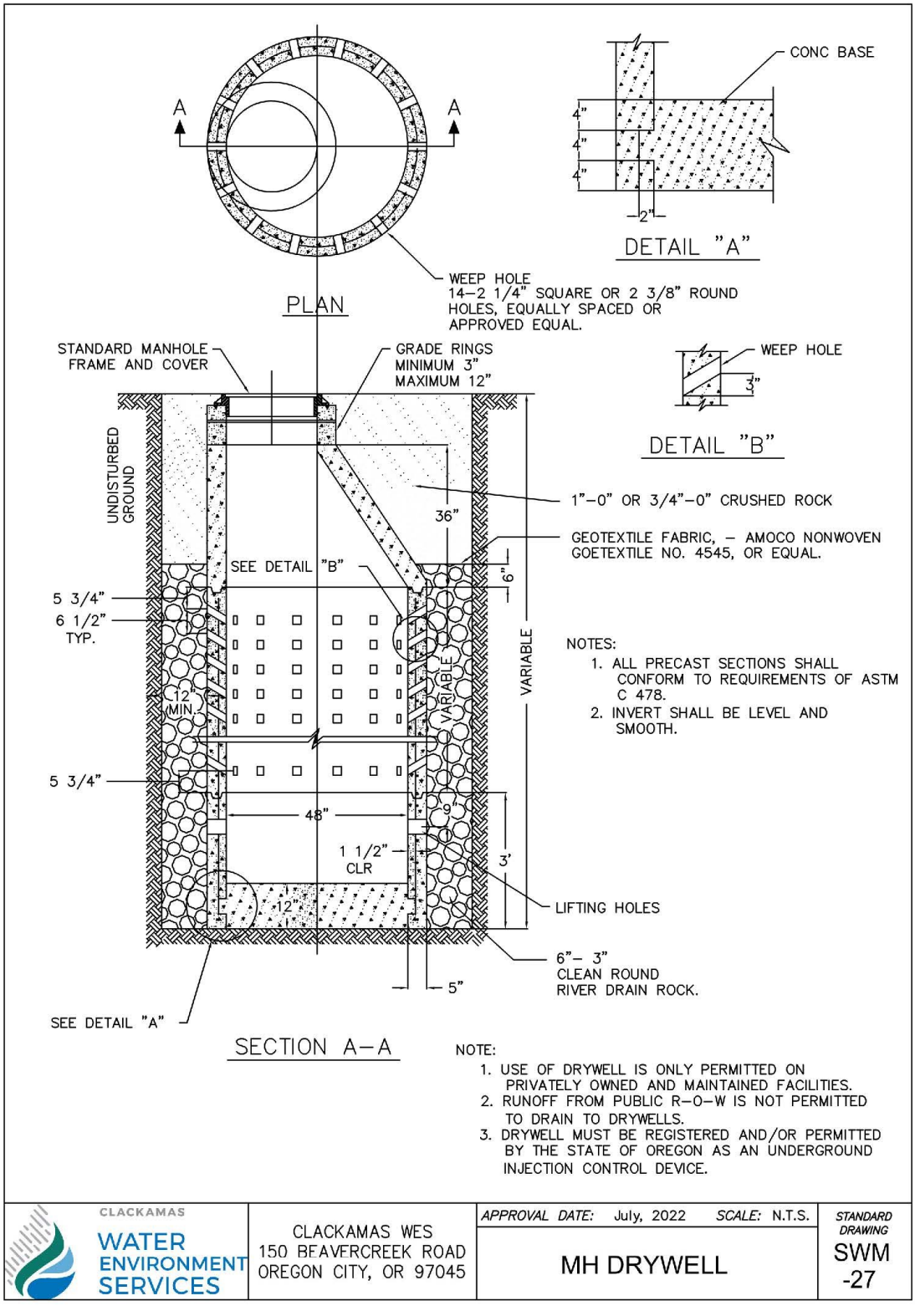


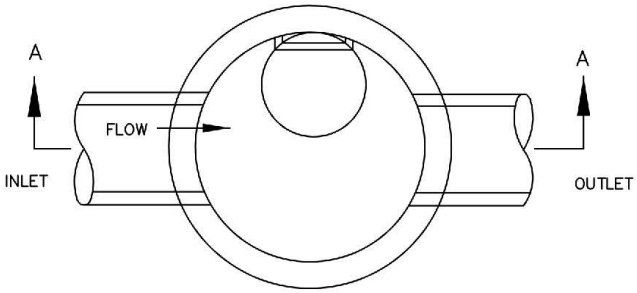
PRECAST RING EXTENSION

NOTES

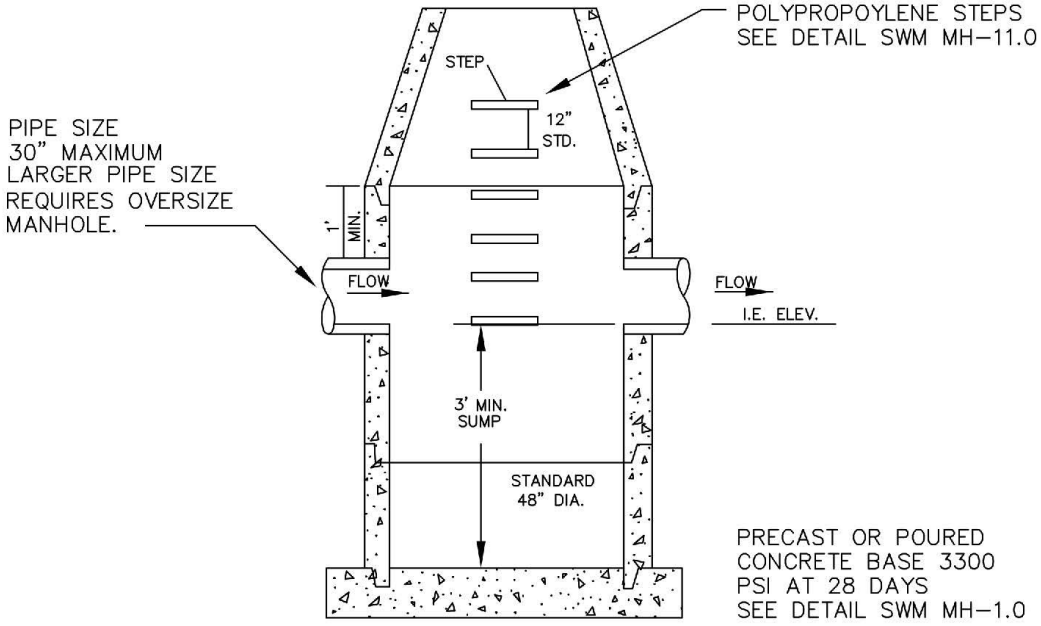
1. SPECIFICATIONS FOR CONCRETE AND MISCELLANEOUS MATERIALS USED IN CONSTRUCTION SHALL CONFORM TO CURRENT APWA STANDARD SPECIFICATIONS.
2. NUMBER OF RISER RINGS ALLOWED SHALL NOT EXCEED 12" MAXIMUM.

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. MH CHANNEL AND RING EXTENSION	*STANDARD DRAWING* SWM -26


A
A
PLAN
WEEP HOLE
14–2 1/4" SQUARE OR 2 3/8" ROUND
HOLES, EQUALLY SPACED OR
APPROVED EQUAL.
CONC BASE
4"
4"
4"
2"
DETAIL "A"
STANDARD MANHOLE
FRAME AND COVER
GRADE RINGS
MINIMUM 3"
MAXIMUM 12"
WEEP HOLE
3"
DETAIL "B"
UNDISTURBED
GROUND
1"–0" OR 3/4"–0" CRUSHED ROCK
36"
GEOTEXTILE FABRIC, – AMOCO NONWOVEN
GOETEXTILE NO. 4545, OR EQUAL.
SEE DETAIL "B"
6"
5 3/4"
6 1/2"
TYP.
VARIABLE
VARIABLE
12"
(MIN.)
5 3/4"
48"
9"
1 1/2"
CLR
3'
12"
LIFTING HOLES
6"– 3"
CLEAN ROUND
RIVER DRAIN ROCK.
5"
SEE DETAIL "A"
SECTION A–A
NOTES:
1. ALL PRECAST SECTIONS SHALL CONFORM TO REQUIREMENTS OF ASTM C 478.
2. INVERT SHALL BE LEVEL AND SMOOTH.
NOTE:
1. USE OF DRYWELL IS ONLY PERMITTED ON PRIVATELY OWNED AND MAINTAINED FACILITIES.
2. RUNOFF FROM PUBLIC R–O–W IS NOT PERMITTED TO DRAIN TO DRYWELLS.
3. DRYWELL MUST BE REGISTERED AND/OR PERMITTED BY THE STATE OF OREGON AS AN UNDERGROUND INJECTION CONTROL DEVICE.
CLACKAMAS
WATER ENVIRONMENT SERVICES
CLACKAMAS WES
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
APPROVAL DATE: July, 2022
SCALE: N.T.S.
MH DRYWELL
STANDARD DRAWING
SWM -27



