DESIGN AND CONSTRUCTION STANDARDS

Douglasville – Douglas County Water and Sewer Authority

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SECTION ONE

Administrative Procedures

The following procedures are established to provide a standard process for the approval of plans and subsequent project construction. Additional information may be required, if deemed necessary, by the Douglasville-Douglas County Water and Sewer Authority ("Authority").

Approval of construction drawings by the Authority shall not relieve any party from the duty to comply with all applicable standards and specifications established by the Authority. The construction drawings approved by the Authority indicate the extent and general arrangement of the water distribution, sanitary sewer collection and stormwater management systems. If any departure from the approved construction drawings are deemed necessary by the contractor, details of such departures and the reasons therefore shall be submitted to the Authority as soon as practicable for approval.

All approved construction drawings which may include site plans, water distribution system plans, sewer system plans, stormwater management plans, erosion control plans, pollution prevention plans, hydrology studies and other materials submitted to and reviewed by the Authority, along with these specifications, shall be considered as supplementary, one to the other, so that materials and labor indicated, called for, or implied by these specifications and not on the plans, shall be supplied and installed as though specifically called for on the plans.

All contractors and designers should be aware of the Authority's construction specification requirements prior to construction. As such, all contractors and designers are required to possess a copy of the Authority's Construction Standards Latest Edition. The contractor's copy of these specifications shall be available for consultation at the construction site. WSA reserves the right to stop the contractor's water line, sewer line, and stormwater construction if the Authority's Construction Standards for Water, Sanitary Sewer, and Stormwater, Latest Edition, are not available for inspection and consultation at the construction site. Paper copies may be purchased at the Authority's Administrative Offices on Hospital Drive for a fee of $25.00. A CD-ROM version in PDF format is also available for a fee of $5.00.

The Authority will not be held responsible for any water**,** sewer, or stormwater distribution system installation, which cannot be accepted into its system because of the contractor's lack of knowledge of the existence of the Authority's specifications. If it appears that the plans were prepared without regard to these specifications, they will be returned unapproved without comment.

A. CONSENT TO AUTHORITY REGULATIONS

The developer and property owner for every private development project, regardless of size or type, shall be required to execute a "Consent to Authority Regulations," which shall utilize the form at the end of this Section or such other form as may be required by the Authority.

B. LAND DISTURBANCE PERMIT

1. As required by the Georgia Erosion and Sedimentation Control Act, development and redevelopment projects that involve the disturbance of one or more acres or any soil disturbance within 200 feet of the bank of a perennial stream, must obtain a Land Disturbance Permit (LDP). All documents associated with LDPs shall be submitted to the Authority. Projects undertaken by private owners for their personal residence that involve less than one acre can be within 200 feet of a stream bank and not require an LDP.

2. A Notice of Intent (NOI) shall be submitted to both the Authority and the State of Georgia Environmental Protection Division (EPD) prior to issuing an LDP. The NOI shall include the construction exit location latitude and longitude in degrees, minutes and seconds.

3. Performance Bonding in the amounts required by Chapter 4 of the Authority's Rules and Regulations are due in full prior to issuance of an LDP. Developers that fail to comply with federal, state, and local standards risk performance bond forfeiture.

4. The LDP will be issued once all local governing authority requirements have been met. The Authority will release the LDP to the owner/developer at the pre-construction meeting.

C. PROJECT APPROVAL PROCEDURE

1. All project design and construction shall be in accordance with all federal, state, and local standards and regulations, including but not limited to the latest editions of the following documents:

    a. Douglasville – Douglas County Water and Sewer Authority Design and Construction Standards, latest edition

    b. Douglasville – Douglas County Water and Sewer Authority Rules and Regulations, latest edition

    c. Georgia Stormwater Management Manual

    d. Manual for Erosion and Sediment Control in Georgia

    e. Recommended Standards for Wastewater Facilities

    f. Minimum Standards for Public Water Systems

    g. American Water Works Association (AWWA) Standards

2. A project Concept Meeting should be held with the WSA Engineering Department prior to the approval of any preliminary plat or very early in the design process if no preliminary plat is required. The purpose of the Concept Meeting is to ensure the following:

    a. The Developer and the Developer's Engineer are familiar with all aspects of WSA Design & Construction Standards relative to Erosion & Sediment Control, Water, Sewer, and Stormwater

    b. Review and discuss the general characteristics of the project relative to any unusual aspects of Erosion & Sediment Control, Water, Sewer, and Stormwater

    c. The Developer and the Developer's Engineer are aware of the process of submitting plans for review and approval by the WSA

    d. The Developer and the Developer's Engineer understand any special requirements relative to any local, state, or federal regulations which have to be included with plan submittals

    e. The Developer and the Developer's Engineer understand the WSA's expectations relative to Erosion & Sediment Control and the use of BMPs, especially those BMPs relating to cut and fill slopes

    f. The Developer and the Developer's Engineer are aware that the WSA is a separate entity for the City and County and that the WSA has standards and rules separate from the City and County

3. A water and sewer availability letter may be issued by the Authority upon request. NOTE: The issuance of an availability letter does not constitute a guarantee of water or sewer plant or infrastructure capacity. Capacity is not allocated or guaranteed until it is purchased through the sale of a water meter. Water and/or sewer service may require infrastructure upgrade at the developer's expense. Under no circumstances is an availability letter valid for more than one year.

4. Developers are required to purchase a flow test for each project involving water infrastructure or fire protection construction. The flow test must be performed by the Authority to determine the quantity of water available to the proposed development.

5. Developers wishing to obtain Authority approval shall submit two (2) copies of the site design and construction drawings and two (2) copies of the Stormwater Management Plan (if applicable) for review. Drawings shall be professionally printed on sheets sized 24 inches x 36 inches. Plans containing handwritten notes, as well as "half-size" and architectural size (30 inches x 42 inches) drawing sets will not be reviewed and will be returned to the owner/developer.

6. The cover sheet on all drawing submittals shall contain the following information:

    a. Total acreage for the site

    b. Disturbed acreage

    c. For commercial projects provide the following impervious surface quantities:

        1. The total impervious surface of the project (in square feet) including, but not limited to, buildings, paving, and curb and gutter, and all impervious areas in the public right-of-way.

        2. The impervious area (in square feet) for the private property portion of the site only, excluding all impervious areas in the public right-of-way.

    d. A blank space 7 inches high by 5 inches wide for the Authority approval stamp.

7. The cover sheet on all drawing submittals shall contain the following notes:

    a. Stormwater management structures on private property must be maintained by the property owner. All subsequent owners must be informed of operations and maintenance requirements. Failure to maintain stormwater infrastructure may result in enforcement action. Changes and modifications to stormwater infrastructure (public and private) must be approved by the Douglasville – Douglas County Water and Sewer Authority.

    b. Downstream impacts of development are the responsibility of the Owner. Development may not cause downstream impacts such as increased flood hazard, erosion of off-site soils and stream channels, or impairment of water quality of receiving waters.

    c. Approval is based on information supplied on these drawings. If unknown conditions are encountered, or site conditions change, or these plans are otherwise found to be not representative of site conditions, contact the Douglasville – Douglas County Water and Sewer Authority Engineering Department. Design revision and re-submittal may be required.

    d. Construction, which impacts streams, wetlands, or other environmentally sensitive areas, shall comply with applicable local, state, and federal laws. Plan approval by WSA does not relieve the Owner, Developer, and Contractor of the obligation to apply for and obtain required permits and comply with current regulations.

    e. Development may not occur in flood prone areas as defined by the Douglasville – Douglas County Water and Sewer Authority. Unauthorized development will be ordered removed and restoration of the site required, both at the expense of the Developer.

f. Approval of these plans is based on submitted information regarding extents of soil disturbance, schedule of activities, and proposed measures to control erosion and sediment control. Significant changes to project design or schedule elements must be approved by the Authority.

g. Plan approval does not release any party from duty to comply with local, state, and federal law. It is unlawful to increase turbidity in receiving waters more than 25 NTU.

h. The Douglasville – Douglas County Water and Sewer Authority requires that every service connection be equipped with a backflow prevention device. Facilities that, in the opinion of the Authority, may potentially introduce hazardous or toxic substances into the water supply will be required to install a reduced pressure assembly that vents to the atmosphere.

i. Douglasville – Douglas County WSA approval of these plans does not constitute a guarantee of water or sewerage capacity. Capacity is not allocated until it is purchased through the sale of a water meter.

j. Any modifications/changes to an existing or additions to a portion of the water, sewer, or stormwater systems is required to be inspected and or reviewed by WSA (WSA Eng. Dept. Phone # 770-949-7617)

k. Plan approval does not release the Owner, Developer, or Contractor from responsibility for environmental damage, property damage, or endangerment of public health. Responsible parties shall mitigate impacts, repair damage, and compensate affected parties as required by local and state law.

l. All construction and materials shall be in full accordance with current Rules and Regulations and Design Standards and Specifications published by the Douglasville – Douglas County Water and Sewer Authority. It is the responsibility of each Developer and Contractor to familiarize himself with all current WSA rules and standards.

m. The Douglasville – Douglas County Water and Sewer Authority will obtain road bore permits and road cut permits at the County and State levels for all approved projects. Road bore/cut work shall not begin until permits are obtained.

n. Please Notify W.S.A. Engineering Dept. 72 Hours Before Construction at 770-949-7617.

8. The Authority will review the site design and construction drawings and the Stormwater Management Plan and identify required changes. Review comments will be returned to the project engineer. Plan review fees shall be applied as stipulated in the Authority's Rules and Regulations, latest edition. When the drawings and plans are corrected to

reflect all Authority comments, five (5) sets of design and construction drawings shall be stamped approved as well as two (2) sets of the Stormwater Management Plan. The Authority shall retain two (2) sets of approved design drawings and one (1) set of the Stormwater Management Plan. Three (3) sets of approved plans will be returned to the project engineer. One set of approved drawings shall be on site throughout development construction.

9. Plans will not be approved until all state and federal permits and all variances are received.

10. One additional drawing set shall be submitted to the WSA for approval and WSA submittal to the Georgia Environmental Protection Division for all projects that include any of the following:

    a. 36-inch diameter sewer lines or larger

    b. 700 gpm sewer lift stations or larger

    c. Any sewer lines within 2000 feet of the Chattahoochee River

11. Plan approval does not relieve the developer from the responsibility of downstream impacts caused by the quality or the quantity of stormwater runoff, nor does plan approval constitute a guarantee of plant or infrastructure capacity.

12. Plan approval shall be valid for a period of one year. If construction is not substantially underway within one year after the approval date, a re-submittal of the plans may be required. Authority review and approval does not relieve the owner, developer, and/or contractor from any responsibility or liability.

13. Plan approval shall not relieve any party from the duty to comply with all applicable construction specifications established by the Authority. The owner, developer, and/or contractor must comply with applicable federal, state, and local regulations including but not limited to, pollutant discharge limits, wetland protection, stream buffer protection and flood protection.

14. Upon project acceptance, the Authority will accept dedication of and own all water mains, sewer mains and lift stations that serve more than one property owner, as well as all stormwater collection and conveyance structures located in the public right-of-way or stormwater structures outside of the public right-of-way that have been accepted by the Authority, including inlets, catch basins, pipes, ditches, and channels. Regardless of dedication by plat or otherwise, project acceptance by the Authority shall not be deemed an acceptance, either express or implied, of any stormwater facilities and structures located outside of the public right-of-way or on private property. All stormwater facilities and structures located on private property shall be owned and maintained by the property owner(s). The Authority shall not accept, own, or be responsible for any stormwater facilities or structures located outside of the public right-of-way or on private property

unless the Authority specifically agrees to take ownership and responsibility for said facilities or structures in a separate document approved in writing by the Authority.

15. All submittals to this Authority pertaining to the design or construction of water, sewer and stormwater infrastructure, including "As-Built" drawings, shall be sealed and signed by a Professional Engineer licensed in the State of Georgia. The Authority reserves the right to return documents not meeting this criterion without review or comment.

D. PRE-APPROVED CONTRACTORS

1. Water, Sewer, and Stormwater Infrastructure Construction

   All contractors performing water**,** sewer**,** and stormwater installation within the Authority's service area must be on an Approved Contractors List maintained by the Authority. Only contractors on the Approved Contractors List may perform water, sanitary sewer, and stormwater utility contracting work within the Authority's service area.

2. Application and Selection Criteria

   Contractors may apply for inclusion in the Approved Contractors List by completing the application form prescribed by the Authority and available through the Engineering Department or by submitting a request in writing in letter form to the person having delegation at the Authority, which includes the information contained in Section**s** (a) and (b) below. All contractors must have a current Georgia Utility Contractors License. The license must be in the name of the contracting company doing the work. Approved Contractors shall not subcontract water and sewer line construction to others not on the Authority's Approved Contractors List except for wet-taps, concrete coring, and road paving. No work is allowed under the umbrella of another contractor's license or inclusion to the Approved Contractors List. Based upon the criteria in Sections (a) and (b) below, the Authority shall select those contractors authorized to perform water and sanitary sewer utility contracting work within the Authority's service area.

   a. Résumé of Experience and Qualifications

      1. Names and addresses of all principals associated with the contractor, including a summary of the job qualifications and experience for each party affiliated with the contractor.

      2. Summary of water, sanitary sewer, and stormwater utility contracting work performed by the contractor, including:

         (a) a description of each such project;

         (b) the names and telephone numbers of the developers, inspectors, and other utilities, consulting engineers, etc. for each such project;

(c) project cost;

(d) summary of job difficulty;

(e) other factors deemed relevant by the contractor.

3. Certifications and licenses of superintendents, foremen, crew members, and company principles. (e.g., Utility Contractor's License, Utility Manager's License, Utility Foreman's License, Competent Persons Trenching Certification, Flagging Certifications, etc.).

4. Bonding capacity or letter of credit worthiness.

5. Any disciplinary actions, fines or charges including liquated damages brought against the contractor by any entity within the past five (5) years.

6. Prior failure in contractual obligations to the owner or any governmental entity within the past five (5) years.

7. Credit rating (voluntary).

8. Applications will be reviewed by a panel consisting of any of the following as designated by the Executive Director: The Deputy Director of Engineering and Maintenance, the Engineering Manager, the Maintenance Manager or any Superintendent level or higher Engineering Department personnel. This panel shall be chaired by the highest-ranking employee.

9. The Authority's Deputy Director of Engineering and Maintenance shall have the right to summarily reject incomplete or inaccurate applications.

b. Evidence of Poor Contracting Skills and Management

1. Evidence of any disciplinary action, fines, or charges brought against the contractor by any entity within the past five (5) years.

2. Instances of improper water, sewer, and stormwater utility contracting work known to the Authority.

3. Instances in which the contractor has failed to follow published Authority construction standards.

4. The disregard by the contractor or the contractor's representatives of private property rights (e.g., failing to adequately repair a driveway or yard; failing to stabilize construction areas, resulting in erosion and sedimentation run-off; etc.)

5. Hostile, belligerent, and threatening behavior toward Authority personnel.

6. Unsafe work practices.

7. Unauthorized tampering with the Authority system (e.g., unsupervised and /or un-permitted tying into the centralized water or sanitary sewer system; tying into the Authority system without an Authority inspector present; flushing mud into the centralized sanitary sewer system; installing fire hydrants without Authority permission and without an Authority inspector present; making a sewer tap for an individual lateral without Authority permission and inspector present, unauthorized fire hydrant/fire line usage, etc.)

8. Deliberately deceiving or attempting to deceive Authority personnel concerning matters of Authority business.

9. Failing to act in a timely manner to correct problems with an installation (e.g., failing road cuts associated with water and sewer projects; leaks; hydrants installed too close to the road; leaking hydrants; points of infiltration on sewer lines; missing valve pads and markers; etc.).

10. Repeated non-compliance with Authority construction standards and ignorance of said standards.

11. Contractors that are inactive in the Authority's service area for a period of 12 months or have changes in corporate structure or ownership are subject to removal from the Approved Contractors List. The Authority will consider reinstating such contractors after they have filed a new application with the Authority.

12. Other evidence of a general nature which demonstrates the inability of the contractor to properly perform water and sanitary sewer utility contracting work within the Authority's service area.

c. Probationary Period

Contractors that are approved for water, sanitary sewer, and stormwater utility contracting work shall be placed on a six-month probationary period from the date of the contractor starting a water and/or sewer construction project within the Authority's service area. During the probationary period, all work by the contractor will be reviewed based upon the criteria described in Section D.2.a and Section D.2.b above. Contractors on probation shall be scrutinized more closely than those contractors not on probation. Provided all work performed in the probationary period is satisfactory, the contractor will be removed from probationary status and placed on the Approved Contractors List. During the probationary period, the contractor must perform work in sufficient quantity for the Authority to judge the adequacy of the work. If work is not adequate, probation may be extended, or the contractor dropped

from the Approved Contractors List, at the sole discretion of the Authority's Engineering Manager.

d. Right of Appeal

1. Any contractor denied inclusion on or removed from the Approved Contractors List shall have the right to appeal such denial by filing a written Notice of Appeal with the Executive Director within thirty (30) days of the date that the adverse decision is issued by the Authority's Engineering Manager. An administrative appeal hearing shall be scheduled within thirty (30) days of the Executive Director's receipt of the written appeal. The Authority's Approved Contractors Appeal Panel shall hear all appeals. The Approved Contractors Appeal Panel shall consist of any three (3) of the following, which shall be designated by the Executive Director to serve for the specific appeal at the time of receipt of the written notice of appeal: Executive Director, Chief Financial Officer, Water Operations Manager, Wastewater Operations Manager, Human Resources/General Services Manager, or Management Information Systems Manager. The Approved Contractors Appeal Panel shall have the right to review the issues de novo. The contractor shall have a right to attend the appeal hearing and present evidence in its defense. The Approved Contractors Appeal Panel shall issue its decision in writing within thirty (30) days of the date of the appeal hearing. The decision of the Approved Contractors Appeal Panel shall be final.

2. The administrative appeal process established in this Section shall be a condition precedent to any affected contractor seeking judicial relief. Any decision of the Approved Contractors Appeal Panel above may be reviewed upon petition for writ of certiorari in the Superior Court of Douglas County, which shall be filed within (30) days of the date of the decision of said Appeal Panel.

e. Removal from Approved List

1. In the event a contractor included in the Approved Contractors List is found to have engaged in conduct of the nature described in Section D.2.b, that contractor may be removed from the Approved Contractors List by the Authority's Engineering Manager. Written notice of removal shall be given to the contractor.

2. The Authority's Engineering Manager shall be authorized to place a contractor on probation for minor infractions of the general nature described in Section D.2.b. Repeated infractions or infractions of a serious and willful nature may result in removal from the Approved Contractors List.

3. Removal from the Approved Contractors List may be appealed in the manner described in Section D.2.d.

E. PROJECT CONSTRUCTION

1. Prior to the release of the Land Disturbance Permit, a copy of the recorded permanent easements naming the Developer as the grantee for all required off-site public water and sanitary sewer structures shall have been received by the Authority's Engineering Department. Also, a copy of the recorded off-site permanent drainage easements naming the Developer as the grantee shall have been received by the Authority's Engineering Department prior to the release of the Land Disturbance Permit. The owner / developer is responsible for obtaining all required off-site easements in accordance with the requirements of Section 1-23 of the Authority's Rules and Regulations. The Developer shall be responsible for recording the off-site easement(s) in the Records of the Clerk of the Superior Court of Douglas County, Georgia. Upon completion of construction and prior to project acceptance, easements for public water and sanitary sewer structures shall be transferred to name the Authority as grantee in accordance with the WSA Design and Construction Standards, Project Acceptance section.

2. Construction may begin after Authority approval and applicable permits are obtained. At least a 72-hour notice shall be given to the Authority to allow sufficient time for the developer to schedule a pre-construction meeting with the Authority and for an inspector to be assigned to the project.

3. The first activities that shall occur on site shall be installation of the access pad (construction exit), sediment barriers, and sediment storage. Once these are properly installed, the developer shall contact the Authority for an inspection. Construction activities including clearing, grading and demolition may not commence until the initial erosion control measures are inspected and approved by the Authority's inspector.

4. Infrastructure that has not been inspected and has been backfilled is subject to being excavated for the purposes of a full and complete inspection at the Authority's sole discretion.

5. If construction of infrastructure with a hydraulic component must vary from approved plans, the design engineer shall submit revised plans for approval prior to the installation of the infrastructure.

6. Contractors shall provide the Authority inspector with a construction schedule and shall make every effort to perform infrastructure construction during the Authority's regular business hours, typically Monday – Friday, 7:30 a.m. – 6:30 p.m. Contractors performing infrastructure work at times other than the Authority's regular business hours are subject to reimbursing the Authority for inspection services. These inspection services shall be billed as stipulated in the Authority's Rules & Regulations, latest edition. Under no circumstances shall contractors perform infrastructure construction prior to dawn or after dusk without prior authorization. Contractors violating the provisions of this paragraph are subject to removal from the Authority's Approved Contractors List.

7. Authority inspectors are required to be present during infrastructure tie-ins to Authority owned and operated systems. Contractors violating the provisions of this paragraph are subject to removal from the Authority's Approved Contractors List.

8. The Authority will inspect erosion and sediment control measures during the first week of the project and at least once a week thereafter. Inspections may also be performed before, during, or after rainfall events. In the event that problems are observed, the inspector shall issue a written Notice of Violation to comply and notify the 24-hour contact listed on the erosion control plan.

   In the event the remedial measures described in the Notice of Violation have not been completed by the date set forth for such completion in the Notice of Violation, a Stop Work Order may be issued. If the violation presents an immediate threat to public health or waters of the state or if land-disturbing activities are conducted without obtaining a Land Disturbance Permit, the Authority may issue an immediate Stop Work Order. All stop orders shall be effective immediately upon issuance and shall remain in effect until the necessary corrective action is taken to the satisfaction of the Authority. If proper corrective action is not taken within 10 days of issuance of a Stop Work Order, the Authority may call the Performance Bond or any part thereof to be forfeited and may use the proceeds to hire a contractor or use the Authority's own forces to stabilize the site.

9. Utility permits are required prior to commencing infrastructure work in the Douglas County Right-of-Way and in the Georgia Department of Transportation (GDOT) Right-of-Way. Utility permits are in addition to permits for road bores and road cuts. The Authority will obtain these permits and issue them to private development contractors at the pre-construction meeting or prior to construction within the Right-of Way.

10. Warranty - Pipes, structures, and devices that convey, detain, or treat potable water, sanitary sewage or stormwater which are accepted by the Authority for ownership, operation and maintenance shall be warranted and guaranteed for a period in accordance with the provisions in Section 1(H)(1) from the date of final acceptance The warranty shall provide for completed utility systems free from any and all defects due to faulty products or workmanship. The contractor shall make such corrections as may be necessary by reason of such defects upon notice by the Authority. This provision includes but is not limited to repairing and/or replacing infrastructure components that have been damaged by the developer's contractors and other utility contractors. The Authority may make a claim against the developer's road bond with the local governing authority for infrastructure that is damaged as a result of paving operations.

    In addition to the one-year warranty required of the contractor, the developer and the owner agree that they shall forever warrant the design, installation, and function of all structures constructed pursuant to the approved plans for the project with respect to any latent defect, improper workmanship below the standard of care established by these Design and Construction Standards, or any other impropriety, whether a result of negligence or intentional misconduct. The developer and the owner shall be responsible for the correction of any problems arising from a defect pursuant to this paragraph.

F. PROJECT ACCEPTANCE

1. The Engineering Department will issue an acceptance letter for all projects when the following requirements are met:

   a. All quality assurance tests are conducted by the contractors, observed by Authority personnel and are found to meet or exceed established requirements.

   b. All water, sewer, and stormwater conveyance structures, detention facilities, and best management practices are completed for the development.

   c. All "As-Built" drawings in accordance with Section 1, Item G have been approved.

   d. Maintenance bonding for water, sewer, and stormwater infrastructure in accordance with Section 1, Item H has been received.

   e. All fees, such as impact fees and lift station maintenance fees, are paid.

   f. The original permanent easements naming the Authority as the grantee for all required off-site public water and sanitary sewer structures have been received by the Authority's Engineering Department. The owner/developer is responsible for obtaining all required off-site easements in accordance with the requirements of Section 1-23 of the Authority's Rules and Regulations. The Authority's in-house attorney is responsible for preparing all easements to be dedicated to the Authority upon receipt of the proper plat information. Five (5) copies of a plat of survey in legally recordable form, showing the off-site easement(s) and all related bearings, courses, and distances should be submitted to the Authority's in-house counsel for preparation of the required documents. The Authority will not accept any easements or other grants of property unless the easement, deed, or other document of conveyance has been reviewed by the Authority's attorney and approved by the Executive Director or his designee in writing on the face of the original document. Upon approval, the Authority shall be responsible for recording the off-site easement(s) and plats of survey in the Records of the Clerk of the Superior Court of Douglas County, Georgia.

   g. A copy of the proposed final subdivision plat (where applicable), or five (5) copies of a plat of survey in legally recordable form (for non-subdivision projects), must be submitted to the Authority for review and approval, showing all water and sanitary sewer easements to be dedicated to the Authority for acceptance of all public water structures, sanitary sewer structures, and stormwater structures and features. The size and material of water, sewer, and stormwater lines shall be shown. The final survey plat must be approved by the Authority, as evidenced by the placement of the following notation on the final plat, which shall be signed by the Executive Director of the Authority or his designee:

      "Approval of this plat and acceptance of the project represented herein shall be deemed to be an acceptance by the Douglasville-Douglas County Water and

Sewer Authority (the "Authority") of all dedicated water mains, sanitary sewer mains, and lift stations that serve more than one property owner, as well as all stormwater collection and conveyance structures located in the public right-of-way, including inlets, catch basins, pipes, ditches, and channels. Approval of this plat and acceptance of the project represented herein shall not be deemed an acceptance, either express or implied, of any stormwater facilities, structures, or features located outside the public right-of-way on private property. All stormwater facilities, structures, and features located on private property shall be owned and maintained by the property owner(s), in accordance with the requirements of the Authority's Rules and Regulations. The Authority shall not be responsible or liable for any drainage outside of the right-of-way; for any drainage leading from drop inlets, catch basins, or surface drainage; for flooding or erosion from storm drains; or for flooding from high water of natural creeks or rivers. This statement is included on this final plat as a condition of acceptance and shall be in the nature of a covenant running with the land, serving as notice to all future owners of the existence of the drainage easements and stormwater features as shown on the plat and the private duty to maintain them in perpetuity. As a condition of approval of this plat and acceptance of this project by the Authority, the developer and owner hereby covenant that any future deed conveying all or any portion of the property or lots shown herein shall specifically refer to this plat and incorporate this plat by reference."

Said final subdivision plat or final plat of survey of the project shall be recorded in the Records of the Clerk of the Superior Court of Douglas County, Georgia and proof of recording provided to the Authority within ten (10) days of the Authority's acceptance of the project or the appropriate governmental entity's approval of the final subdivision plat, whichever is later. Failure to record the final plat or to timely provide proof of such recording to the Authority may result in the suspension of the sale of water meters for the project and/or the termination of water service to the property.

2. Nine months after the letter of acceptance is issued, the project will be re-inspected to ensure system acceptability. A representative of the developer must be present for this inspection. If any corrective measures are necessary, a letter delineating the items to be corrected will be sent to the developer.

3. After the project is accepted, after the bonding period as specified in Section 1(H)1 has been fulfilled, and after all final punch-list items have been resolved, the maintenance bond will be released.

G. "AS-BUILT" DRAWINGS

1. The Engineering Department will not release the project for field-testing (as described in other sections of these specifications) until paper and electronic copies of the "As-Built" drawings that meet the requirements of this section have been submitted and approved.

2. Paper copies shall be original drawings. Blue line drawings will not be accepted.

3. Electronic "As-Built" drawings shall be compatible with the Authority's version of AutoDesk Map. Each object type shall have its own layer. For example, each of the following shall have its own layer: topographical lines, water mains, fire hydrants, sewer lines, manholes, stormwater lines, catchbasins, etcetera.

4. All "As-Built" drawings shall use the state plane coordinate system, USA, GA, Nad 83, West Foot. Both electronic and paper "As-Built" drawings shall include all information contained on the approved construction drawings in the "As-Built" state.

5. The Stormwater Management Report shall be submitted electronically in a PDF format.

6. The developer must provide printed name, signature and certification that the project has been constructed in accordance with Authority Design and Construction Standards and Rules and Regulations and that the project has been built as shown on the "As-Built" drawings. The following standard certification language shall appear on each sheet of the "As-Built" drawings, accompanied by the signature of the owner/developer, prior to approval of the drawings by the Authority:

   > "I certify that this project has been constructed in accordance with Douglasville – Douglas County Water and Sewer Authority's Design and Construction Standards and Rules and Regulations, Latest Editions. I also certify that this project has been built as shown on the "As-Built" drawings."

7. The professional engineer must provide printed name, signature, seal and certification that the plans and specifications were designed in accordance with all acceptable standards. The following standard certification language shall appear on each sheet of the "As-Built" drawings, accompanied by the signature of the engineer, prior to approval of the drawings by the Authority:

   > "I certify that the plans and specifications of this project were designed in accordance with all applicable standards. I have reviewed the as-built survey for this project and have found the facilities, structures, and utilities as shown on that survey to be in conformance with the design drawings for this project."

8. A registered land surveyor or Professional Engineer, licensed in the State of Georgia, is required to field verify the "As-Built" drawings (location and invert elevation of pipes, basins, drains, ponds, BMPs, etc.). "As-Built" drawings shall reflect actual field conditions. Unmodified construction drawings are not acceptable.

9. The following standard certification language shall appear on each sheet of the "As-Built" drawings, accompanied by the signature of the registered engineer or land surveyor, prior to approval of the drawings by the Authority:

   > "I certify that this project has been built as depicted on the "As-Built" drawings. I further certify that I have field verified all elevations, volumes, and locations

as appropriate for the potable water, sanitary sewer and stormwater management structures depicted on these drawings."

10. Each certification statement, as listed in this section, shall be accompanied by the appropriate signature. The signatory's name shall be either type written or legibly printed below each signature. "As-Built" drawings containing illegibly printed or typed names will be considered unacceptable and the drawings will be returned unapproved. Projects with unacceptable "As-Built" drawings will not be released for field-testing. The developer may be required at his or her cost to construct, reconstruct, remove or modify utility infrastructure to comply with the "As-Built" drawings when and if field conditions do not match the "As-Built" drawings.

H. MAINTENANCE REQUIREMENTS

1. The owner must maintain all water, sewer, and stormwater infrastructure accepted by the Authority for a period of 12 months after acceptance. After 12 months, accepted infrastructure belongs to the Authority and the Authority shall provide all maintenance in perpetuity.

2. Private water, sewer, and stormwater infrastructure shall be maintained by the owner in perpetuity. Even though these structures maybe regulated by the Authority, the Authority does not claim ownership and shall not provide maintenance.

3. Examples of private infrastructure include but are not limited to:

    a. Water – domestic service lines, fire protection lines, hydrants on private lines, post indicator valves, and backflow prevention devices along with associated boxes, vaults, and covers.

    b. Sewer – service lines, clean outs, manholes, grease traps, and other pretreatment devices with associated covers, rims, and lids.

    c. Stormwater – detention facilities, water quality structures, drainage ditches, pipes, inlets, and other structures not located within the right-of-way of public streets. This includes structures and facilities in common space and those on private lots with designated drainage easements.

4. Maintenance of accepted infrastructure during the 12-month warranty period shall be guaranteed by a maintenance bond provided by the owner as a condition of acceptance. The Owner shall provide bonding for a minimum period of one year after acceptance unless specified otherwise by the Authority. Maintenance bond amounts shall be as required by Chapter 4 of the Authority's Rules and Regulations.

5. The Authority, in its sole discretion, reserves the right to consider proof of actual cost in lieu of the above-listed standard costs for construction.

6. The maintenance bond must remain in full force and effect for a minimum of 12 months from the date of issuance of an acceptance letter by the Authority or the contractor's warranty period established by Paragraph E.9 above, whichever is longer.

7. All stormwater management facilities, including detention ponds and water quality facilities, on common space must be maintained by the owner.

8. All permanent stormwater detention ponds and/or water quality pond must be in the condition of final stabilization and in working order prior to conveyance to a homeowners association (HOA). If construction has not been completed at the time of conveyance, the developer must establish a maintenance account in the name of the HOA with sufficient funds to achieve final stabilization once all construction is complete.

9. When all construction is complete, the owner of the pond(s) shall immediately remove sediment as needed to comply with design criteria and shall establish permanent vegetation to achieve final stabilization. All sediment barriers and retrofits must be removed.

10. All ponds will be inspected periodically by WSA. In the event maintenance problems are observed by WSA inspectors, the pond owner will be notified in writing regarding the problem. Failure of the owner to take action as required to restore the pond to good condition may result in other enforcement action as set forth in WSA Rules and Regulations.

11. All bonds as discussed in these specifications must meet the approval of the Authority. The Authority, in its sole discretion, may accept an irrevocable letter of credit in lieu of a bond.

12. Failures to the system while under warranty are the responsibility of the developer, including but not limited to damage caused by the developer's contractors and other utility contractors. The Authority will make a reasonable effort to contact the developer to repair failed infrastructure. Should the developer fail to respond in a timely manner (immediately in the case of emergencies) or should the repair be unsatisfactory to the Authority in any way, the Authority will make the repair and bill the developer at the rates specified in the Authority's Rules and Regulations.

13. The Authority reserves the right to notify the developer's surety and/or financial institution(s) regarding defective and/or damaged infrastructure. Such notifications may consist of, but not necessarily be limited to, copying the surety and/or financial institution(s) on punch-list letters and other such correspondence pertaining to the construction project.

I. PERFORMANCE BONDING REQUIREMENTS

1. Performance bonding in the amounts required by Chapter 4 of the Authority's Rules and Regulations are due in full prior to issuance of a Land Disturbance Permit.

    a. Construction activity involving the disturbance of public or third-party private property may require additional performance bonding at the sole discretion of the Authority.

b. Developers that fail to comply with these specifications risk performance bond forfeiture.

1. Road bores, pavement cuts, driveway cuts, and other items as determined by the Authority may require additional bonding prior to the start of construction activity.

2. The Authority may require, at its sole discretion, a cash bond for the price of the repair to the yards, driveways, landscaping, and other features associated with proposed utility lines that cross property owned by others. The purpose of the cash bond is to assure that prompt and satisfactory repair of the damaged property is performed.

3. Erosion Control Performance bonding will be released when final stabilization is achieved and the Authority receives a copy of the Notice of Termination (NOT).

J. CERTIFICATES OF OCCUPANCY

The Authority will sign-off on certificates of occupancy after inspecting each residential lot for drainage and final stabilization.

Consent to Authority Regulations

Project Name: _____

Project Description: _____

The undersigned developer and property owner hereby agree that all pre-construction, construction, and post construction activities, including perpetual maintenance of private stormwater facilities, associated with the above-referenced project (the "Project") shall be undertaken by the developer, property owner, and their contractors, subcontractors, agents, employees, and representatives in strict compliance with: (1) The approved plans and stormwater management report for the Project; (2) The Authority's Rules and Regulations; (3) The Authority's Design and Construction Standards; (4) All applicable city and/or county ordinances, including but not limited to soil erosion and sedimentation control ordinances and zoning ordinances; (5) All other applicable regulations, rules, or requirements of any entity with regulatory jurisdiction over the development and construction activities to be undertaken by the developer and/or property owner; and (6)All applicable provisions of state and federal law.