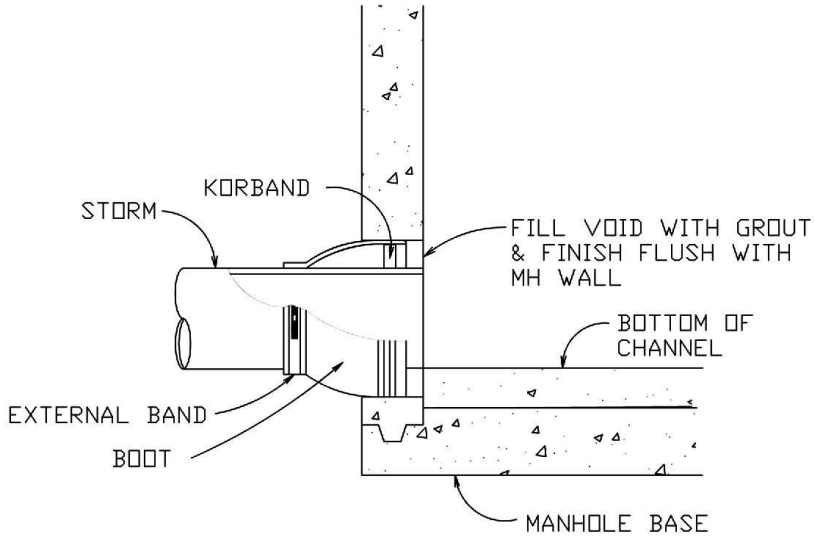
PLAN



SECTION A–A

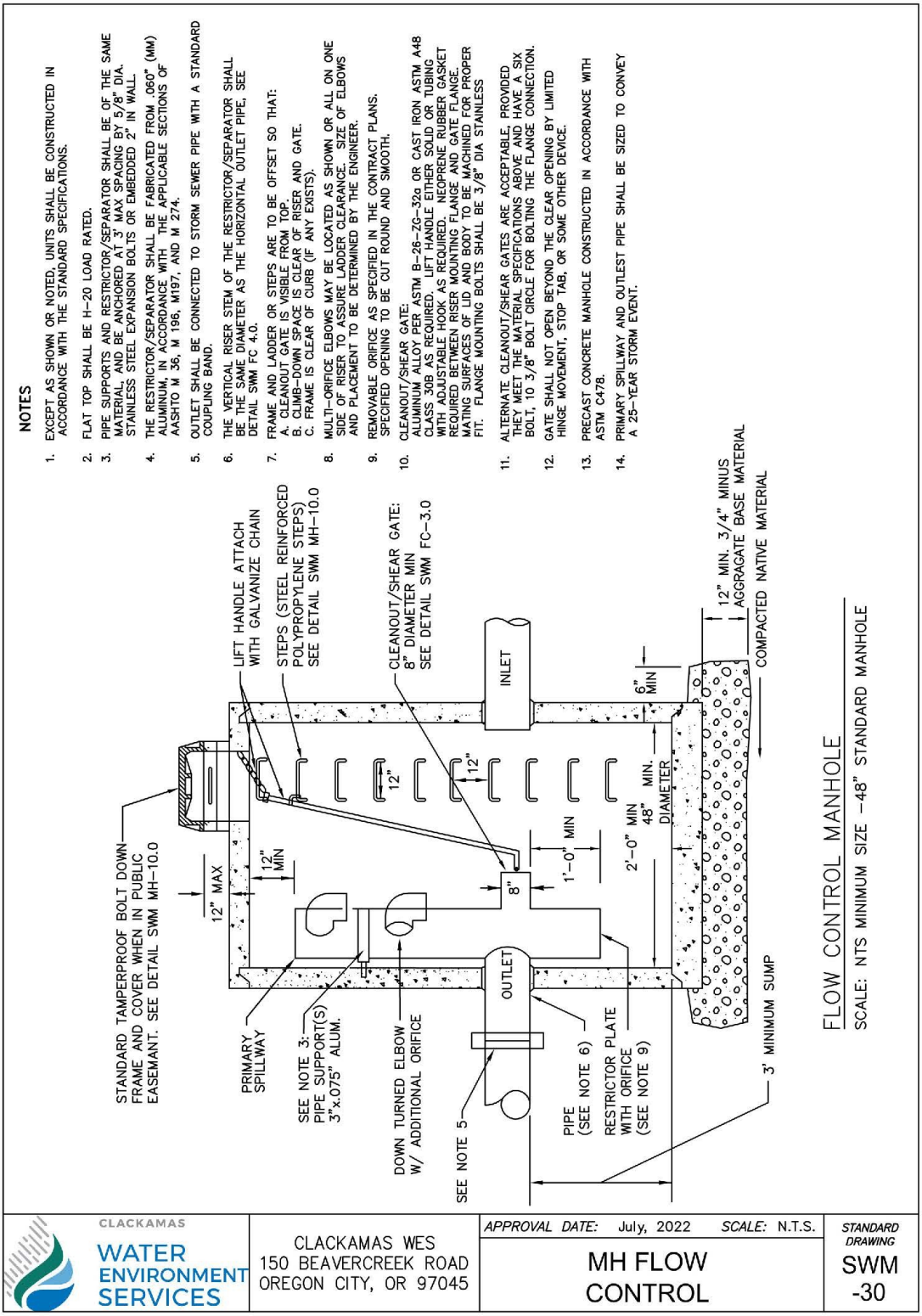
NOTE: PROVIDE 6" OF COMPACTED CRUSHED ROCK BELOW STRUCTURE

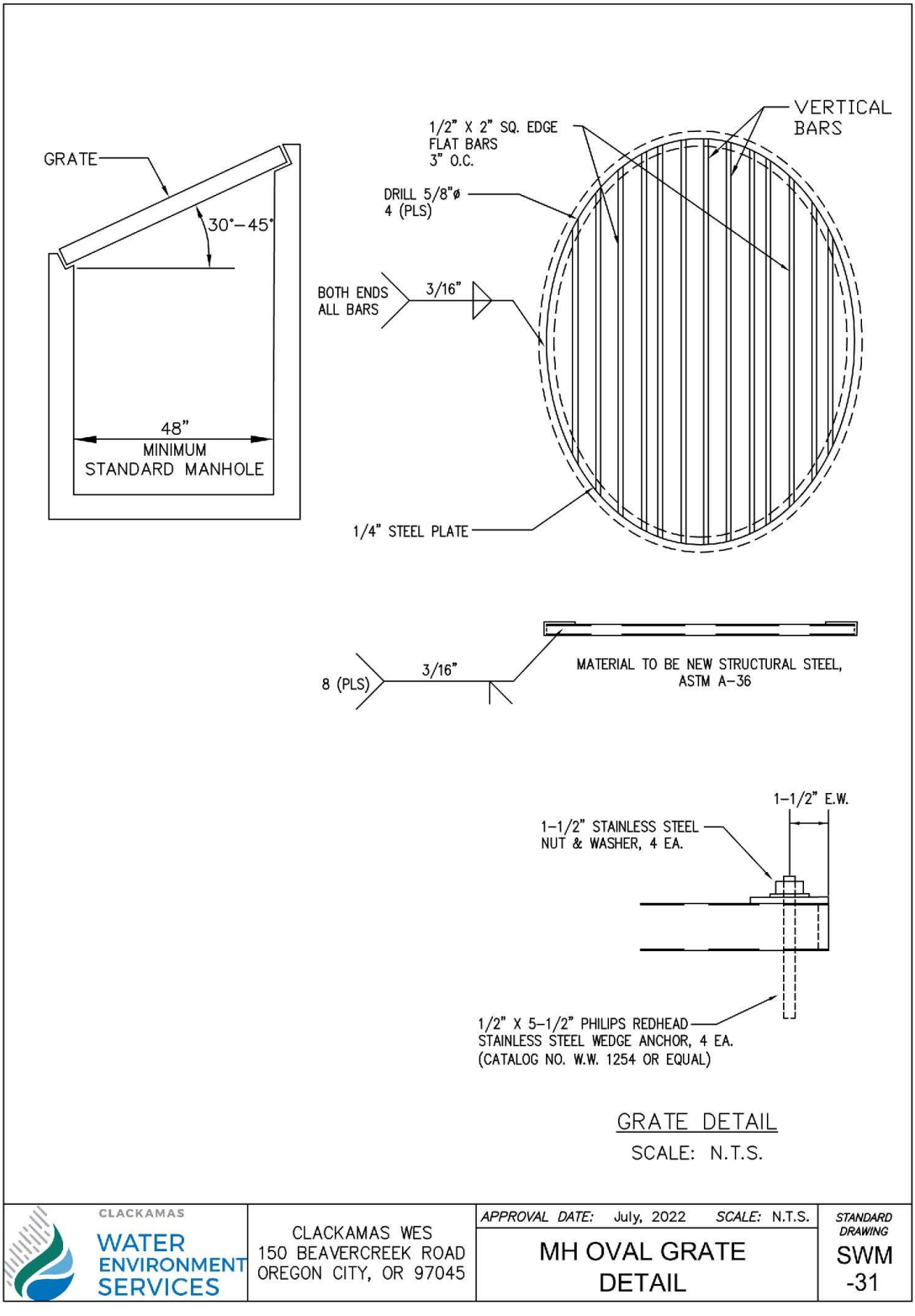
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. MH ENERGY DISSIPATOR	*STANDARD DRAWING* SWM -28



FLEXIBLE MANHOLE CONNECTION
(KOR-N-SEAL OR EQUAL)

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. MH FLEXIBLE CONNECTION	*STANDARD DRAWING* SWM -29

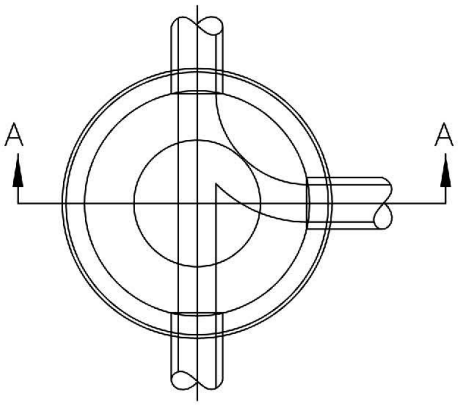

NOTES
1. EXCEPT AS SHOWN OR NOTED, UNITS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.
2. FLAT TOP SHALL BE H-20 LOAD RATED.
3. PIPE SUPPORTS AND RESTRICTOR/SEPARATOR SHALL BE OF THE SAME MATERIAL, AND BE ANCHORED AT 3' MAX SPACING BY 5/8" DIA. STAINLESS STEEL EXPANSION BOLTS OR EMBEDDED 2" IN WALL.
4. THE RESTRICTOR/SEPARATOR SHALL BE FABRICATED FROM .060" (MM) ALUMINUM, IN ACCORDANCE WITH THE APPLICABLE SECTIONS OF AASHTO M 36, M 196, M197, AND M 274.
5. OUTLET SHALL BE CONNECTED TO STORM SEWER PIPE WITH A STANDARD COUPLING BAND.
6. THE VERTICAL RISER STEM OF THE RESTRICTOR/SEPARATOR SHALL BE THE SAME DIAMETER AS THE HORIZONTAL OUTLET PIPE, SEE DETAIL SWM FC 4.0.
7. FRAME AND LADDER OR STEPS ARE TO BE OFFSET SO THAT:
A. CLEANOUT GATE IS VISIBLE FROM TOP.
B. CLIMB-DOWN SPACE IS CLEAR OF RISER AND GATE.
C. FRAME IS CLEAR OF CURB (IF ANY EXISTS).
8. MULTI-ORIFICE ELBOWS MAY BE LOCATED AS SHOWN OR ALL ON ONE SIDE OF RISER TO ASSURE LADDER CLEARANCE. SIZE OF ELBOWS AND PLACEMENT TO BE DETERMINED BY THE ENGINEER.
9. REMOVABLE ORIFICE AS SPECIFIED IN THE CONTRACT PLANS. SPECIFIED OPENING TO BE CUT ROUND AND SMOOTH.
10. CLEANOUT/SHEAR GATE:
ALUMINUM ALLOY PER ASTM B-26-2G-32a OR CAST IRON ASTM A48 CLASS 30B AS REQUIRED. LIFT HANDLE EITHER SOLID OR TUBING WITH ADJUSTABLE HOOK AS REQUIRED. NEOPRENE RUBBER GASKET REQUIRED BETWEEN RISER MOUNTING FLANGE AND GATE FLANGE. MATING SURFACES OF LID AND BODY TO BE MACHINED FOR PROPER FIT. FLANGE MOUNTING BOLTS SHALL BE 3/8" DIA STAINLESS
11. ALTERNATE CLEANOUT/SHEAR GATES ARE ACCEPTABLE, PROVIDED THEY MEET THE MATERIAL SPECIFICATIONS ABOVE AND HAVE A SIX BOLT, 10 3/8" BOLT CIRCLE FOR BOLTING THE FLANGE CONNECTION.
12. GATE SHALL NOT OPEN BEYOND THE CLEAR OPENING BY LIMITED HINGE MOVEMENT, STOP TAB, OR SOME OTHER DEVICE.
13. PRECAST CONCRETE MANHOLE CONSTRUCTED IN ACCORDANCE WITH ASTM C478.
14. PRIMARY SPILLWAY AND OUTLEST PIPE SHALL BE SIZED TO CONVEY A 25-YEAR STORM EVENT.
STANDARD TAMPERPROOF BOLT DOWN FRAME AND COVER WHEN IN PUBLIC EASEMANT. SEE DETAIL SWM MH-10.0
12" MAX
12" MIN
LIFT HANDLE ATTACH WITH GALVANIZE CHAIN
STEPS (STEEL REINFORCED POLYPROPYLENE STEPS) SEE DETAIL SWM MH-10.0
CLEANOUT/SHEAR GATE: 8" DIAMETER MIN SEE DETAIL SWM FC-3.0
INLET
12"
12"
6" MIN
12" MIN. 3/4" MINUS AGGRAGATE BASE MATERIAL
COMPACTED NATIVE MATERIAL
8"
1'-0" MIN
2'-0" MIN 48" MIN. DIAMETER
PRIMARY SPILLWAY
SEE NOTE 3: PIPE SUPPORT(S) 3"x.075" ALUM.
DOWN TURNED ELBOW W/ ADDITIONAL ORIFICE
OUTLET
SEE NOTE 5
PIPE (SEE NOTE 6)
RESTRICTOR PLATE WITH ORIFICE (SEE NOTE 9)
3' MINIMUM SUMP
FLOW CONTROL MANHOLE
SCALE: NTS MINIMUM SIZE -48" STANDARD MANHOLE
CLACKAMAS
WATER ENVIRONMENT SERVICES
CLACKAMAS WES
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
APPROVAL DATE: July, 2022
SCALE: N.T.S.
MH FLOW CONTROL
STANDARD DRAWING
SWM -30



GRATE DETAIL

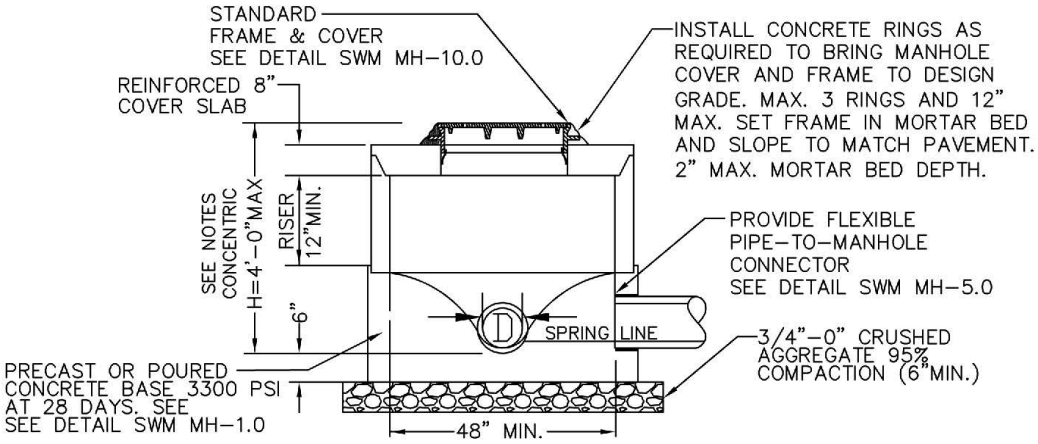
SCALE: N.T.S.

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. MH OVAL GRATE DETAIL	*STANDARD DRAWING* SWM -31



PLAN

(FRAME & COVER NOT SHOWN)

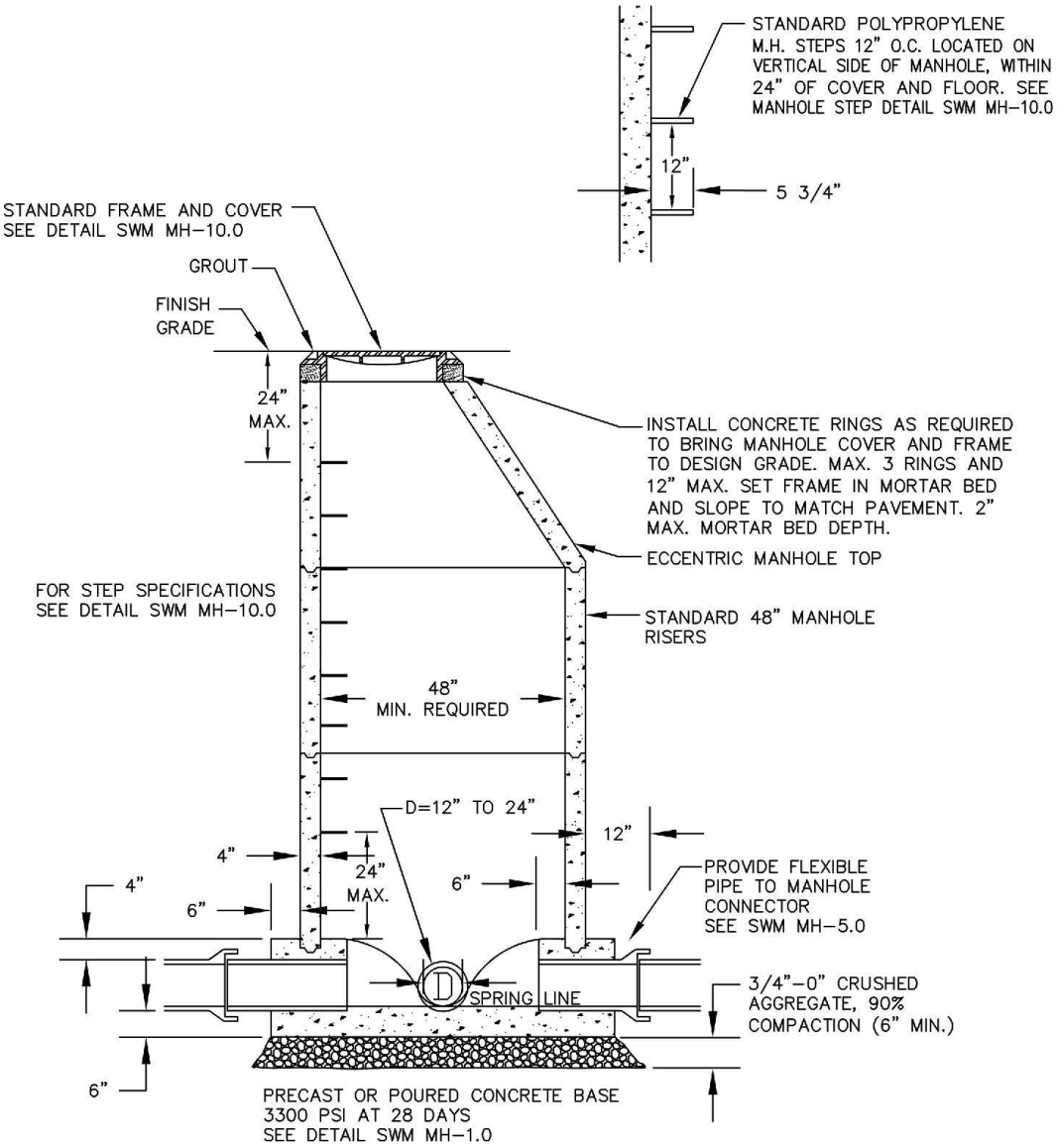


SECTION A-A

NOTES:

1. FLEXIBLE PIPE-TO-MANHOLE CONNECTIONS SHALL BE INSTALLED ACCORDING TO MANUFACTURES SPECIFICATIONS.
2. WATER TIGHT JOINTS.
3. ALL MANHOLE SECTIONS MUST MEET OR EXCEED ASTM C 478.
4. CONCENTRIC EQUAL TO OR LESS THAN 4-FEET – NO STEPS; ECCENTRIC GREATER THAN 4-FEET TO 6'-6" – REQUIRES STEPS.