By execution of this Consent, the developer and the property owner acknowledge and agree that the Authority shall, without limiting any other enforcement remedies or legal actions available to the Authority, have the right to withhold the issuance of any water meters for the Project for noncompliance with all applicable rules, regulations, and directives of the Authority.

By execution of this Consent and as a material inducement to approval of the plans for the Project by the Authority, the developer and the property owner, for themselves and for their contractors, subcontractors, agents, employees, and representatives, agree to indemnify and forever hold the Authority and its agents, employees, and representatives harmless for any and all injuries, damages, claims, demands, actions, judgment, and/or costs, including but not limited to attorney's fees, court costs, and expenses of litigation, of any kind or character whatsoever, arising from or associated with the approval of the plans for the Project and the construction of the Project, whether on-site or off-site, including but not limited to any structures, features, measures, or other activity required by the Authority's Rules and Regulations and Design and Construction Standards or otherwise undertaken in conjunction with the Project.

By execution of this Consent, the developer and the property owner further stipulate and agree that any and all claims, demands, actions, or suits whatsoever arising out of or related to the Project, which involve the Authority in any capacity, shall be subject to the jurisdiction of the Superior Court of Douglas County, Georgia. The undersigned further agree that jurisdiction and venue in said forum is proper and appropriate since construction of the Project is to be accomplished within Douglas County, Georgia.

The undersigned represent and warrant that they are agents authorized to act on behalf of the developer and property owner, respectively, and that their execution of this Consent shall be binding upon their principals.

Print Name of Developer: _____

Signature of Developer/Developer's Agent: _____

Print Name _____

Print Title _____

Sworn to and subscribed
before me this ____ day
of _____, 202__.
(Affix Seal of Developer, if corporation)

_____
Notary Public (Affix Notary Seal)

Print Name of Owner: _____

Signature of Owner/Owner's Agent: _____

Print Name _____

Print Title _____

Sworn to and subscribed
before me this ____ day
of _____, 202__.
(Affix Seal of Owner, if corporation)

_____
Notary Public (Affix Notary Seal)

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SECTION TWO
DESIGN STANDARDS – WATER

A. DESIGN STANDARDS

1. Minimum water line size

Main	8 inches
Service	3/4 inch
Siamese service	1 inch

2. Minimum flow per residential service — 2 gpm

3. Minimum fire flow

Residential	750 gpm*
Commercial	1,000 gpm*

*Or other value as determined by the Douglas County Fire Marshall's Office.

4. Maximum distance between hydrants as follows or as determined by the Fire Marshall:

Residential:	400 feet
Commercial and Industrial:	400 feet
Water lines installed by the Authority in rural areas:	1,000 feet

NOTE: The Authority and the Douglas County Fire Marshall's Office, respectively, require fire hydrants to be located in all cul-de-sacs and in all public right-of-way intersections. Consequently, the number of hydrants required for a project may exceed the spacing requirements cited above. Reduced distances between hydrants may also be required by other governmental regulations.

5. Pressure on residential service

Minimum	20 psi
Maximum	150 psi

6. Maximum spacing between valves shall be 1000 feet.

7. Minimum ground cover — 4 feet

8. Design period — 50 years

9. All new and existing water lines are to be located five feet behind the existing or proposed curb or as specified by the WSA Engineering Department. In subdivisions, water lines shall be located on the south or west side of the road.

10. A horizontal and vertical separation of at least 18 inches shall be maintained between water lines and stormwater structures.

11. A horizontal separation of at least 10 feet must be maintained between the existing or proposed water main and the sewer. When water mains cross sewers, a minimum vertical separation of 18 inches must be provided between the two pipe (measured edge to edge). At crossings, one full length of water pipe must be located so that both joints are as far from the sewer as possible.

12. Casing is required for public water mains crossing public or private roads and commercial driveways. Casing size shall be per Section 6 of these Standards.

13. PVC casing shall be required for all water service lines beneath paved surfaces in new residential and commercial subdivisions. The minimum casing size for residential service lines is 2-inch. The minimum casing size for commercial service lines is 4-inch.

14. Service lines shall be installed to each subdivision lot at the time infrastructure is installed. In subdivisions where the minimum lot size is 5 acres or greater, the developer will not be required to install service lines prior to acceptance, provided there is adequate room on the right-of-way for the Authority to install the meters. Meters will be installed by the Authority upon payment of the appropriate fees by the owner / builder.

15. Meters, service lines, and taps shall be located outside the limits of driveways.

16. District meters may be required on large developments (100 or more houses) on a case-by-case basis.

17. Construction material and installation shall be in accordance with the current Authority specifications.

18. When a proposed development will abut an existing development, the developer will be required to interconnect the existing line with the proposed development. Every effort will be made to avoid "dead end" line configurations. For future loops in the system, the Authority may, at its sole discretion, require the developer to extend the water main to the edge of his property or pay a fee to the Authority for this extension in the future. The fee will be based on a reasonable and customary estimate by the Authority and shall also be accompanied by all necessary easements.

19. The Authority, in its sole discretion, may require the owner/developer to lay water lines outside the public right-of-way in its efforts to loop the water distribution system and

minimize "dead end" line configurations (e.g., cul-de-sacs) within the bounds of the development.

20. When a proposed subdivision development with a street cul-de-sac 250 feet or less, the Authority may at its discretion downsize the 8-inch water main requirement on a case-by-case basis depending on the number of lots in the cul-de-sac. On dead end/cul-de-sac streets, a hydrant shall be placed not to exceed 250 feet from back of curb at the street's end.

21. Residential Fire Sprinkler System meters shall only be used where code requires residences to be sprinkled. Such meters shall not be allowed for commercial uses.

22. The Authority may at its discretion reduce the minimum ground cover of a water line from 4.0 ft. to 2.5 ft. on a case-by-case basis depending on the quantity of rock encountered.

23. The minimum water meter size for all shell buildings shall be a 2-inch compound meter. The Authority, in its sole discretion, may downsize the minimum water meter size requirement if the owner/developer submits detailed architectural plans showing all proposed fixtures and the total fixture count justifies a smaller sized water meter.

24. For all multi-family residential developments approved on or after January 1, 2006, the developer / owner shall install individual sub-unit meters for the metering of water use by each individual unit.

25. The developer is responsible for ensuring that the Automatic Meter Reading (AMR) signal for all meters in new development and redevelopment is of sufficient strength to be read by the Authority's AMR system:

    a. The developer may be required to install any and all equipment, including but not limited to, repeaters or towers, as necessary to boost signal strength.

    b. The installation of such equipment shall be in accordance with the Fixed Network Installation Manual for the Douglasville – Douglas County Water and Sewer Authority by Itron.

26. To protect the integrity of the potable water system, an air gap must exist between all well water supplies and the potable water distribution system. WSA expressly prohibits all cross connections between well water supplies and treated drinking water on the customer side of the meter.

27. The Authority, in its sole discretion, may require the plans to include details of all elements of the design not covered by these specifications. A Professional Engineer registered in the State of Georgia shall certify all such details.

28. To facilitate future extension of the potable water distribution system, the Authority, in its sole discretion, may require the owner/developer to provide an easement through the property or extend an easement to the edge of the project property line

29. Where a development proposes to widen an existing public or private road over the top of an existing public water main, the water main shall be relocated to be a minimum of five (5) feet off the edge of pavement or back curb.

30. To limit highway water line crossings, WSA reserves the right to prohibit longside bore water service for roadways that are 3 lanes (36 feet) or wider. If longside bores are prohibited, water service must be obtained by extending the water line on the development's side of the roadway.

31. When water lines cross or are in close proximity to a hazardous location (i.e. gas lines), the Authority may require additional measures.

32. For projects that utilize fire pumps, the following information shall be submitted prior to plan approval:

    a. Minimum water system pressure and minimum water system flow required to operate fire pumps. Design shall include reasonable reductions of system pressure and flow to account for normal fluctuations of the water system and to account for reductions in overall system pressures.

    b. Flow and pressure data on all fire pumps

    c. A low pressure cut off shall be installed to maintain a minimum pressure on the suction side of each pump at a pressure to be determined by the Authority

    d. The process on how fire pump alarms will be monitored

B. INFORMATION TO BE SHOWN ON PLANS - WATER

1. Project name and valid registration stamp of the Professional Engineer registered in the State of Georgia. The stamp and signature of registered land surveyors or landscape architects are not acceptable. The registered Professional Engineer must also stamp any plan redesign. The registered Professional Engineer must sign across the stamp.

2. All construction drawings submitted to the Authority for review shall be professionally printed (AutoCad format or approved equal). Hand-written notes are not acceptable and will not be reviewed.

3. Site plans should include street, street names, lot layout (if subdivision) or building locations (if multi-family, commercial or industrial), land lots and district, north arrow, water layout only.

4. Detailed plans of the location and the construction of water mains, valves, fire hydrants, and appurtenances.

5. Limits of the 100-year flood plain.

6. Location and size of water meters. For commercial subdivisions where lot use is unknown, meter size and location are not required.

7. Thrust blocks at all bends and tees. Thrust blocks shall be designed by a registered Professional Engineer licensed in the State of Georgia.

8. Type of material to be used.

9. Location and size of existing water lines surrounding the project.

10. Nearest existing line valves on the main.

11. Other utilities in area of potential conflict.

12. Existing ground elevation.

13. Proposed tie-in with existing lines.

14. Pressure-flow test results, development water demand and fire flow requirements.

15. Twenty-foot permanent easements are required where the water line crosses private property. More easement area may be required as deemed necessary by the Authority.

16. Plan and profile scales shall be:
    Vertical: 1 inch = 5 feet or 1 inch = 10 feet
    Horizontal: 1 inch = 20 feet or 1 inch = 50 feet

17. Sheet size is 24 inches x 36 inches. "Half-size" drawing sets will not be reviewed and will be returned to the owner/developer.

18. A general site location map shall be shown on the title sheet or first page.

19. The following notes shall be required on all drawings submitted to the Authority:

    All water mains and sanitary sewer construction shall conform to the Douglasville-Douglas County Water and Sewer Authority's Design and Construction Standards, latest edition.

    Notify the WSA Engineering Department at least 72 hours prior to beginning of construction on water and sewer. An inspector will be assigned and a pre-construction meeting scheduled at this time.

"As-Built" drawings shall be field verified and stamped by a registered Professional Engineer or land surveyor, licensed in the State of Georgia.

All contractors for water and sewer construction shall be on the WSA Approved Contractors List. Contact the WSA Engineering Department for a copy of the List and/or applications.

Contractors have the responsibility to assure erosion control of all Authority easements, particularly when these easements are in close proximity to drainage easements. See the assigned Douglasville-Douglas County WSA inspector for details.

The contractor shall comply with all Utilities Protection Center requirements.

20. Additional items may be requested if deemed necessary by the Authority.

SECTION THREE
DESIGN STANDARDS – SEWER

A. DESIGN STANDARDS

1. Minimum sewer size

Collector	8 inches
Service	6 inches
Force Main	4 inches DIP

2. Design period — 50 years (per EPA)

3. Minimum drop inside a manhole — 0.2 feet

4. Maximum drop inside a manhole — 2.0 feet

5. Maximum drop outside a manhole — 20.0 feet

6. Minimum depth of cover over pipe — 4.0 feet

7. Minimum sewer line slope (8-inch pipe): 0.40%

   Minimum sewer line slope for all other pipe sizes shall be in accordance with the Recommended Standards for Wastewater Facilities, latest edition.

8. Maximum sewer line slope:

Ductile Iron Pipe Requirements

< 10%	No special requirements.
10% - 15%	Concrete collar required at the downstream manhole.
>15% - 25%	Concrete collar at every joint Or Concrete collar at the downstream manhole and a certified compaction test.*

PVC Pipe Requirements

< 10%	No special requirements.
10% - 20%	Concrete collar required at every joint Or Concrete collar at the downstream manhole and a certified compaction test.*
>20%	Unacceptable

*All compaction tests must be performed and certified by a soil scientist or Professional Engineer registered in the State of Georgia and shall be to 95% standard Proctor compaction test (ASTM D 698). The number of tests required shall be based on field conditions as determined by the WSA inspector.

9. Flow Calculations

Detached Single Family Residence	400 gpd per lot
Multi-Family Residence (as defined in the Authority's Rules & Regulations) and Single-Family Attached Residence (such as townhomes):	250 gpd per lot
Peak Factor	2.5

Note: At peak flow, pipes shall flow no more than 25% depth with respect to pipe diameter. For example, an 8-inch gravity sewer line shall be designed such that depth at peak flow conditions does not exceed 2-inches.

10. Minimum Manning's "n" Factor — 0.013 for DIP
0.010 for PVC or HDPE

11. A sewer flow calculation table similar to the following shall be included with the plans:

Sewer Line I.D.	Number of Lots Falling to Line	Average Daily Flow (ADF) @ 400 GPD per Lot	Peak Flow @ 2.5 x ADF	Minimum Slope Needed to Meet Peak Flow at 25% of Diameter Depth	Minimum Proposed Sewer Line Slope	Velocity (fps)
A	75	30,000	75,000	0.5%	0.7%	
B	90	36,000	90,000	0.8%	1.0%	
C	165	66,000	165,000	2.5%	2.6%	

12. Velocity requirements

    a. Force Main
       Minimum 2.0 fps
       Maximum 8.0 fps

    b. Gravity Sewer
       Minimum 2.0 fps
       Maximum 15.0 fps

       Where velocities in gravity sewer lines are greater than 15 fps, the Authority may require special provisions to protect against displacement by erosion and impact. Drop manholes and/or steel erosion plates can be constructed to reduce high flow velocities.

13. Infiltration Allowance 50 gpd/in. Dia./Mile

14. Maximum distance between manholes 400 feet

15. Sewer lines shall be located in the centerline of road rights-of-way, if possible.

16. When a smaller sewer pipe joins a larger one, the pipe shall be installed to match the elevation of the crown of the two pipes, not the invert. The Authority, on a case-by-case basis, will review special situations.

17. When a new development proposes to widen the pavement of an existing public or private road, existing force mains shall be relocated to be a minimum of 5 feet off the edge of pavement or back of curb.

18. Service line stub-outs shall be plugged or capped with leakproof plugs or caps as manufactured by ETCO, Inc. or equal and the locations of each service shall be identified by station on the "As-Built" drawings.

19. Service line stub-outs shall be wrapped with underground detection / tracer tape.

20. Construction material and installation shall be in accordance with the current Authority construction specifications.

21. Sewer cleanouts shall be located outside the limits of driveways.

22. A horizontal separation of at least 10 feet must be maintained between the water main and the existing or proposed sewer. When water mains cross sewers, a minimum vertical separation of 18 inches must be provided between the two pipes (measured edge to edge). At crossings, one full length of water pipe must be located so that both joints are as far from the sewer as possible. All sewers shall be designed to prevent damage from superimposed live, dead and frost-induced loads. Proper allowances for

loads on the sewer shall be made because of soil and potential ground water conditions, as well as the width and depth of the trench. The weight of soil above the sewer and the weight and buoyancy forces associated with the water must be taken into account.

23. PVC or DIP shall be used on all gravity sewer lines to cover depths of up to 25 feet. DIP shall be used on all gravity sewer lines with cover depths of 25 feet or greater. All DIP and ductile iron fittings shall be lined with a ceramic epoxy lining such as Tnemec Series 431 Perma-Shield PL or approved equal. The Authority reserves the right to require an engineering evaluation of soil loading and alternate pipe material for cover depths greater than 25 feet.

24. Sewer line shall be installed within steel casing whenever:

    a. Stormwater pipe overlays the sewer line unless the sewer line is DIP. The casing, at a minimum, shall extend 10 feet on either side of the centerline of the stormwater pipe and cover the upstream joint of the sewer line.

    b. Sewer lines are exposed, including sewer lines crossing streams and drainage ditches, unless the sewer line is DIP. The casing, at a minimum, shall extend 5 feet beyond each stream bank.

    c. Sewer lines are installed beneath streams using the jack and bore method.

    d. Sewer lines cross public roads.

25. Buoyancy of sewers shall be considered in sewer design. The Authority, in its sole discretion, reserves the right to require additional soil cover and/or concrete anchor blocks to prevent floatation of the pipe where high ground water conditions are anticipated.

26. Force mains shall be HDPE. Alternative pipe materials (e.g., DIP, PVC, fusible PVC) may be allowed at the sole discretion of the Authority. All ductile iron pipes and fittings shall be lined with a ceramic epoxy lining such as Tnemec Series 431 Perma-Shield PL or approved equal.

27. All sanitary sewer service laterals at the easement line or right-of-way line shall be a minimum of 2 feet below any related finished floor elevation.

28. The developers of new subdivisions shall be required to install sewer laterals to all lots in sewered subdivisions.

29. Individual service laterals must serve only one dwelling. Under no circumstances shall two dwellings share the same public or private lateral.

30. Drainage from structures that could potentially cause infiltration or inflow (e.g., downspouts, uncovered garbage and trash receptacles, uncovered dumpsters, etc.) shall not connect to the sanitary sewer collection system.

31. Restaurants are encouraged to connect their dumpster pads to the sanitary sewer system. Dumpster pads that connect to the sanitary sewer system shall connect through an approved grease trap and be covered to prevent surface water from entering the drain.

32. All dumpster pads that discharge pollutants or water containing pollutants and are not connected to the sanitary sewer shall be in violation of illicit stormwater discharge regulations. Illicit stormwater discharges are subject to the policies and penalties of the Authority's Rules and Regulations, latest edition.

33. Amalgam separators with a removal efficiency of a least 95% shall be installed in all dental facilities.

34. The Authority, in its sole discretion, may require the plans to include details of any and all elements of the design not covered by these specifications. A Professional Engineer registered in the State of Georgia shall certify all such details.

35. In order to facilitate future extension of the sewer collection system, the Authority, in its sole discretion, may require the owner/developer to provide an easement through the property or extend the sewer line to the edge of the project property line.

36. All private lift stations, excluding single-family residences, shall be designed in accordance with WSA Design and Construction Standards. Upon review, the Authority, at its discretion, may waive some of the requirements based on the specific conditions of each private lift station.

37. All flood related information shown on the plans shall be as determined by a step-backwater analysis performed by a Professional Engineer licensed in the State of Georgia.

38. When sewer lines cross or are in close proximity to a hazardous location (i.e. gas lines), the Authority may require additional measures.

39. Wastewater generated from swimming pool facilities shall be discharged into the Authority's sanitary sewer system. If the pool facility is not served by the Authority's sanitary sewer system, the pool discharge shall drain to a system approved by the Department of Environmental Health.

40. All force mains and reclaimed water lines shall be marked with locator / tracer tape located a minimum of 2 feet above the pipe. Tape colors shall conform to the APWA Uniform Color Code as listed below:

    a. Force mains – Green

    b. Reclaimed water lines – Purple

41. All force mains and reclaimed water lines shall be painted 270° starting on the top of the pipe, according to the specifications below or as approved by the Authority:

    a. Surface Preparation: SSPC-SP3 Power Tool Clean

    b. Field Prime: Tnemec Paint Series 135 @ 3.0 to 5.0 mils, dry film thickness

    c. Field Second: Tnemec Paint Series N 69 @ 3.0 to 5.0 mils, dry film thickness (2 coats)

    d. Paint colors shall conform to the APWA Uniform Color Code as listed below:

        i. Force mains – Green

        ii. Reclaimed water lines - Purple

B. LIFT STATION REQUIREMENTS

1. Lift Station Policy

   It is the goal of the Douglasville-Douglas County Water and Sewer Authority to provide for the conveyance of wastewater by natural gravity flow wherever and whenever possible. In order to facilitate the Authority's goal, the Authority has policies that allow the reimbursement of certain costs of off-site trunk sewer extensions and oversizing lines.

   The installation of a lift station increases the cost of providing sewer service and transfers the burden of extending trunk sewers and/or repairing, improving, and replacing the lift station to the Authority and its sewer customers. Lift stations, if deemed necessary, must be carefully integrated into the Authority's overall plan for providing wastewater service to its customers.

2. Detailed Plans and Specifications

   Design drawings and specifications for the lift station shall be reviewed by the Authority concurrently with the overall development plans. This submittal shall contain: 1) design and operational information, 2) detailed design drawings, and 3) technical specifications.

3. Lift Station Requirements

   Lift stations must be designed by a Professional Engineer licensed in the State of Georgia and shall be designed and constructed in accordance with the Authority's standards in affect at the time. These standards, in conjunction with the standard details in the Appendix of Section 6 and the current Rules and Regulations, shall include, but not be limited to, the following:

a. Site Location and Layout

1. The lift station shall be located, whether inside or outside of the proposed development, to service ten-times the developed area. The maximum required service area shall be 2,000-acres or no more than 10,000 feet of gravity sewer outside the development, whichever is less. The service area can include area served by any existing public sewer system; however, any area served by an existing lift station that will not be eliminated according to the below requirements must be excluded from the service area for the proposed lift station. Note that this requirement affects the location of the lift station only, not the sizing.

2. The lift station must be located at or beyond the nearest downstream confluence outside the development. The maximum required amount of gravity sewer outside the development to meet this requirement shall be 100 linear feet per developed acre or 10,000-feet, whichever is less. This requirement may be waived if the lift station located within the proposed development area will serve more than two-times the service area requirement.

3. The lift station cannot be located upstream of an existing lift station. If the proposed lift station is upstream of an existing lift station, the developer shall install a gravity sewer line from the proposed development to convey flows to the existing lift station and upgrade the existing lift station as necessary. The maximum amount of gravity sewer line required outside the development shall be 100 linear feet per developed acre or 10,000-feet, whichever is less.

4. The lift station cannot be located downstream of an existing lift station. If the proposed lift station is downstream of an existing lift station, the developer shall install a gravity sewer line to convey the flow from the existing lift station to the proposed lift station, thus eliminating the existing lift station. The maximum amount of gravity sewer line required outside the development shall be 100 linear feet per developed acre or 10,000-feet, whichever is less. Furthermore, the developer may request, and the Authority may approve depending on applicability and condition, the reuse of equipment from the existing lift station. If the reuse of equipment is allowed, the developer must coordinate with the Authority and assume complete responsibility for the handling of all flows during the transition period.

5. A waiver of any or all of the above requirements, Items 1-4, may be considered in the sole discretion of the Authority in any of the following cases:

    a. The proposed lift station will eliminate two or more existing lift stations.

b. The proposed lift station will be eliminated by a future project or projects known to the Authority.

c. The total amount of gravity sewer required outside of the development (both upstream and downstream together) to satisfy all of the applicable requirements above, Items 1-4, is greater than 100 linear feet per developed acre or 10,000-feet. In this case, the Authority, on a case-by-case basis and at its discretion, will determine the best combination of requirements to locate the proposed lift station. In no case will the developer be required to install more than one 100 linear feet per developed acre or 10,000-feet, whichever is less, outside the development.

d. The Authority is compensated for the difference in cost to locate the lift station at a site that satisfies the applicable requirements above, Items 1-4, versus locating the lift station on the project site or another site proposed by the developer. The cost difference shall be determined by the Authority as provided in its Rules and Regulations.

6. If the proposed developed area covers more than one drainage area (e.g. parts of the development naturally drain to more than one location), the area shall be divided by its respective drainage pattern(s) and treated as separate developments where each lift station must meet these requirements separately.

7. No lift station will be permitted for a proposed development of less than forty (40) Equivalent Residential Units (E.R.U.) or a watershed having an estimated ultimate development of less than 80 E.R.U.

8. The lift station and incoming manholes shall be outside the 100-year flood zone wherever possible. If not reasonable and/or the Authority determines installation within the 100-year flood zone is acceptable, the lift station and incoming manholes shall be designed and constructed according to all applicable FEMA, NFIP, EPA, EPD, State, and local ordinances.

9. The deeded lot size shall be minimum 40-feet by 40-feet. The lift station shall be fenced minimum 30-feet by 30-feet with 6-inches of crushed stone extending 6-inches outside fence.

10. The lift station layout shall be such that a driveway will access the pump loading point. The lift station access drive shall be paved with either concrete or asphalt, as directed by the Authority. The pump station driveway slope shall not exceed 10%. Drives shall be minimum twelve-feet wide and in accordance with Georgia D.O.T. standards and Douglas County standards for industrial roads. The sub-base shall be compacted to 95% standard proctor per ASTM D698 standards. For driveways over fifty feet in length, a turnaround will be required and shall be twenty-feet off the fence, 16-feet deep with a 15-foot radius to the driveway.

11. The pump station layout shall be configured so the station can be expanded to the ultimate size to pump the ultimate upstream flow. Initial and future land requirements including access for the pump station shall be obtained by the developer and donated to the Authority in fee simple.

12. A debris manhole is required inside the fence.

13. An odor control system, designed by a licensed, professional engineer, shall be provided on all lift stations. The odor control system shall meet the following minimum requirements:

    a. Air shall be removed via applicable fan and induced through carbon media canister unit or other treatment device / method approved by the Authority.

    b. Ductwork shall be plastic material and shall be UV rated or painted with UV rated paint.

    c. Treatment unit (i.e. carbon canister) and fan shall be sized to treat air volume, at a minimum, as follows:

        1. Fan shall be sized to create negative pressure within wetwell to prevent air escaping.

        2. Air volume treated shall be considered the volume displaced by the peak sewerage flows served by the lift station.

        3. Assume area for potential air seepage into and out of the wetwell (i.e. around pump hatch openings, vents, cracks, etc.). Assume 1/8" thick.

        4. At a minimum, air velocity shall be assumed at 100 feet / minute.

        5. For Safety Factor, assume one (1) of the largest hatches remains open at all times.

14. Lift stations shall have a 6-foot high security fence topped with standard 3-strand barbed wire on angled extension arms. Fences shall be installed using 9-gauge fabric with 1-1/2-inch top rails and bottom tension wires; 2-inch line posts and 3-inch corner posts set in concrete 10-feet apart; 16-foot gate with 9 gauge cross-tension wires installed on 4-inch gate posts.

    A vegetative screen shall be installed outside of the security fence such that the lift station will not be visible from off the lift station property except for penetrations required for access. The base of the vegetative screen shall be mulched.

15. A potable water supply line and backflow preventer is required on all lift stations. The water supply line must be capable of delivering a minimum of 20 gpm through a yard hydrant located within the lift station fence.

16. The backflow preventer shall be installed above grade, piped with brass or hard copper, inside a freeze protection cover certified to ASSE Standard 1060 Classes I, II, III with drain flap to allow a minimum discharge of 60 gpm. Cover shall be anchored to suitably sized concrete pad as specified by the manufacturer.

17. The yard hydrant shall be Simmons 800 Series freeze-proof with ¾" hose connection or approved equal. The base of the yard hydrant shall be installed in an adequately sized bed of #57 stone with a 2-foot by 2-foot splash pad at grade.

b. Wet Well Requirements

1. Design calculations, signed by a Professional Engineer, must be submitted to the Authority for review and shall contain the following computations:

   a. Capacity at peak flow

   b. System head – tabulated and plotted on pump performance curve

   c. Cycle time – including starts per hour for peak flow and average flow conditions

   d. Buoyancy calculations

   e. Storage volume – volume available in the event of a power outage

2. Drainage basin flow shall be calculated for the natural drainage basin area flowing into the proposed lift station. Flow calculations shall be based upon acreage, usage per established zoning, anticipated densities and development type if there is evidence of potentially greater wastewater flow being generated in excess of established zoning.

3. The lift station shall be sized based upon the anticipated upstream flow that will be realized in a seven-year period of basin development. The amount of development in a basin is judgmental and shall be determined by the Authority based on land use and zoning maps or other appropriate information.

4. Generally, the following minimum average daily flow rates and peaking factors are used for calculating estimated usage in the basin:

a. Residential Areas: 400 gpd per equivalent residential unit, with a peaking factor of 2.5

b. Commercial and Industrial Areas: 2,000 gpd per acre of developed land, with a peaking factor of 3.0

c. These values may increase depending on the actual development in the basin, as determined by the Authority on a case-by-case basis.

5. The lift station influent line invert shall be set so that all upstream gravity flow into the lift station can be achieved. The influent pipe shall be sized at a minimum slope per "10 State standard" for basin flow with a peaking factor of 2.5 (or greater as specified by the Authority).

6. The wet well shall be sized for peak flow conditions using a peaking factor of 2.5 (or greater as specified by the Authority). The allowable number of pump cycles per hour shall be determined by dividing the pump manufacturer recommended pump starts per hour by 1.3. The wet well shall have a plugged stub so that the gravity sewer system may be extended when future expansion allows, or an additional wet well can be installed and interconnected should future flows dictate additional wet well storage. The stub out shall be at least as large as the influent pipe, sized for the ultimate basin flow.

7. All sewer lift stations shall have additional wet well storage for a total capacity of at least three hours at the design flow rate. Storage volume shall be calculated between the high-level alarm and the lowest point of overflow (including basement elevations regardless of backflow valves in service lines). Storage may consist of any combination of line capacity, manhole capacity, and wet well volume. No corrugated metal pipe may be utilized for storage.

8. Wet wells shall be a minimum of 6-feet in diameter, or a minimum of 6-feet on each side, if not cylindrical. Wet wells shall be constructed of reinforced concrete; precast concrete may be used on wet wells for smaller pump stations.

9. The interior of the wet well shall be protected against leakage and corrosion. If precast concrete is used, the joints shall be sealed to prevent infiltration and inflow. All exposed concrete and piping shall be epoxy coated. Epoxy coating shall conform to the specifications below. All guide rails, brackets, connectors, pump pull chains, etc. shall be stainless steel to resist corrosion.

   Standard Epoxy Coating shall be 100% solids, solvent-less two-component epoxy resin-coating system with increased bond strength and broad range chemical resistance. Apply a maximum of 40 mils in two applications over a smooth horizontal, vertical or overhead surface. The coverage will vary from 30 to 60 mils depending on the application.

In lieu of an epoxy coating, the wet well may be constructed of steel reinforced polymer concrete. Construction, installation, and testing shall be in accordance with the following standards, including but not limited to ASTM D 6783, ASTM C 478, ASTMC 443, ASTM C 923, ASTM C 33, and ASTM C 497.

10. The top of the wet well shall contain a lockable aluminum hatch cast into the top. The pump manufacturer shall specify the size of the wet well hatch. The top of the wet well shall extend 6" above finished grade.

11. Wet wells shall be provided with a positive ventilation capacity of 30 air changes per hour based on the wet well volume below grade and above the minimum wastewater level.

12. Pumps must be submersible pumps as manufactured by FLYGT, unless otherwise specified by the Authority. FLYGT N-series pumps shall be used when available. FLYGT C-series pumps shall be used when the N-series is not available. Pumps shall be constant speed and self-seating with stainless steel guide rail systems. All pump motors shall be three phase.

13. Pumps and motors shall be sized to handle twice the design peak flow of the proposed development (but not less than the total of the proposed development plus any existing development tributary to the lift station) or the total upstream watershed, whichever is less. Pumps shall be sized when possible so that ultimate basin flow conditions can be achieved by increasing impeller size. In any case, a minimum of two pumps shall be located in the wet well, each sized such that if one pump fails, the remaining pump(s) can handle peak flow.

14. Provide factory test, startup by a supplier authorized by the manufacturer, and on-site testing of the system.

15. Provide spare parts as recommended by the manufacturer and required by the Authority.

16. All lift station site lights shall be LED type lighting fixtures.

c. Valve Vault and Force Main Requirements

1. The discharge piping from each pump shall be routed through the valve vault with check valves and shutoff valves on horizontal stretches of pipe. Check valves shall be placed upstream of shutoff valves. Connection of the discharge pipes should be accomplished outside and downstream of the valve vault.

2. Valve vaults, including walls and floor and top slab, shall be constructed of reinforced concrete; precast concrete may be used on valve vaults for smaller pump stations.

3. Either a round or square vault can be used to contain the check valves and shutoff valves. The vault shall be bedded on a minimum 12" of #57 stone. The top of the vault shall contain a minimum 30" by 30" aluminum lockable lid cast into the top, which shall extend 6" above finished grade.

4. The floor of the valve vault shall be sloped to a sump to collect water. A drain shall be provided in the sump, routed to the wet well with a backwater valve to prevent hazardous gases from entering the vault and flooding of the vault, respectively. The backwater valve shall be accessible for cleaning.

5. All force mains and fittings shall be ductile iron pipe per AWWA standard C151. Force main and fittings shall be installed per AWWA standards. All bends, tees and crosses shall be blocked or restrained. All fittings outside the wet well and valve vault shall be mechanical joints. All fittings inside the wet well and valve vault shall be flange-to-flange joints. Air release valve locations and sizes shall be as required by the Authority. Air release valves shall be installed in all high points and other areas as required by the Authority. All ductile iron force main pipes and fittings shall be lined with a ceramic epoxy lining such as Tnemec Series 431 Perma-Shield PL or approved equal. Alternative pipe materials may be allowed at the sole discretion of the Authority.

6. The force main shall be sized for a minimum of two feet per second flow with the pump station operating at minimum flow. Force main piping shall be at least 4-inches in diameter. Class of pipe shall be as required for working pressure plus surge pressure and as directed by the Authority. Sewer force mains shall have a minimum of 4 feet of cover.

7. A connection for a quick-connect bypass pump shall be provided in case of complete station failure. The bypass connection shall be located in the single force main, downstream of where the pump discharges tie together. Plug valves shall be provided immediately upstream of the bypass connection to isolate the station during bypass and on the bypass branch to isolate the bypass connection during normal station operation.

8. Surge valves shall be utilized when force main surges are in excess of 150 psi. Surge valves shall be mechanical and shall be field adjustable from 0 to 100% of the rated pressure capacity.

9. Weighted arm, cushion swing check valves shall be used on the pump discharge as directed by the Authority. Pump check valves shall have adjustable rapid closure in the event of power failure.

10. Shutoff valves shall be either ball valves or plug valves, as determined by the Authority.

11. Air release valves shall be manufactured by Crispin, A.R.I., H-TEC, or approved equal. Air release valves shall be stainless steel or plastic or have an epoxy coating both inside and outside.

12. Air release valves shall be installed in minimum 4-foot diameter manhole on 6-inches of #57 stone with an additional 6-inches of #57 stone inside manhole; bolt-down frame and cover cast into flat manhole top, flush with finished grade. Install a 2-inch wheel or ball valve between force main and air release valve.

13. All fittings, such as valves, nipples, unions, and tapping saddles, for air release valves shall be stainless steel.

14. An odor control unit shall be installed with the air release valve on all force mains 8-inches or larger. The unit shall connect directly to the air release valve and contain carbon or other suitable media for scrubbing of hydrogen sulfide gas. The unit shall be constructed of stainless steel or plastic or have an epoxy coating both inside and outside.

15. Check valves shall be GA Industries or Val-Matic or approved equal.

d. Electrical Requirements

1. Electrical service to lift stations shall be three phase.

2. Dual electric feeds are preferred at wastewater lift stations. If dual feeds are available, they shall be provided from the utility grid. If dual feeds are unavailable, a letter of exception must be obtained from Douglasville-Douglas County W.S.A.

3. The electrical service pole with meter shall be located outside the fence with underground feeder to electrical distribution.

4. The lift station shall have a fused disconnect.

5. The security light shall be directional style and wired to a switch or breaker inside the pump control panel. The light shall be a sodium vapor light with 150-watt high-pressure luminaire with 120-volt ballast, photoelectric control, and heat and impact resistant lens.

6. For pump stations with pumps in excess of 88 hp, motor starters, motor control centers, and miscellaneous electric controls shall be housed in a building. Building architecture shall be per the requirements of the Authority.