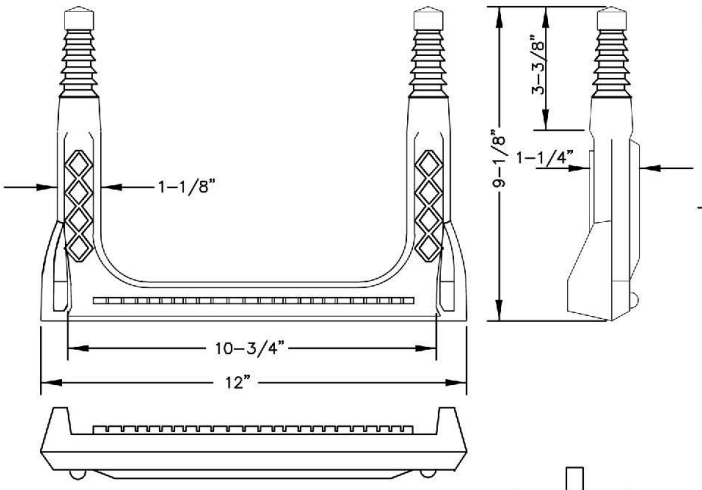
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. MH SHALLOW PRECAST	*STANDARD DRAWING* SWM -32



NOTE

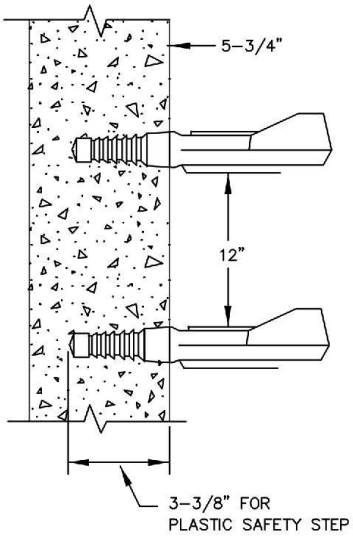
1. SPECIFICATIONS FOR CONCRETE AND MISCELLANEOUS MATERIALS USED IN CONSTRUCTION SHALL CONFORM TO CURRENT APWA STANDARD SPECIFICATIONS.

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2021 *SCALE:* N.T.S. MH STANDARD	*STANDARD DRAWING* SWM -33



NOTES:

1. ALL STEPS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-478.
2. MANHOLE STEPS MUST BE TIGHT AND FIRMLY EMBEDDED.
3. ALL STEPS WITHIN A MANHOLE SHALL BE OF THE SAME DESIGN, TYPE, AND SIZE. (MIXING OF UNMATCHED STEPS IS NOT PERMITTED).



NOTES:

1. STEPS LOCATED AT 12" O.C. LOCATED ON VERTICAL SIDE OF MANHOLE.
2. STEPS A MAXIMUM OF 24" FROM RIM AND 6" FROM TOP OF CONE TO FIRST STEP.
3. REFERENCE DETAILS SWM MH-2.0, MH-8.0, AND MH-9.0.

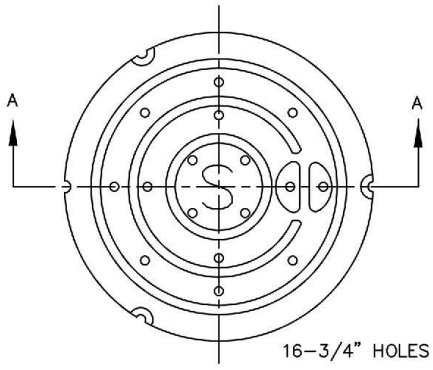
MATERIALS:

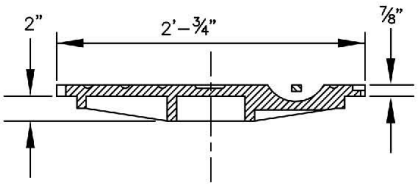
PLASTIC:

MUST CONFORM WITH ASTM C-478.
STEEL REINFORCING BAR MINIMUM 1/2" GRADE 60.
MEETING REQUIREMENTS OF ASTM A615 ENCAPSULATED
WITH INJECTION MOLDED COPOLYMER POLYPROPYLENE
WITH SERRATED SURFACES.

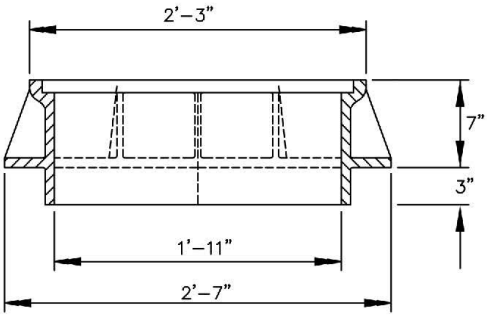
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. MH STEP	*STANDARD DRAWING* SWM -34

STANDARD MANHOLE

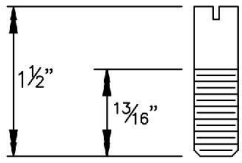




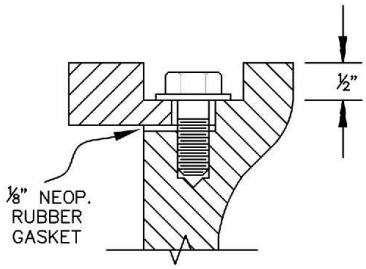
SECTION A–A

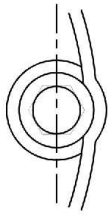


WATER TIGHT DETAILS
TAMPERPROOF



LOCATING STUD
(1) REQUIRED PER COVER





CAP SCREW
(3) REQUIRED ½" x 1¼"
PENT OR HEX HEAD
BRONZE OR CAD PL.

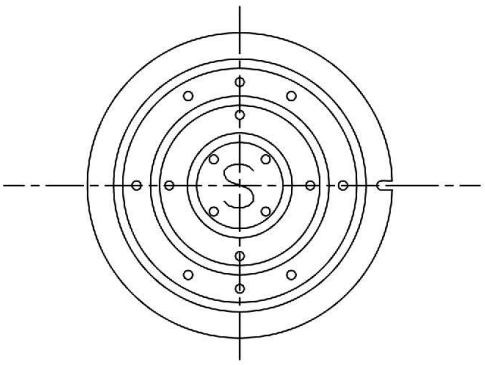
CLACKAMAS WATER ENVIRONMENT SERVICES

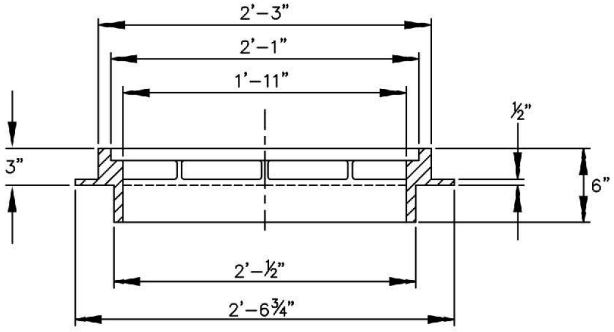
CLACKAMAS WES
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

APPROVAL DATE: July, 2022 *SCALE:* N.T.S.

MH STANDARD
FRAME & COVER

STANDARD DRAWING
SWM
-35

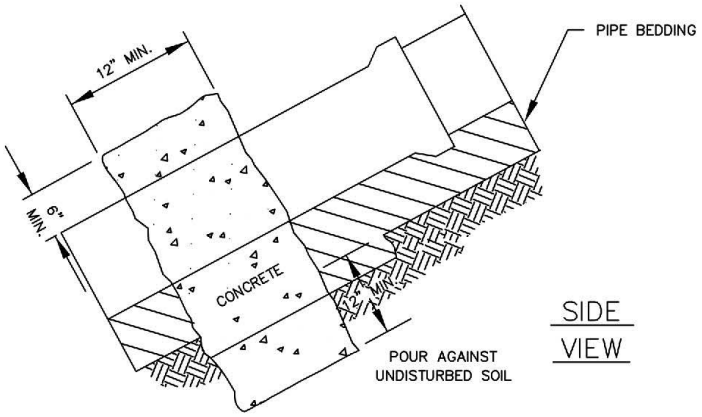




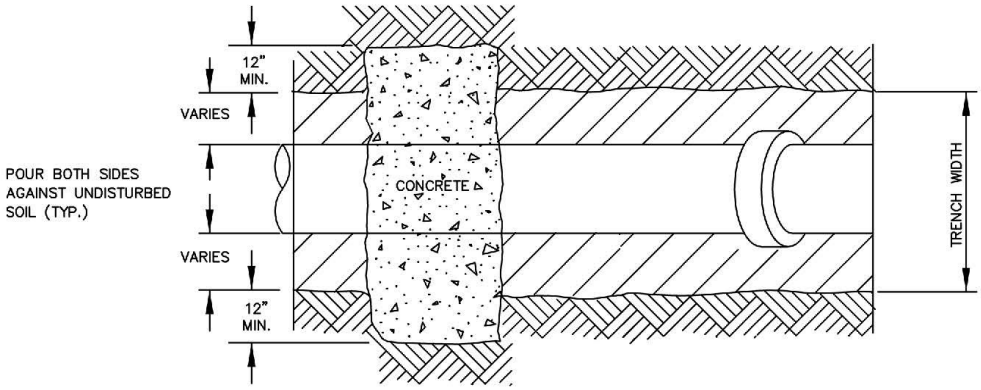
NOTES

1. SUBURBAN FRAME & COVER CAN BE USED IN EASEMENTS AND SUBDIVISION STREETS EXCEPT COLLECTOR, ARTERIAL, AND INDUSTRIAL STREETS, OR AS NOTED ON CONSTRUCTION PLANS.
2. 16, 3/4"Ø HOLES.