Pump control panels for stations below 88 hp shall be in accordance with the Control Panel section below.

7. Pump controls shall be Multitrode with Square D components. Power for the pump controls, alarms, and telemetry shall be provided by a minimum 5 KVA uninterruptible power supply. Electrical equipment and controls shall be furnished with surge arresters for protection against surges caused by lightning or switching. Reference the Control Panel section below for additional information.

8. Pump power cables shall enter the wet well above the force main and behind the pump guide rails.

9. Lift stations shall have telemetry installed to monitor power failure, high wet well pump failure and other sensing points as required by the Authority. Reference the Control Panel section below for additional information.

10. All wet wells with a water depth of 15 feet or less shall have a 2-meter probe. All wet wells with a water depth greater than 15 feet shall have a 3-meter probe.

11. The level control systems, telemetry and generator, and all associated equipment shall be of a brand, type, and configuration acceptable to the Authority and compatible with the Authority's existing sewer lift stations.

12. Provide spare parts as recommended by the manufacturer and required by the Authority.

13. An arc flash analysis shall be performed on all electrical equipment greater than 50 volts in accordance with NFPA 70E, latest edition. Said equipment shall be labeled per the results of the analysis. A written report with the analysis results shall be provided to the Authority.

e. General Control Panel Requirements

1. These control panel specifications shall be applicable for all lift stations up to and including 88 horsepower. Lift stations greater than 88 horsepower are considered a special circumstance by the Authority, and the requirements thereof shall be determined by the Authority on a case-by-case basis and addressed in the Project Concept Meeting.

2. The pump station shall be operated by an on-site pump control panel / motor control center (MCC) which shall initiate and terminate pump operations based on the liquid levels within the wet well while providing the station with electrical protection and information and status displays. The control system shall operate the required number of pumps as specified on the drawing with

power and performance characteristics as described in full, in the associated plans. The MCC shall provide for both manual and automatic control of the pumps to maintain a pumped down condition in the wet well. The control shall function as described below.

3. The automatic mode shall have a primary controller, redundant high and low floats to run and shutdown the pump(s) in the event of primary controller failure, and a tertiary function provided to shut down all pumps at a low liquid level to protect the pumps from operating in a dry condition.

4. The primary controller shall sense the liquid wet well levels through a conductance actuated probe set at a pre-determined level to initiate the lead pump on, lag pump(s) on, hi-level alarm and all pumps off. The normal operation is caused by the rising and falling levels of the liquid in the wet well meeting the designated pre-determined points. The lead pump will start followed by the subsequent or lag pumps if the wet well level rises sufficiently with all pumps stopping when the wet well level falls to a low point ceasing the demand for pump operation. Upon the pumps being turned off, the controller will reset and alternate the lead pump, the former lead pump to become the new lag pump. This shall equalize the run times for all pumps.

5. If the station inflow continues rise to the set point of the hi-level, an alarm will be activated and sound continuously. A high-level alarm light will simultaneously flash. The audible and visual alarms will continue until the wet well liquid level falls below the alarm point. Note that the audible alarm may be silenced manually, but the high-level alarm light shall continue to flash until the level falls sufficiently. If the wet well level continues to rise and reaches the Hi-Hi Level float, the redundant system shall assume control of the station and shall initiate a call for the lead pump to come on, followed by an additional call for the lag pump to come on after a specified brief time delay. Both pumps shall continue to operate until deactivated by either the primary controller reassuming control or the low-level float set at a comparable low point.

6. The control system shall be designed, approved, fabricated to either UL 508A or UL 698A standards as applicable with appropriate addenda and be assigned its individual UL certification serial number by a UL Certified panel builder for Industrial Control Panels for Hazardous Locations.

7. The equipment and component descriptions listed below are provided as a guide and does not relieve the supplier from providing a system that will operate as intended by the designer and required by the application. It is the supplier's responsibility to seek timely clarification on all relevant issues associated with this equipment and project.

    i. CONTROL PANEL SPECIFICATIONS

1) PUMP CONTROL PANEL / MOTOR CONTROL CENTER (MCC) ENCLOSURE: The enclosure shall be a 14-gauge, NEMA 4X rated enclosure manufactured from 304 stainless steel. The enclosure shall be a wall-mounted type with a minimum depth of 12" and sized to adequately house all components with appropriate spacing and 10% spare interior back plate space for future upgrades. The door gasket shall be of rubber composition with a retainer to assure a positive weatherproof seal. The door shall open a minimum of 180 degrees. An engraved phenolic label shall be affixed to the front of the panel describing the panel's function.

2) INNER DEAD FRONT DOOR: A brushed aluminum dead front shall be mounted on a continuous aircraft type hinge within the enclosure to separate operator accessible control and status functions from the live internal components and wiring within the interior compartment. It shall contain cutouts for mounted operational and status components/devices such as control switches, indicator pilot lights, elapsed time meters, a Ground Fault Circuit Interrupting Receptacle (GFCI) as well as any other devices requiring operator access as necessary. Further cutouts for breaker handles shall allow operation of breakers without entering the interior compartment. The dead front door shall open a minimum of 150 degrees to allow access to the interior compartment for maintenance by qualified personnel. A ¾" break shall be formed around the perimeter of the dead front to provide structural rigidity.

3) INTERIOR BACK PLATE: The back plate shall be manufactured of 12-gauge steel and shall be finished with a primer coat and two (2) additional coats of baked-on white enamel. All hardware mounted to the back plate shall be attached with 304 stainless steel machine screws and threaded and tapped holes. Sheet metal screws are not acceptable. All devices shall be permanently labeled and identified with engraved phenolic labels adhered to the back plate at locations easily identifying the component.

4) CONTROL PANEL IDENTIFICATION: An engraved phenolic label shall be affixed to the front of the Inner Dead Front Door and shall include the following information:

   a) Project Name

   b) Control Panel Serial Number

   c) Pump Manufacturer, Model, and Impeller Code and/or Trim

d) Pump Horsepower and Full Load Amps at Rated Voltage

e) Incoming Power Voltage, Phase and Frequency

f) Pump Control Panel (MCC) Manufacturer

ii. CONTROL PANEL POWER DISTRIBUTION

1) The panel's service power distribution shall include all necessary components and be completely wired with stranded, tin-plated, machined-tooled copper conductors rated at 90 degrees C. All conductor terminations shall be easily accessible and as recommended by the device manufacturer. All control conductors shall be identified with wire markers at each end, as close as practical to the end of the conductor.

2) CIRCUIT BREAKERS: All circuit breakers shall be Square D Type FAL, KAL, LAL, or MAL, depending on applicable current requirements, heavy-duty thermal magnetic molded case circuit breakers or motor circuit protectors and shall be permanent trip, UL Listed, CSA Certified, IEC Rated and shall meet the requirements of Federal Specification Number W-C-375B/GEN. Each motor breaker shall be adequately sized to meet the pump motor operating characteristics and shall have a minimum of 14,000 amps interrupting capacity at 480 VAC. Heavy-duty circuit breakers shall be used to protect the control circuit.

3) TRANSFORMERS: Control transformers (5 KVA minimum) shall be UL Listed and shall be used to produce the 120 VAC and/or 24 VAC for control pilot circuits. The transformers shall be fused on both the primary and secondary circuits. The secondary circuits shall be grounded. Transformers shall be sized to provide for internal control pilot circuit use and to provide for a convenience utility outlet (20 Amp single-pole), a SCADA (RTU) circuit (15 Amp single-pole), area lighting (15 Amp single-pole) and a spare 20 Amp single-pole circuit breaker. On installations with a permanent stand-by generator there shall be a 20 Amp single-pole circuit breaker for a block heater (within the generator) and a 20 Amp single-pole circuit breaker for a battery charger (within the generator).

4) MOTOR STARTERS (ACROSS-THE-LINE) REQUIRED FOR LESS THAN 30 HP PUMPS: Motor starters shall be UL Listed open frame, across-the-line, NEMA rated with individual overload protection in each leg. If one leg opens, all legs must open. Motor starter contacts and coil shall be replaceable from the front of the

starter without removal from its mounted position. Overload heaters shall be block type, utilizing melting alloy spindles and shall have visual trip indication. Overloads shall be sized for the full load amperage draw of the pumps. Adjustable type overloads, definite purpose contactors, fractional size starters and horsepower rated contactors or relays shall not be acceptable.

5) MOTOR STARTERS (SOLID-STATE REDUCED VOLTAGE) REQUIRED FOR 30 HP PUMPS AND ABOVE:

a) Motor starters shall be UL Listed solid-state reduced voltage (SSRV) starters. The SSRV shall include a digital keypad for adjusting the soft starter parameters, viewing process values and motor and soft starter status.

b) The motor shall be automatically protected from solid-state component failure by an isolation contactor that opens when the motor is stopped or when the controller detects a fault condition, including a shorted silicon control rectifier (SCR). The SSRV shall utilize an SCR bridge consisting of at least two (2) SCR's per phase to control the starting and stopping of the pump motors.

c) The soft start shall provide torque control for linear acceleration independent of motor load or application type without external feedback. The gating of the SCR's shall be controlled in such a manner as to ensure stable and linear acceleration ramp. The soft starter shall be controlled by a microprocessor that continuously monitors the current and controls the phasing of the SCR's. Analog control algorithms shall not be allowed.

d) The SSRV shall automatically and continuously adapt for operation at 60 Hertz with a frequency tolerance of +/- 5%. By configuration, it shall be capable of operation at a varying supply line frequency of +/- 20% during steady state operation. Further, the soft start shall be capable of supplying 400% of rated full load current for 23 seconds at maximum ambient temperature and of 10 evenly spaced starts per hour at 400% of full rated current for 12 seconds per start.

e) The SCR's shall have a minimum Peak Instantaneous Voltage (PIV) rating of 1800 VAC. Lower rated SCR's with Metal Oxide Verister (MOV) protection are not acceptable. All programming / configuration devices, display units and field control wiring terminals shall be accessible on the front of the

control module. Exposure to control circuit boards or electrical power devices during routine adjustments is prohibited.

iii. CONTROL PANEL SYSTEM OPERATIONS

1) Each pump shall have a three-position Hand/Off/Automatic (HOA) switch mounted on the dead front door for the selection of the operational mode of each pump. The "Hand" position will be an operator selected means of manually turning the pump on, the "Off" position will be an operator selected means of manually turning the pump off and making the pump unavailable for automatic running and the "Automatic" position shall place the pump in the automatic control of the MultiSmart pump controller. The switches shall be NEMA 4X rated with 10 Amp contacts and be labeled by a position indicating legend plate.

2) In summary, in the Hand position the operator may run the pumps in the manual mode, by-passing all other automatic features of the controller except final dry pit shutdown for reduced amps draw indicating a lack of fluid at the impeller and/or shutdown on moisture/temperature alarm. The Off position will render the pump non-responsive to any call for operation until switched to either the manual hand or automatic modes. The automatic position will cause the pump(s) to operate or stop at the demands of either the probe, as further described below, or redundant floats. There shall be a low float to shutdown all pumps when the wet well level falls below the predetermined elevation of the low float. There shall also be a high float to run all pumps, with a predetermined time delay between the starting of pumps, when the wet well level rises above the predetermined elevation of the high float. This high float shall also initiate the "Wet well Hi-Hi Level" alarm.

3) A UL Listed MultiSmart pump controller by MultiTrode shall be provided to operate the system based on conductance actuated by the wet well liquid level utilizing a single piece multi-sensored probe interfacing with intrinsically safe barriers for pump operation and level alarms. This controller shall be the primary controller for the pump station.

4) The controller is a self-contained device and shall monitor and control the operation of all pumps and alarms. Status information for the pumps, pump fault status, mode of operation, next pump to start status and level alarms shall be clearly indicated on the front display.

5) The controller shall allow all essential operating parameters to be adjusted via the front keypad or via a communication port as a

connection link to other MultiTrode equipment or other "smart" monitoring and control equipment either on or off the station site. These parameters shall include setting levels, time delays, probe sensitivities, pump alternation, hand-off-automatic selection and fault resets. Level information is accepted from a MultiTrode probe or an analog device as either 4-20 mA or 0-10 V and the controller keypad can be disabled to prevent unauthorized keyboard entry.

iv. CONTROL PANEL ANCILLARY EQUIPMENT

1) ELAPSED TIME METER: Individual pump UL Listed 120 VAC non-resettable elapsed time meters (6 digit and tenths) shall be mounted on the dead front door to indicate and record the number of each pump's running hours.

2) SYSTEM STATUS INDICATORS: Indicator lights shall be mounted on the dead front door and include the following:

a) Green – Pump Run, individual lights to indicate pump has been called to run.

b) Red – Pump Fault, individual lights to indicate the pump has failed for whatever reason.

c) White – Power On indicates power is on to the MCC.

d) Amber – Hi-Level or Hi-hi Level Alarm Light.

3) MOTOR THERMAL SENSORS AND SEAL LEAKAGE MONITORING: The MultiSmart pump controller shall monitor the embedded motor thermal sensors and pump seal leakage sensors when available within the pump. The circuitry shall operate on the current sensing principle whereby any changes reflecting high motor temperature or fluid intrusion into the pump will either stop or prevent the pump from starting. An illuminated light on the controller shall indicate the failure mode and the status will be sent to the SCADA through connections to the external contacts provided for the SCADA. The status of the pumps shall be indicated by LED lights on the face of the controller, as status indicator lights on the dead front door and by signal to the dry contacts for the remote SCADA system.

4) VISUAL AND AUDIBLE ALARM SYSTEM: All alarm components shall be UL Listed. High wet well level conditions shall be sensed by either the primary probe sensors or the redundant Hi-hi Level float, which shall cause the alarm light and the alert horn to

come on. The alarm light shall be a MCC externally top-mounted weatherproof, shatterproof, flashing red light fixture with a 130 VAC incandescent 40 Watt bulb, which shall flash until the alarm condition ceases. The alarm horn shall emit a sound of not less than 90 db at 10 feet and shall have a manual silence switch, in order for the operator investigating the alarm condition to silence the alarm horn.

5) CONDENSATE HEATER: An internal UL Listed 100-watt 120 VAC condensate heater recognized for industrial control panels shall be provided to minimize condensation within the control panel. The heater shall be thermostatically controlled to maintain the temperature above the dew point.

6) VENTILATION FAN: Adequate ventilation fan(s) shall be provided for all MCC's. The fan shall be a UL Listed 120 VAC NEMA 4X stainless steel device, suitably sized to maintain temperatures below the maximum recommended by the transformer, VFD, and/or SSRV manufacturer.

7) OPERATOR'S TROUBLE LIGHT: An internal UL Listed fluorescent trouble light 120 VAC sized appropriately for the enclosure size shall be installed to illuminate the interior compartments of the enclosure and shall operate via a micro switch so that when the dead front door is opened, the interior compartment is illuminated automatically.

8) SCADA INFORMATION FOR REMOTE MONITORING: Separate dry contacts shall be factory wired to individual terminals to provide operational information and status data to the remote off-site SCADA system. The following contacts shall be provided as a minimum:

   a) Pump Status (Individual Alarms for Each Pump)

      (i) Pump Run

      (ii) Pump Overload

      (iii) Pump Seal Leakage Alarm

      (iv) Pump Soft Start Starter Failure (if used)

   b) Power Status

      (i) Phase Loss

(ii) Normal Power Failure

c) Generator Status

(i) Generator Run

(ii) Emergency Power (Transfer Switch Activation)

(iii) Generator Common Alarm (to be wired to all additional generator alarms)

d) Alarm Status

(i) Wet well Hi-Level

(ii) Wet well Hi-Hi Level

(iii) Pump Station Disabled

9) LIGHTNING ARESTOR: The lightning arrestor shall be UL Listed and meet the requirements of NEC Article 280, ANSI/IEEE C62.41-1991 as an appropriate 3 phase service device with a maximum 600 Volt phase to ground rating.

10) LIGHTNING TRANSIENT PROTECTION: Each complete suppression device shall be rated at 650 VAC phase-to-ground maximum and be UL listed as a secondary surge arrestor, bear CSA certification and meet both the standards of ANSI/IEEE C62-11-1987 NEC Article 280 for suitability in indoor and outdoor applications and service entrance locations. It shall be selected for proper operation based on the full load capacity of the MCC and operate at a speed and of sufficient capacity to protect the MCC and associated equipment in case of lightning-transient/power surges.

11) PHASE MONITOR: A UL Listed, line voltage rated, adjustable, phase monitor shall be installed to sense high and low voltage, loss of power, phase reversal and loss of phase and shall indicate which fault has occurred. The self-indicating phase monitor shall provide troubleshooting analysis of the MCC service power via red, green or flashing lights, with a legend printed on the front of the device. The control circuit shall de-energize upon sensing any of the faults and shall automatically restore service upon return to normal power. An auxiliary dry contact shall be provided for SCADA indication.

12) WET WELL LIQUID LEVEL SENSORS: For the purposes of standardization and appropriate interface with the MultiSmart primary controllers and redundant devices, all conductivity probes

or pressure transducers (MTPT) shall be as manufactured by MultiTrode, Inc of Boca Raton, FL. All liquid level floats shall be as manufactured by ITT Flygt Corporation of Trumbull, CT. Cable lengths shall be as shown on the plan drawings and as confirmed by the written specifications with a minimum of 10-feet of additional cable for field connection and fit.

13) PORTABLE GENERATOR (BY OTHERS) REQUIREMENTS:

a) Main and emergency breakers shall be interlocked using a walking beam type interlock. While both breakers may be in the "off" position at the same time, the walking beam shall not allow both breakers to be in the "on" position simultaneously.

b) The MCC shall have a UL Listed emergency generator receptacle mounted to the right-side exterior of the MCC enclosure and shall, for standardization purposes, be as manufactured by Crouse Hinds, Model AR1042 (100 Amp, 480 VAC/230 VAC) or AR2042 (200 Amp, 480 VAC/230 VAC).

14) PERMANENT GENERATOR REQUIREMENTS: The Automatic Transfer Switch shall be located outside of the MCC enclosure for any pump station with a permanently installed, stand-by generator and shall be provided by the generator supplier. Generator status indicators shall be provided by the MCC manufacturer as previously described.

v. CONTROL PANEL MISCELLANEOUS REQUIREMENTS

1) DRAWINGS: A final, "as built" schematic drawing encapsulated in clear self-adhesive laminating plastic shall be affixed to the inside of the front outer door with defining legends as well as other required and appropriate information, warning stickers and UL Certification Serial Number.

2) PRE-SHIPMENT FACTORY QUALITY ASSURANCE TESTING: All pump station control panels (MCC's) shall be tested on the designated service power for all specified functions to the maximum extent practicable in the manufacturer's shop prior to shipping to assure proper operation and integrity of the MCC. The owner may elect to be present during such testing and shall coordinate such with the manufacturer if desired.

3) FIELD START-UP OF PUMP STATION:

a) The contractor shall coordinate and provide assistance as necessary to the pump manufacturer or their designated representative, the generator supplier or their designated representative and the MCC manufacturer for field start-up of the station at an appointed time with appropriate supervision by the owner.

b) No pump shall be started without the express approval of the on-site pump representative and no power shall be applied to the MCC for the purposes of operating the pump(s) without the express approval of the on-site MCC manufacturer representative and no generator power shall be applied without the express approval of the generator supplier.

c) A start-up report shall be written and forwarded to both the contractor and owner within ten (10) business days of the final start-up activity approving the successful installation and start-up operation of the pump station.

d) The MCC manufacturer shall provide operation and maintenance training to the operators available or as otherwise arranged by the contractor on behalf of the owner and shall turn over a minimum of three (3) sets of O & M manuals to the senior owner representative present.

4) MANUFACTURER'S WARRANTY: The manufacturer of the MCC shall warrant the control for design, materials and workmanship for a period of five (5) years from the date of shipment. Such warranty is limited to repair or replacement as necessary for the proper operation of the pump station and as determined by the manufacturer and does not provide for alterations, modifications or interference by others, negligence, willful destruction or misuse or acts of God.

5) PUMP CONTROL PANEL /MOTOR CONTROL CENTER (MCC) MANUFACTURER: The MCC manufacturer shall be currently certified by Underwriter Laboratories, Inc. as a UL 508A and UL 698A control panel shop for the design and fabrication of Industrial Control Panels for Hazardous Locations and shall be approved to certify, assign and affix individual UL serial numbers for each control built to applicable UL standards with appropriate addenda. The control manufacturer shall further be UL 914A approved to field configure, adapt and modify non-UL controls to UL standards suitable for field certification, assignment and affixing of an individual UL serial number.

6) STORAGE: All pump control panels shall be stored on pallets and out of all possibility of sustaining weather-related damage from wind, snow, ice, rain, lightening or other unforeseen incidences which may allow damage such as vehicular traffic, construction, vandalism, tampering or curiosity.

7) GROUNDING: The MCC shall be grounded in accordance with Article 250 of the National Electric Code with no deviations permitted.

8) WIRE CONDUITS: Pump power cables shall be run in conduit separate from conduit containing cable from the sensors (probes, floats or transducers). Conduits shall be appropriately sized, planned and installed to protect the cables entering the wet well and to allow easy replacement of the sensors and cables if necessary. Conduit entry into the MCC enclosure shall use "seal offs" to prevent gas or moisture intrusion from the wet well.

vi. Generator Requirements

1) All sewer lift stations shall have a standby electrical generator with an electronic transfer switch that will automatically switch the station to generator power when the electric utility power system fails. The generator shall self-test at least once per week. Telemetry is required on all lift stations regardless of basin and shall monitor the status of the generator.

2) The standby generator shall be commissioned in accordance with NFPA 110 Standards. Provide factory test, startup by a supplier authorized by the manufacturer, and on-site testing of the system.

3) The generator shall be housed in a weatherproof enclosure. Quiet site soundproofing shall be provided to reduce noise to 70 db at a distance of 7 meters for diesel powered generators.

4) The entire standby generator set shall be warranted for a period of five years from the date of commissioning.

5) Outdoor weather-protective housing with critical grade exhaust muffler shall be installed. The housing shall have hinged side access doors and a rear control door. All doors shall be lockable. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color. Vibration isolators as recommended by the generator set manufacturer shall be provided. The generator must be mounted far enough away from obstructions to allow all doors to be opened 90º. All conduits and

gas lines shall be installed underground. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.

6) Generator shall be supplied with all auxiliary systems necessary for operation (i.e. batteries, battery charger, block heater, etc.).

7) Engine mounted, thermostatically controlled, coolant heater(s) shall be required for each engine. Heater voltage shall be as required by the manufacturer. The coolant heater shall be UL499 listed and labeled.

   a) The coolant heater shall be installed on the engine with silicone hose connections. The coolant heater installation shall be specifically designed to provide proper venting of the system. The coolant heaters shall be installed using quarter turn ball valves to isolate the heater for replacement of the heater element. The quarter turn ball valves shall allow the heater element to be replaced without draining the engine cooling system or significant coolant loss.

   b) An AC power connection box shall be provided for a single AC power connection to the coolant heater system.

   c) The coolant heater(s) shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 100°F (40°C) in a 40°F ambient, in compliance with NFPA 110 requirements, or the temperature required for starting and load pickup requirements of the particular lift station.

8) The generator set shall operate at 1800 rpm and at a voltage of as specified by the Authority. The power supply shall be three-phase, four-wire, and 60 hertz. Voltage regulation shall be plus or minus 1.0 percent for any constant load between no load and rated load. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5 percent. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.25%. An electronic governor system shall provide automatic isochronous frequency regulation.

9) The generator set shall be provided with a mounted main line circuit breaker, sized to carry the rated output current of the generator set on a continuous basis.

10) The standby power system shall include an automatic transfer switch. Transfer switch shall be rated for 100% of full load. This switch shall be provided with indicators for all phases of operation and be equipped with a fully programmable timer for exercising the equipment. The switch must be selectable for load or no load. The switch shall be configured with in-phase transition or neutral delay.

11) The generator shall be load tested at 100% full load on site for a period of four hours using resistive load banks. Notify Douglasville-Douglas County W.S.A. inspector prior to test, and provide certification letter from the manufacturer.

12) Three complete sets of O & M manuals and keys shall be provided for the generator and the automatic transfer switch.

13) The generator control system must include a programmable control device to allow automatic start-up and test functions. Test functions can be programmed for daily, weekly or monthly testing. Connections for remote monitoring of function and failure must be provided.

14) Pump stations are required to have continuous standby power. All generators shall be diesel powered with 100 gallons minimum fuel storage capacity or 24-hour operating time, whichever is greater. Fuel storage shall be accomplished by the use of corrosion-resistant double wall sub-base fuel tank only, no underground storage will be allowed. A leak detection device shall be provided in the interstitial space for sensing fuel leakage. The device contact shall be connected to the generator control panel terminals for telemetry. Fuel containment and spill prevention, if needed, shall conform to the Georgia Environmental Facilities Authority and US Environmental Protection Agency requirements. A Spill Prevention, Control, and Countermeasure (SPCC) plan shall be prepared in accordance with Code of Federal Regulation (CFR) 40, Part 112.

15) Consideration of an engine driven pump or standby pump station in lieu of a generator will be considered on a case-by-case basis at the sole discretion of the Authority.

16) Generators can be obtained from the following manufacturers/representatives:

    a) Caterpillar

    b) Cummins-Onan

c) MTU Detroit

d) Generac

17) The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in-service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.

18) The generator manufacturer shall provide a 60-month comprehensive warranty to include parts and labor. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

19) Transfer switches shall be in NEMA-4X enclosure obtained from the following manufacturers/representatives:

a) Cummins-Onan

b) ASCO

c) GE Zenith

d) Generac

20) The transfer switches shall be configured to switch back when power is restored to the station.

21) The generator shall be installed on a suitably sized concrete pad and a generator ground grid shall be provided. The ground grid design shall be in accordance with the National Electric Code (NEC) and subject to Authority approval.

22) The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration. Training date shall be coordinated with the facility owner.

4. Definitions

   a. Branch Sewer – a sewer line that receives wastewater from two or more laterals, serves a relatively small area, and discharges into a trunk sewer serving one or more branch sewer areas

   b. Confluence – the intersection of two or more creeks, streams, rivers, or lakes which appear in the Authority's sewer map

   c. Design E.R.U. – the number of Equivalent Residential Units (E.R.U.) for which a lift station, gravity sewer line, and/or force main is designed and constructed

   d. Development Area – the amount of land on which development is proposed

   e. Drainage Basin – the area of land drained by a creek, stream, or river and its tributaries (Douglas County has 6 drainage basins defined: Sweetwater Creek, Anneewakee Creek, Bear Creek, Dog River, Hurricane Creek, and Wolf Creek)

   f. Extension (or Off-site Extension) – gravity sewer line which is over 1,000-feet outside the development, as defined by the Authority's Rules and Regulations

   g. Gravity Sewer (or Natural Gravity Sewer) – the normal type of wastewater collection system that relies on the natural, downhill flow of wastewater through pipes constructed along drainage patterns and creeks to a wastewater treatment facility

   h. Non-Participating Development – properties proposing to convey wastewater flow to a lift station, which properties have/will not make substantial improvements to the lift station with a cost proportionate, by number of lots, to the initial cost of constructing the lift station

   i. Outfall – the largest sewer lines, usually at the lowest elevations, into which tributary sewers discharge, and which convey flow by natural gravity; also referred to as an interceptor

   j. Oversized Lines (or Upsized Lines) – gravity sewer line which is sized larger than what is necessary to serve the developed property, as defined by the Authority's Rules and Regulations

   k. Participating Development – (1) properties within the initial service area of a lift station; (2) properties outside the initial service area of a lift station which make substantial improvements to the lift station with a cost proportionate, by number of lots, to the initial cost of constructing the lift station; (3) existing homes and other existing development in a lift station initial service area

   l. Service Area – the amount of land that will naturally drain to a particular point

m. Sub-basin – an area of land within a drainage basin that drains to a centralized location; generally, multiple sub-basins comprise a drainage basin

n. Tributary – a body of water (creek, stream, river, lake, etc.) that feeds a larger body of water; an area of land that drains to a particular point; or a conduit that feeds a larger conduit

o. Trunk Line – a sewer line, which serves as an outlet for a large contributing area; also called main sewer; in large systems, the principle sewer to which branch sewers and sub-main sewers are tributary and usually discharges to an interceptor sewer; in small systems, a sewer to which one or more branch sewers are tributary

C. INFORMATION TO BE SHOWN ON SEWER PLANS AND PROFILES

1. Project name and valid registration stamp of the Professional Engineer registered in the State of Georgia competent in the treatment of water pollution. A registered land surveyor is not acceptable. The registered Professional Engineer must stamp any plan redesigns. The registered Professional Engineer must sign across the stamp.

2. All construction drawings submitted to the Authority for review shall be professionally printed (AutoCad format or approved or equal). Hand-written notes are not acceptable and will not be reviewed.
3. Proposed service area (acres) and the population that will be served by the project.

4. Total service area (acres) and the population that could ultimately be serviced by the project (i.e., include upstream users).

5. Existing and future sewage flow from upstream users based on existing land use, zoning (e.g., density per acre) and future use for 20-year period.

6. Site plan should include streets, street names, lot layout (if subdivision) or building locations (if multi-family, commercial or industrial), land lots and district, north arrow, sewer layout topography, streams, and storm drainage pipes.

7. 100-year flood plain.

8. Pipe location, size, flow direction, and grade.

9. Manhole location, size, identification, and elevation.

10. Service location, size, tracer peg location, and elevation.

11. Type of material to be used for pipe, manholes, etc.

12. Location and size of existing sewer lines within 1,000 feet of the project.

13. The nearest existing sanitary sewer manhole on existing sewer line.

14. Other utilities in areas of potential conflicts.

15. Existing ground elevation relative to proposed sewer line.

16. Proposed tie-in with existing lines.

17. Thrust blocks shall be designed by Professional Engineer licensed in the State of Georgia.

18. Twenty-foot permanent easements if the sewer line crosses private property. More easement area may be required as deemed necessary by the Authority. Sewer easements that run across slopes shall be graded with a flat bench across the slope to allow for maintenance access.

19. Plan and profile scales shall be:

Vertical:	One inch = 5 feet or 1 inch = 10 feet
Horizontal:	One inch = 20 feet or 1 inch = 50 feet

20. Sheet size is 24 inches x 36 inches. "Half-size" drawing sets will not be reviewed and will be returned to the owner/developer.

21. Effect on existing or proposed pumping station produced by the proposed development. Lift stations must be shown on the drawings indicating recorded easements for roads, fences with gates and wash down potable water/backflow preventer, and telemetry system.

22. A recorded easement for further extending sewer lines in order not to impact neighboring property owners must be shown on all drawings.

23. The following notes shall be required on all drawings submitted to the Authority:

    a. All water mains and sanitary sewer construction shall conform to Douglasville-Douglas County WSA standards and specifications, latest edition.

    b. Notify the Douglasville-Douglas County WSA Engineering Department at least 72 hours prior to beginning of construction on water and sewer. An inspector will be assigned and a pre-construction meeting scheduled at this time.

    c. "As-Built" drawings shall be field verified and stamped by a Professional Engineer or land surveyor licensed in the State of Georgia.

d. All contractors for water and sewer construction shall be on the Douglasville-Douglas County WSA Approved Contractors List. Contact the WSA Engineering Department for a copy of the List and/or applications.

e. Contractors have the responsibility to assure erosion control of all Authority easements, particularly when these easements are in close proximity of drainage easements. See the assigned Douglasville-Douglas County WSA inspector for details.

f. The contractor shall comply with all Utilities Protection Center requirements.

24. Additional items may be requested if deemed necessary by the Authority.

D. INFORMATION TO BE INCLUDED IN LIFT STATION PLANS, REPORTS, & SPECIFICATIONS

1. DESIGN AND OPERATIONAL INFORMATION shall be submitted on paper 8½ inches by 11 inches, with oversized foldout sheets as appropriate, and shall contain, at a minimum, the following components:

a. Title page, including project name and date, correlating with the design drawings

b. Location map showing:

i. Property lines, lot lines, building locations, roads, etc.

ii. Lift station

iii. Influent sewers and manholes

iv. Force mains

c. Basin Assessment including:

i. Identification of land area in the basin tributary to lift station

ii. Breakdown of acreage in basin according to existing land use

iii. Breakdown of acreage in basin according to projected to future land use

d. Average and peak flow calculations, for immediate and future conditions

e. Force main sizing calculations

f. Individual pump and system performance head and flow curves

g. Static head and total dynamic head calculations at a range of wet well levels and pumping rates

h. Net positive suction head available (NPSHA) calculations

i. Pump cycle time and wet well sizing calculations

j. Efficiency and power calculations

k. Hydraulic transient analysis (if required)

l. Standby generator sizing calculations

2. DESIGN DRAWINGS shall be submitted on sheets 24 inches by 36 inches, and shall contain, at a minimum, the following components:

a. Title page

b. Development plan showing location of:

i. Property lines, lot lines, building locations, roads, etc.

ii. Lift station

iii. Influent sewers and manholes

iv. Force mains

c. Lift station site layout showing:

i. Property boundary

ii. Location of structures

iii. Fence lines

iv. Roadways and drives

v. Easements and rights-of-way

vi. Pipelines and other utilities

vii. Topographic contours

viii. 100-year flood elevation

ix. Floodplain areas

d. Plan and elevation views of structures including:

   i. Wet well

   ii. Valve vault

   iii. Electrical building, if required

e. Mechanical design drawing(s) showing:

   i. Plan and profile views of pumps

   ii. Pipe sizes

   iii. Pipe supports

   iv. Valves, couplings, taps, and other appurtenances

   v. Equipment size, manufacturer, and model number

f. Plan and profile views of gravity sewers and force mains leading to and from the lift station

g. Electrical design drawing(s) showing:

   i. Incoming power supply

   ii. Control panel, lighting panel, distribution diagram

   iii. Telemetry

   iv. Auxiliary power

h. Structural, mechanical, electrical, and architectural details, including applicable Authority standard details, for all structures and equipment

i. Landscaping plan

3. TECHNICAL SPECIFICATIONS for all elements of construction and equipment to be installed as part of the lift station shall be submitted. The specifications document shall be submitted on paper 8½ inches by 11 inches and should have a title page that correlates with the design drawings. The name, manufacturer, and model number for all equipment should be included along with a spare parts list. Operation and maintenance manuals are required for all major pieces of equipment specified.

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SECTION FOUR
DESIGN STANDARDS – STORMWATER

WSA Design and Construction Standards shall be applicable to all land development, including private estates, unless specifically exempted by the WSA Rules & Regulations. The stormwater management system design and hydrology study shall comply with the Georgia Stormwater Management Manual.