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. MH SUBURBAN FRAME & COVER	*STANDARD DRAWING* SWM -36



SIDE VIEW



PLAN

SLOPE FT/FT	MIN. ANCHOR SPACING CENTER TO CENTER
0.20 – 0.34	35'
0.35 – 0.50	25'
0.51+	15' OR CONC. ENCASEMENT

ANCHOR WALL

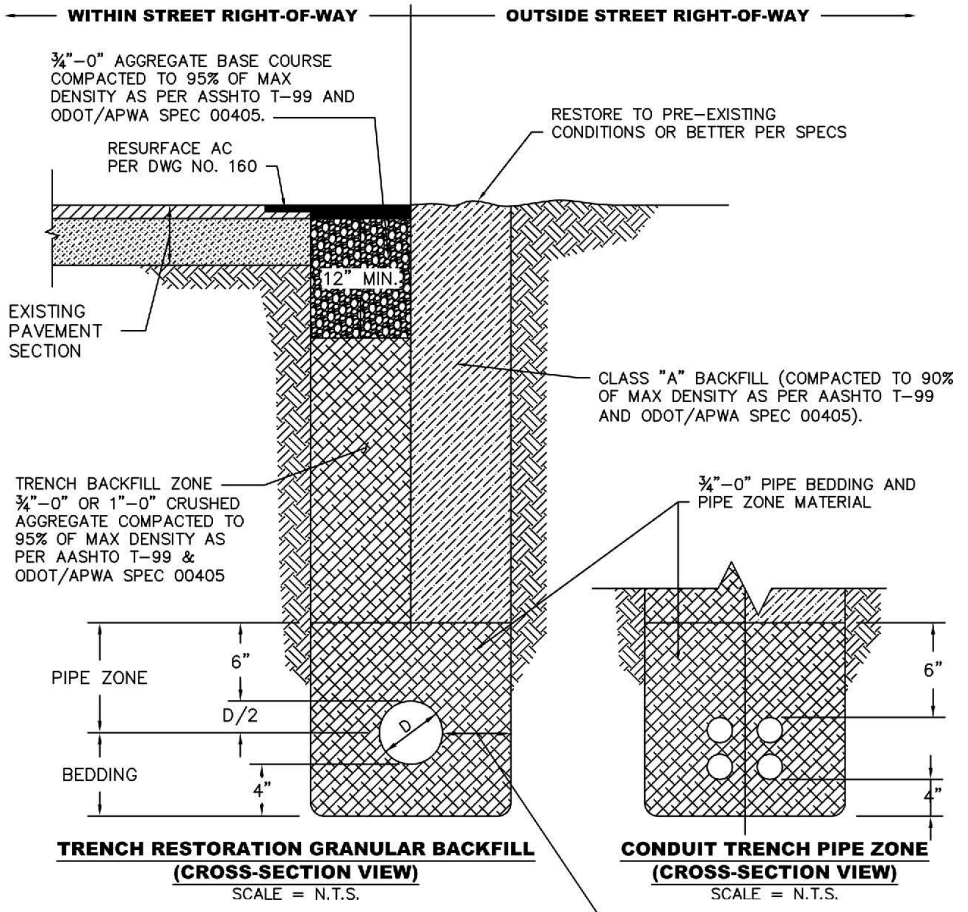
CLACKAMAS WATER ENVIRONMENT SERVICES

CLACKAMAS WES
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

APPROVAL DATE: July, 2022 *SCALE:* N.T.S.

ANCHOR WALL

STANDARD DRAWING
SWM -37



TRENCH RESTORATION GRANULAR BACKFILL
(CROSS-SECTION VIEW)
SCALE = N.T.S.

CONDUIT TRENCH PIPE ZONE
(CROSS-SECTION VIEW)
SCALE = N.T.S.

NOTES:

1. PAVEMENT SHALL BE CUT PER STANDARD DRAWING 200.
2. PROVIDE COMPACT TEST RESULTS FOR TRENCH BACKFILL TO THE CITY FOR VERIFICATION.
3. CONTROL DENSITY FILL SHALL BE USED ON COLLECTOR AND ARTERIAL STREETS. REFER TO STANDARD DRAWING 210.

SHORING TRENCH CLEARANCE WIDTH	
D (IN.)	TRENCH (IN)
4–10	9
12–16	12
18–21	16
24–30	18
36–72	24

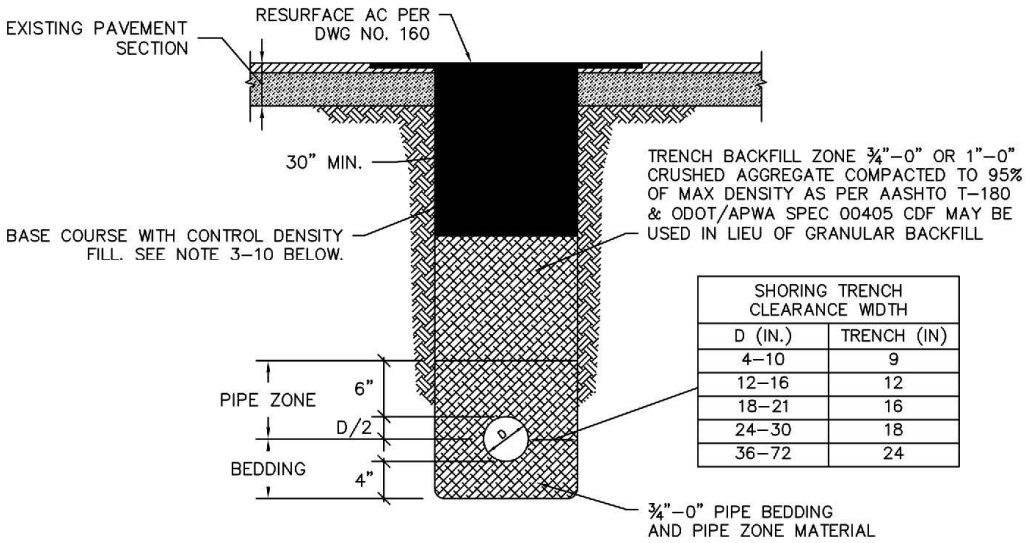
CLACKAMAS WATER ENVIRONMENT SERVICES

CLACKAMAS WES
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

APPROVAL DATE: July, 2022 *SCALE:* N.T.S.

TRENCH RESTORATION

STANDARD DRAWING
SWM -38



SHORING TRENCH CLEARANCE WIDTH	
D (IN.)	TRENCH (IN)
4–10	9
12–16	12
18–21	16
24–30	18
36–72	24

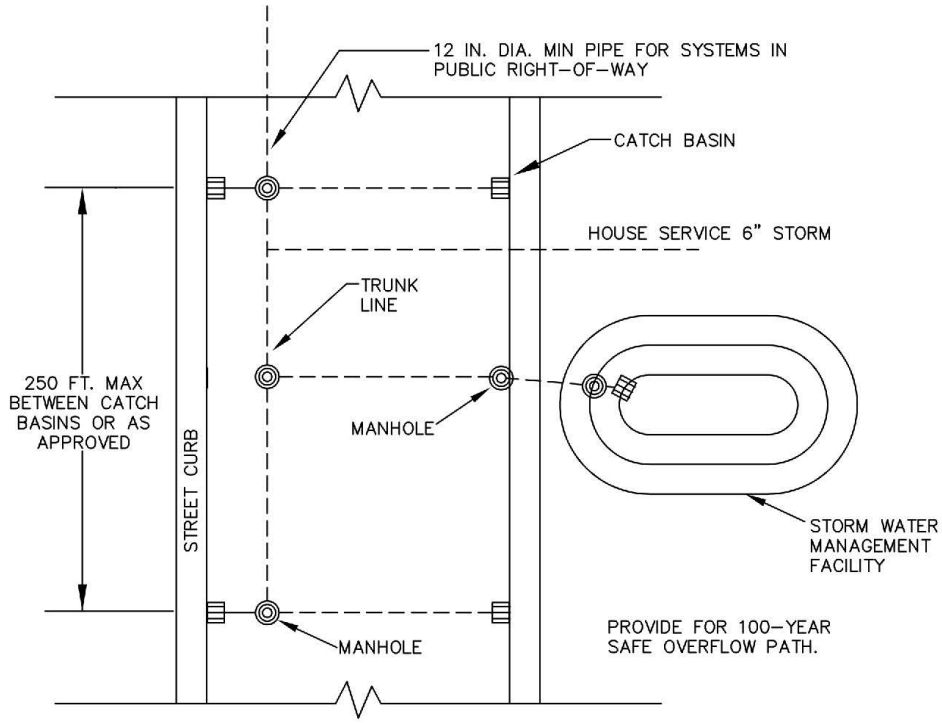
TRENCH RESTORATION W/ CDF

SCALE = N.T.S.

NOTES:

1. SAWCUT EXISTING AC PAVEMENT ACCORDING TO STANDARD DRAWING 200.
2. CONTROL DENSITY FILL (CDF) CONSISTS OF A MIXTURE OF PORTLAND CEMENT, FLY ASH, AGGREGATES, WATER AND ADMIXTURES PROPORTIONED TO PROVIDE A NON–SEGREGATING, SELF–CONSOLIDATING, FREE–FLOWING MATERIAL WHICH WILL RESULT IN A HARDENED, DENSE, NON–SETTLING FILL PRODUCING UNCONFINED COMPRESSIVE 28 DAY STRENGTH FROM 100 PSI TO A MAXIMUM OF 200 PSI.
3. CONTRACTOR WILL PROVIDE BATCH WEIGHTS SHOWING THE AMOUNTS OF ALL INGREDIENTS IN THE MIX, BATCH TIME, AND THE TOTAL AMOUNT OF THE BATCH.
4. CDF SHALL BE PERFORMANCE BASED AND MEET THE FOLLOWING CRITERIA:
   - TYPE F FLY ASH: 200 LB MIN, TYPE I OR II CEMENT: 50 LB MIN
   - SETTLING SHALL BE LESS THAN ⅛" PER FT DEPTH
   - FINE AGGREGATE (LESS THAN ⅜") SHALL BE USED
   - CONCRETE UNIT WEIGHT SHALL BE 100 PCF MIN
5. CDF SHALL NOT BE PLACED ON FROZEN GROUND. DURING PLACEMENT TEMPERATURE MUST BE AT LEAST **34 DEGREES F. AND RISING.** CDF PLACING SHALL STOP WHEN TEMPERATURE IS 38 DEGREES F OR LESS AND FALLING.
6. TRENCH SECTIONS TO BE FILLED WITH CDF SHALL BE CONTAINED AT EITHER END OF THE TRENCH SECTION BY BULKHEADS OR EARTH FILL.
7. DURING CDF CURE TIME (TYP. 48 HOURS) THE CONTRACTOR SHALL INSTALL STEEL SHEETS OR OTHER PROTECTIVE DEVICES TO ALLOW FOR THE PASSAGE AND SAFETY OF TRAFFIC AND SO NO LOAD IS TRANSFERRED TO THE CDF.
8. CONTRACTOR SHALL ALLOW FOR A MINIMUM 48 HOUR CURE TIME FOR CDF PRIOR TO PLACING ASPHALT. STEEL PLATES ARE NOT ALLOWED IN THE ROADWAY JANUARY THRU MARCH, NOVEMBER AND DECEMBER WITHOUT PRIOR APPROVAL FROM THE CITY.
9. 30 INCH DEPTH OF CDF MAY BE REDUCED IF CONFLICTING WITH PIPE ZONE BACKFILL.
10. COPIES OF CDF MATERIAL DELIVERY SLIPS SHALL BE SUBMITTED TO CITY ENGINEERING WITHIN 48–HOURS OF PLACEMENT.

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. TRENCH RESTORATION WITH CDF	*STANDARD DRAWING* SWM -39

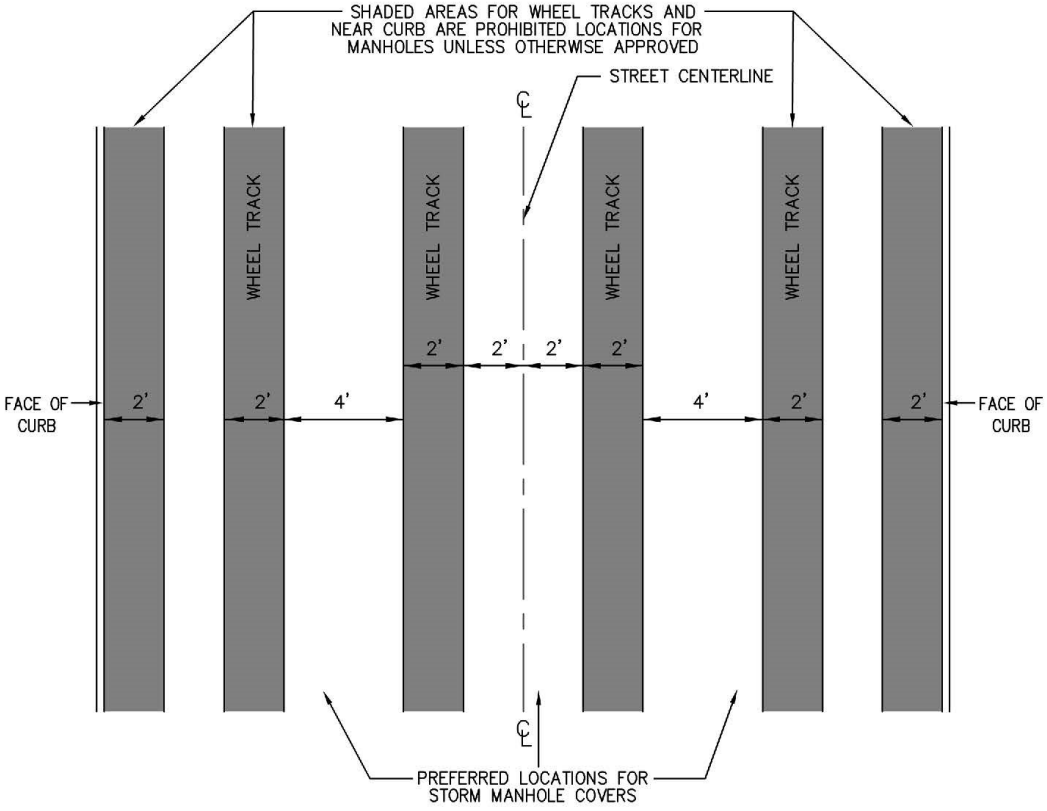


STORM COLLECTION			
STORM COLLECTION	MAX. DISTANCE BETWEEN M.H.	MIN. VELOCITY	MIN. GRADE
12-INCH PIPE	250-400 FEET 0-250 FEET	4 FT/SEC 3 FT/SEC	.01 SLOPE .005 SLOPE
15-INCH PIPE	250-400 FEET 0-250 FEET	4 FT/SEC 3 FT/SEC	.006 SLOPE .004 SLOPE
18-INCH PIPE	250-400 FEET 0-250 FEET	4 FT/SEC 3 FT/SEC	.005 SLOPE .003 SLOPE
24-INCH PIPE	300 FEET	3 FT/SEC	.002 SLOPE
30-INCH PIPE	300 FEET	3 FT/SEC	.002 SLOPE
36-INCH PIPE	300 FEET	3 FT/SEC	.002 SLOPE

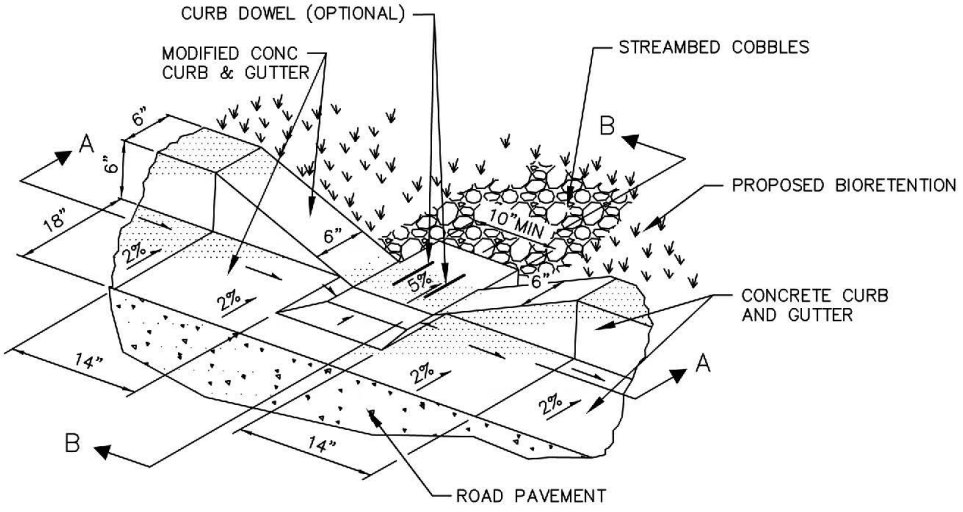
NOTES

1. A MAXIMUM OF THREE CATCH BASINS MAY BE ALLOWED TO BE CONNECTED TOGETHER WITHOUT A MANHOLE AS APPROVED BY THE DISTRICT.
2. DETENTION/WATER QUALITY FACILITIES SHALL CONNECT TO A STRUCTURE.
3. MINIMUM VELOCITY IS 3 FT/SEC.

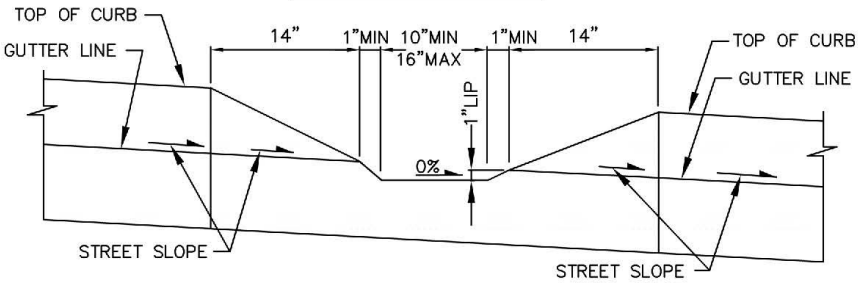
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. COLLECTION SYSTEM DIAGRAM	*STANDARD DRAWING* SWM -40



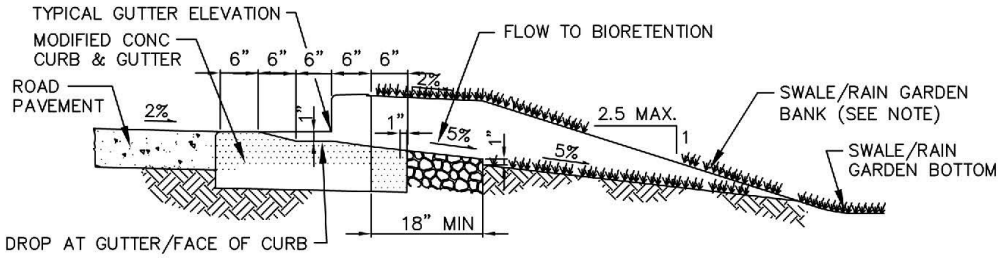
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. MH LOCATION DIAGRAM	*STANDARD DRAWING* SWM -41



SECTION A–A



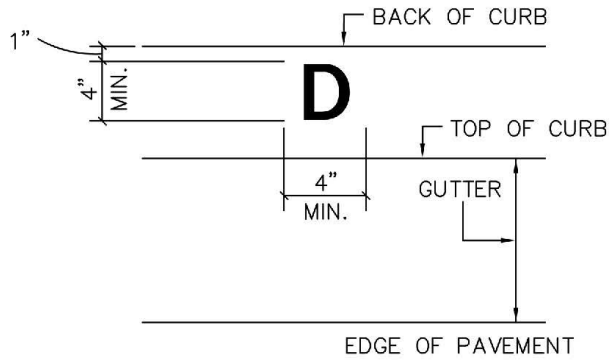
SECTION B–B



NOTE:

MODIFY INLET TO BIORETENTION PLANTER AS NEEDED TO PREVENT EROSION.

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2021 *SCALE:* N.T.S. CURB CUT OPENING	*STANDARD DRAWING* SWM -42



PLAN VIEW
(TYPICAL)

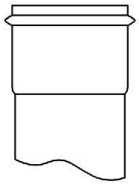
NOTES:

1. ALL STORM AND SANITARY SERVICE LATERALS SHALL BE MARKED APPROXIMATELY AS FOLLOWS:

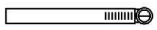
STORM DRAIN LATERAL	"D"	TOP OF CURB
SANITARY SEWER LATERAL	"S"	TOP OF CURB

2. LETTERS SHALL HAVE A 1/2" MAX. WIDTH.

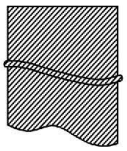
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. CURB STAMP DETAIL	*STANDARD DRAWING* SWM -43



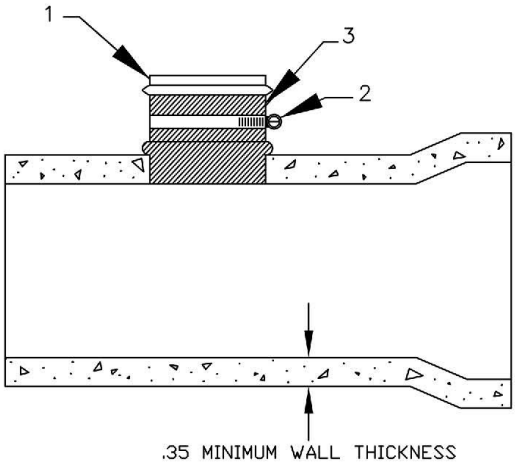
1. PVC HUB SHALL CONFORM TO ASTM 3034, SDR 35 DRIVE INTO CENTER OF RUBBER SLEEVE AFTER SLEEVE IS PLACED IN HOLE.