A. GENERAL REQUIREMENTS

1. Applicability

a. Post Construction Stormwater Management Standards (Runoff Reduction, Water Quality, Detention, Channel Protection, etc.) apply to any new development or redevelopment site that meets one or more of the following criteria:

i. New development that involves the creation of 5,000 square feet or more of impervious cover, or that involves other land development activities of one (1) acre or more;

ii. Redevelopment that includes the creation, addition or replacement of 5,000 square feet or more of impervious cover, or that involves other land development activity of one (1) acre or more;

iii. Any new development or redevelopment, regardless of size, that is defined by the Authority to be a hotspot land use;

iv. Land development activities that are smaller than the minimum applicability criteria set forth in subparagraphs i. and ii. above if such activities are part of a larger common plan of development, even though multiple, separate, and distinct land development activities may take place at different times on different schedules; or

v. Linear transportation projects that exceed the thresholds in i. or ii. above.

b. Exemptions: The following activities are exempt from the Post-Construction Stormwater Management Standards.

i. Individual single-family or duplex residential lots that are not part of a subdivision or phased development project;

ii. Additions or modifications to existing single-family or duplex residential structures;

iii. Land disturbing activity conducted by local, state, authority, or federal agencies solely to respond to an emergency need to protect life, limb, or property or conduct emergency repairs;

iv. Land disturbing activity that consists solely of cutting a trench for utility work and related pavement replacement;

v. Land disturbance activity conducted by local, state, authority, or federal agencies whose sole purpose is to implement stormwater management or environmental restoration;

vi. Repairs to any stormwater management facility or practice deemed necessary by the Authority, and any other repairs performed by the Authority or its agents;

vii. Agricultural or silvicultural land management activities within areas zoned for these activities, with the exception of buildings or permanent structures that meet or exceed the thresholds in Paragraphs 1.a.i or 1.a.ii above;

viii. Installations or modifications to existing structures solely to implement Americans with Disabilities Act (ADA) requirements, including but not limited to elevator shafts, handicapped access ramps and parking, and enlarged entrances or exits; and

ix. Linear construction projects, or portions thereof, for which the Authority determines that post-construction stormwater management standards may be infeasible to apply in accordance with Georgia Department of Transportation standards. In such case, an infeasibility determination report must be submitted to the Authority that contains adequate documentation to support the determination that it is infeasible to apply post-construction stormwater management standards to the project.

c. For redevelopment projects, a credit will be given for existing impervious cover that is to be replaced with pervious cover.

2. A detailed Stormwater Management Report must be prepared and signed by a Professional Engineer registered in the State of Georgia. The study shall provide information on pre-developed and post-developed conditions and include computations to support the hydrology design. The plan shall also include post-

construction performance of the permanent stormwater management system including structural, vegetative, and procedural controls.

3. Stormwater system design and analysis shall be performed using the best available data, which may include current flood studies.

4. Hydrologic Methods

Hydrology design and runoff computations shall be based on the Georgia Stormwater Management Manual, Volume 2, latest edition.

Modified Rational Method	Can be used to size culverts, pipes, channels, and detention structures that drain less than 5 acres.

TR-55 MethodShall be used for detention computations and to size culverts, pipes, and channels that drain 5 acres or more.

5. "Pre-development" means natural unimproved condition and may not represent existing conditions. Pre-developed runoff data shall not exceed the following:

Rational Method Runoff Coefficient (C)	Maximum = 0.30
TR-55 Curve Number (CN)	Maximum = 39 for A soils Maximum = 61 for B soils Maximum = 74 for C soils Maximum = 80 for D soils

Note: The referenced curve numbers correspond with "Open Space" values cited in the Georgia Stormwater Management Manual.

6. For redevelopment projects where detention is required, the developer may pay a fee in lieu of detention provided the following conditions are met:

   a. The Authority shall review the Stormwater Management Report submitted for the project. The downstream analysis, performed in accordance with WSA standards, must show no downstream impacts will occur.

   b. Water Quality may be waived, as determined on a case-by-case basis, with an additional fee in lieu of water quality at the sole discretion of the Authority.

   c. Channel protection requirements may be waived based on a review of the downstream analysis.

d. The amount of impervious cover to be added or replaced must be 50% or less than the existing impervious cover.

e. The site must be in a basin, determined by the WSA, which is suitable for the construction of a regional detention pond.

f. The fee shall be in the amount required by Chapter 4 of the Authority's Rules and Regulations as determined on a case-by-case basis at the sole discretion of the Authority.

7. Catch basins with grate inlets and hoods shall be allowed in the public right-of-way only when the hooded portion alone can handle the design storm event. Calculations shall assume blinding of the grate.

8. Offsite easements must be provided for all discharges of concentrated flow onto private properties to the point where such concentrated flow reached an ephemeral, intermittent, or perennial stream that exists prior to development. The stream must have a definite channel, bank, and bed and be functioning to convey pre-developed runoff from the offsite property. Drainage easements do not relieve the developer of the responsibility of ensuring that post-developed flows do not negatively impact downstream properties.

   Drainage easements are required even if a permanent level spreader is used to convert concentrated flow into sheet flow prior to crossing the property line. However, on a case-by-case basis, permanent level spreaders may reduce the requirements for downstream improvements

B. PIPES AND CULVERTS

1.	Minimum pipe size	18 inch
2.	Required Pipe Material	
	Under Roads	Reinforced Concrete, Ductile Iron, or HDPE* All pipe shall be installed per GDOT specifications.
	In Right-of-Way	Georgia DOT pipe, including HDPE *, approved for right-of-ways with water-tight connections (CMP is not allowed) All pipe shall be installed per GDOT specifications.
	Piping of Perennial or Intermittent Streams	Reinforced Concrete or Ductile Iron

Otherwise	Reinforced Concrete, High Density Polyethylene (smooth lined only), Ductile Iron, Bituminous Coated Hot-Dipped Galvanized Corrugated Steel, Aluminized Corrugated Steel

*Use of HDPE under roads or in the right-of-way requires certification by a Professional Engineer that the bedding, backfill, and compaction have been correctly installed. Certification shall include quality assurance test results. Certification shall be submitted to the Authority prior to project acceptance.

Concrete pipe shall be delivered in lengths of 8 feet or less. Corrugated pipe shall comply with Georgia D.O.T. thickness requirements. 42" – 48" corrugated steel pipe shall not be less than 14 gauge.

3. Minimum Slope: 0.50%

4. Maximum Slope: 25%

5. Additional Pipe Requirements:

Slope	Requirements
< 10%	No special requirements.
10% - 15%	Concrete collar required at the downstream manhole.
>15% - ≤25%	Concrete collar at every joint Or Watertight connections at every joint and concrete collar at downstream manhole.

6. Outlet Protection

Discharge Velocity (100-yr, 24-hr storm)	Outlet Type	Protection
< 5 fps	Flared End Section	Vegetation at pipe.

Discharge Velocity (100-yr, 24-hr storm)	Outlet Type	Protection
5 fps – 10 fps	Flared End Section or Headwall	Reinforced vegetation at outlet using permanent erosion control matting.
> 10 fps	Headwall	Structural protection such as rock, plunge pool, slab, or baffles

7. Minimum Velocity — 2.5 feet per second for 2-year flow

8. Minimum Cover

Under Roads	In accordance with Georgia Department of Transportation Standard 1030D
Otherwise	2 feet

9. Culvert sizing and analysis shall be performed using the best available data which may include current flood studies.

10. Sizing Criteria

Pipes, channel, ditches, culverts, and any structure that conveys concentrated flow will be sized to convey the 100-year, 24-hour storm peak flow.

Outlet protection for permanent stormwater conveyance structures shall be designed for maximum velocity.

11. When stormwater lines cross or are in close proximity to a hazardous location (i.e. gas lines), the Authority may require additional measures.

12. All pipes and structures installed in a permanent pond and/or through a dam shall be made of reinforced concrete. All joints shall be watertight. Pipes in a dam shall have a minimum of one anti-seep collar.

13. When a stormwater pipe discharges from a pipe to a larger size pipe, the pipe shall be installed to match the elevation of the crown of the two pipes, not the invert.

14. In residential areas, drainage pipes shall meet the material requirements for pipes under roads and be installed with watertight joints.

15. Permanent level spreaders must be made of non-erodible materials.

16. No concentrated stormwater shall be discharged directly onto the surface of public streets even with the use of a level spreader.

17. For cast-in-place culverts, the contractor shall be on the Georgia DOT, Douglas County DOT, and the Authority's Approved Contractor Lists.

18. For cast-in-place culverts, a Professional Engineer shall certify all formwork, reinforcement, and concrete placement. Certification shall include quality assurance test results. Certification shall be submitted to the Authority prior to project acceptance.

19. No catch basins shall be installed at the corners of an intersection.

C. STORMWATER MANAGEMENT FACILITY REQUIREMENTS

1. Sizing Criteria

   Stormwater management facilities will be sized to meet the runoff reduction, water quality, channel protection, and overbank flood protection requirements of the latest revision of the Georgia Stormwater Management Manual. Extreme flood protection shall be provided by sizing the stormwater management facility to detain the 100-year, 24-hour storm without an increase in runoff rates from pre-developed condition.

2. A fence, minimum height four feet, shall be installed around all stormwater detention ponds with slopes of 3:1 or steeper. A gate capable of being locked will be installed in the fence. The fence requirement may be waived in lieu of other safety measures when approved by the Authority.

3. All walls in stormwater detention ponds constructed of non-earthen materials, such as concrete, shall be designed by a Professional Engineer licensed by the State of Georgia.

4. A 12-foot wide access drive shall be provided to the dam from a public road or parking area. Construction plans must show drive grading and easements as needed.

5. Pond dams shall be grassed only. No trees or shrubs shall be allowed on the dams. On interior slopes of ponds, grass shall be turf type grass. Other landscaping materials may be considered on a case-by-case basis and must be approved by the WSA prior to planting.

6. All stormwater detention ponds, detention structures/devices (such as for underground detention) that serve more than one lot, shall be located in a common lot within the development.

7. For all stormwater ponds, a minimum of 1 foot of freeboard is required from the 100-year elevation to the top of the dam or wall.

8. No permanent impoundment of water shall be allowed in the Dog River and Bear Creek Basins, excluding stormwater ponds or impoundments with a dam height of less than six (6) feet or impounding less than ten (10) acre-feet of water.

D. RUNOFF REDUCTION / WATER QUALITY REQUIREMENTS

1. Runoff Reduction/Water Quality Treatment

Stormwater runoff reduction and/or water quality treatment shall be provided for the site in accordance with the requirements of the latest revision of the Georgia Stormwater Management Manual. The primary method of water quality treatment will be Runoff Reduction. Best management practices (BMPs) for runoff reduction must retain onsite the first 1.0 inches of rainfall to the maximum extent practicable. This shall be demonstrated by including in the stormwater management report an analysis to determine the level of feasibility of infiltrating or otherwise retaining rainfall onsite (i.e., what portion of the first 1.0 inches of rainfall can be retained onsite).

This analysis shall include all supporting field tests and calculations. Infiltration BMPs require testing in accordance with the Georgia Stormwater Management Manual, Volume 2, Appendix D prior to plan approval.

Stormwater water quality best management practices (BMPs) shall not be constructed in the floodplain or floodway.

Once the level of runoff reduction feasibility has been determined, the remainder of the first 1.2 inches of rainfall shall receive Water Quality Treatment to provide an 80% reduction in Total Suspended Solids (TSS) loads. The Authority may require additional testing to demonstrate adequate removal of other pollutants of concern, including but not limited to, total petroleum hydrocarbons (TPH), heavy metals, or pesticides. The required buffer along state waters shall not be used for pollutant removal.

Acceptable BMPs include:

a. Wet Retention Ponds
b. Constructed Wetlands
c. Bioretention Areas
d. Sand Filters
e. Infiltration Trenches
f. Enhanced Swales
g. Filter Strips
h. Grassed Channels
i. Submerged Gravel Wetlands
j. Gravity Separators (Oil & Grit)
k. Pervious Surfaces
l. Hydrodynamic Devices

2. The Georgia Stormwater Management Manual "Stormwater Quality Site Development Review Tool" shall be used to demonstrate 80% removal of TSS. Results shall be shown on stormwater plans and in the stormwater management report. The "Stormwater Quality Site Development Review Tool" is available at https://atlantaregional.org/georgia-stormwater-management-manual.

3. Best management practices not specified herein may be accepted by the Authority after thorough review of design details. A Professional Engineer registered in the State of Georgia shall certify all such details.

4. The Authority reserves the right to accept or reject the use of any proprietary device. Proprietary devices such as CrystalStream, ADS, Hancor, Bay Saver, StormCeptor, etc. may be considered if the following is submitted for review:

   a. Proposed location, type of device, and target pollutants

   b. Projected treatment volumes, flows, and removal efficiencies

   c. Manufacturer supplied technical data

   d. Independent-third party field test data using soils similar to those in the metro Atlanta region for the verification of removal efficiencies.

   e. Reference contact information

   f. In lieu of the above, evaluation of the device by the Metropolitan North Georgia Water Planning District Stormwater Technology Assessment Protocol Program (STAPP) will be accepted.

5. Dumpster pads shall not discharge any pollutants or water containing pollutants directly or indirectly to the stormwater system.

6. For wet water quality ponds, detention shall be "stacked" on top of the permanent pool.

7. Water Quality best management practices and/or devices located on individual lots in residential subdivisions shall only treat runoff from the lot on which they are located.

8. Conservation easements shall be held by a third party such as governmental entities or a nonprofit organization recognized under Section 501(c)3 of the Internal Revenue Code to ensure that lands are maintained in perpetual conservation. The easement document must provide a detailed description of the condition of the land, clearly specify how the natural area vegetation shall be managed and how

E. INFORMATION TO BE SHOWN ON GRADING & DRAINAGE PLANS

1. Project name and valid registration stamp of the Professional Engineer licensed in the State of Georgia. A registered land surveyor is not acceptable. A registered Professional Engineer must stamp any redesign or revision.

2. All construction drawings submitted to the Authority for review shall be professionally printed (AutoCad format or approved equal). Hand-written notes are not acceptable and will not be reviewed.

3. Site plans should include street, street names, lot layout (if subdivision) or building locations (if multi-family, commercial or industrial), land lots and district, north arrow.

4. Detailed plans of the location and the construction of drains, conduits, outlet protection, ponds, and other structures to convey, detain, or treat stormwater.

5. Grading only plans shall include post-construction stormwater management controls.

6. Final drainage plans for each individual residential lot shall be required. These plans shall detail the post-developed drainage patterns for each lot and show proper conveyance of stormwater runoff.

7. Type of material to be used.

8. Show location and extents of all state waters, stream buffers, wetlands, tree save areas, and other conservation areas.

9. Show location of all discharge points for pre-developed and post-developed concentrated runoff.

10. Locations and type of nearest existing utilities in areas of potential conflict.

11. Existing and proposed ground contours.

12. Extents of floodplain including floodplain designation and referencing corresponding FEMA/FIRM map panel or alternate source of best available floodplain data.

13. Discharge flow rates and velocities from pipes, headwalls, ditches, and other outlet structures for the 2-year and 100-year storms.

14. Concentrated run-off must be conveyed to receiving body in a responsible manner. Pipes adjacent to residential lots of less than 1 acre shall extend to rear building lines.

15. Drainage easements must be provided for all (on-site and off-site) concentrated flow. Off-site drainage easements must be provided to the point where concentrated flow reaches an ephemeral, intermittent, or perennial stream.

16. Twenty-foot permanent stormwater easements are required where pipes, ditches, channels, etc. convey concentrated stormwater runoff across private property. Twenty-foot permanent access easements to all structures that receive runoff from two or more separate properties for detention or treatment are required. More easement area may be required as deemed necessary by the Authority. Said easements outside the public right of way are dedicated to the public good and are limited to providing access to stormwater structures. Under no circumstances shall stormwater easements be conveyed to the Authority, as indicated in Section 1, Paragraph G.1.c, of these Construction Standards.

17. Plan and profile scales shall be:

    Vertical: 1 inch = 5 feet or 1 inch = 10 feet
    Horizontal: 1 inch = 20 feet or 1 inch = 50 feet

18. The 100-year hydraulic grade line (HGL) shall be shown on profiles and pond sections.

19. A general site location map should be shown on the title sheet or first page.

20. All flood related information shown on the plans shall be as determined by a Professional Engineer licensed in the State of Georgia using methods approved by FEMA and the Authority.

21. The following notes shall be required on all drawings submitted to the Authority:

    a. All stormwater construction shall conform to Douglasville-Douglas County Water and Sewer Authority Design and Construction Standards and specifications, latest edition.

    b. Notify the Douglasville-Douglas County WSA Engineering Department at least 72 hours prior to beginning of land disturbance. An inspector will be assigned and a pre-construction meeting scheduled at this time.

    c. "As-Built" drawings shall be field verified and stamped by a State of Georgia licensed Professional Engineer or land surveyor.

    d. All contractors for grading, erosion control, and stormwater system construction shall be approved by the Authority.

    e. Contractors have the responsibility to comply with erosion control requirements of the local Land Disturbance Permit and NPDES General Permit if applicable.

f. The contractor shall comply with all Utilities Protection Center requirements.

22. Provide landscape and open space plan for the site.

F. INFORMATION TO BE INCLUDED IN STORMWATER MANAGEMENT REPORT

The Stormwater Management Report must be stamped and signed by a Professional Engineer, registered in the State of Georgia, and shall include the following:

1. Common address and location map of the project site.

2. Pre-developed conditions of the project including ground cover, soil type, topography, groundwater recharge rates, receiving surface waters, and existing pollutant sources.

3. Description of methods and software used to compute peak flows, plot hydrographs, and to size conduits, channels, detention facilities, and treatment structures.

4. Rainfall information for Douglasville as described in the Georgia Stormwater Management Manual utilizing the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 publication, or online using the Precipitation Frequency Data Server database for any location across Georgia ((http://hdsc.nws.noaa.gov/hdsc/pfds/).

5. Pre-development peak flows and hydrographs, for each drainage basin within the project boundaries, including by-pass basins, for the following 24-hour rainfall events:

   a. 1 year storm
   b. 2 year storm
   c. 5 year storm
   d. 10 year storm
   e. 25 year storm
   f. 50 year storm
   g. 10 year storm

6. Post development conditions including ground cover, % impervious surface, topography, soil type for fill material, by-pass flows, groundwater recharge rates, receiving surface waters, and potential pollutant sources.

7. Post development peak flows and hydrographs, for each drainage basin within the project boundaries, including bypass basins, for the following rainfall events:

a. 1 year storm
b. 2 year storm
c. 5 year storm
d. 10 year storm
e. 25 year storm
f. 50 year storm
g. 100 year storm

8. Provide a summary table for the site comparing the sum of post-developed peak discharges to the sum of pre-developed discharges. Include all on-site sub-basins and bypass. Post developed peak discharges shall not exceed pre-developed peak discharges. Allowable peak discharge equals the pre-developed peak discharge minus the post-developed bypass peak discharge. Show all storm events.

9. Drainage maps showing delineation of onsite drainage basins for pre-development and post development conditions. Off-site portions of the drainage basins (upgradient and downgradient of site) shall also be shown. Indicate discharge points, receiving waters, and all study points.

10. Use the "Stormwater Quality Site Development Review Tool" to show compliance with 80% TSS removal. Provide a map showing the water quality drainage areas that corresponds with the drainage areas used in the "Stormwater Quality Site Development Review Tool."

11. Detailed stage/storage computations for detention facilities that treat runoff from more than 5 acres shall be performed using the SCS TR-55 Method. For detention facilities that serve less than 5 acres, the Modified Rational Method, as defined in the Georgia Stormwater Management Manual, Volume 2, may be used. The Stormwater Quality Site Development Review Tool, formerly the Site Development Review Tool, may not be used for the design of detention ponds.

12. Details of outlet control structure design including routing computations to show compliance with the following:

    a. Extended detention of 1-year storm released over 24 hours (minimum) to provide channel protection in receiving waters. Show supporting computations.

    b. Detention of 1-year, 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year, 24-hour storms such that post development peak discharges do not exceed pre-development peak flows to provide downstream overbank flood protection.

    c. Anti-flotation calculations for the outlet control structure.

13. Details of structures, methods, or devices proposed to remove 80% of pollutants from the first 1.2 inches of rainfall.

14. Provide sizing calculations for all structures, methods, or devices proposed to remove 80% of pollutants from the first 1.2 inches of rainfall per the Georgia Stormwater Management Manual.

15. Details of walls in stormwater detention ponds constructed of non-earthen materials, such as concrete.

16. Stormwater Management System - Provide description of proposed structural and non-structural controls and practices to provide flood control and remove pollutants from stormwater runoff. Provide design details of all structural practices and devices to be installed. Include storage volumes, water surface elevations, invert elevations, removal efficiency, flow, and velocity. For all pipes include length, diameter, type, slope, and invert elevations. For collection structures such as inlet and catch basins, include top elevation, invert elevation, type and material. For ditches, swales, and channels provide dimensions, average cross-sectional area, slope, and lining.

17. Post Development Downstream Analysis - A downstream analysis to determine flood impacts on receiving water bodies and downstream property owners shall be performed as follows:

    a. Include study points at the downstream most discharge point of the onsite drainage area, at every point that concentrated runoff crosses a property line, at road crossings, at all downstream culverts, stormwater pipes, and stream confluences to where the project is 10% or less of the entire surface area that drains to that point.

    b. Provide pre- and post-developed hydrographs for all storm events at each study point. Provide a summary table for each study point comparing pre- and post- developed flows for all storm events. The downstream analysis must show no increase in peak flood elevation or peak flows at all of the aforementioned study points. All downstream stormwater pipes to the 10% point shall be analyzed for conveyance of the 100-year storm event.

    c. For the overall basin, provide pre- and post-developed hydrographs for all storm events. Provide a summary table comparing pre- and post-developed flows for all storm events.

    d. The Post Development Downstream Analysis shall be performed in accordance with the Georgia Stormwater Management Manual.

    e. Sites that contain more than one drainage area shall perform a downstream analysis for each drainage area.

    f. A dam breach analysis is required for all new, rebuilt, or modified stormwater ponds and other water impoundments with a dam height of six

feet or higher. Downstream structures, roads, and infrastructure impacted by a dam breach shall be identified and quantified in the analysis as well as shown graphically. This analysis shall be performed according to the Georgia Safe Dams Program, "Engineer Guidelines" (https://epd.georgia.gov/document/publication/engineer-guidelines/download), Section 2. Dam Breach Modeling Protocol.

i. The breach shall be modeled as discussed in Section 2.4 of the Engineer Guidelines.

ii. Downstream structures should not be modeled as blocked (as the Engineer Guidelines call for). They should be modeled fully open.

iii. If the analysis shows that roads are overtopped or structures impacted, a comparison shall be made to the existing conditions during the 100-year storm, in order to demonstrate the change in potential flooding caused by the proposed development.

g. When an existing Category II dam may be reclassified to a Category I dam because of proposed development downstream of the dam or when development is proposed downstream of an existing Category I dam, the developer shall obtain concurrence for the development from the Georgia Safe Dams Program.

18. Operations and Maintenance Plan - Provide details of Post-Development operations and maintenance activities required to ensure the continued function of the stormwater management system. Include inspection schedules, maintenance tasks, responsible parties, access and safety, etc.

19. Maintenance Access Easements - Description of easements required for the stormwater management facilities.

20. Inspections of privately owned facilities shall be performed as often as deemed necessary by the owner to properly maintain facilities and prevent discharges of pollutants. Reports and records of maintenance activities must be kept on site and made available to the Authority upon request.

21. Evidence of Acquisition of Applicable Permits - such as Stream Buffer Variance or Wetland Permits where required. Provide evidence that they have been obtained.

G. FLOODPLAIN MANAGEMENT

1. Basis for Area of Special Flood Hazard – Flood Area Maps and Studies

For the purposes of this Chapter, the following are adopted by reference:

A. The Flood Insurance Study (FIS), latest edition, as amended, with accompanying maps and other supporting data and any revision thereto. For those land areas acquired by a municipality through annexation or otherwise lying in unincorporated Douglas County, the current effective FIS and data for unincorporated Douglas County are hereby adopted by reference.

B. Other studies which may be relied upon for the establishment of the base flood elevation of delineation of the 100-year floodplain include:

1. Any flood or flood-related study conducted by the United States Corps of Engineers or the United States Geological Survey applicable to the City of Douglasville and/or Douglas County, Georgia; or

2. Any base flood study authored by a registered professional engineer in the State of Georgia that has been approved by the Authority and the City of Douglasville and/or Douglas County, Georgia, as applicable.

C. Other studies that may be relied upon for the establishment of the future-conditions flood elevation or delineation of the future-conditions floodplain and flood prone areas include:

1. Any flood or flood-related study conducted by the United States Corps of Engineers or the United States Geological Survey applicable to the City of Douglasville and/or Douglas County, Georgia; or

2. Any base flood study authored by a registered professional engineer in the State of Georgia that has been approved by the Authority and the City of Douglasville and/or Douglas County, Georgia, as applicable.

D. The repository for public inspection of the flood studies, accompanying maps and other supporting data is located at the Authority's Engineering Department.

2. Permit Application Requirements

A. No owner or developer shall perform any land development activities on a site where an area of special flood hazard is located without first meeting the requirements of this Chapter prior to commencing the proposed activity.

B. Unless specifically excluded by this Chapter, any owner or developer desiring a permit for a land development activity shall submit a permit application to the Authority on a form provided by the Authority for that purpose.

C. No land development permit will be approved for any land development activities that do not meet the requirements, restrictions, and criteria of this Chapter.

3. Floodplain Management Plan Requirements

A. No application for a development project within any area of special flood hazard will be approved unless it includes a floodplain management/flood damage prevention plan. This plan shall be in accordance with the criteria established in this Section.

B. The floodplain management/flood damage prevention plan must be submitted with the stamp and signature of a Professional Engineer (PE) licensed in the State of Georgia, who will verify that all designs are consistent with the requirements of this Chapter.

C. The approved floodplain management/flood damage prevention plan shall contain certification by the applicant that all land development activities will be done according to the plans or previously approved revisions. Any and all land development permits and/or use and occupancy certificates or permits may be revoked and water service may be terminated by the Authority at any time if the construction and building activities are not in strict accordance with approved plans.

D. The floodplain management/flood damage prevention plan shall include, but not be limited to, the following: plans drawn to scale of the site in question and the nature, location, and dimensions of existing or proposed structures, earthen fill placement, storage of material or equipment, and drainage and stormwater management facilities. Specifically, the following information is required:

1. Site plan, including but not limited to:

    a. For all proposed structures in the base floodplain or future-conditions floodplain, spot ground elevations at the building corners and 20-foot or smaller intervals along the foundation footprint, or 1-foot contour elevations throughout the building site;

    b. Proposed placement of earthen fill, amount and location of excavations and storage of material and equipment;

    c. Proposed locations of water supply, sanitary sewer, and utilities;

    d. Proposed locations of drainage and stormwater management facilities;

    e. Proposed grading plan;

    f. Base flood elevations or future-conditions flood;

    g. Boundaries of the base flood or future conditions flood; and

    h. If applicable, the location of the floodway.

    i. Certification of the above by a registered professional or surveyor.

2. Building and foundation design detail, including but not limited to:

    a. Elevation in relation to mean sea level (or highest adjacent grade) of the lowest floor, including basement, of all proposed structures;

    b. Elevation in relation to mean sea level to which any non-residential structure will be floodproofed;

c. Certification that any proposed non-residential floodproofed structure meets the criteria in this Section;

d. For enclosures below the base flood elevation, location and total net area of foundation openings as required in this Chapter.

e. Design plans certified by a registered professional engineer or architect for all proposed structure(s).

3. Description of the extent to which any watercourse will be altered or relocated as a result of the proposed land development project; and

4. All appropriate certifications required under this Chapter.

5. Hard copies and digital files of computer models, if any, copies of work maps, comparison of pre- and post-development condition base flood elevations, future-conditions flood elevations, flood protection elevations, areas of special flood hazard and regulatory floodway widths, flood profiles and all other computations and other relevant information.

6. Copies of all applicable State and Federal permits necessary for the proposed development.

4. Construction Stage Submittal Requirements

A. For all new construction and substantial improvements on sites with a floodplain management / flood damage prevention plan, the permit holder shall provide to the Authority a certified as-built Elevation Certificate or Floodproofing Certificate for non-residential construction including the lowest floor or floodproofing is completed. A final Elevation Certificate shall be provided after completion of construction including final grading of the site. Any lowest floor certification made relative to mean sea level shall be prepared by or under the direct supervision of a registered land surveyor or professional engineer and certified by same. When floodproofing is utilized for non-residential structures, said certification shall be prepared by or under the direct supervision of a professional engineer or architect and certified by same.

B. Any work undertaken prior to approval of these certifications shall be at the permit holder's risk. The Authority shall review the above referenced certification data submitted. Deficiencies detected by such review shall be corrected by the permit holder immediately and prior to further work being allowed to proceed. Failure to submit elevation certificates or failure to make the corrections required hereby shall be cause to issue a stop work order for the project.

5. Definition of Floodplain Boundaries

A. Studied "A""AE" zones, as identified in the FIS Flood Insurance Study, shall be used to establish base flood elevations whenever available.

B. For all streams with a drainage area of 100 acres or greater, the future-conditions flood elevations shall be provided by the Authority. If future-conditions elevation data is not available from the Authority, then it shall be determined by a professional engineer using methods approved by FEMA and the Authority; the cost of which shall be paid by the applicant. The Chattahoochee River shall be exempt from the future-conditions flood elevation requirements.

6. Definition of Floodway Boundaries

A. The width of a floodway shall be determined from the FIS or FEMA approved flood study.

B. Following the consultation meeting with the Authority, the boundaries or limits of the floodway shall be shown on the site plan containing existing topographic information. For all streams with a drainage area of 100 acres or greater, the regulatory floodway shall be provided by the Authority. If floodway data is not available from the Authority, then it shall be determined by a professional engineer using methods approved by FEMA and the Authority; the cost of which shall be paid by the applicant.

7. General Standards for Land Development

A. No development shall be allowed within the base floodplain or the future-conditions floodplain that could result in any of the following:

1. Raising the base flood elevation or future-conditions floodplain equal to or more than 0.01-foot;

2. Reducing the regulatory flood storage capacity – All compensation for storage capacity shall occur between the average ground water table and the base flood elevation or future-conditions flood elevation and lie either within the boundaries of ownership of the property being developed, or within a permanent, recorded flood control easement, and shall be within a reasonable proximity to the location of the encroachment. Acceptable means of providing required compensation include: lowering of natural ground elevations within the floodplain; or lowering of adjoining land areas to create additional floodplain; or raising of the regulatory flood elevation within the boundaries of ownership of the property being developed. All cut areas are to be graded to a slope of no less than two percent (2%). In no case shall any required compensation be provided via bottom storage or by excavating below the elevation to the top to the natural (pre-development) stream channel. A step-backwater analysis will be required to determine the volume of flood storage created by raising the regulatory flood elevation;

3. Changing the flow characteristics as to the depth and velocity of the waters of the base flood or future-conditions flood as they pass both the upstream and the downstream boundaries of the property. Verification shall be provided via a step-backwater analysis; or,

4. Creating hazardous or erosion-producing velocities or resulting in excessive sedimentation. In all cases, effective transitions must be provided such that flow velocities occurring on both upstream and downstream properties are not increased or decreased.

B. All proposed public utilities and facilities, such as sewer, gas, electrical, and water system, shall be located and constructed to minimize infiltration or flood damage.

C. Any significant changes or revisions to the flood data adopted herein and shown on the FIRM shall be submitted as a Conditional Letter of Map Revision (CLOMR) or Conditional Letter of Map Amendment (CLOMA), whichever is applicable. The CLOMR submittal shall be subject to approval by the Authority and the City of Douglasville or Douglas County using the Community Consent forms before forwarding the submittal package to FEMA for final approval. The responsibility for forwarding the CLOMR to FEMA and for obtaining the CLOMR approval shall be the responsibility of the applicant. Within six months of the completion of construction, the applicant shall submit as-built surveys that demonstrate general conformance to the approved designs as submitted in the CLOMR application. A Letter of Map Revision (LOMR) or Letter of Map Amendment (LOMA) must be issued before the Final Plat can be approved or a Certificate of Occupancy can be issued. Significant changes or revisions shall be defined as any change to the FIRM easily observed when plotted at a scale of 1" = 1000'. The changes or revisions may be due to, but are not limited to, more current and/or superior topographic information or compensatory cut and fill grading done as part of the development.

8. Engineering Study Requirements for Floodplain Encroachments

An engineering study is required, as appropriate to the proposed development activities on the site, whenever a development proposes to disturb the base floodplain or future-conditions floodplain. This study shall be prepared by a currently registered Professional Engineer in the State of Georgia and made a part of the application for a permit. This information shall be submitted to and approved by the Authority prior to the approval of any permit that would authorize the disturbance of land located within the floodplain. Such study shall include:

A. Description of the extent to which any watercourse or floodplain will be altered or relocated as result of the proposed development;

B. Step-backwater analysis, using a method approved by the Authority. Cross-sections (which may be supplemented by the applicant) and flow information will be obtained whenever available. Computations will be shown duplicating FIS results and will be then rerun with the proposed modifications to determine the new base flood and regulatory flood profiles;

C. Floodplain storage calculations based on cross-sections (at least one every 100 feet) showing existing and proposed floodplain conditions to show that regulatory floodplain storage capacity would not be diminished by the development;

D. If changes to the regulatory flood elevation are proposed, profiles of the channel showing the existing and proposed regulatory flood elevations must be provided; and,

E. The study shall include a preliminary plat, grading plan, or site plan, as appropriate, which shall clearly define all floodplain encroachments.

9. Floodway Encroachments

Located within Areas of Special Flood Hazard are areas designated as floodway. A floodway may be an extremely hazardous area due to velocity floodwaters, debris, or erosion potential. In addition, floodways must remain free of encroachment to allow for the discharge of the base flood without increased flood heights. Therefore, the following provisions shall apply:

A. Encroachments are prohibited, including earthen fill, new construction, substantial improvements, or other development within the regulatory floodway, except when required for the construction of bridges, culverts, roadways, and utilities, provided it is demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the encroachment shall not result in any increase to the pre-project base flood elevations, floodway elevations, or floodway widths during the regulatory or base flood discharge. A registered professional engineer must provide supporting technical data and certification thereof; and,

B. If the applicant proposes to revise the floodway boundaries, no permit authorizing the encroachment into or an alteration of the floodway shall be issued by the Authority until an affirmative Conditional Letter of Map Revision (CLOMR) or Conditional Letter of Map Amendment (CLOMA), whichever is applicable, is issued by FEMA and a no-rise certificate is approved by the Authority.

10. General Standards for Flood Hazard Reduction

In all Areas of Special Flood Hazard, the following provisions apply:

A. New construction of residential buildings, including manufactured homes, shall not be allowed within the limits of the base floodplain or future-conditions floodplain;

B. New construction of non-residential structures shall not be allowed within the future-conditions floodplain unless all the Authority's requirements are met;

C. Substantial improvements of existing structures shall be anchored to prevent flotation, collapse, or lateral movement of the structure;

D. Substantial improvements of existing structures shall be constructed with materials and utility equipment resistant to flood damage;

E. Substantial improvements of existing structures shall be constructed by methods and practices that minimize flood damage;

F. Elevated Buildings – All substantial improvements of existing structures that include any fully enclosed area located below the lowest floor formed by foundation and other exterior walls shall be designed to be an unfinished and flood resistant enclosure. The enclosure shall be designed to equalize hydrostatic flood forces on exterior walls by allowing for the automatic entry and exit of floodwater.

1. Designs for complying with this requirement must either by certified by a professional engineer or architect or meet the following minimum criteria:

   a. Provide a minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding;

   b. The bottom of all openings shall be no higher than one foot above grade; and,

   c. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided they permit the automatic flow of floodwater in both directions.

2. So as not to violate the "Lowest Floor" criteria of the Chapter, the unfinished or flood resistant enclosure shall only be used for parking of vehicles, limited storage of maintenance equipment used in connection with the premises, or entry to the elevated area; and,

3. The interior portion of such enclosed area shall not be portioned or finished into separate rooms.

G. All heating and air conditioning equipment and components (including ductwork), all electrical, ventilation, plumbing, and other service facilities shall be designed and/or located three (3) feet above the base flood elevation or one (1) foot above the future-conditions flood elevation, whichever is higher to prevent water from entering or accumulating within the components during conditions of flooding;

H. Manufactured homes shall be anchored to prevent flotation, collapse, or lateral movement. Methods of anchoring may include but are not limited to, use of over-the-top or frame ties to ground anchors. This standard shall be in addition to and consistent with applicable state requirements for resisting wind forces;

I. New and replacement water supply systems shall be designed to minimize or eliminate infiltration of floodwaters into the system;

J. New and replacement sanitary sewer supply systems shall be designed to minimize or eliminate infiltration of floodwaters into the systems and discharges from the systems into floodwaters;

K. On-site waste disposal systems shall be located and constructed to avoid impairment to them or contamination from them during flooding; and,

L. Any alteration, repair, reconstruction, or improvement to a structure that is not compliant with the provisions of this Chapter, shall be undertaken only if the nonconformity is not furthered, extended, or replaced;

M. If the proposed development has multiple flood zones or multiple base flood elevations, the higher or more restrictive base flood elevation or future-conditions elevation and development standards shall take precedence.

11. Building Standards for Structures and Buildings Within the Floodplain

A. Residential Buildings

1. New construction. New construction of residential buildings, including manufactured homes, shall not be allowed within the limits of the base floodplain or future-conditions floodplain.

2. Substantial improvements. Substantial improvement of any existing residential structure or manufactured home shall have the lowest floor, including basement, elevated no lower than three (3) feet above the base flood elevation or one (1) foot above the future-conditions flood elevation, whichever is highest. Should solid foundation perimeter walls be used to elevate a structure, openings sufficient to equalize the hydrologic flood forces on exterior walls and to facilitate the unimpeded movements of floodwaters shall be provided in accordance with the standards of "Elevated Buildings."

B. Non-residential buildings

1. New construction. New construction of principal buildings, including manufactured homes, shall not be allowed within the limits of the Base floodplain or Future-conditions floodplain unless all requirements of the Authority have been met. New construction that has met these requirements may be floodproofed in lieu of elevation. The structure, together with attendant utility and sanitary facilities, must be designed to be watertight to one (1) foot above the base flood elevation, or at least as high as the future conditions flood elevation, whichever is higher, with walls substantially impermeable to the passage of water and structural components having the capacity of resisting hydrostatic and hydrodynamic loads and the effect of buoyancy. A registered professional engineer or architect shall certify that the designs and methods of construction are in accordance with accepted standards of practice for meeting the provisions above and shall provide such certification to the Authority.

2. Substantial Improvements. Substantial improvement to any existing structure located in A1-30, AE or AH zones may be authorized by the Authority to be floodproofed in lieu of elevation. The structure, together with attendant utility and sanitary facilities, must be designed to be watertight to one (1) foot above the base flood elevation, or at least as high as the future-conditions flood elevation, whichever is highest, with walls substantially impermeable to the passage of water, and structural components having the capability of resisting hydrostatic

and hydrodynamic loads and the effect of buoyancy. A registered Professional Engineer or architect shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions above and shall provide such certification to the Authority.

C. Accessory structures and facilities. Accessory structures and facilities (i.e., barns, sheds, gazebos, detached garages, parking lots, recreational facilities, and other similar non-inhabitable structures and facilities) which are permitted to be located within the limits of the floodplain shall be constructed of flood-resistant materials and designed and constructed to pass all floodwater in a manner consistent with this Chapter and be anchored to prevent flotation, collapse, or lateral movement of the structure.

D. Standard for recreational vehicles. All recreational vehicles placed on sites must either:

1. Be on the site fewer than 180 days and be fully licensed and ready for highway use (a recreational vehicle is ready for highway use (a recreational vehicle is ready for highway use if it is licensed, on its wheels or jacking system, attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached structures or additions); or

2. Existing manufactured homes within an existing manufactured home park or subdivision shall be floodproofed as follows:

a. The manufactured home shall be elevated such that the lowest floor is elevated not lower than three (3) feet above the base flood elevation, or one (1) foot above the future-conditions floodplain, whichever is higher; and

b. The manufactured home must be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement in accordance with The Authority's Rules and Regulations.

12. Building Standards for Structures and Buildings Authorized Adjacent to the Floodplain

All buildings shall comply with the City's or the County's building codes, in addition to the following:

A. Residential Buildings. No new residential structures may be constructed within the base floodplain or the future-conditions floodplain. For new construction, adjacent to the base floodplain or future-conditions floodplain, or substantial improvement of any existing residential building or manufactured home within a floodplain, the elevation of the lowest floor, including basement and access to the building, shall be at least three (3) feet above the level of the highest base flood (100 year) elevation or one (1) foot above the future-conditions flood elevation, whichever is higher.

General Standards for Flood Hazard Reduction in Section 4.E.10 shall also apply.

B. Non-Residential Buildings. For new construction or substantial improvement of any principal non-residential building, the elevation of the lowest floor, including the basement and access to the building, shall be a least one (1) foot above the level of the highest base flood (100 year) elevation or at least as high as the future-conditions flood elevation, whichever is highest.

General Standards for Flood Hazard Reduction in Section 4.E.10 shall also apply.

13. Building Standards for Residential Single-Lot Developments on Streams Without Established Base Flood Elevations and/or Floodway (A-Zones)

A. For a residential single-lot development not part of a subdivision that has Areas of Special Flood Hazard, where streams exist but no base flood data have been provided (A-Zones), the Authority shall review and reasonably utilize any available scientific or historic flood data, base flood elevation and floodway data, or future-conditions flood elevation data available from Federal, State, local, or other source, in order to administer the provisions and standards of this ordinance.

B. If data are not available from any of these sources, the following provisions shall apply:

1. No encroachments, including structures or fill material, shall be located within an area equal to twice the width of the stream or fifty (50) feet from the top of the bank of the stream, whichever is greater.

2. In special flood hazard areas without base flood or future-conditions flood elevation data, new construction and substantial improvements of existing structures shall have the lowest enclosed area (including basement) elevated no less than the three (3) feet above the highest adjacent grade at the building site. Openings sufficient to facilitate the unimpeded movements of floodwaters shall be provided in accordance with the Authority's Rules and Regulations.

14. Building Standards for X Zone Areas

A. Located outside of A Zones and AE Zones, X Zones include the following:

1. Areas outside the 100-year floodplain but within the 500-year floodplain as determined by a detailed study (spotted X Zones).

2. Areas outside the 500-year floodplain as determined by a detailed study.

3. Areas that have not been studied.

B. The Authority reserves the right to requires further studies for any development within an X Zone if there is evidence that a potential flood hazard exists. Such evidence may include but shall be limited to:

1. Eyewitness reports of historic flooding or other reports of historic flooding deemed credible by the Authority.

2. Geologic features observed that resemble floodplains (such as flat areas along stream).

3. Proximity to manmade or natural constrictions such as road crossings that can cause backwater effects.

4. Drainage basin characteristics such as drainage area, slope, percent impervious cover, land use, etc.

C. For new homes constructed adjacent to a new or existing roadway crossing of a stream where the roadway forms a sag vertical curve, the lowest floor of the lowest enclosed area (including basement) shall be elevated no less than three (3) feet above the top of roadway or curb, whichever is higher, measured at the low point of the curve.

15. Building Standards for Areas of Shallow Flooding (AO-Zones)

Areas of Special Flood Hazard may include designated "AO" shallow flooding areas. These areas have base flood depths of one to three feet above ground, with no clearly defined channel. In these areas, the following provisions apply:

A. All substantial improvements of residential and non-residential structures shall have the lowest floor, including basement, elevated to no lower than one (1) foot above the flood depth number specified on the Flood Insurance Rate Map (FIRM), above the highest adjacent grade. If no flood depth number is specified, the lowest floor, including basement, shall be elevated to at least three (3) feet above the highest adjacent grade. Openings sufficient to facilitate the unimpeded movements of floodwaters shall be provided in accordance with standards for "Elevated Buildings".

The applicant's or owner's engineer shall certify to the Authority that the lowest floor elevation level is at least three (3) feet above the highest adjacent grade and the record shall become a part of the permanent file;

B. Substantial improvement of a non-residential structure may be floodproofed in lieu of elevation. The structure, together with attendant utility and sanitary facilities, must be designed to be watertight to the specified FIRM flood level plus one (1) foot above the highest adjacent grade, with walls, substantially impermeable to the passage of water, and structural components having the capability of resisting hydrostatic and hydro dynamic loads and the effect of buoyancy. A registered professional engineer or architect shall certify that the design and methods of construction are in accordance with accepted standards of practice; and

C. Drainage paths shall be provided to guide floodwater around and away from any proposed structure.

16. Standards for Subdivisions

A. All subdivision proposals shall identify special flood hazard area and provide base flood or future-conditions flood elevation data;

B. All residential lots in a subdivision shall have sufficient buildable area outside of the base floodplain or future-condition floodplain such that encroachments into the floodplain for residential structures will not be allowed.

C. All subdivision plans will provide the elevation of proposed structure(s) and pad(s). If the site is filled above the base flood or regulatory flood elevation, the lowest floor and pad elevations shall be certified by a registered professional engineer or surveyor and provided to the Authority.

D. All subdivision proposals shall be consistent with the need to minimize flood damage;

E. All subdivision proposals shall have public utilities and facilities, such as sewer, gas, electrical, and water systems located and constructed to minimize flood damage; and

F. All subdivision proposals shall have adequate drainage provided to reduce exposure to flood hazards.

17. Standards for Utilities

A. All new and replacement water supply and sanitary sewerage systems shall be designed to minimize or eliminate:

1. Infiltration of flood waters into the systems; and,

2. Discharges from the systems into flood waters.

B. On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.
   a. FEMA and the Authority.

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SECTION FIVE

DESIGN STANDARDS – EROSION, SEDIMENTATION, AND POLLUTION CONTROL

1. General

a. All design must conform to the minimum requirements set forth in the "Manual for Erosion and Sediment Control in Georgia," latest edition (hereafter referred to as the Manual), State General Permit, and any other pertinent regulations.

b. On-site, above ground storage shall fully comply with the Oil Pollution Prevention Act and the Spill Prevention Containment and Countermeasure Rule (40 CFR Part 112).

c. Design criteria for the mitigation of spilled petroleum shall fully comply with the Georgia Underground Storage Tank Management Rules.

d. For projects that disturb 1 or more acres, erosion design must comply with requirements for the Erosion and Sediment and Pollution Control Plan as set forth in GAR100001, GAR100002, or GAR100003 as applicable.

e. Per the NPDES permit, no more than 50 contiguous acres may be disturbed at any one time. In addition, for non-residential developments, the maximum disturbed acreage at any one time is 150% of the building size. For residential developments, the maximum disturbed acreage at any one time is 150% of the right-of-way. More disturbed acreage may be approved with the submission and approval of additional plans. The additional plans must detail the erosion and sedimentation control measures that will prevent sediment from leaving the site during every stage of construction.

2. Sediment

a. Construction Exit

1. No soil disturbing-activities will be performed until a construction exit is properly installed as specified in the "Manual for Erosion and Sediment Control in Georgia."

2. The construction exit shall be of sufficient length, depth, and width to accommodate all necessary vehicular traffic into and out of the disturbed area while preventing the tracking of soil, mud, and debris onto public roadways.

3. Construction exits must also be constructed for each residential lot, regardless of whether the road frontage is public roadway. While this exit may be smaller than the minimum length required by the manual, all other design criteria applies.

b. Silt Fence

1. No soil disturbance may occur prior to the installation of silt fencing or other approved sediment barrier.

2. At least one half of the perimeter of the disturbed area shall be protected by a silt fence or other approved sediment barrier.

3. All silt fences shall be Type Sd1-NS (Non-Sensitive Areas) or Type Sd1-S (Sensitive Areas) as defined the "Manual for Erosion and Sediment Control in Georgia." Fabric shall conform to specifications listed in Table 6-27.4 of the Manual.

4. Silt fencing shall be maintained throughout construction and until final stabilization is achieved, at which time the fencing shall be removed. Fabric shall be replaced as needed.

c. Sediment Storage - all projects disturbing one or more acres shall provide for the temporary storage of sediment in accordance with the "Manual for Erosion and Sediment Control in Georgia."

d. Mud and debris must not discharge onto any part of a public street. For the purpose of this section, public streets do not include newly constructed roads interior to a development that have not yet been accepted by the local government.

e. All designs must include a washing station to be located as close as practicable to the construction exit. Wash water from the washing station must drain to a temporary sediment storage area or other suitable treatment device. In the event that petroleum contamination is caused by washing of vehicle tires (a sheen is visible on the water), spill containment boons, pads, or pillows shall be used to absorb petroleum off of the surface of the wash water, prior to discharge into state waters. Detergents may not be used in the washing of mud from tires.

f. Cement trucks shall be required to wash at this wash station.

g. The travel path from the washing station to the construction exit must be stabilized in accordance with criteria established in the Manual for construction road stabilization.

h. Erosion and sediment control shall include provisions for treatment or control of any source of sediments. Adequate sedimentation control facilities shall be provided to retain sediments onsite or preclude sedimentation of adjacent waters so that turbidity is not increased more than 25 NTU.

3. Streams

a. All projects that include a permanent stream crossing must also include complete design details for a temporary stream crossing. During construction, the Developer

may skip installation of the temporary crossing in favor of installing the permanent crossing. However, all designs must include the temporary crossing. Submit pipe-sizing calculations for WSA review.

b. Any proposed disturbance of state waters must be clearly shown on the design drawings. It is the responsibility of the Designer to apply for a stream buffer variance from the Georgia Environmental Protection Division as needed. Designers are encouraged to seek WSA determination of state waters and buffers early in the design process. A land disturbance permit cannot be issued for any project involving disturbance of buffers until a variance has been obtained.

c. For any disturbance within a flowing stream (intermittent or perennial), a stream diversion must be installed in accordance with the Manual to prevent the flow of water through an area of active soil disturbance. For minor disturbance of short durations, such as trenching across a stream for a water line, the diversion may consist of damming the stream with plywood and pumping the flow around the work area.

d. All disturbed stream banks must be stabilized with rock, vegetation, or both, immediately after disturbance is completed.

e. Construction activities that discharge into an Impaired Stream Segment (https://epd.georgia.gov/georgia-305b303d-list-documents), or within 1 linear mile upstream of and within the same watershed of the Impaired Stream Segment are required to comply with the Total Maximum Daily Load (TMDL) Plan (https://epd.georgia.gov/total-maximum-daily-loadings), if applicable, as well as including at least four (4) of the following best management practices in the Erosion, Sedimentation, and Pollution Control Plan:

    1. During construction activities, double the width of the 25-foot undisturbed vegetated buffer along all State waters classified as “trout streams” requiring a buffer. During construction activities, EPD will not grant variances to any such buffers that are increased in width pursuant to this section.

    2. Increase all temporary sediment basins and retrofitted stormwater management basins to provide sediment storage of at least 3600 cubic feet (134 cubic yards per acre drained).

    3. Use baffles in all temporary sediment basins and retrofitted stormwater management basins to at least double the conventional flow path length to the outlet source.

    4. Place a large sign (minimum 4 feet x 8 feet) on the site visible from the roadway identifying the construction site, the permittee(s), and the contact person(s) and telephone number(s).

5. Use anionic polyacrylamide (PAM) and/or mulch to stabilize areas left disturbed for more than seven (7) calendar days.

6. Conduct turbidity and Total Suspended Solids (TSS) sampling after every rain event of 0.5 inch or greater within any 24-hour period.

7. Comply with the applicable end-of-pipe turbidity effluent limit, without the "BMP defense" as provided for in O.C.G.A. 12-7-6(a)(1).

8. Limit the total planned site disturbance to less than 50% impervious surfaces (excluding any State mandated buffer areas from such calculations).

9. Limit the amount of area disturbed at any one time to no greater than 25 acres or 50% of the total planned site, whichever is less.

10. Use "Dirt II" techniques to model and manage stormwater runoff (e.g. seep berms, sand filters, anionic PAM), available on the EPD website, http://gaswcc.georgia.gov/sites/gaswcc.georgia.gov/files/imported/SWCC/Files/dirt2.pdf

11. Add appropriate organic soil amendments (e.g., compost) and conduct pre- and post-construction soil sampling to a depth of 6 (six) inches to document improved levels of soil carbon after final stabilization of the construction site.

12. Use much filter berms, in addition to a silt fence, on the site perimeter wherever stormwater may be discharged.

13. Apply the appropriate Georgia Department of Transportation approved erosion control matting or blankets or bonded fiber matrix to all slopes steeper than 3:1.

14. Use appropriate erosion control matting or blankets instead of concrete in construction stormwater ditches and storm drainages that feed into temporary sediment basins and retrofitted management basins.

15. Use anionic PAM under a passive dosing method (e.g., flocculant blocks) within construction stormwater ditches and storm drainages that feed into temporary sediment basins and retrofitted management basins.

16. Install sod for a minimum 20-foot width, in lieu of seeding, along the side perimeter wherever stormwater may be discharged.

17. Use a surface draining skimmer designed to drain temporary sediment basins and retrofitted stormwater management basins over a minimum three (3) day period.

18. Certified personnel shall conduct inspections at least twice every seven (7) calendar days and within 24 hours of the end of the storm that is 0.5 inches rainfall or greater.

19. Apply the appropriate compost blankets (minimum depth 1.5 inches) to protect soil surfaces until vegetation is established during the final stabilization phase of the construction activities.

20. Use alternative BMPs whose performance has been documented to be superior to conventional BMPs as certified by a Design Professional (unless disapproved by EPD or the State Soil and Water Conservation Commission).

4. Petroleum

a. If on-site storage vessels exceed a capacity of 1320 gallons of petroleum, a spill prevention containment and countermeasures plan must be prepared by a registered professional engineer as required by the Oil Pollution Prevention Act. All drums and tanks 55 gallons or larger shall be included in the capacity count. If the designer does not know what storage capacity needs are, the design can limit on-site storage capacity by notation in the Erosion Sedimentation and Pollution Control Plan.

b. All project design drawings shall designate at least one fuel storage area or a fueling station. These shall be located as far from receiving waters as practical. Multiple storage areas or fueling stations may be shown. However, re-fueling of vehicles and equipment may only occur at a designated fueling station or storage area.

c. Design of all fuel storage areas and fueling stations shall incorporate spill containment controls to obstruct the flow of spilled petroleum. Such secondary containment must be sufficient to hold 110% of the capacity of the largest container within the containment.

d. All Erosion Sedimentation and Pollution Control Plans must include a narrative section on the proper equipment and proper handling of petroleum to minimize spills and proper containment measures to be taken should a spill occur.

e. In the event of a release of petroleum into state waters, the following agencies must be notified immediately, no later than 24 hours after the occurrence:

1. WSA Engineering Department (770-949-7617) or WSA inspector

2. Georgia EPD UST Office 1-800-241-4113

3. National Response Center 1-800-424-8802

f. Any petroleum release must be remediated immediately. Sampling and remediation must comply with standards set forth in the Georgia Rules for Underground Storage Tank Management (391-3-15)

5. Polymer Usage

a. Provide plan showing location of specific polymers and application rates.

b. Provide soil analysis report and recommended polymers and application rates.

c. Provide toxicity reports for polymers. Polymers shall meet or exceed local, state, and federal toxicity requirements.

6. Information To Be Shown on the Erosion Sedimentation and Pollution Control Plan (ESPCP)

a. Sheet size is 24 inches x 36 inches. "Half-size" drawing sets will not be reviewed and will be returned to the owner/developer.

b. Certifications.

1. The following Certification Paragraph must be shown on the drawings undersigned by a Design Professional.

   "I certify that the permittee's Erosion, Sedimentation, and Pollution Control Plan provides for an appropriate and comprehensive system of best management practices required by the Georgia Water Quality Control Act and the document "Manual for Erosion and Sediment Control in Georgia" (Manual) published by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity was permitted, provides for sampling of the receiving water(s) or the sampling of the stormwater outfalls and that the designed system of best management practices and sampling methods is expected to meet the requirements contained in the General NPDES Permit No. GAR 10000(1,2 or 3)."

2. The following Certification Statement must be shown on the drawings undersigned by a Design Professional.

   "I certify under penalty of law that this Plan was prepared after a site visit to the locations described herein by myself or my authorized agent, under my supervision."

3. The following Certification Statement must be shown on the drawings undersigned by the Owner/Permittee.

   "I certify that to the best of my knowledge and belief, that the Erosion, Sedimentation and Pollution Control Plan (Plan) was prepared by a design professional, as defined by this permit, that has completed the appropriate certification course approved by the Georgia Soil and Water Conservation Commission in accordance with the provisions of O.C.G.A. 12-7-19 and that I will adhere to the Plan and comply with all requirements of this permit."

c. Information to be Shown on Design Drawings.

The following must be shown on the site design drawings:

1. Stamp and signature of a Licensed Professional

2. Site location and vicinity map with street names (may be omitted from ESPCP if included elsewhere in the set of design drawings).

3. Extents of 100-year base flood plain and corresponding FEMA/FIRM map panel number.

4. Graphic scale and north arrow indicating magnetic north. Scale shall be sufficient to show details. The Authority may specify a maximum allowable scale.

5. Existing and proposed ground contour lines with interval not to exceed 2 feet.

6. Soil series types and delineation.

7. Contact information for local 24-hour contact responsible for erosion, sedimentation and pollution control.

8. Location of all on-site water bodies including the designation of all state waters on site. Also, show all off-site state waters with 200 feet and receiving waters. Offsite topography and receiving waters may be shown and a scale larger than the maximum allowed for design drawings.

9. Show 25-foot state buffers adjacent to state water where vegetation has been wrested by normal stream flow. Also show Authority buffers as follows:

   a. Dog River Basin — 200-foot buffers

   b. Bear Creek Basin — 100-foot buffers

   c. Sweetwater Creek Basin — 100-foot buffers on all perennial streams that are tributary to Sparks Reservoir and are within a seven (7) mile radius of the reservoir boundary

   d. All other streams — 50-foot buffers

10. Location and delineation of all wetlands, ponds, marshes, and other environmentally sensitive areas.

11. Location of erosion sedimentation and pollution control measures and practices using the uniform coding system provided in the "Manual for Erosion and

Sediment Control in Georgia," latest edition. The plan shall include a minimum of three phases of design, including:

a. Initial Controls

b. Intermediate Controls

c. Final Controls

12. All disturbed areas on individual lots shall have sod and/or landscaped areas consisting of established vegetation and mulch for final stabilization. Seed and straw is not acceptable as final stabilization for residential lots.

13. Delineation of all areas to be disturbed and all areas not to be disturbed.

14. All existing and proposed structures, utilities, and pavements.

15. All proposed landscaping (may be omitted from ESPCP if included elsewhere in the set of design drawings).

16. Location of stormwater outfalls and discharges into state waters.

17. Location of all proposed sample collection stations.

18. Location of all trash receptacles / dumpsters.

d. Details.

1. For each erosion, sedimentation, or pollution control plan provide design details as needed so that the control device can be properly installed. Use details from the "Manual for Erosion and Sediment Control" where possible. Where controls are used that are not in the manual, the Licensed Professional shall furnish adequate details.

2. Provide a chart or timeline of the intended sequence of major activities that disturbs soils. Include all erosion sedimentation and pollution controls shown on the design drawings and indicate when each is to be installed within each phase of construction (initial, intermediate or final).

e. Narrative.

The ESPCP shall contain a narrative section containing description and clarification of the following:

1. Description of the project and the nature of proposed construction activities.

2. Total site acreage.

3. Total disturbed acreage.

4. Summary of key hydrology data such as peak flows and runoff coefficients for pre- and post-development. Supporting data and calculations do not need to be supplied in the ESPCP if a suitable Stormwater Management Report has been submitted.

5. Description of soil types and ground cover.

6. Description of receiving water bodies.

7. List of secondary permittees (only for common developments – GAR 100003)

8. List of all on-site pollutant sources (existing and proposed regardless of ownership) along with description of proposed controls and procedures to minimize the risk of pollutant release.

9. Description of stream buffer requirements and proposed controls and procedures to protect buffers.

10. If no state waters are present, add the following note in bold: **No state waters or wetlands are located on or within 200 feet of this project.**

11. Description of installation methods for each erosion, sedimentation and pollution control practice to include structural and vegetative measures.

12. Description of inspection requirements including what areas are to be inspected and what is to be inspected for each of the following:

    a. Daily inspections

    b. Weekly inspections (bi-monthly if infrastructure project – GAR100002)

    c. Monthly inspections

    d. Inspections after every ½ inch storm event

13. Description of minimum qualifications of inspectors.

14. Description of requirements for monthly inspection reports to be kept on site.

15. Description of procedure for revision of the ESPCP.

16. Description of maintenance procedures for each erosion, sedimentation, and pollution control device to include structural and vegetative measures.

17. Description of sampling requirements and narrative instruction on collection methods for each of the sampling locations indicated on the design drawings.

18. Description of methods to be used in the transport and analysis of samples collected. Include identification of analytical method and required quality assurance/quality control measures.

19. Description of requirements for monthly monitoring report and address to where it is to be sent.

20. Description of allowable NTU concentrations for each outfall to be sampled and allowable NTU increase in each receiving water to be sampled.

21. Rationale for designation of representative streams (only for infrastructure projects – GAR 100002).

22. Description of qualifying sampling events and time limitations relative to sample collection, transportation, and analysis.

23. Description of non-stormwater discharges anticipated for the project including pollution prevention practices required to prevent discharges of pollutants to surface water. Address all existing and proposed sources of non-stormwater runoff.

f. Notes to be Shown on Plans

The following standard notes must be included in the order shown on the design drawings (may be omitted from ESPCP if included elsewhere in the set of design drawings):

1. The escape of sediment from the site shall be prevented by the installation of erosion and sediment control measures and practices prior to land disturbing activities.

2. Erosion control measures will be maintained at all times. If full implementation of the approved plan does not provide for effective erosion control, additional erosion and sediment control measures shall be implemented to control or treat the sediment source.

3. All disturbed areas must be stabilized with mulch or temporary seeding as soon as possible but not longer than 14 days after disturbance.

4. Notify the Douglasville-Douglas County Water and Sewer Authority at least 72 hours prior to commencement of land disturbing activities. An inspector will be assigned, and a pre-construction meeting held prior to commencement of land disturbance.

5. All contractors for erosion sedimentation and pollution control shall be approved by the Authority.

6. The contractor must notify the Utilities Protection Center at 1-800-282-7411 at least 72 hours prior to commencement of land-disturbing activities.

7. Stripping of vegetation, re-grading, and other development activities shall be conducted in such a manner to minimize erosion.

8. Cut and fill operations shall be kept to a minimum.

9. Development plans must conform to topography and soil type, to create the lowest practicable erosion potential.

10. Whenever feasible, natural vegetation shall be retained, protected, and supplemented.

11. Disturbed areas and their duration of exposure to erosive elements shall be kept to a practicable minimum.

12. Disturbed soil shall be stabilized as quickly as practicable.

13. Temporary vegetation or mulching shall be employed to protect exposed critical areas during development.

14. Permanent vegetation and structural erosion control measures shall be installed as soon as practicable.

15. To the extent necessary, sediment in run-off water shall be trapped by the use of debris basins, sediment basins, silt traps, or similar measures until the disturbed area is stabilized.

16. Adequate provisions shall be provided to minimize damage from surface water to the cut face of excavations or the sloping surfaces of fills.

17. Cuts and fills shall not endanger adjoining property.

18. Fills shall not encroach upon natural watercourses or constructed channels in a manner that would adversely affect other property owners.

19. Grading equipment must cross flowing streams by the means of bridges or culverts, except when such methods are not feasible, provided in any case that such crossings shall be kept to a minimum and that a properly designed temporary stream crossing is constructed in accordance with state and local regulations.

20. Provisions shall be provided for treatment or control of any source of sediments and adequate sedimentation control facilities to retain sediments on site or preclude sedimentation of adjacent waters beyond the levels specified in this permit.

21. No construction activities shall be conducted within a 50-foot buffer along the banks of all state waters (as measured horizontally from the point where vegetation has been wrested by normal stream flow or wave action) unless a formal waiver has been granted by the Authority.

22. Where the Authority grants a waiver, no construction activities shall be conducted within a 25-foot state buffer without full compliance of state regulations and obtaining a variance if applicable.

23. Except as provided above, for required buffers no construction activities shall be conducted within a buffer and a buffer shall remain in its natural, undisturbed, state of vegetation.

24. No land disturbing activities shall be conducted in a buffer. Once the final stabilization of the site is achieved and a valid Notice of Termination is submitted, a buffer may be thinned or trimmed of vegetation so long as a protective vegetative cover remains to protect water quality and aquatic habitat and a natural canopy is left in sufficient quantity to keep shade on the streambed.

SECTION SIX
CONSTRUCTION STANDARDS -WATER

1.0 SCOPE

This specification covers the material requirements and installation procedures for all water pipe, structures, and appurtenances to be accepted into the Douglasville-Douglas County Water and Sewer Authority ("Authority") water system. However, this does not limit the Authority's ability to require and/or accept other materials, construction techniques, or engineering, when deemed appropriate by the Authority. Any water pipe, structures, or appurtenances which the Authority has reason to believe is not in conformance with these specifications will not be accepted.

2.0 QUALITY ASSURANCE

2.1 Applicable Standards

The contractor shall supply all products and perform all work in accordance with WSA Design & Construction Standards, applicable standards from American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), and the Georgia EPD Minimum Standards for Public Water Systems. Latest revisions of all standards are applicable.

2.2 Quality Assurance

If requested by the Authority, the contractor shall submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two years.

2.3 Substitutions

Whenever a product is identified in the specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, etc., the contractor may freely choose from those referenced products which ones he wishes to provide. Any item or product other than those so designed shall be considered a substitution. The contractor shall obtain prior approval from the Authority for all substitutions.

3.0 ACCEPTABLE MATERIALS

The contractor shall furnish all pipe fittings, valve tapping sleeves, hydrants and all other material required for the completion of the work as shown on the approved drawings or indicated by these specifications. The contractor shall only furnish materials in accordance with the following:

3.1 Pipe Materials

3.1.1 Ductile Iron Pipe and Fittings: (3-inch diameter through 64-inch diameter)

The Authority will only accept Ductile Iron Pipe totally manufactured in the United States and supplied by ACIPCO, Griffin, McWane, or U.S. Pipe.

Ductile iron pipe shall be minimum class 50 cement lined and conform to AWWA C104 (Note: Where pipe provided is "pressure class," 350 PSI class shall be substituted for class 50 Ductile Iron Pipe unless otherwise specified in the contract documents, project design, or design engineer). The exterior of ductile iron pipe shall be coated with a layer of arc-sprayed zinc. The mass of the zinc applied shall be 200 g/m2 of pipe surface area. A finishing layer topcoat shall be applied to the zinc. The mean dry film thickness of the finishing layer shall not be less than 3 mils with a local minimum not less than 2 mils. All pipe shall be manufactured and coated in the United States at the pipe manufacturer's facility.

Pressure pipe class and standard pipe class pipe thickness shall be determined by AWWA C150 Standards by an internal pressure of 350 psi working pressure, or an external loading, whichever loading yields the thickest pipe. Minimal external loading shall be determined from 2.5 feet cover, AWWA type 1 trench, American Association of State Highway Transportation Official (AASHTO) H-20 line loading, or greater external loading if depth of cover yields a thicker pipe using AASHTO H-20 loading with AWWA type 1 trench conditions.

Joints shall be push-on type, for pipe and standard mechanical joints for fittings. All joints on pipe within casing shall be restrained. Push-on mechanical joints shall conform to AWWA C111. Restrained joint pipe (RJP) shall be either the bolted joint type, or modified push-on type with joint restraint using ductile iron components. Restrained joint pipe where required shall be American, U.S. Pipe or equal as approved by the Authority. The use of locking type gaskets may be allowed where the Authority deems appropriate.

Fittings shall conform to AWWA C110, or AWWA C153 with minimum rated working pressure of 250 PSI. Ductile iron pipe fittings shall be produced in accordance with all applicable terms and provisions of ANSI/AWWA C153/A21.53 and ANSI/AWWA C111/A21.11. Fittings shall be cement lined and seal coated in accordance with ANSI/AWWA C104/A21.4.

The contractor is to provide the appropriate gaskets for mechanical or flange joints. Gaskets for flange joints shall be made of 1/8-inch thick cloth reinforced rubber; gaskets may be ring type or full-face type. Gaskets shall

be yellow or orange in color and color shall be consistent throughout the entire cross-section of the gasket. The color shall not be attained by surface coating; it shall be inherent within the rubber.

The contractor is to provide the necessary bolts for mechanical or flange connections. Mechanical or flange connections shall be steel with American regular unfinished heads. Nuts shall be steel with American Standard regular hexagonal dimensions, all as specified in AMSI B 17.2, and AWWA C111. All bolts and all nuts shall be treated in accordance with ANSI B 1.1, Coarse Thread Series, Class 2A and 2B fit.
All pipes shall be furnished in lengths of at least 18 feet and fully gauged per AWWA Standards.

Material acceptance will be on the basis of the Authority's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.

3.1.2 Polyvinyl Chloride (PVC) Pipe (2 inch, 4 inch)

PVC pipe material shall be used as casing material only for copper service lines and shall be a minimum of Class 200.

3.1.3 Copper Pipe and Fittings (3/4 inch – 2 inch)

Copper pipe shall be type "K" soft drawn copper water tube packed in coils or cartons when specified. (ASTM B88) AWWA C800.

Copper pipe fittings shall be compression type brass. Tail pieces and meter couplings shall be cast brass threaded type. Copper Alloy No. C83600, ASTM B62 or ASTM B584.

3.2 Valves

Buried valves shall be equipped with cast iron valve boxes. Extension stems will be provided where required. Valves shall be manufactured by Mueller, U.S., M & H, Clow, Kennedy, American Flow Control or equal as approved by the Authority.

Curbing shall be marked using an approved method of cutting symbols into the top of the curb ("W" for water service and "V" for valves). Where no curbing exists, concrete valve markers shall be installed for each valve excluding fire hydrant valves. Valve markers, where appropriate, shall be located at the back of the right-of-way.

3.2.1 Gate Valves

Gate valves shall be required for diameters of 3 - 10 inches and shall be resilient seat type conforming to the requirements of AWWA C509 or AWWA C515 with flanged, and mechanical joint ends. Valves shall be furnished with O-ring type stem seals. All valves shall open in a counterclockwise direction and close in a clockwise direction.

3.2.2 Butterfly Valves

Butterfly valves shall be required for diameters of 12 inches and larger and shall conform to AWWA Standard C504 with flanged, and mechanical joint ends.

3.3 Backflow Preventers

Backflow preventers shall be the reduced pressure zone type, double check type, or dual check type (for residential use only) as determined by the Authority on a case-by-case basis. Backflow preventers shall conform to current requirements (ASSE, or USC-FCCC) and be certified by a USC laboratory. The installation shall meet all applicable State, and AWWA M-14, and local codes. Backflow preventers shall be manufactured by Hersey (Becco), Watts, Febco, Ames or approved equal. For buildings located where there is insufficient space between the right-of-way and the building, the location of the backflow preventer may be determined on a case-by-case basis at the sole discretion of the Authority.

Sizes 3/4 inch through 2-inch shall have bronze bodies with threaded connections and bronze union on either side of the device.