2. STAINLESS STEEL BAND SECURES UPPER HALF OF RUBBER SLEEVE TO THE PVC HUB. STAINLESS STEEL BAND SHALL BE 300 SERIES, $\frac{9}{16}$" BAND WIDTH, CADMIUM PLATED CARBON STEEL, AND ATTACHED WITH HEX HEAD SLOTTED SCREW.

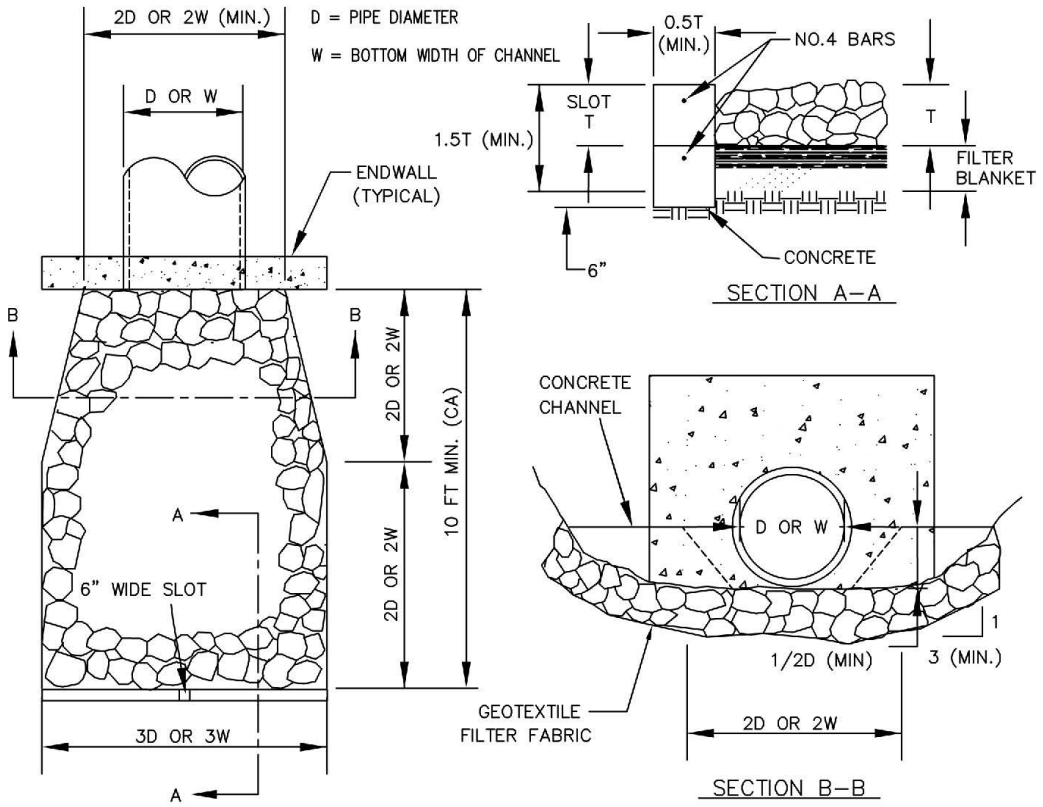


3. COMPLETE RUBBER SLEEVE INCLUDES A MOLDED SEGMENT THAT HOLDS IT IN PLACE.



NOTE:
1. ALL INSERTA–TEE HOLES SHALL BE MACHINE DRILLED AND CORED.
2. INSERTA–TEE ARE ALLOWED IN NEWLY CONSTRUCTED SEWER MAINS 12" AND LARGER INSIDE DIAMETER (I.D.).
3. SEWER MAIN SHALL BE TWO SIZES (NOMINAL I.D.) LARGER THAN THE INSERTA –TEE.
4. HOST PIPE SHALL BE MINIMUM .35" WALL THICKNESS.

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. INSERTA TEE	*STANDARD DRAWING* SWM -44



NOTES
1. PLANS SHALL SPECIFY:
   A) ROCK CLASS AND THICKNESS (T)
   B) FILTER MATERIAL, NUMBER OF LAYERS AND THICKNESS.
2. RIP RAP SHALL BE EITHER QUARRY STONE OR BROKEN CONCRETE (IF SHOWN ON THE PLANS). COBBLES ARE NOT ACCEPTABLE. SEE DETAIL SWM ST–10.1 FOR SIZING.
3. RAP RAP SHALL BE PLACED OVER FILTER BLANKET WHICH MAY BE EITHER GRANULAR MATERIAL OR PLASTIC FILTER CLOTH.
4. PLACEMENT
   A) MINIMUM DEPTH = 1–1/2 TIMES AVERAGE STONE SIZE.
   B) ROCKS SHALL BE PLACED TO PROVIDE A MINIMUM OF VOIDS.
   C) SURFACE ROCKS SHALL PROTRUDE AT LEAST 1/2 THEIR VERTICAL DIMENSION.
   D) RIPRAP IS TO BE PLACED OVER A GEOTEXTILE FABRIC ON A NATURAL BEDDING, OR IT MAY BE GROUTED OR PLACED OVER A GRAVEL BEDDING AS REQUIRED BY THE DISTRICT.

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2021 *SCALE:* N.T.S. OUTFALL RIP RAP	*STANDARD DRAWING* SWM -45

RIP RAP SIZING AT OUTFALLS FOR PIPES GREATER THAN 6 INCHES IN DIAMETER

DISCHARGE VELOCITY AT DESIGN FLOW (FPS)	REQUIRED PROTECTION MINIMUM DIMENSIONS				
	TYPE	DEPTH*	WIDTH	LENGTH**	WIDTH
0 – 5	RIPRAP*	2 X (MAX STONE SIZE)	DIAMETER +6 FEET	10' MIN. OR AS CALCULATED IF LONGER	CROWN +1 FOOT
6 – 10	RIPRAP*	2 X (MAX STONE SIZE)	DIAMETER +6 FEET OR 3 X DIA. WHICH–EVER IS GREATER	AS CALCULATED	CROWN +1 FOOT
11 – 20	GABION OR RIPRAP*	2 X (MAX STONE SIZE)	DIAMETER +6 FEET OR 4 X DIA. WHICH–EVER IS GREATER	AS CALCULATED	CROWN +1 FOOT
OVER 20	ENGINEERED ENERGY DISSIPATER REQUIRED				

* RIPRAP SIZE SHALL BE DETERMINED USING THE FOLLOWING FORMULAE***

V = AVERAGE VELOCITY (FT/S)
Do = PIPE DIAMETER (FT)
ds = RIPRAP DIAMETER (FT)
Lsp = APRON LENGTH (FT)
depth = THICKNESS (FT)
Fo = $V/(g*DO)^{0.5}$

*RIPRAP SIZE ds=0.25*Do*Fo (6" MINIMUM)
DEPTH=2*ds (1–FOOT MINIMUM)
**APRON LENGTH Lsp=Do(8+17*Log Fo)

g= 32.2 FT/S^2

*** US ARMY CORPS OF ENGINEERE DESIGN FORMULAS FROM EROSION AND RIPRAP REQUIREMENTS AT CULVERT AND STORM OUTLETS, JANUARY 1970.

CLACKAMAS WATER ENVIRONMENT SERVICES

CLACKAMAS WES
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

APPROVAL DATE: July, 2022 *SCALE:* N.T.S.