Sizes 3 inch and larger shall be bronze or iron bodied with corrosion resisting moving parts and trim and flange connections.

3.3.1 Reduced Pressure Assemblies

Facilities using hazardous chemical or biological substances, including, but not limited to hospitals, medical clinics, veterinary clinics, and pest control facilities shall be equipped with reduced pressure zone (RPZ) backflow preventers with a fixed air gap. Reduced pressure zone (RPZ) backflow preventers shall also be required on all shell buildings and master metered developments. The device shall be equipped with four leak-proof test cocks for 5/8 inch and larger devices. A fixed air gap, or funnel, shall be installed at the relief port. A drain line shall be piped from the discharge side of the air gap and shall be supported independently from the device. The lowest point of the RPZ shall be a minimum of 12-inches above the floor drain for indoor applications or 12-inches above the drain flap invert for outdoor applications.

An auxiliary check valve and strainer shall be installed upstream of the device. Valves shall be installed upstream and downstream of the device.

3.4 Corporation and Curb Stops

Corporation and curb stops shall be ball valve type, shall be made of bronze conforming to ASTM B 61 or B 62, and shall be suitable for the working pressure of 175 PSI or greater.

Ends shall be suitable for compression type joint. Threaded ends for inlet and outlet of corporation stops shall conform to AWWA C 800; couplings not for connection to flared copper tubing shall conform to ANSI B 16.26. Corporation stops shall be manufactured by Hays, (Lee Brass) (5200 CF) Mueller (H-15008) Ford (F10003G) and/or McDonald (4701BT) or approved by the Authority. Curb stops shall be manufactured by Hays (Lee Brass) (4302CFW), Mueller (B25170R), Ford (B41233WG) and/or McDonald (6102WT) or approved by the Authority.

3.5 Residential Service Line Shutoff Valve

A shutoff valve shall be installed on all residential service lines immediately downstream of the backflow preventer. The shutoff valve shall be made of bronze conforming to AWWA Standard C800 and ASTM B-62, shall be quarter-turn ball valve type with lever handle, and shall be manufactured by Ford Meter Box Company or approved equal. The shutoff valve shall be installed in a separate valve box manufactured by DFW, Ametek, Carson Brooks or approved equal.

3.6 Valve Boxes

All valves shall be equipped with valve boxes. Valve boxes shall be heavy roadway type. The valve boxes shall be cast iron two-piece screw type with drop covers. The valve boxes shall be adjustable up or down from the nominal required cover over the pipe. Typical valve box details are included in the Appendix. All valve boxes shall be manufactured by Higgins Foundry, U.S. Foundry, Tyler Pipe, Opelika or as approved by the Authority.

3.7 Tapping Sleeves and Valves

Tapping sleeves greater than two inches shall be of the split sleeve, mechanical joint type. Valves shall be gate valves furnished in accordance with the specifications shown above, with flanged connection to the tapping sleeve and mechanical joint connection to the branch pipe. The necessary bolts, glands, and gaskets shall be furnished. Tapping sleeves and valves shall be cast iron or ductile iron. Prefabricated tapping sleeves may be used on PVC and AC Pipe upon approval by the Authority.

3.8 Tapping Saddles

Tapping saddles up to two inches shall be ductile iron body type with O-ring gasket and alloy steel double straps. Connection shall be threaded as required. Tapping saddles shall be manufactured by Smith Blair, Mueller, Ford, Dresser or equal as approved by the Authority.

3.9 Meter Boxes for 3/4 Inch x 5/8 Inch Meters

Meter boxes shall be manufactured in the United States and made from high density polyethylene. Meter boxes shall be 12 inches in height and the bottom shall not be less than 18 inches in length x 13inches in width. Meter boxes shall be DFW, Ametek, Carson Brooks Plastic or approved equal. Lids shall be AMR/AMI radio compatible, consistent with the lids currently being used by the Authority and manufactured by DFW or approved equal.

3.10 Fire Hydrants

All fire hydrants shall conform to the requirements of AWWA C502 for 150 PSI working pressure and NFPA 1993 addition. Hydrants shall be the compression type, closing with line pressure. The valve opening shall not be less than 5 1/4 inches. All valves shall open counterclockwise.

In the event of a traffic accident, the hydrant barrel shall break away from the standpipe at a point above grade and in a manner which will prevent damage to the barrel and stem, preclude opening of the valve, and permit rapid and inexpensive restoration without digging or cutting off the water. The means for attaching the barrel to the standpipe shall permit facing the hydrant a minimum of eight different directions.

Hydrants shall be fully bronze mounted, with all working parts of bronze. Valve seat ring shall be bronze and shall screw into a bronze retainer.

All working parts, including the seat ring, shall be removable through the top without disturbing the barrel of the hydrant. The opening nut shall match those on the existing hydrants. The opening threads shall be totally enclosed in an operating chamber separated from the hydrant barrel by a rubber O-ring stem seal and lubricated by a grease or oil reservoir.

Hydrant shall be a non-freezing design and be provided with a simple, positive, and automatic drain, which shall be fully closed whenever the main valve is opened.

Hose and pumper connections shall be threaded and pinned to seal them permanently to the hydrant barrel.

Each hydrant shall have two 2 ½-inch hose nozzle connections using Douglasville-Douglas County Water and Sewer Authority's standard threads (7.5 per inch) per

National Standard Specs and one 4 ½-inch nominal size connection with National Standard threads (4 per inch). Each connection shall be equipped with cap and chain.

Hydrants shall be furnished with a mechanical joint shoe connection to the spigot of the 6-inch hydrant lead.

Minimum depth of bury shall be 4.0 feet or as existing water main depths dictate. Provide extension section where necessary for vertical installation and in accordance with manufacturer's recommendations.

Fire hydrants shall be factory painted silver.

Hydrants shall be Mueller: Model Super Centurion 250, #A-423; M&H Valve Company: Model 129T; U.S. Pipe: Model Metropolitan; American: Model American-Darling B-84-B-5; EJ: Model WaterMaster 5CD250 or equal as approved by the Authority.

3.11 Fire Lines

A fire line meter and double check backflow preventer shall be installed on all privately owned fire lines. If a commercial development is not master metered, each lot may be required to have a fire line meter and double check backflow preventer as determined by the Authority on a case-by-case basis. The meter shall be installed in a vault and located in the public right-of-way. The backflow preventer shall be installed in a vault and located on private property. Fire line meters shall be the same size as the installed fire line and shall be manufactured by Badger Meter, Inc. or an Authority approved equal. Subject to the approval of the Authority, the owner may request an alternate meter size by providing (1) certification by a Professional Engineer licensed in the state of Georgia and (2) approval of the Fire Marshall.

When installing meters 3" and larger with a strainer, a minimum of five (5) pipe diameters of straight run pipe (can include components that are fully open in their normal operating position) is required upstream and along with a minimum of two (2) pipe diameters downstream of the meter/strainer assembly.

There will be no impact fee charged for the fire line meter. However, the actual cost of the meter will be the responsibility of the owner.

For one and two family residential structures that have a combined domestic and fire line service, meters shall meet AWWA Standard C714-13 and the minimum allowable meter size shall be ¾-inch. The owner/developer is responsible for sizing the service line and meter to provide domestic and fire flow.

3.12 Material Inspection and Acceptance

Acceptance of all water pipe and appurtenances shall be on the basis of the Authority's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with all applicable standards, latest revisions.
Each pipe shall be clearly marked as required by the governing ASTM Standard Specifications to show its class, date of manufacture and the name and trademark of the manufacturer.

Latitudes in workmanship and finish allowed by the ASTM Specifications notwithstanding, all pipe shall be first quality, have smooth exterior and interior surfaces and be free from cracks, blisters and other imperfections, and true to theoretical shapes and forms throughout each length. All pipe shall be subject to inspection by the Authority at the pipe plant, trench and other points of delivery for the purpose of culling and rejecting pipe, independent of laboratory tests. Pipe that does not conform shall be marked as such by the Authority and shall not be delivered or used in the work. On-the-job repairing of rejected pipe will not be permitted.

Any pipe or special items which have been broken, cracked or otherwise damaged before or after delivery or which have failed to meet the required tests, shall be removed from the site of the work and shall not be used therein.

4.0 HANDLING MATERIALS

4.1 Unloading

The contractor shall furnish equipment and facilities for unloading, handling, distributing, and storing pipe, fittings, valves, and accessories. The contractor will have equipment available at all times for use in unloading. Any materials dropped or dumped will be subject to rejection by the Authority without additional justification.

4.2 Handling

The contractor will handle pipe, fittings, valves and accessories carefully to prevent shock or damage. Pipe should be handled by rolling on skids, forklift, or front loader. The contractor shall not use material damaged in handling.

4.3 Distribution

The contractor shall distribute and place pipe and materials so as not to interfere with traffic. Pipe shall not be strung more than 1,000 feet beyond the area where pipe is being laid. Drainage ditches shall not be obstructed.

4.4 Storage

The contractor shall store all pipe that cannot be distributed along the route. The contractor shall make arrangements for the use of suitable storage areas.

5.0 CLEARING

The contractor shall clear the entire width of the permanent easement prior to trenching. All trees, growth, debris, stumps, and other objectionable matter shall be removed. Clearing of the construction easement is permitted, with special care taken to adhere to the requirement of Paragraph 20.0. All unsuitable material shall be removed from the easement.

6.0 EXCAVATION

The contractor shall excavate all materials encountered, including rock, and dispose of excess excavated material not required for backfilling. All excavation shall be performed in accordance with applicable local, state, and federal regulations, including the Occupational Safety and Health Act of 1970 (PL 91-596).

6.1 Depth of Trenches

The contractor shall excavate trenches to provide a minimum cover of four feet above the top of the pipe. Within the right-of-way of highways, streets, or roadways, the contractor shall excavate to place the top of the pipe a minimum of four feet below the nearest pavement edge.

6.2 Width of Trenches

Trenches shall be excavated wide enough to allow proper installation of pipe, fittings, and other materials and not less than six inches clear of the outside barrel of the pipe on any side at any point.

6.3 Bell Holes

At each joint, the contractor shall excavate bell holes of ample depth and width to permit the joint to be made properly and to relieve pipe bell of any load.

6.4 Earth Excavation

The contractor shall excavate and prepare the trench bottom to support the pipe uniformly throughout its length. For both ductile iron pipe and PVC pipe, the trench shall meet all requirements of Standard Laying Condition Type 2 in accordance with AWWA C600**.**

If the trench is excavated to excessive width or depth, as determined by the Inspector, the contractor shall provide a crushed stone bedding material meeting the

requirements of Georgia D.O.T. Specification 800.01 for No. 57 stone and bed the pipe to achieve Condition Type 4 in accordance with AWWA C600**.** Trench width, pipe bedding and installation shall be per the manufacturer's recommendation

6.5 Rock Excavation

6.5.1 Rock (Defined)

Any material that cannot be excavated with equipment having a minimum digging force of 25,000 pounds using a standard 3-foot bucket and occupying an original volume of at least 1/2 cubic yard.

6.5.2 Excavation

Where rock is encountered, the contractor shall excavate to the minimum depth and width, which will provide six inches clearance beyond the outside diameter of the pipe bell. Trench width, pipe bedding and installation shall be per the manufacturer's recommendations.

6.5.3 Blasting

Only licensed blasting contractors shall be employed, and all blasting shall be monitored by seismographs. Liability insurance shall be required in the amount deemed appropriate by the Authority. The contractor shall provide experienced workmen to perform blasting.

All blasting operations shall be conducted in accordance with all existing ordinances and regulations. The contractor shall protect all structures from the effects of the blast and repair any resulting damage.

6.5.4 Removal of Rock

The contractor shall not use excavated rock as backfill material. All rock which is surplus or not suitable for use as riprap shall be disposed of appropriately.

7.0 EXISTING UNDERGROUND UTILITIES AND OBSTRUCTIONS

It is the responsibility of the contractor to locate all existing utilities along the path of construction. Drawings shall indicate underground utilities or obstructions that are known to exist. Where these or unforeseen underground utilities are encountered, the location and alignment of the water main may be changed, upon written approval of the Authority, to avoid interference. It is the responsibility of the contractor to have all existing utilities located prior to any trenching operation. Any utility that may be damaged in this operation will be at the expense of the contractor.

7.1 Abandoning Existing Water Lines

7.1.1 Water System Mains

The Authority must expressly approve all water system mains that are to be removed from service and abandoned prior to their removal. The Authority may also require replacement of water lines encountered during construction that are not made of ductile iron pipe. The requirements for removing a water system main from service include but are not limited to the following:

1. The developer shall be responsible for physically disconnecting the proposed abandoned main from the Authority's water distribution system. All penetrations into the Authority's system from the abandoned main shall be capped off and sealed to the Authority's satisfaction.

2. The replacement main must be no less than the size of the existing main. The Authority, in its sole discretion, may require the existing water main to be replaced with a larger sized main.

3. The developer shall be responsible for connecting all existing WSA customers, fire lines and taps that are served by the existing water main onto the replacement main. All costs of connecting existing WSA customers, fire lines and taps to the replacement main, including ancillary costs (e.g., meter and service line relocation, etc.), shall be borne by the developer.

4. Replacement fire hydrants and their installation shall be in accordance with current Authority standards.

5. The contractor shall formulate a plan to minimize service interruptions to existing WSA customers. Said plan shall be subject to review and approval by the Authority.

6. The replacement line shall meet all construction standards as stipulated in the latest edition of these specifications.

7.1.2 Water Service Lines

Water service lines that are to be removed from service shall be terminated at the corporation stop.

8.0 LAYING AND JOINTING PIPE AND FITTINGS

The contractor shall lay all pipe and fittings to accurately conform to the lines and grades and shown on the drawings previously approved by the Authority as follows:

8.1 Pipe Handling

The contractor shall lower pipe, fittings, valves and accessories into the trench by suitable means. The contractor shall not drop or dump pipe or accessories into the trench.

The contractor shall clean pipe and fittings thoroughly with vegetable soap and water before laying. Care shall be taken to keep the pipeline clean until final acceptance.

If any pipe or other material is discovered to be defective or damaged after being laid, the contractor shall remove and replace it.

8.2 Pipe Alignment and Gradient

The contractor shall lay pipe straight in alignment of gradient or follow true curves as nearly as practical.

No joints shall be deflected more than the maximum deflection allowed by the manufacturer. The contractor shall maintain a transit and accessories at the job site to lay out angles and ensure that deflection allowances are not exceeded.

8.3 Expediting Work

The contractor shall excavate, lay the pipe, and backfill as closely together as possible. Unjointed pipe shall not be left in the trench overnight. The contractor shall backfill and compact the trench as soon as possible after laying, jointing and inspection are completed.

The exposed end of the installed pipe shall be sealed with a mechanical joint plug each day at the close of work and at all other times when work is not in progress. If necessary, to backfill over the end of an uncompleted pipe, the end shall be closed with a mechanical joint plug. However, backfilling shall commence only after inspection.

8.4 Laying Pipe in Trenches

The contractor shall lay the pipe with solid bearing throughout its length as described below:

8.4.1 Earth Trenches

The bottom of the trench shall be graded to a true line. The pipe shall be laid in clean bedding material, free of rock, organics, and other materials which, in the opinion of the inspector, are unsuitable. All pipe shall be installed and bedded per the manufacturer's recommendations.

8.4.2 Rock Trenches

The pipe shall be bedded in at least six inches of granular bedding material. The contractor shall backfill with the same material to at least two feet above the pipe. All pipe shall be installed and bedded per the manufacturer's recommendations.

8.4.3 Wet Trenches

Pipe shall not be laid in water. The contractor shall provide dewatering equipment to maintain a ground water level below the bottom of the pipe while pipe is being laid. Any damage that may result from the contractor's dewatering processes is the responsibility of the contractor.

8.5 Jointing

All joints shall be made in accordance with all applicable ASTM and ANSI/AWWA Standards.

9.0 CONNECTIONS TO EXISTING PIPELINES

Before laying pipe, the contractor shall locate the points of connection to existing pipelines and uncover them as necessary for the Authority to confirm the nature of the connection to be made. The contractor shall furnish all materials and make the connection to all existing pipelines.

The contractor will be charged a connection fee to cover the expenses of the Authority. All taps being made into existing pressurized lines shall only be made by WSA approved contractors with the Authority's inspection and using a method recommended by the DIPRA or the Uni-Bell Association. The Authority may, at its sole discretion, choose to perform the final tie-in to the system and charge the developer a rate specified in the Authority's Rules and Regulations. Tie-in to the existing system shall be the final act of the project and under no circumstances shall the tie-in be performed without Authority approval. Any communication with the public concerning temporary service outages or any other activities associated with the project shall be subject to the approval of the Authority. This shall include, but is not limited to, installation of individual fire hydrants, services, fire service, etc.

10.0 THRUST RESTRAINT

The contractor shall provide a restraint at all points where hydraulic thrust may develop. Restraints shall have a minimum design safety factor of 2.5 and shall be certified by a Professional Engineer registered in the State of Georgia. The contractor shall install eyebolts and rods as required on all associated fittings, valves, and related piping.

10.1 Retainer Glands

Retainer glands shall be equal to ACIPCO A 90875.

10.2 Concrete Blocking

Concrete blocking shall be provided for all other bends, tees, valves, and other points where thrust may develop. Concrete shall have a compressive strength of not less than 3000 PSI, with not less than 5.5 bags of cement per cubic yard and a slump between 2 ½ to 4 inches. For job mixed concrete, the contractor shall submit the concrete mix design for approval by the Authority. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C94. Reinforcing steel shall conform to the requirements of ASTM A615, Grade 40.
The contractor shall form and pour concrete blocking at fittings as shown on the construction drawings as designed by the developer's Professional Engineer licensed in the State of Georgia and as directed by the Authority.

Blocking shall be poured against undisturbed earth. Increase dimensions when required by over excavation. Concrete shall not cover bolts or nuts. Precast thrust blocks are unacceptable without prior approval.

11.0 BACKFILLING

The contractor shall backfill and compact the soil to prevent settlement and displacement of the pipe. Before heavy construction equipment is permitted to cross over a pipe, an earth fill shall be constructed to an elevation of at least three feet over the top of the pipe or to an elevation as required by the manufacturer, whichever is greater.

11.1 Suitable Material

The contractor shall backfill trenches with earth only. Rock material excavated from trenches shall not be used in the backfill material. If necessary, the contractor shall furnish suitable earth material to backfill the trench.

11.2 Backfilling Procedure

The contractor shall place initial backfill material in the bottom of the trench and up to two feet above the pipe in 6-inch layers. The material shall be compacted in place one on each side and top of the pipe.

The contractor shall place and compact final backfill material in 12 inch layers if mechanical tamping equipment is used to achieve proper compaction. Final backfill material may be placed in 2-foot layers when compacting with heavy tamping equipment.

11.3 Backfill Under Roads

Backfill underlying pavement and backfill under dirt and gravel roads shall be compacted to 95% of the maximum dry density as determined by the Standard Proctor Compaction Test (ASTM D 698). Compaction test may be required in existing or proposed streets, sidewalks, drives, and other existing or proposed paved areas at varying depths and at intervals determined by the Authority engineer with a maximum of one required test for each 400 feet of water main construction, unless soil conditions or construction practices in the opinion of the Authority engineer warrants the need for additional tests.

11.4 Settlement

If the trenches settle, the contractor shall refill and grade the top of the trench to conform to the adjacent surface.

12.0 CONSTRUCTION ALONG HIGHWAYS, STREETS, ROADWAYS AND STREAMS

12.1 Conformance with Governmental Agencies

The contractor shall comply with all construction operation requirements, safety requirements, traffic control requirements, road maintenance requirements and repair requirements of the City of Douglasville, Douglas County and/or the Georgia Department of Transportation while installing any water line and/or appurtenance along highways, streets and roadways. As required, WSA shall procure D.O.T. and county permits necessary to complete the project. The contractor shall be responsible for obtaining any and all permits from other governing bodies necessary to complete the project.

These other permitting agencies may include but are not necessarily limited to the following:

1. City of Douglasville
2. Douglas County
3. Georgia Environmental Protection Division (EPD)
4. United States Department of Agriculture – Natural Resources Conservation Service (USDA – NRCS)
5. United States Army Corps of Engineers

12.2 Protection of Traffic

The contractor is to provide and maintain suitable signs, barricades, and lights for protection of traffic. All highway signs removed for construction shall be replaced at the end of each day. The contractor shall not close or block any highway, street, or roadway without first obtaining permission from the proper authorities. The contractor shall provide trained and Georgia D.O.T. certified flagmen to direct and expedite the flow of traffic.

12.3 Construction Operations

The contractor is to perform all work along highways, streets and roadways to minimize traffic interference.

12.3.1 Stripping

Where the pipeline is laid along road shoulders, the contractor shall strip and stockpile all sod, topsoil, and other material suitable for shoulder restoration.

12.3.2 Trenching, Laying and Backfilling

Trench excavation shall not be open cut any further ahead of pipe laying operations than is necessary. The contractor shall backfill and remove excess material immediately behind laying operations. Complete excavation and backfill for any portion of the trench in the same day. All lines shall be plugged at the end of each day.

12.3.3 Shaping

The contractor shall reshape damaged slopes, side ditches and ditch lines immediately after completing backfilling operations. Topsoil, sod, and any other materials removed from shoulders shall be replaced.

12.4 Excavated Materials

The contractor shall not place excavated material along highways, streets, and roadways in a manner that obstructs traffic. All scattered excavated material shall be swept off the pavement. If all material cannot be removed from the pavement, the contractor is to notify the Governmental Agency having jurisdiction over the street or roadway so that they can assist the contractor in cleanup efforts. The contractor shall be responsible for any fees or damage resulting from construction activity.

13.0 REMOVING AND REPLACING PAVEMENT

13.1 Removing Pavement

The contractor shall remove existing pavement as necessary for installing the pipeline and appurtenances. The developer shall accept full responsibility for the pavement/roadway during all construction activities. The developer shall also be responsible for securing all pavement cut permits from City, or other governing authority.

WSA may procure permits from D.O.T. upon request from the developer. Prior to obtaining a D.O.T. permit, the Authority, in its sole discretion, may require the developer to post bond up to and including 100% of the cost of replacing the roadway impacted by the proposed construction activity.

13.1.1 Marking Pavement

Before removing any pavement, the contractor shall mark the pavement neatly paralleling the pipeline and existing street lines. The marks shall be spaced the width of the trench.

13.1.2 Breaking Pavement

The contractor shall break the asphalt pavement along the marks using jack hammers or by scoring with a rotary saw and breaking below the score by jack hammers or other suitable tools.

13.1.3 Machine Pulling Pavement

No pavement shall be pulled with machines until it is completely broken and separated from the pavement that is to remain.

13.1.4 Damage to Adjacent Pavement

The contractor shall not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, the contractor is responsible for removing and replacing the damaged pavement.

13.1.5 Sidewalks

Sidewalks shall be removed and replaced to their full width.

13.1.6 Curbs and Gutters

The contractor shall remove and replace or tunnel under any curb encountered.

13.1.7 Driveways

Driveways shall be removed and replaced to their full width to the satisfaction of the property owner.

13.2 Replacing Pavement

Upon completion of the placing and consolidation of the backfill, the contractor shall arrange to have the compaction tested by an independent testing laboratory approved by the Authority. After the compaction testing has been satisfactorily completed, the contractor shall replace all pavement, sidewalks and curbs that had to be removed.

13.3 Materials to be Replaced

The contractor shall place the materials for pavement to the dimensions shown on the drawings. The following types of sub-bases will be replaced:

13.3.1 Graded Aggregate Base

The contractor shall furnish graded aggregate base (GAB) in two sizes of such gradation that when combined in approximately equal quantities, the resulting mixture is well graded from course to fine and meets the gradation requirements of Section 816 of the Georgia D.O.T. standard specifications.

13.3.2 Black Base

The base for all paved roadways shall conform to the requirements of the Georgia State Highway Department of Transportation Specifications for the black base (Hot Mix). A Pug Mill Rotary Drum type mixer shall be used with a minimum capacity of not less than 50 tons per hour for asphalt production. The base shall be applied and compacted in two courses by asphalt spreader equipment of design and operation approved by the Authority. After compaction, the black base shall be smooth and true to establish profiles and sections.

13.3.3 Surface Course

The surface course for all pavement, including paint or tack coat when required by the governing agency, shall conform to the requirements of the Georgia State Highway Department of Transportation Specifications for Asphaltic Concrete, Section 400, Type "E" (Modified Top). The contractor shall produce the surface course in an asphalt plant of the same type as noted above for black base.

The surface course shall be applied and compacted in a manner approved by the Authority. Any high, low, or defective areas shall be immediately

corrected by cutting out the course, replacing with fresh hot mix, and immediately compacting it to conform and thoroughly bonding it to the surrounding area.

13.3.4 Concrete

The contractor shall provide concrete and reinforcing for concrete pavement in accordance with the requirements of the Georgia State Highway Department of Transportation Specifications for Portland Concrete Pavement.

13.4 Supervision and Approval of Pavement Restoration

Pavement restoration shall meet the requirements of the regulatory agency responsible for the pavement. The contractor shall obtain agency approval of all pavement restorations before requesting final payment. The contractor shall obtain the Authority's approval of pavement not the responsibility of a regulatory agency such as the City of Douglasville or the Douglas County Public Works.

13.4.1 Pavement Replacement

Prior to replacing the pavement, the contractor shall make a final cut in concrete pavement nine inches back from the edge of the trench. The contractor shall make the cut using a rotary saw. Asphalt pavement shall be removed nine inches back from the edge of the trench using jack hammers or other suitable tools. The contractor shall replace all street and roadway pavement as shown on the drawings. All driveways, sidewalks, and curbs shall be replaced with the same material and to the same dimensions as existing.

13.4.2 Pavement Failure

Should any pavement restoration or repairs fail or settle for a period of one year following construction, the contractor shall promptly restore or repair all defects. All paving replacements must be acceptable to the appropriate governing body.

14.0 BORING AND TUNNELING

The Authority may procure all bore permits from the D.O.T. at the request of the developer. Bonding provisions as noted in Section 14.1 shall apply. The developer is responsible for securing all bore permits from City, County, or other governing authorities. The contractor shall furnish and install tunnel liner or pipe casing and install the pipeline therein in accordance with the following specifications:

14.1 Well Pointing

The contractor shall operate well points or drainage systems in the vicinity of the tunnel or casing construction to prevent the accumulation of flood water in the tunnel or casing and to maintain the ground water table below the tunnel or casing invert.

14.2 Damage to Existing Structures

The contractor shall take precautions to construct the tunnel so that no settlement of the over passing roadway, railway or any other structure will occur. In order to prevent such settlement, the use of poling plates, breast boards, shields, and soil solidification or a combination of these methods may be necessary. The Authority shall not be responsible for any damage that may result from the tunnel construction.

14.3 Boring

The contractor shall furnish all material and equipment and perform all labor required to install steel pipe casing at the locations indicated on the drawings. Boring design and materials shall be per all AREA, AASHTO, Georgia D.O.T., and other applicable standards.

14.3.1 Casing Material and Size Requirements

Steel casing pipe shall be Schedule 30 steel pipe manufactured from steel conforming to ASTM A 139, Grade B. The steel sleeves shall be coated inside and outside with two coats of bitumastic paint prior to delivery on the job site. All casing size and thickness shall be as follows:

Casing Requirements Beneath Highways and Railroads
(All dimensions below are inches)

Pipe Diameter	Casing Diameter	Wall Thickness Under Highways	Wall Thickness Under Railroads
4	8	0.25	0.50
6	12	0.25	0.50
8	16	0.25	0.50
10	16	0.25	0.50
12	20	0.25	0.50
14	24	0.25	0.50
16	30	0.375	0.50
18	36	0.375	0.50
20	36	0.375	0.50
24	36	0.375	0.50
30	40	0.50	0.625

14.3.2 Joint Usage of Casing Pipe

The contractor shall not install any pipe in an existing steel casing that is being used for any other purpose without the written approval of the Authority.

14.3.3 Casing Pipe Installation

The contractor shall install the steel casing pipe by the dry boring method. The contractor shall bore the hole and install the casing through the soil simultaneously by a cutting head on a continuous auger mounted inside the casing pipe to the preceding section in accordance with the AWS recommended procedures. After the boring and installation of the casing is complete, the contractor shall install a cleaning plug on the rig and clean the casing.

14.3.4 Rock Formations

In the event that rock is encountered during the installation of the pipe casing that, in the opinion of the Authority, cannot be removed through the casing, the Authority shall direct the contractor to complete the crossing by installing a tunnel.

14.4 Tunneling

The contractor shall install the tunnel liner in strict accordance with the Department of Transportation (D.O.T.) and/or Railroad Company requirements. The contractor shall provide any special insurance coverage required by the governing body.

The tunnel installer shall have a minimum of five years of experience in the construction of tunnels of a similar size. The contractor shall submit evidence of the installer's experience for review by the Authority.

14.4.1 Blasting Permits

Prior to any work involving explosives the contractor shall make application to the D.O.T., or other appropriate agencies for a blasting permit. This permit will be in addition to any tunneling permit not involving explosives. The contractor shall comply with all requirements and conditions of the permits including required submittals.

14.4.2 Traffic Control Requirements

The contractor shall schedule the work so as not to interfere with or in any way endanger traffic flow on the highway or railway. The contractor shall provide all required safety measures as specified in the Georgia Manual on Uniform Traffic Control Devices.

14.4.3 Materials

Tunnel liner plates shall be manufactured from steel conforming with ASTM A569 with the following mechanical properties before cold forming:

Minimum tensile strength = 42,000 PSI
Minimum yield strength = 28,000 PSI
Elongation, two inches = 30%

Liner plates shall be 10 gauge, with the neutral axis diameter shown on the drawings for each crossing.

Minimum coatings required shall be galvanized in accordance with ASTM A 123 for liner plates and hot-dip galvanizing in accordance with ASTM A 153 for all other hardware. Additional protection required shall consist of a full bituminous coating meeting the requirements of ASSHTO M 190.

All plates shall be punched for bolting on both longitudinal and circumferential seams or joints and shall be so fabricated as to permit complete erection from the inside of the tunnel. The plates shall be equipped with 2-inch standard pipe half-couplings welded into a hole in the center of the plate for grouting of voids occurring outside of the liner. Couplings shall be fitted with threaded cast-iron plugs. Bolts shall be no less than 5/8-inch diameter. The contractor shall submit shop drawings showing details of the plates' size, length, and width for review by the engineer, the Authority and Georgia D.O.T.

14.4.4 Tunnel Construction Methods

After the tunnel has been completely constructed, the contractor shall thoroughly clean the interior and shall place structural quality concrete of a strength approved by the Authority within the invert of the tunnel. The contractor shall screen and trowel the top of the exterior of a pipe width placed on proper grade within the tunnel. As the pipe is jointed, it shall be drawn into position inside the tunnel.

Systems of standard pipe, fitting, hose, and special grouting outlets embedded in the liner places shall be provided by the contractor. Care shall be taken to ensure that the parts of the system are maintained free from dirt. Grout composed of cement, sand, and water shall be forced under pressure into the grouting connections. Grouting shall be started in the lower connections and shall proceed until grout begins to flow from upper connections. Connections shall then be made to these holes and the operation continued to completion.

Apparatus for mixing and placing grout shall be of a type approved by the engineer and the Georgia D.O.T. and shall be capable of mixing effectively

and stirring the grout and then forcing it into the grout connections in a continuous uninterrupted flow.

Liner plates shall be installed as soon as possible, but no more than five feet of tunnel shall remain unlined while tunneling operations are in progress. Not more than 1 foot of tunnel shall be left unlined at the end of the day's operation. The contractor shall locate the liner plates with grout couplings at the top of the tunnel at intervals not to exceed five feet. Additional plates with grout couplings shall be installed on each side of the tunnel between the top couplings.

After grouting is completed, pressure shall be maintained by means of stop cocks, or other suitable devices until the grout has set sufficiently. After the grout is set, grout holes shall be completely filled with dense concrete and finished neatly without evidence of voids or projections.

14.5 Installation of Pipe

After the installation of the casing or tunnel is complete, the contractor shall install the pipeline by a method that has received prior approval of the designing engineer and the Authority.

14.5.1 Pipe Closure

The contractor shall close the ends of the casing with 4- inch brick walls, plastered with Portland cement mortar. Brick and mortar shall meet the requirements for manhole materials.

14.5.2 Tunneling Closure

A brick bulkhead shall be constructed at both ends of the tunnel with a drain at the lower end. The bulkhead shall be a three-course mortared brick wall, plastered with Portland cement mortar and waterproofed with asphaltic roofing cement. Brick and mortar shall meet the requirements for manhole materials.

14.6 Boring Safety

The contractor shall provide all necessary bracing, bulkheads, and shields to ensure complete safety to all traffic at all times during the boring operation. All work shall be performed in such a manner as to not permanently damage the roadbed or interfere with normal traffic over it. The Authority will not be responsible and shall be saved harmless, in the event of delays to the contractor's work resulting from any cause whatsoever. All construction must meet or exceed OSHA requirements.

14.7 Tunneling Safety

The contractor shall begin the tunneling operation in a pit, sheeted and shored as necessary and being at and proceeding from one end. The contractor shall observe all applicable requirements of all governing agencies and shall conduct the operations in such a manner that all work will be performed below the level of the roadbed. All work shall be coordinated and scheduled with all governing agencies. The contractor shall complete all tunneling work at one particular location before work is started at another location.

A temporary bulkhead against the face of the excavation shall be provided and placed during the cessation of work where the heading is within 20 feet of railroad tracks or highway pavement.

In the event that distress occurs to the roadway due to the tunneling operation, the contractor shall be required to submit a plan to repair the roadway. The plan must be acceptable to all governing agencies and the Authority.

All construction must meet or exceed OSHA requirements.

14.8 Riprap Material Requirements

The contractor shall use either stone riprap or sand-cement riprap throughout the job. The riprap shall meet the following material requirements.

14.8.1 Stone Riprap

Stone riprap shall be composed of sound, tough, durable stones resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. The stone's specific gravity shall be 2.0 or higher. The minimum weight of each individual stone shall be 50 pounds. The maximum allowable dimension for an individual stone shall be 24 inches. At least 50% of the stones shall have a minimum dimension of 12 inches.

The contractor shall embed the stone riprap neatly to form a compact layer at least 12 inches thick. The riprap shall be placed in such a way that the smaller stones are not segregated but evenly distributed. Chinking stones shall be placed in the crevices between the larger stones so that a dense, well-graded mass is produced.

14.8.2 Sand-Cement Bag Riprap

Sand-cement bag riprap shall be composed of cement sacks or burlap bags having a capacity of from one to two cubic feet. Bags previously used for sugar or chemicals will not be acceptable. Bags shall be filled with a mixture or one-part Portland cement to five parts sand.

The contractor shall embed the bags by hand to form a compact layer at least 12 inches thick. The bags shall be placed to form overlapping joints. The finished surface shall not deviate from that specified by more than three inches at any point.

15.0 STREAM AND DITCH CROSSING

At all points where banks or streams or drainage ditches are disturbed by excavation or where natural vegetation is removed, the contractor shall carefully compact backfill and place riprap to prevent subsequent settlement and erosion.

This requirement applies equally to construction along the sides of a stream or drainage ditch, as well as the crossing of streams or drainage ditches. The contractor shall place riprap a distance of not less than 10 feet upstream and 10 feet downstream from any disturbed area. Actual distance of riprap will be determined by the inspector. Riprap shall be extended from one foot below the streambed to the top of the bank and shall be placed to conform with the natural slope of the stream bank.

Water lines crossing streams shall be laid inside casing meeting the requirements of section 14.3 of these Standards. The casing shall extend at least five feet beyond each stream bank. The following cover requirements over the casing must be met:

1. A minimum of one foot where the water line is located in rock.

2. A minimum of three feet where the water line is not located in rock. The Authority, in its sole discretion, may require additional cover depending on the size and flow rate of the stream.

3. The top of the casing shall be place a minimum of four inches below the bottom of the channel pavement for paved streams.

The contractor shall use either stone riprap or sand-cement riprap throughout the job. The riprap shall meet the same material requirements as described in Section 15 above.

16.0 TESTING

"As-Built" drawings meeting all requirements as stipulated must be received and approved by the Authority before a project can be released for testing.

The Authority reserves the right to continuously and/or periodically inspect construction methods to ensure compliance with these specifications. Unless other provisions have been specifically approved by the Authority, water lines and related facilities will be inspected and tested by the contractor with testing and line sterilization certified by the Authority before acceptance to the Authority's system.

16.1 Testing Procedures

When a length of pipe approved by the Authority is ready for testing, the contractor shall fill the line with water, bleed out all air, and perform a leakage test.

16.1.1 Preparation

The contractor shall provide a test pump, an accurate water meter, and all other accessories required to make the test. The contractor shall provide a corporation stop at each high point on the pipe to bleed off air. The contractor shall provide and remove all temporary bulkheads, plugs, and flanges required to perform the pressure test.

16.1.2 Test Pressure and Leakage

The pipeline shall be tested at 250 PSI measured at the lowest point. The test shall be performed for a minimum of two hours. The main shall not have detectable pressure loss at any time during the two-hour period.

If leaks are detected, the contractor shall locate and repair all leaks and retest the line. If results are not totally satisfactory, the Authority may require testing for a longer period of time.

16.1.3 Existing Valves

The contractor shall not operate valves in the existing system. Contractors violating this provision are subject to immediate removal from the Authority's Approved Contractors List.

16.2 Disinfecting Pipeline

The contractor shall disinfect all installed potable water lines and all other pipelines which may have been contaminated by the work.

16.2.1 Disinfection

The contractor shall prepare a one percent (1%) chlorine solution using high-test calcium hypochlorite (HTH) and place an adequate quantity of this solution into the water mains to obtain a minimum chlorine concentration of 50 mg/L. Application of the chlorine may be at the time of filling for pressure testing. At the end of 24-hours, the Authority shall test for chlorine residual; if found to be less than 25 mg/L, the contractor shall add chlorine solution, and the Authority shall re-test again after 24-hours. The following is the minimum quantity of solution required per 100 feet of pipeline to obtain the desired concentration:

Pipe Diameter (inches)	Quantity (Gallons)	Strength (%)
1	0.02	1
2	0.08	1
3	0.18	1
4	0.32	1
6	0.73	1
8	1.30	1
10	2.04	1
12	2.88	1
14	0.38	10
16	0.50	10
18	0.63	10
20	0.78	10
24	1.12	10
30	1.72	10

16.2.2 Flushing

After completing chlorination, the contractor shall flush the line with potable water and test for the amount of chlorine residual at the point of discharge until the chlorine residual is equal to the chlorine residual of the water used for flushing. The Authority shall allow the pipeline to remain full for 24 hours and take samples for bacteriological and turbidity examination. The Authority shall analyze these samples. Results must be acceptable to the State. If the samples are not satisfactory, the contractor shall perform additional sterilization until acceptable samples are obtained.

16.2.3 Sampling

Sampling determinations of chlorine residual for sterilization and flushing shall be performed by the Authority's laboratory personnel. The Authority shall be requested to perform such sampling and testing no less than 48 hours prior to the requested sampling time.

16.2.4 De-chlorination

Water shall be de-chlorinated per State Regulations.

17.0 PROTECTION AND RESTORATION OF WORK AREA

17.1 General

The contractor shall return all items and all areas disturbed, directly or indirectly, by work under these specifications to their original condition or better as quickly as possible after work is started.

17.2 Restoration of Man-made Improvements

The contractor shall protect or remove and replace, with the Authority's approval, all fences, piers, docks, walkways, mailboxes, pipelines, drain culverts, power and telephone lines and cables and other improvements that may be encountered in the work.

17.3 Cultivated Growth

The contractor shall not disturb cultivated trees or shrubbery unless approved by the Authority. Any such trees or shrubbery, which must be removed, shall be heeled in and replanted under the direction of an experienced nurseryman.

17.4 Cutting of Trees

The contractor shall not cut trees for the performance of the work except as absolutely necessary. Trees that shall remain in the work area shall be protected from damage from equipment. The contractor shall not store spoil from excavation against the trunks. The contractor shall remove excavated material stored over the root system of all trees within 30 days to allow proper natural watering of the root system. All damaged trees over three inches in diameter shall be repaired by an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the contractor. No stumps, woodpiles, or trash piles will be permitted on the work site.

17.5 Grassing

The contractor shall replant grass removed or damaged in residential areas using the same variety of grass and at the first appropriate season. Outside of developed areas, the contractor shall plant the entire area disturbed by the work in rye, fescue, Bermuda, or other suitable ground cover upon the completion of work in the area. In all areas, the contractor shall promptly re-establish permanent grass to match or exceed original conditions.

17.6 Erosion Control

Erosion and sedimentation control shall be per Georgia Environmental Protection Division standards and per the requirements of applicable local governmental standards. The contractor shall plan excavation work to prevent erosion and the washing of soil into adjacent streams. The contractor shall limit the amount of open excavation at any one time. Spoil shall be placed in the proper place and all natural water routes shall be kept open. Contractors must fully comply with erosion and sedimentation control act, and the Nation Pollutant Discharge Elimination System general permit, where applicable.

17.7 Disposal of Rubbish

The contractor shall dispose of materials cleaned and grubbed during the construction of the project in accordance with the applicable codes and rules of the appropriate regulatory agencies, county, state and federal.

17.8 Pollution Prevention

Contractors must prevent discharges of pollutants onto soils and into surface water where applicable. Contractor shall comply with Federal Petroleum spill prevention rules set forth in 40 CFR 112.

18.0 BASIN PROTECTION-RESERVOIR BOAT DOCKS

18.1 Administrative Procedures

The following procedures are established to provide a standard process for the approval of plans and subsequent dock construction. Additional information may be required if deemed necessary by the Authority. To obtain a permit to construct a dock:

1. The owner of the property adjacent to the reservoir must submit for approval to the Authority the following:

    a. A general site plan of the property showing:

        1. Location of proposed dock;

        2. Measurement of frontage property;

        3. Building setbacks;

        4. Depth of the Reservoir 15 horizontal feet from the normal pool as established by the Authority.

    b. Three sets of dock plans that have been approved by a Professional Engineer licensed in the State of Georgia that show a multi-view of frame and support system.

    c. A list of materials being used for construction of the dock.

    d. Additional items if deemed necessary by the Authority.

2. The submitted plans will be reviewed by the Authority.

3. Upon approval of the plans, the owner will be required to pay the established permit fee found in Section 4-23 of the Douglasville-Douglas

County Water and Sewer Authority's Rules and Regulations. One set of plans will be returned to the owner to begin construction. The two remaining sets of plans remain with the Authority.

4. Upon completion of the dock facility and before the dock is put into the reservoir, the owner should notify the Authority to conduct a final inspection and permit.

5. After an authorized representative of the Authority inspects the dock, they will issue a seasonal permit that will be affixed to the dock.

6. The permit is valid for the current year only and the dock must be re-inspected prior to the issuance of a new seasonal permit.

7. The owner is responsible for supplying the Authority with a copy of the liability insurance of a minimum $100,000 that covers the dock facility. The Authority shall be named as additional insured for the dock facility.

18.2 Dock Design Criteria

The following criteria are to be used for the design of all Dog River Reservoir docks:

1. Multi-level docks are prohibited.

2. Docks must be of a platform/t-dock type. The dock must be a floating dock without roof or enclosure of any configuration (always remaining completely open) and must be capable of being removed.

3. The landowner must have a minimum of five acres of property including 500 feet of reservoir frontage to construct a dock.

4. The dock cannot be closer than 100 feet to an existing dock.

5. Docks will only be permitted at sites that provide a water depth sufficient to allow the dock structure at normal pool elevation as established by the Authority to float.

6. Size of the dock may not exceed 12 x 15 feet with the 15-foot section running parallel to the shoreline, subject to the other restrictions of this section.

7. The floating dock and boarding ramp together may not project more than twenty percent (20%) of the Reservoir's total width at point of placement and the dock cannot be more than 20 feet from the shoreline at its furthest most point as determined by the Authority.

8. Other reasonable requirements as may be established by the Authority.

9. A sign or plaque shall be placed and maintained in a conspicuous location at the shore entrance to the dock to adequately convey the regulations to all dock users. The sign shall be a minimum 8½ inches by 11 inches with a minimum font size of 12 units. The sign shall display the following items:

   a. The possession or consumption of alcohol, illegal drugs, or any controlled substance is prohibited.

   b. The possession or use of firearms, ammunition, archery equipment, including bows and arrows, loaded projectile firing devices, or explosives are prohibited.

   c. Audio or noise producing devices operated or used in such a manner as to unreasonably annoy or endanger other individuals are prohibited.

   d. No pets.

   e. No glass containers of any kind.

   f. No littering or dumping.

   g. No Styrofoam coolers, buckets, or utensils.

   h. No utility service of any kind, either permanent or temporary, may be extended to or used on the dock facility.

   i. No cooking may be done on docks.

   j. No permanent or temporary lighting, gas stoves or grills, barbeque grills, refrigerators or any fixtures may be on the docks.

   k. No storage containers may be placed on the docks, except for those permanently affixed to the dock and approved by the Authority. Gas cans and chemical containers of any type are not permitted on the dock at any time.

   l. No cleaning of docks, decking or boats moored at docks with soaps or solvents while they are floating in or suspended above the reservoir may be done.

   m. No pay for fishing is allowed off private docks or private shoreline property.

n. No diving, wading, or swimming in the reservoir off the docks is allowed.

o. Any temporary lounging furniture (chairs, loungers, etc.) placed on the dock must be properly secured.

18.3 Approved Materials for Design Construction

The Dog River Reservoir was primarily established to provide a potable water supply for the Authority's service area. Very strict standards are required to maintain its overall water quality. All materials used should be acceptable for use on a raw water supply reservoir and will be strictly enforced. The Authority will approve commercially manufactured docks that meet the following requirements.

18.3.1 Flotation Devices

No metal covered or injected drums, bed board, particle board, wood pilings or foam bead materials will be allowed. The only acceptable flotation material is a minimum one-pound density expanded polystyrene foam encapsulated or an approved equal by the Authority Engineering Department. Two accepted manufacturers of this product are:

1. Cellofoam North America Inc.
   1971 Rockdale Industrial Blvd
   Conyers, Georgia 30012
   770-483-4491

2. Formex Manufacturing, Inc.
   601 Hurricane Shoals Rd NW
   Lawrenceville, GA 30046
   Phone: (770) 962-9816

18.3.2 Framing Structure

A galvanized metal frame system is acceptable for use or approved equal by the Authority Engineering Department.

Materials:

1. G-90 galvanized, cold-formed steel structural members ASTM A-153 minimum yield 35,000 PSI).

2. Corner angle brackets of 10 gauge Galvanized at all corners.

3. 3/8-inch x 1-inch grade five bolts, nuts, and lock washer plated with DIFCOAT II.

18.3.3 Decking

Pressure treated 2-inch by 6-inch southern pine, treated with preservatives approved by the American Wood Preserves Association with the exception of creosote solutions should be used for the decking. No paints, stains, shellacs, or varnishes may be used on decking or any part of the dock structure.

A face board made from Authority acceptable materials must be used around the outside of the frame to prevent boats from slipping beneath the dock structure.

18.3.4 Cable and Winch Anchoring System

The anchoring system for the dock should be a cable and winch system due to the fluctuation of water levels at the reservoir. The dock must be anchored to galvanized steel post, which are buried three feet into concrete. These cables may not be anchored to trees, wooden poles, or any other natural formation.

The cable used must be 7000 lbs. test, galvanized aircraft cable. A manual winch should be affixed to the cable to keep tension on the lines at all times.

18.3.5 Deck Cleats

The Authority does not require deck cleats for floating docks. Owners wishing to moor a boat to their docks are recommended to attach deck cleats. If used, they must be of stainless steel or galvanized metal and must be bolted not screwed down.

18.3.6 Fastening Floating to Framing

A 1-inch x 1/4-inch x 6-feet aluminum strip formed to make a strap around the polystyrene flotation device every 12 inches on center, fastened to the frame system with bolts.

18.3.7 Walkway or Boarding Ramp

Framing and decking of walkways are to be constructed of the same materials as specified for dock structure.

The hinging apparatus is of a prefabricated design and constructed of 14-gauge galvanized steel.

The walkway should also be reinforced by 7000 lb. aircraft cable to prevent sideways motion of the ramp. The cable will run from the corner of the dock to the corner of the walkway.

18.4 Erosion and Sedimentation Control Devices

Any site where land-disturbing activity occurs must be protected from erosion. Typically, the developer's project engineer prepares an Erosion and Sedimentation Control Plan, which must be submitted to the appropriate governing body for approval and permitting processes.

The Authority requires all current state manuals for Erosion and Sedimentation Control in Georgia and Douglas County Soil and Erosion and Sedimentation Control Act regulations be strictly adhered to in the field.

No land-disturbing activities shall be conducted in the buffer zones, unless required by the Authority and adheres to all applicable regulations. Discharge of stormwater runoff from disturbed property shall not exceed 25 Nepholometric Turbidity Units (NTU) higher than the level of the receiving stream immediately upstream of the site.

Items required by the State and local governments include the following:

18.4.1 Silt Fence

Silt fence should be a commercially manufactured fabric approximately 30 inches in height supported vertically by wooden or metal stakes at $\pm$ 3 feet on center. Hay bales may be utilized directly behind the silt fence to add an additional sedimentation barrier and support. Under certain applications, hay bales may be used as silt fence; however, for projects lasting over a six-month period a fabric barrier is required.

Silt sedimentation build-up behind silt fence must be removed periodically to maintain effective siltation control. A typical silt fence with hay bales is shown in the Appendix.

18.4.2 Detention and Sedimentation Ponds

Any flow that is collected across a land disturbing site should be collected and routed through ditches, flumes, or enclosed conduit to a detention and/or sedimentation pond. The pond must be designed to collect the flow and reduce its velocity to a level where the silt will be retained prior to its discharge off the site. The ponds are to be cleaned as sedimentation build-up in order to maintain a properly functioning system.

18.4.3 Filter Berms

Filter berms at the exit from construction sites may be required where land disturbing activities occur. These filter berms consist of a layer of #57 stone 6 feet to 8 feet wide x 12 inches deep and be constructed completely across all egresses from the site. These filter berms must be cleaned

regularly so they remain functional during the construction process. A typical filter berm is shown in the Appendix.

18.4.4 Riprap

Where directed by the Authority riprap will be required. A typical riprapping detail is shown in the Appendix.

18.4.5 Rock Dams

On open cut drainage ditches tributary to rivers, creeks, or reservoirs, rock dams must be placed at specified intervals. Rock dams should be constructed with #75 riprap stone and should cover the full width of the ditch from slope to slope. The stone should cover from the toe of the slope to top of slope. A rock dam detail is shown in the Appendix.

18.4.6 Grassing

Grassing of disturbed areas should be done as soon as possible. The manual for Erosion and Sedimentation Control list the types of grass to be used for various times of the year and application rate of grass seeds and the fertilizer to be used on the various types of soil.

Additional items such as catch basins, pipes, storm drainage and paved ditches are other items that may be required by the Authority to minimize erosion on land disturbed sites.

19.0 SAFETY

Contractors are advised that certain hazards are inherent to utility work including but not limited to vehicle traffic, trench cave ins, existing utilities, and heavy equipment. Contractors are solely responsible for job-site safety. Contractors are responsible for compliance with all applicable OSHA regulations, including those found in CFR Part 1926. The Authority shall not be held responsible for safety violations of the contractor.

20.0 LOW FLOW PLUMBING FIXTURES

20.1 Standards

After April 1, 1992, there shall not be initiated within the Authority's service area the construction of any residential building of any type which:

1. Employs a gravity tank-type, flushometer valve, or flushometer tank toilet that uses more than an average of 1.6 gallons of water per flush; provided, however, this paragraph shall not be applicable to one-piece toilets until July 1, 1992;

2. Employs a showerhead that allows a flow more than an average of 2.5 gallons of water per minute at 60 pounds per square inch of pressure;

3. Employs a urinal that uses more than an average of 1.0 gallons of water per flush;

4. Employs a lavatory faucet or lavatory replacement aerator that allows a flow of more than 2.0 gallons of water per minute; or

5. Employs a kitchen faucet or kitchen replacement aerator that allows a flow of more than 2.5 gallons of water per minute.

6. The flow restrictive device in a showerhead shall be a permanent and integral part of the showerhead and must not be removable to allow flow rates in excess of that stated above.

7. Lavatory faucets located in restrooms intended for use by the general public shall be of the metering of self-closing type, in addition to the flow requirement listed above.

20.2 Exceptions

The following fixture uses or applications shall be exempt from the standards established above:

1. When the repair or renovation of the existing building does not include the replacement of the plumbing or sewage system servicing toilets, faucets, or showerheads within such existing building;

2. When such plumbing or sewage system within such existing building, because of its capacity, design, or installation, would not function properly if the toilets, faucets, or showerheads required by the above standards were installed;

3. When such system is a well or gravity flow from a spring and is owned privately by an individual for use in such individual's personal residence; or

4. When units to be installed are:

    a. Specifically designed for use by the handicapped;

    b. Specifically designed to withstand unusual abuse or installation in a penal institution; or

    c. Toilets for juveniles.

APPENDIX
WATER DETAILS

Figure #	Description
1.	Standard Locations for Underground Utilities
2.	Typical Water Line Trench Section Under Pavement for State Roads & Highways
3.	Bedding Details
4.	Open Cut Pavement Repair
5.	Typical Railroad or Freeway Crossing
6.	Typical State of GA DOT or Douglas County Road Crossing
7.	Fire Hydrant Detail Utilizing Hydrant Tee and Anchor Coupling
8.	Typical Valve Box Installation
9.	Typical 4" – 12" Screw Type Valve Box Assemblies
10.	Detail "A" Valve Marker Detail
11.	3/4" through 2" Meter and Backflow Preventer Installation
12.	5/8" x 3/4" Residential Meter Installation
13.	Double Check
14.	Typical Siamese Service Installation
15.	Typical Fireline Meter and Backflow Preventer Installation
16.	3" thru 6" Meter Installation (Plan View)
17.	8" thru 10" Meter Installation Detail
18.	Cul-De-Sac Detail
19.	End of Line Detail
20.	3-Way Valve and Tee Installation Detail
21.	4-Way Cross Installation Detail
22.	Reduced Pressure Assembly Outdoor Installation
23.	Reduced Pressure Assembly Indoor Installation
24.	Pressure Reducing Valve

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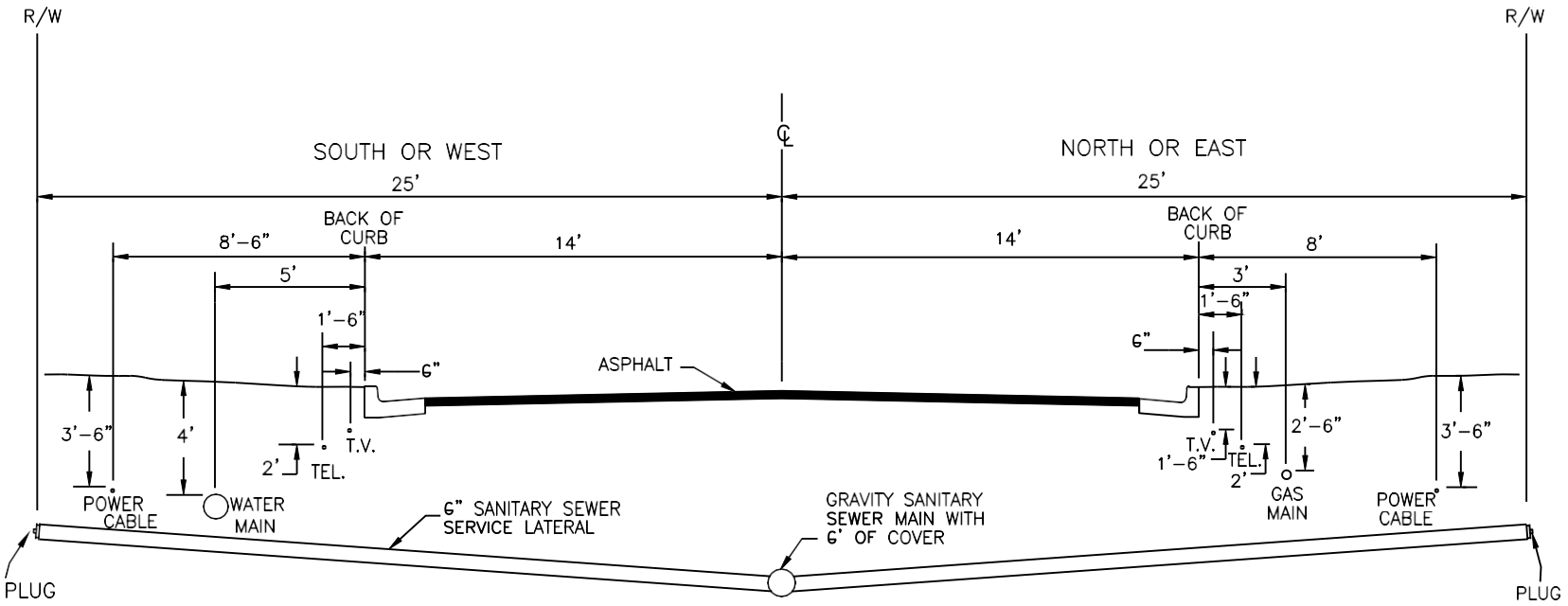
DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

WATER - FIG. 1
Dec. 2025



NOTES:

UTILITIES PROTECTION CENTER, INC.
404-623-4344 OR 1-800-282-7411

1. ON ALL UNCURBED TWO LANE STREETS, UTILITY LOCATIONS SHALL BE AT THE SAME DISTANCES FROM THE CENTER LINE AS SHOWN ABOVE.

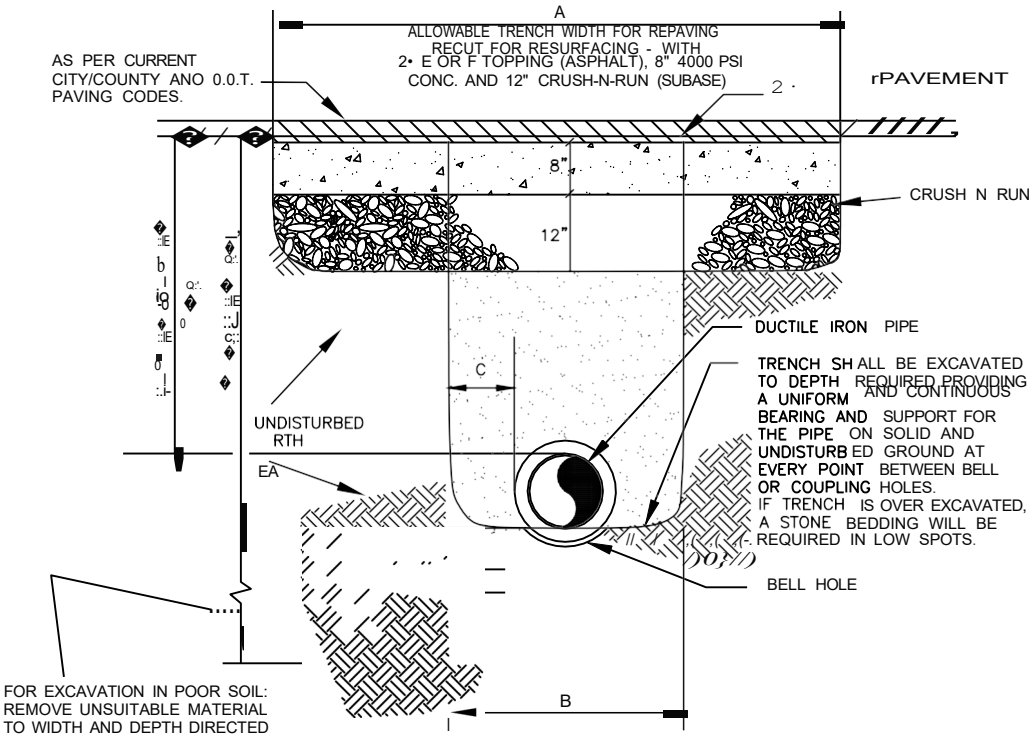
2. POLES FOR OVERHEAD UTILITIES SHALL BE LOCATED A MINIMUM OF 20' FROM THE CENTER LINE OF THE ROAD ON TWO LANE STREETS.

STANDARD LOCATIONS FOR UNDERGROUND UTILITIES

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

ROAD CUTS AND REPAIRS SHALL BE ACCORDANCE WITH GDOT REGULATIONS.

WATER - FIG. 2
Dec. 2025



FOR EXCAVATION IN POOR SOIL: REMOVE UNSUITABLE MATERIAL TO WIDTH AND DEPTH DIRECTED BEFORE PIPE IS LAID. THE SUBGRADE SHALL BE BACKFILLED WITH AN APPROVED MATERIAL IN 12" LAYERS. EACH LAYER SHALL BE THOROUGHLY TAMPED TO 95% COMPACTION.

WIDTH REQUIRED TO PERMIT PIPE TO BE LAID AND JOINED PROPERLY AND THE BACKFILL TO BE PLACED AND COMPACTED AS SPECIFIED.

PIPE SIZE (NOMINAL)	A MAXIMUM EARTH	B MAXIMUM ROCK	C MIN/MAX
6"	3.5'/4.0'	2.0'/2.5'	9"/12·
8"	3.5'/4.0'	2.0'/2.5'	9•/12·
12·	4.0'/4.5'	2.5'/3.0'	9"/12·
16"	4.5'/5.0'	3.0'/3.5'	9"/12"
20·	4.5'/5.0'	3.5'/4.0'	9"/12·
24"	5.0'/5.5'	3.5'/4.0'	9"/12"
30"	5.5'/6.0'	4.0'/4.5'	9"/12"
36"	6.0'/6.5'	4.5'/5.0'	9•;12·
48"	7.0'/7.5'	5.5'/6.0'	9"/12"

NOTES:

1. COMPACTION BACKFILLS SHALL BE BUILT UP IN LAYERS ANO EACH LAYER SHALL BE THOROUGHLY COMPACTED BEFORE BEGINNING ANOTHER LAYER. LAYERS SHALL BE NO MORE THAN 12 INCHES IN DEPTH. PUDDLING WILL NOT BE PERMITTED, NOR WILL FROZEN OR WET MATERIAL BE PLACED IN TRENCHES.

2. COMPACTION STANDARDS: ALL BACKFILL MATERIALS USED SHALL CONTAIN A SUFFICIENT AMOUNT OF MOISTURE FOR PROPER COMPACTION, ANO THESE MATERIALS SHALL BE COMPACTED AT NOT LESS THAN NINETY-FIVE (95)% PERCENT OF THEIR OPTIMUM COMPACTION FOR ANY SPECIFIC SOIL CLASSIFICATION. AS DETERMINED BY THE STANDARD PROCTOR TEST, ASTM 0698.

3. COMPACTION TESTS: COMPACTION TESTS WILL BE REQUIRED IN EXISTING OR PROPOSED STREETS, SIDEWALKS, DRIVES AND OTHER EXISTING OR PROPOSED PAVED AREAS AT VARYING DEPTHS AND AT INTERVALS AS DETERMINED BY THE ENGINEER WITH A MINIMUM OF ONE TEST ON EACH JOB, AND A MAXIMUM OF ONE REQUIRED TEST FOR EACH 400 FEET OR LESS OF WATER MAIN CONSTRUCTION, UNLESS SOIL CONDITIONS OR CONSTRUCTION PRACTICE, IN THE OPINION OF THE ENGINEER, WARRANT TNE NEED FOR ADDITIONAL TESTS.

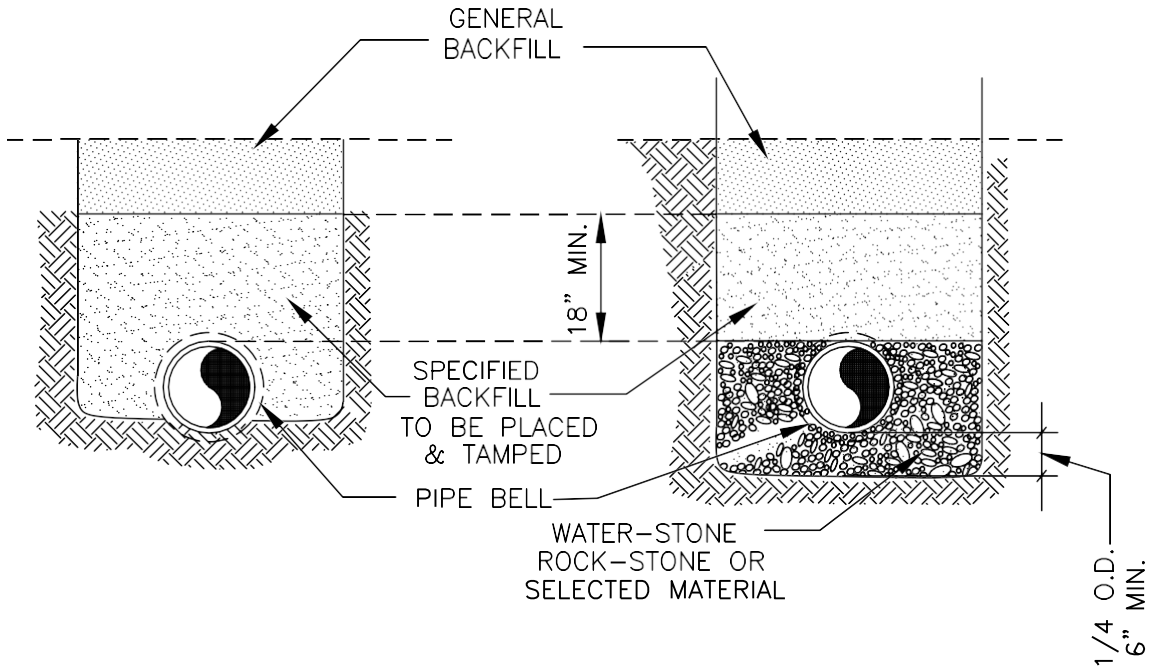
4. REFER TO PARAGRAPH 13.20 FOR DETAILED SPECIFICATIONS ON BACKFILLING TRENCHES.

TYPICAL WATER LINE TRENCH SECTION UNDER PAVEMENT

FOR STATE ROADS AND HIGHWAYS

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

WATER - FIG. 3
Dec. 2025



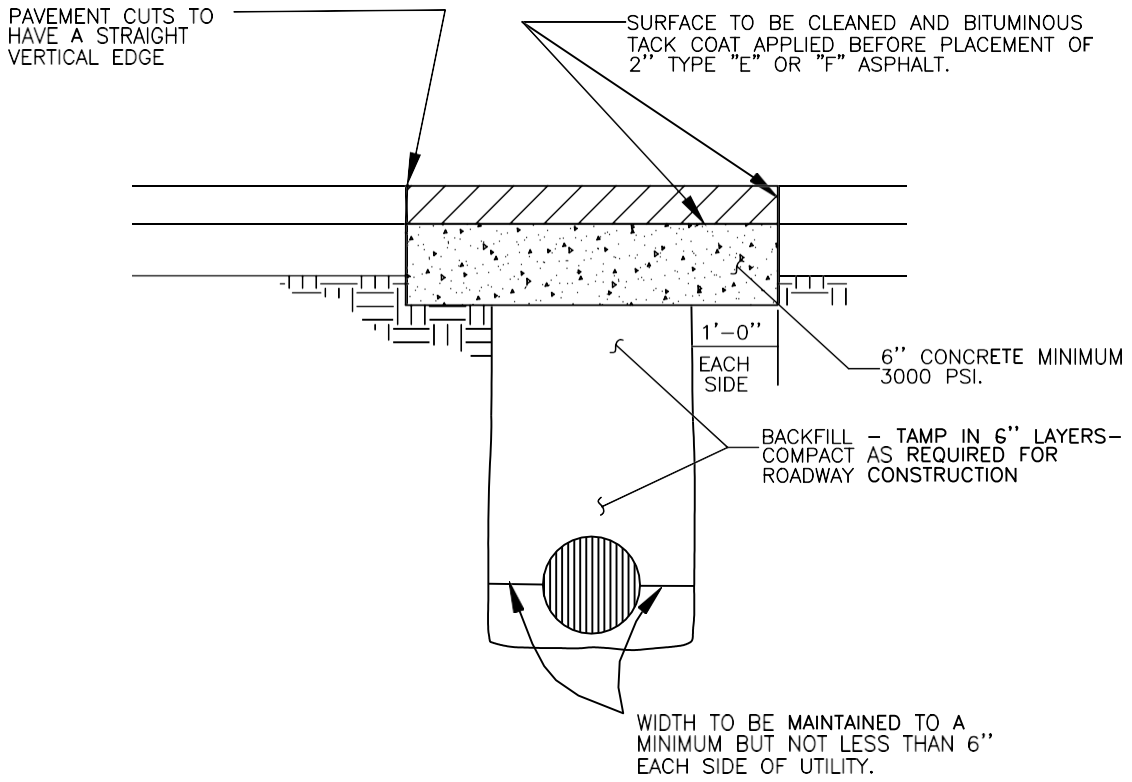
STANDARD EARTH
C–1

WET TRENCH OR ROCK
C–2

BEDDING DETAILS

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

WATER - FIG. 4
Dec. 2025



NOTE:

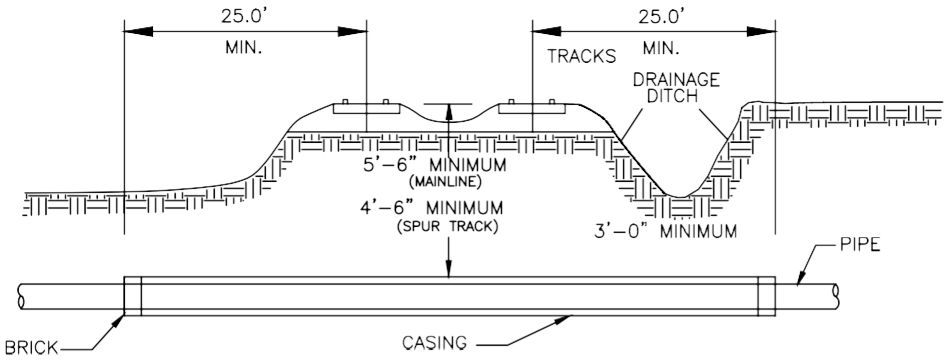
TEMPORARY 6'' GRAVEL WITH STRUCTURAL STEEL PLATE SHALL BE USED WHEN WEATHER DOES NOT PERMIT PAVING OR CONCRETE PLACEMENT.

ROAD CUTS AND REPAIRS SHALL BE IN ACCORDANCE WITH CITY OR COUNTY REGULATIONS AS APPROPRIATE.