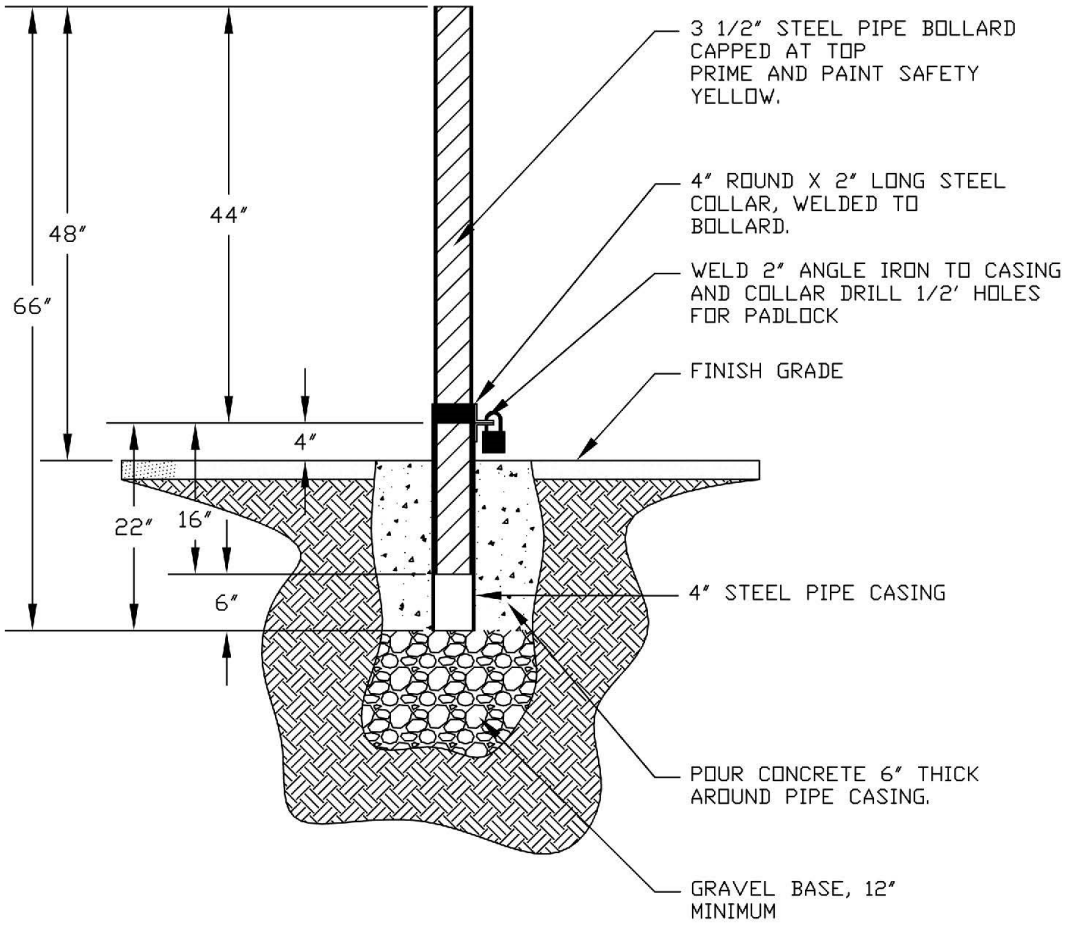
OUTFALL RIP RAP SIZING

STANDARD DRAWING SWM -46

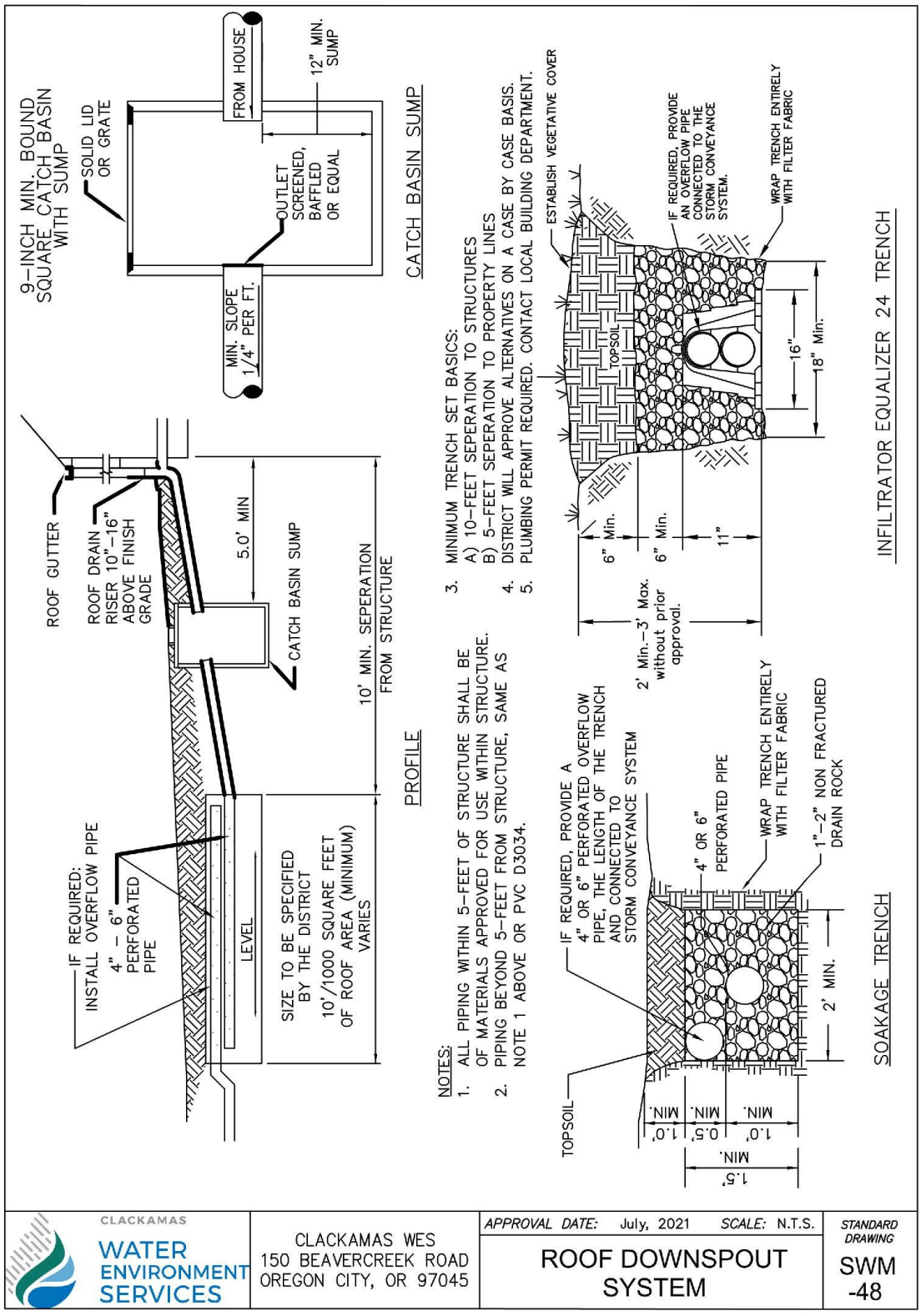
STEEL PIPE SPECIFICATIONS

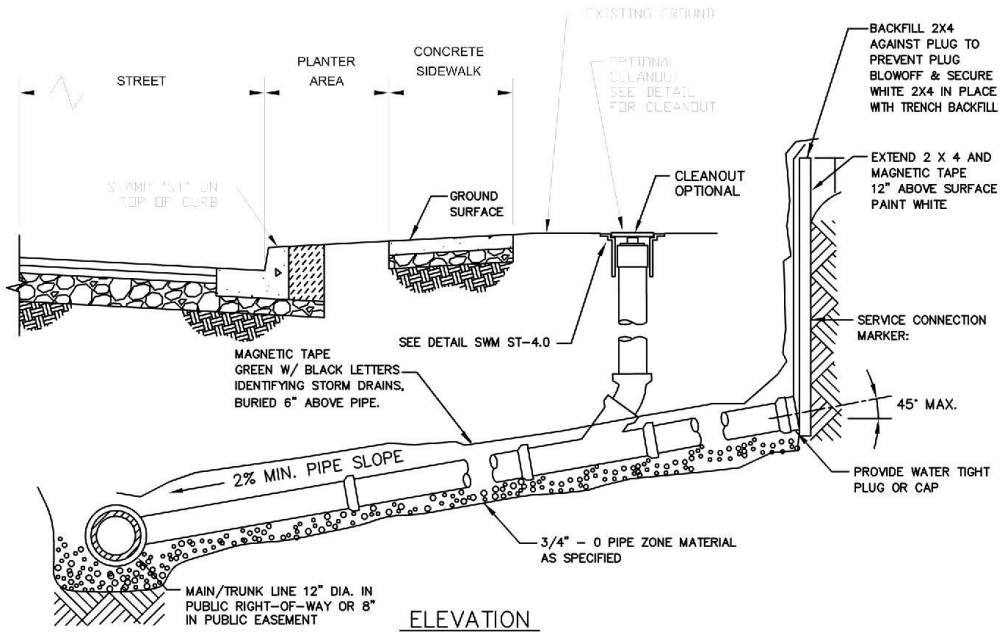
ASTM A-53 STEEL, SCHEDULE 40, BLACK, HOT DIPPED, ZINC-COATED, WELDED, SEAMLESS

4-INCH STEEL PIPE	O.D. = 4.500″	I.D. = 4.026	THICKNESS = 0.237
3 1/2-INCH STEEL PIPE	O.D. = 4.000″	I.D. = 3.549″	THICKNESS = 0.226″



CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. REMOVABLE BOLLARD	*STANDARD DRAWING* SWM -47


9-INCH MIN. BOUND SQUARE CATCH BASIN WITH SUMP
SOLID LID OR GRATE
FROM HOUSE
12" MIN. SUMP
OUTLET SCREENED, BAFFLED OR EQUAL
MIN. SLOPE 1/4" PER FT.
CATCH BASIN SUMP
ROOF GUTTER
ROOF DRAIN RISER 10"-16" ABOVE FINISH GRADE
5.0' MIN
CATCH BASIN SUMP
10' MIN. SEPERATION FROM STRUCTURE
IF REQUIRED: INSTALL OVERFLOW PIPE 4" - 6" PERFORATED PIPE
LEVEL
SIZE TO BE SPECIFIED BY THE DISTRICT 10'/1000 SQUARE FEET OF ROOF AREA (MINIMUM) VARIES
PROFILE
NOTES:
1. ALL PIPING WITHIN 5-FEET OF STRUCTURE SHALL BE OF MATERIALS APPROVED FOR USE WITHIN STRUCTURE.
2. PIPING BEYOND 5-FEET FROM STRUCTURE, SAME AS NOTE 1 ABOVE OR PVC D3034.
3. MINIMUM TRENCH SET BASICS:
A) 10-FEET SEPERATION TO STRUCTURES
B) 5-FEET SEPERATION TO PROPERTY LINES
4. DISTRICT WILL APPROVE ALTERNATIVES ON A CASE BY CASE BASIS.
5. PLUMBING PERMIT REQUIRED. CONTACT LOCAL BUILDING DEPARTMENT.
ESTABLISH VEGETATIVE COVER
TOPSOIL
IF REQUIRED, PROVIDE AN OVERFLOW PIPE CONNECTED TO THE STORM CONVEYANCE SYSTEM.
WRAP TRENCH ENTIRELY WITH FILTER FABRIC
6" Min.
6" Min.
11"
16"
18" Min.
2' Min.-3' Max. without prior approval.
INFILTRATOR EQUALIZER 24 TRENCH
IF REQUIRED, PROVIDE A 4" OR 6" PERFORATED OVERFLOW PIPE, THE LENGTH OF THE TRENCH AND, CONNECTED TO STORM CONVEYANCE SYSTEM
4" OR 6" PERFORATED PIPE
WRAP TRENCH ENTIRELY WITH FILTER FABRIC
1"-2" NON FRACTURED DRAIN ROCK
2' MIN.
TOPSOIL
1.0' MIN.
0.5' MIN.
1.0' MIN.
1.5' MIN.
SOAKAGE TRENCH
CLACKAMAS WATER ENVIRONMENT SERVICES
CLACKAMAS WES
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
APPROVAL DATE: July, 2021
SCALE: N.T.S.
ROOF DOWNSPOUT SYSTEM
STANDARD DRAWING
SWM -48



STORM SEWER LATERAL SERVICE CONNECTION

NOTE: EVERY PROPERTY SHALL HAVE A SEPARATE SERVICE CONNECTION CONNECTED DIRECTLY TO THE MAINLINE, UNLESS OTHERWISE APPROVED BY THE DISTRICT. SHARED SERVICES ARE NOT ALLOWED.

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2022 *SCALE:* N.T.S. SERVICE CONNECTION	*STANDARD DRAWING* SWM -49