OPEN CUT PAVEMENT REPAIR

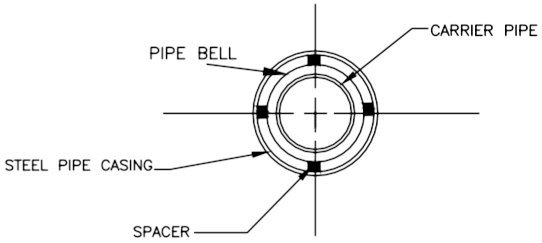
DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

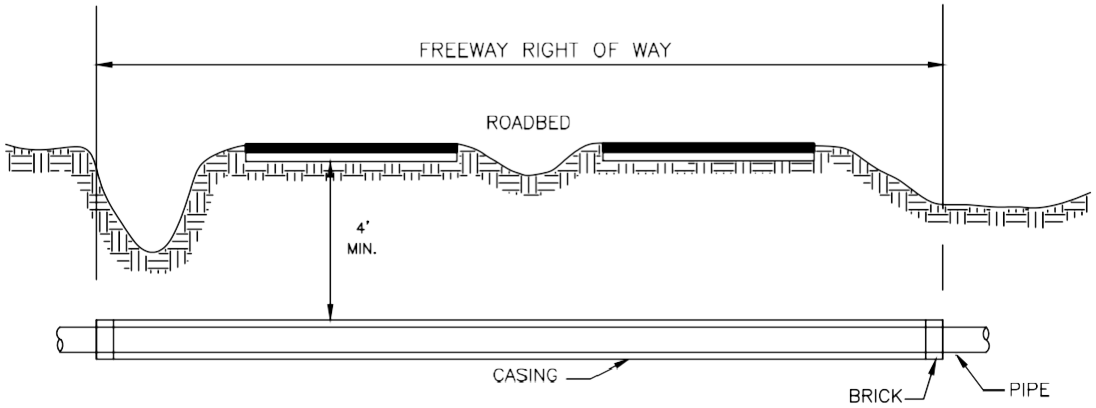
WATER - FIG. 5
Dec. 2025



RAILROADS

SEE CASING CHART





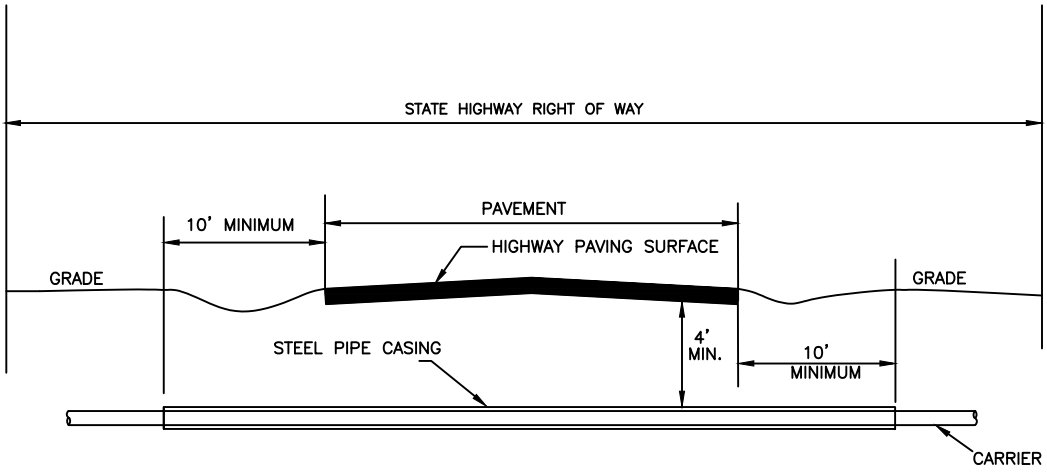
FREEWAYS*

* WATER LINE CROSSINGS UNDER FREEWAYS SHALL BE PERFORMED IN ACCORDANCE WITH GDOT REGULATIONS.

TYPICAL RAILROAD OR FREEWAY CROSSING

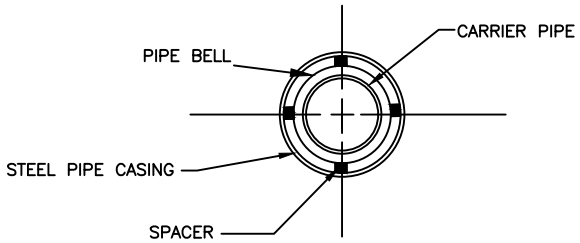
DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

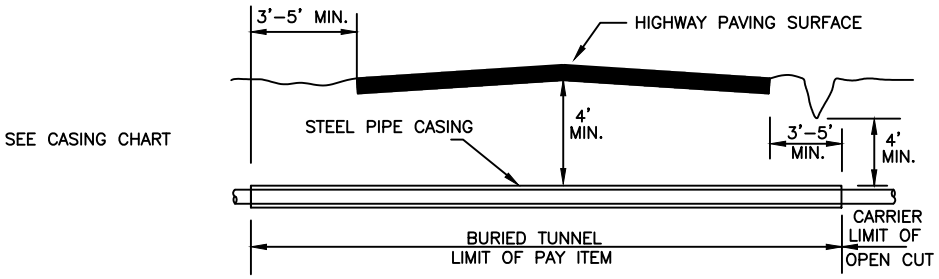
WATER - FIG.6
Dec. 2025



STATE OF GA DOT ROAD CROSSING*

* WATER LINE CROSSINGS UNDER STATE ROUTES SHALL BE PERFORMED IN ACCORDANCE WITH GDOT REGULATIONS.



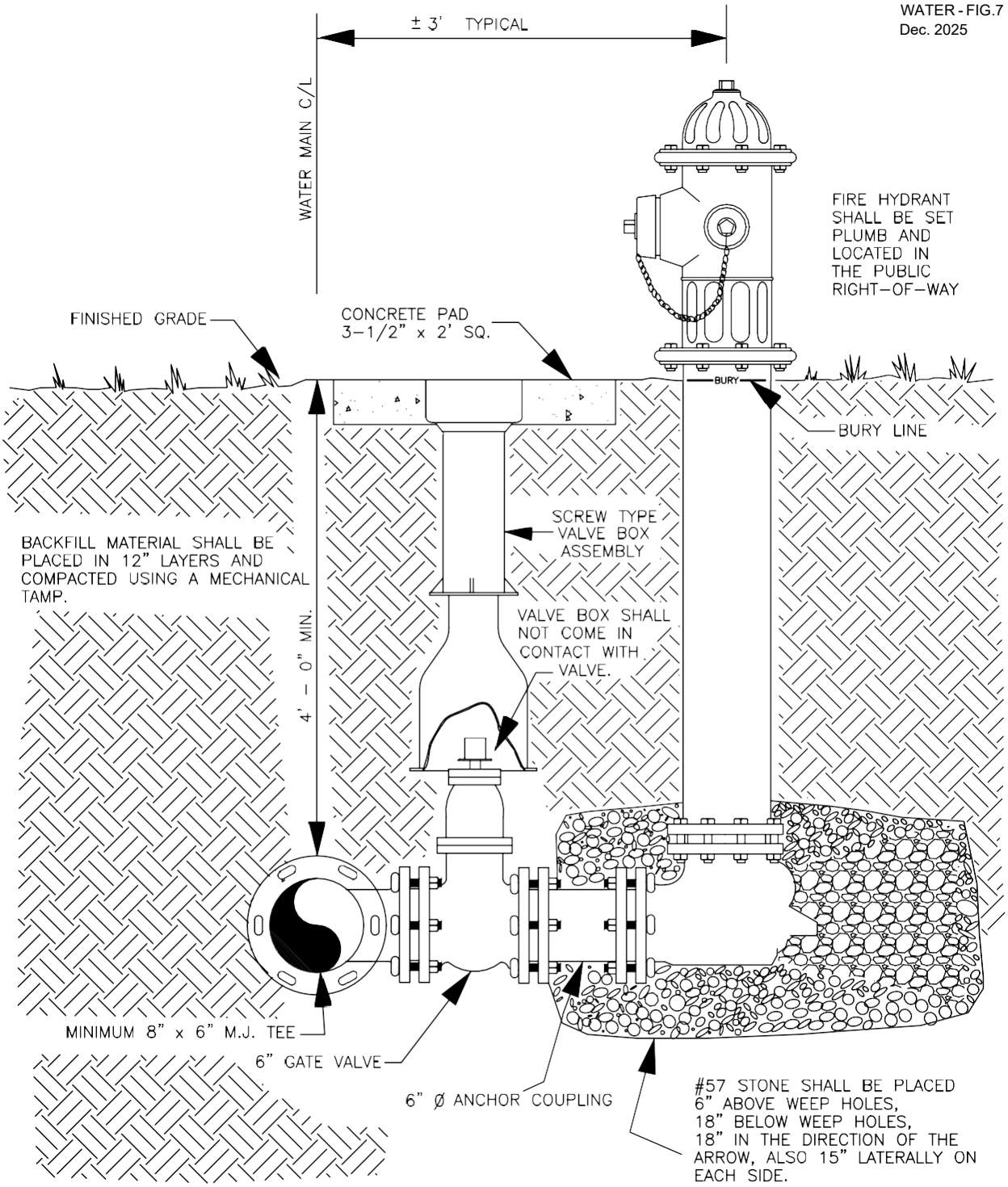


LOCAL DOT ROAD CROSSING

TYPICAL STATE OF GA DOT OR DOUGLAS COUNTY ROAD CROSSING

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

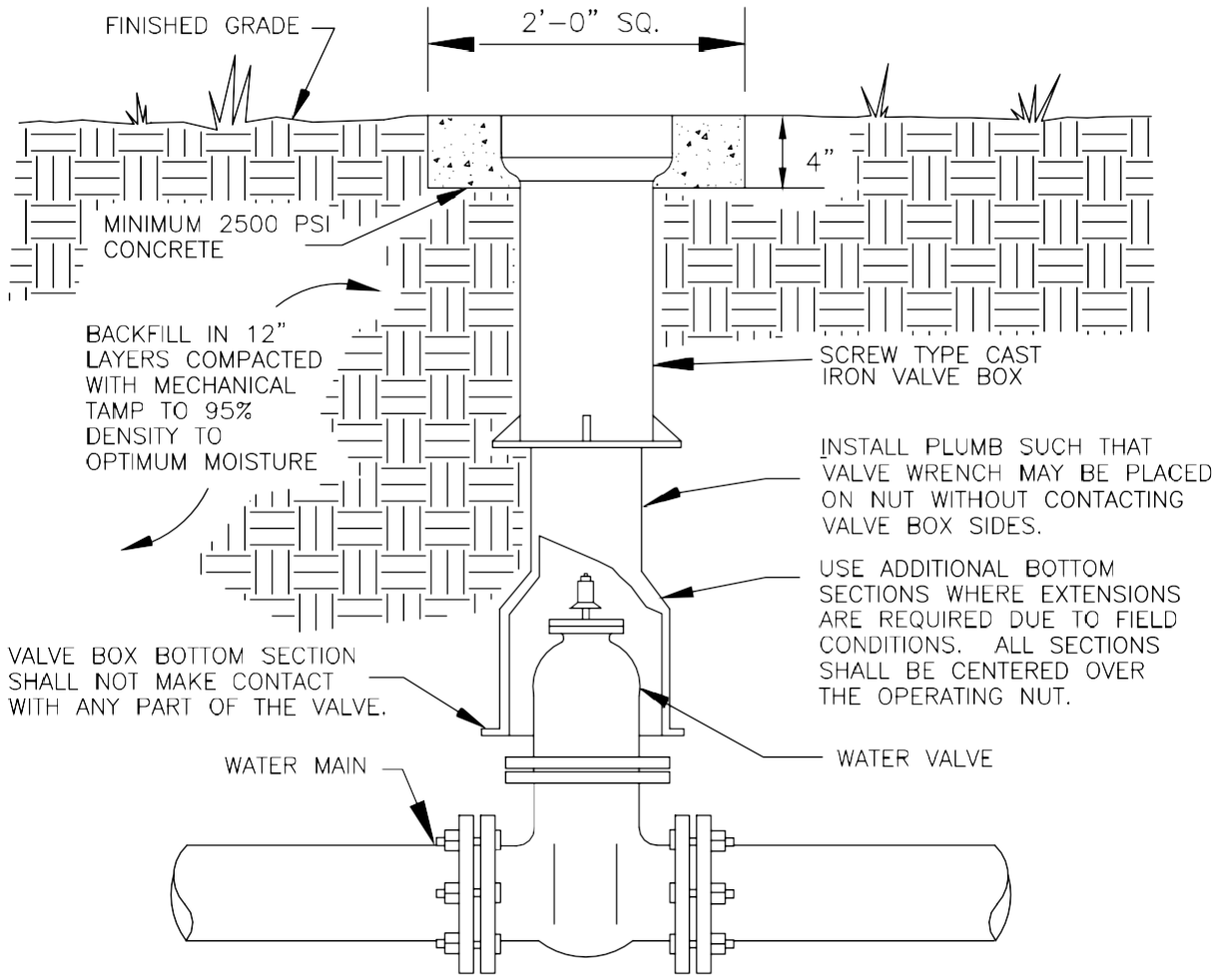
WATER - FIG.7
Dec. 2025



FIRE HYDRANT DETAIL UTILIZING HYDRANT TEE AND ANCHOR COUPLING

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

WATER - FIG. 8
Dec. 2025



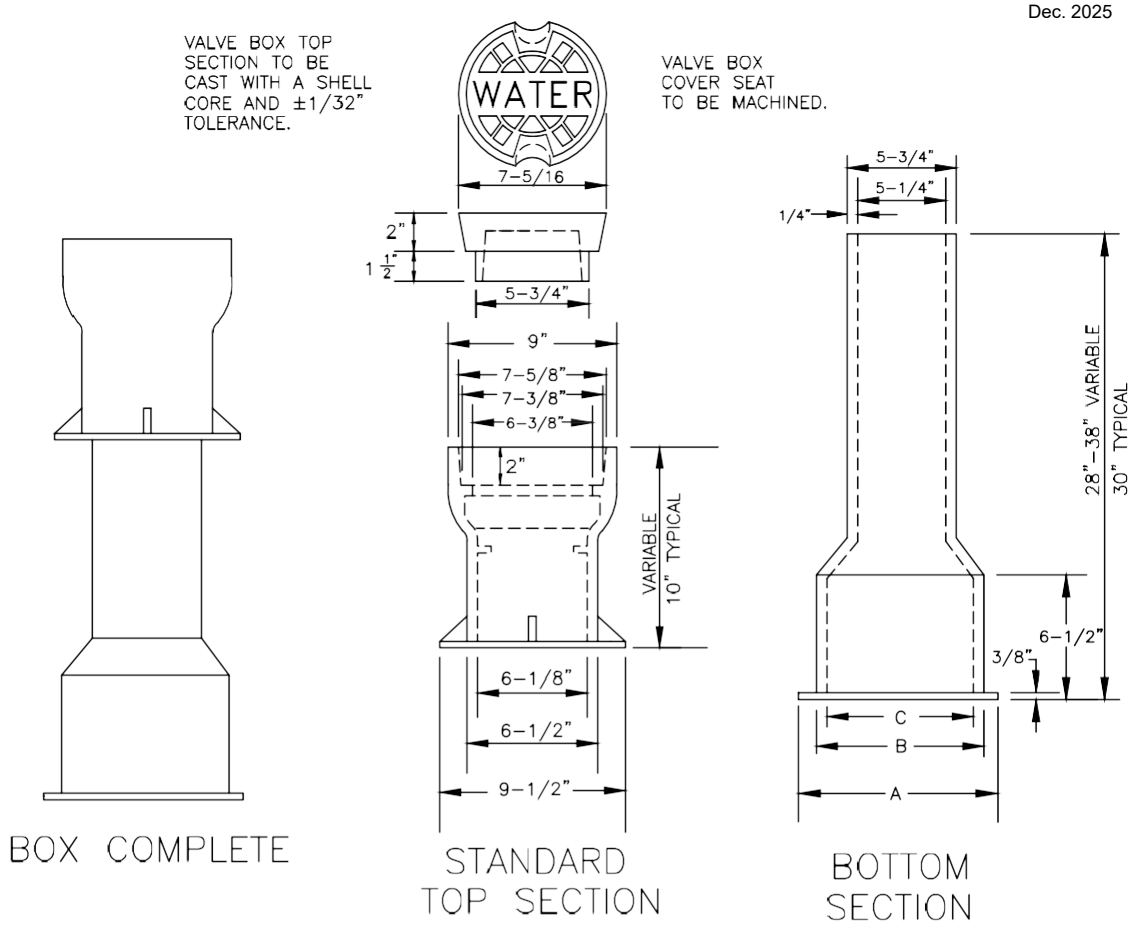
TYPICAL VALVE BOX INSTALLATION

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

WATER - FIG. 9
Dec. 2025

VALVE BOX TOP SECTION TO BE CAST WITH A SHELL CORE AND ±1/32" TOLERANCE.

VALVE BOX COVER SEAT TO BE MACHINED.



BOX COMPLETE

STANDARD TOP SECTION

BOTTOM SECTION

24" x 24" CONCRETE PAD AROUND VALVE BOX WHEN SET IN GRASS.

NOTES:

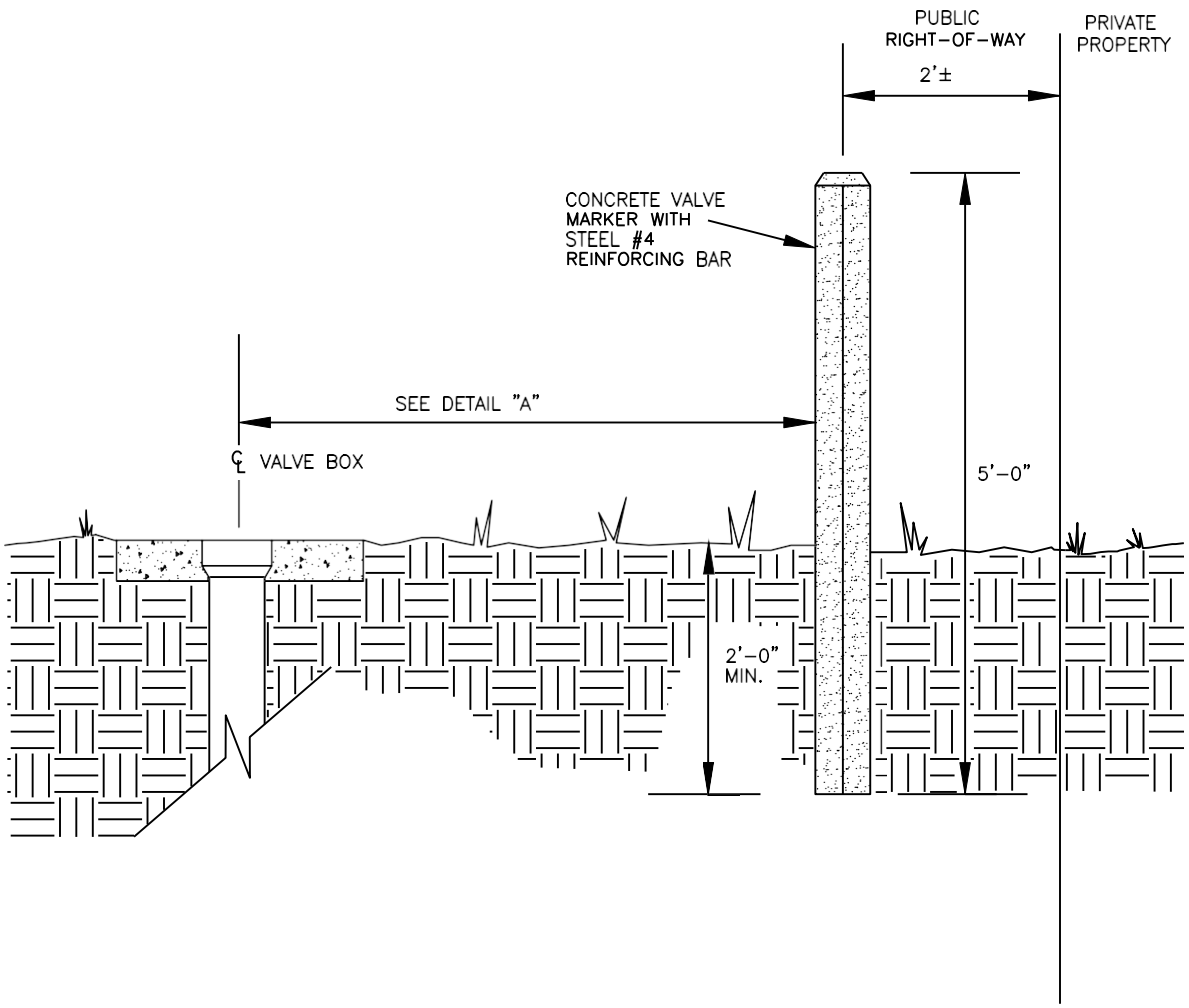
1. UNLESS NOTED OTHERWISE, CAST IRON SHALL CONFORM TO ASTM SPECIFICATIONS A48 LATEST REVISION FOR CLASS 20 GREY IRON CASTINGS.
2. CASTINGS SHALL BE TRUE AND FREE OF HOLES. THEY SHALL BE CLEANED ACCORDING TO GOOD FOUNDRY PRACTICE, AND GROUND AS NEEDED TO REMOVE FINS AND ROUGH PLACES.
3. FINISHED CASTINGS SHALL BE COATED INSIDE AND OUTSIDE WITH COAL TAR PITCH VARNISH AS INDICATED IN AWWA SPECIFICATIONS C110 LATEST REVISION. COATING MAY BE APPLIED COLD AND SHALL THOROUGHLY COVER ALL METAL SURFACES. FINISHED COATING SHALL BE SMOOTH, GLOSSY, NOT BRITTLE WHEN COLD, NOT STICKY WHEN EXPOSED TO THE SUN, AND SHALL ADHERE TO THE METAL AT ALL TEMPERATURES.
4. WHEN COATING IS COMPLETE, LID SHALL FIT SNUGLY WITHOUT ROCKING.

BOTTOM SECTION	A	B	C
4"-6"	9"	8"	7"
8"	9-1/2"	8-1/2"	7-1/2"
10"-12"	10-1/4"	9"	8"

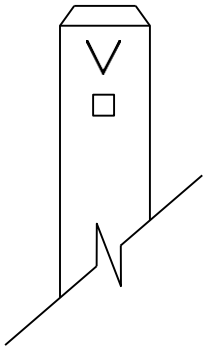
TYPICAL 4" - 12" SCREW TYPE VALVE BOX ASSEMBLIES

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

WATER - FIG. 10
Dec. 2025



NOTE: MARKER TO BE SET FOR ALL VALVES THAT ARE LOCATED ON UNCURBED STREETS, EXCLUDING FIRE HYDRANT ASSEMBLY VALVES.

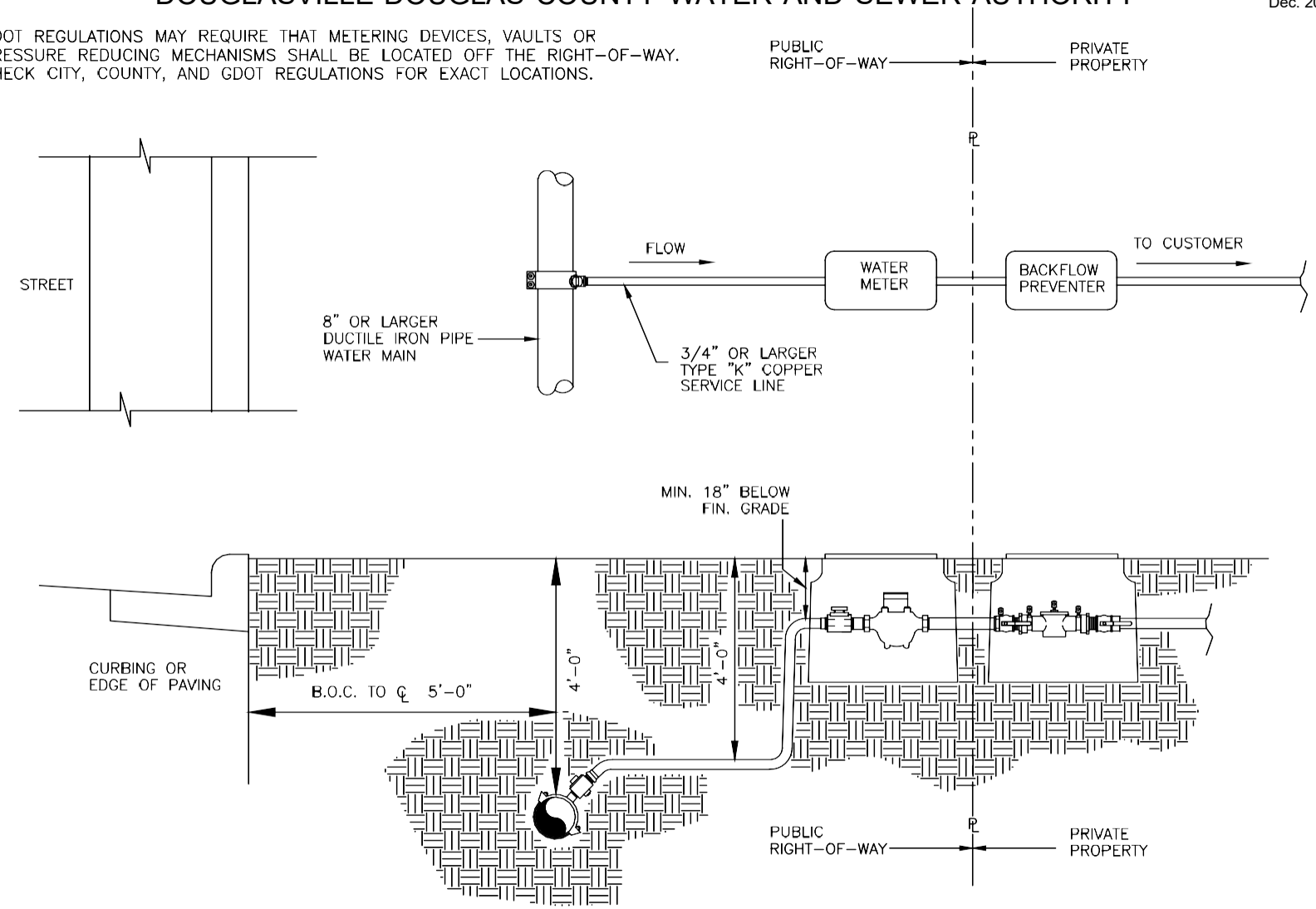


THE DISTANCE FROM THE VALVE TO THE VALVE MARKER SHALL BE STAMPED INTO THE VALVE MARKER ON THE METAL PLATE THAT IS PROVIDED.

DETAIL "A"
VALVE MARKER DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

GDOT REGULATIONS MAY REQUIRE THAT METERING DEVICES, VAULTS OR PRESSURE REDUCING MECHANISMS SHALL BE LOCATED OFF THE RIGHT-OF-WAY. CHECK CITY, COUNTY, AND GDOT REGULATIONS FOR EXACT LOCATIONS.

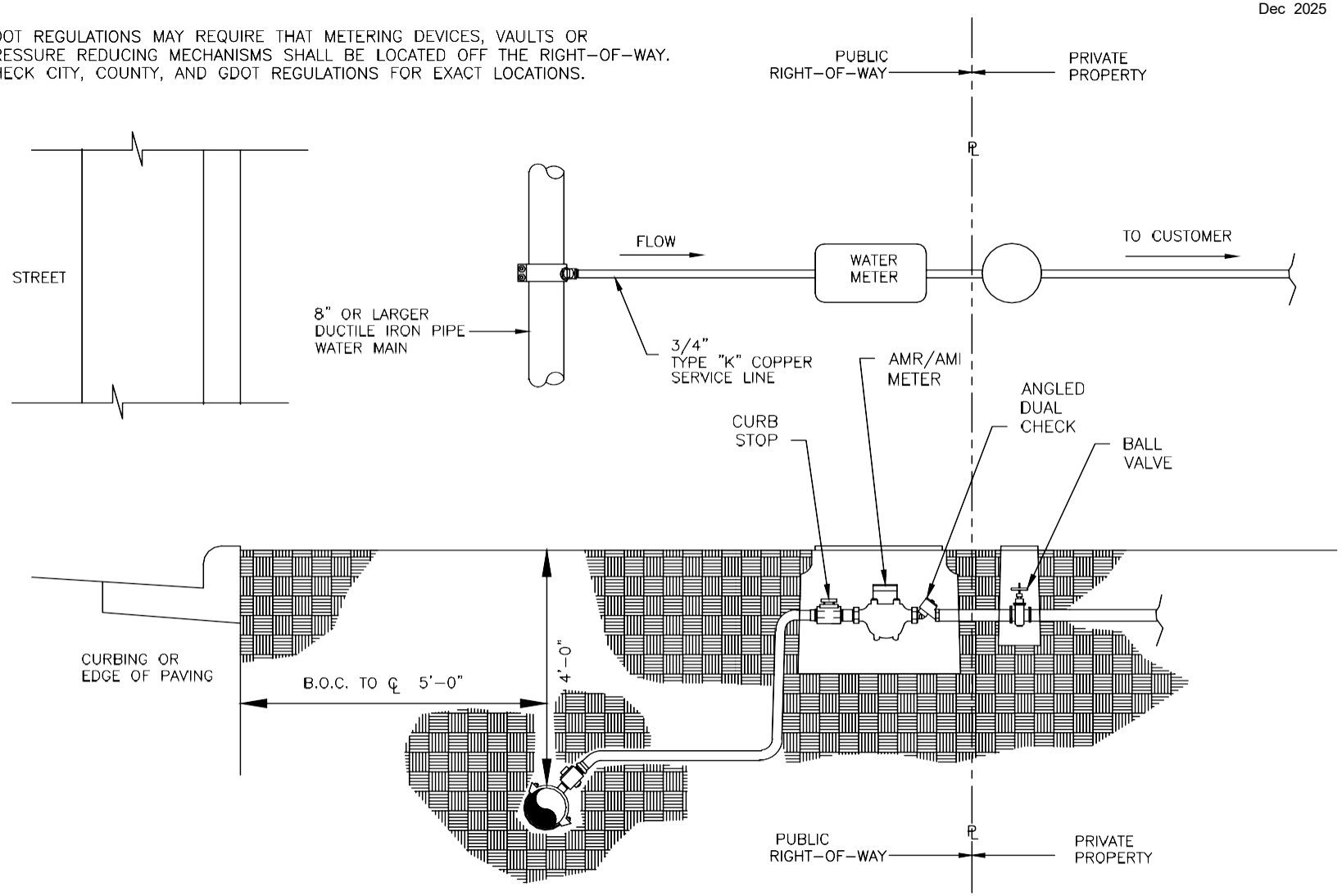


3/4" THROUGH 2" METER AND BACKFLOW PREVENTER INSTALLATION

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

WATER - FIG. 12
Dec 2025

GDOT REGULATIONS MAY REQUIRE THAT METERING DEVICES, VAULTS OR PRESSURE REDUCING MECHANISMS SHALL BE LOCATED OFF THE RIGHT-OF-WAY. CHECK CITY, COUNTY, AND GDOT REGULATIONS FOR EXACT LOCATIONS.

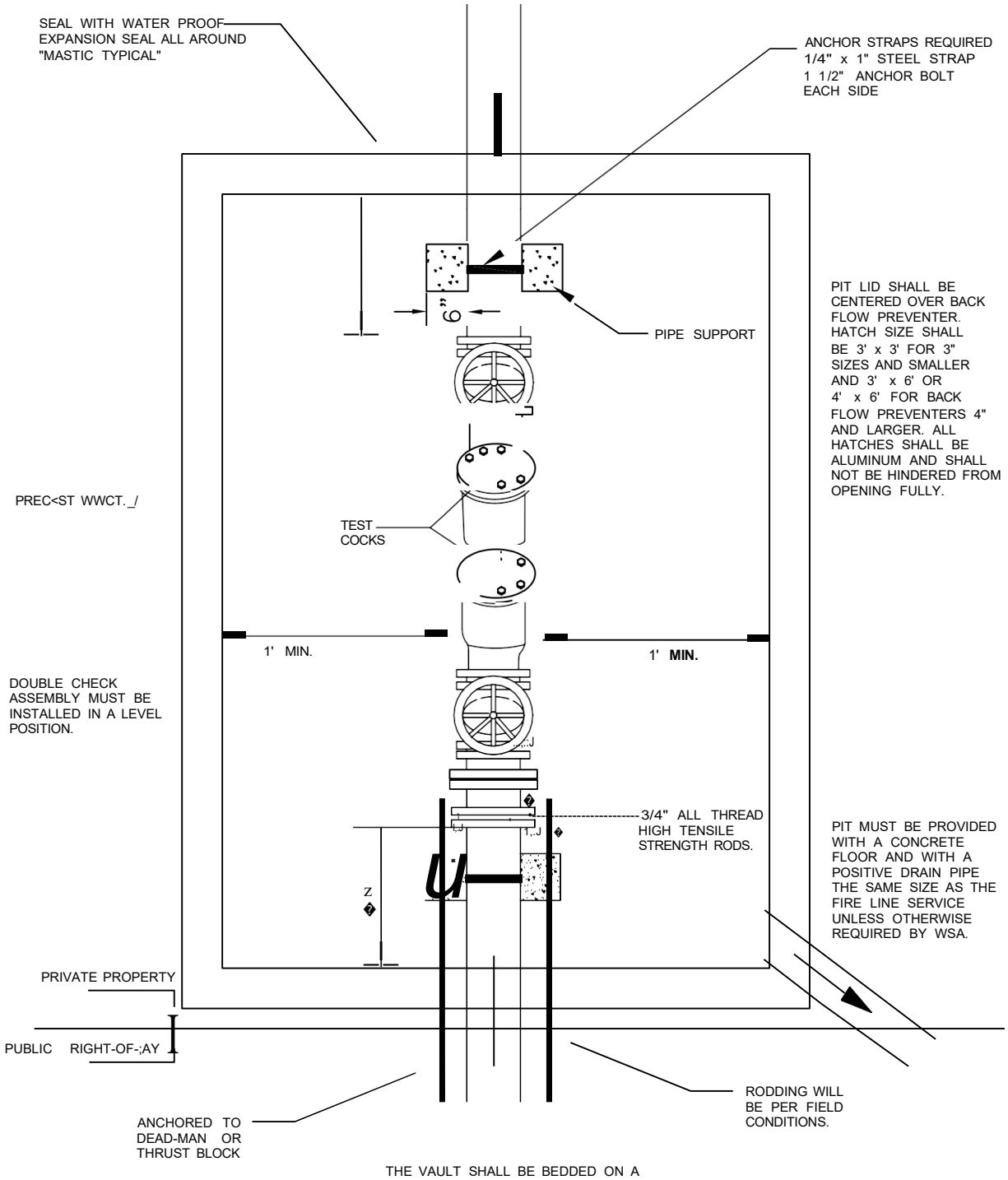


5/8"x3/4" RESIDENTIAL METER INSTALLATION

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

GDOT REGULATIONS MAY REQUIRE THAT METERING DEVICES, VAULTS OR PRESSURE REDUCING MECHANISMS SHALL BE LOCATED OFF THE RIGHT-OF-WAY. CHECK CITY, COUNTY, AND GDOT REGULATIONS FOR EXACT LOCATIONS.

WATER - FIG. 13
Dec. 2025

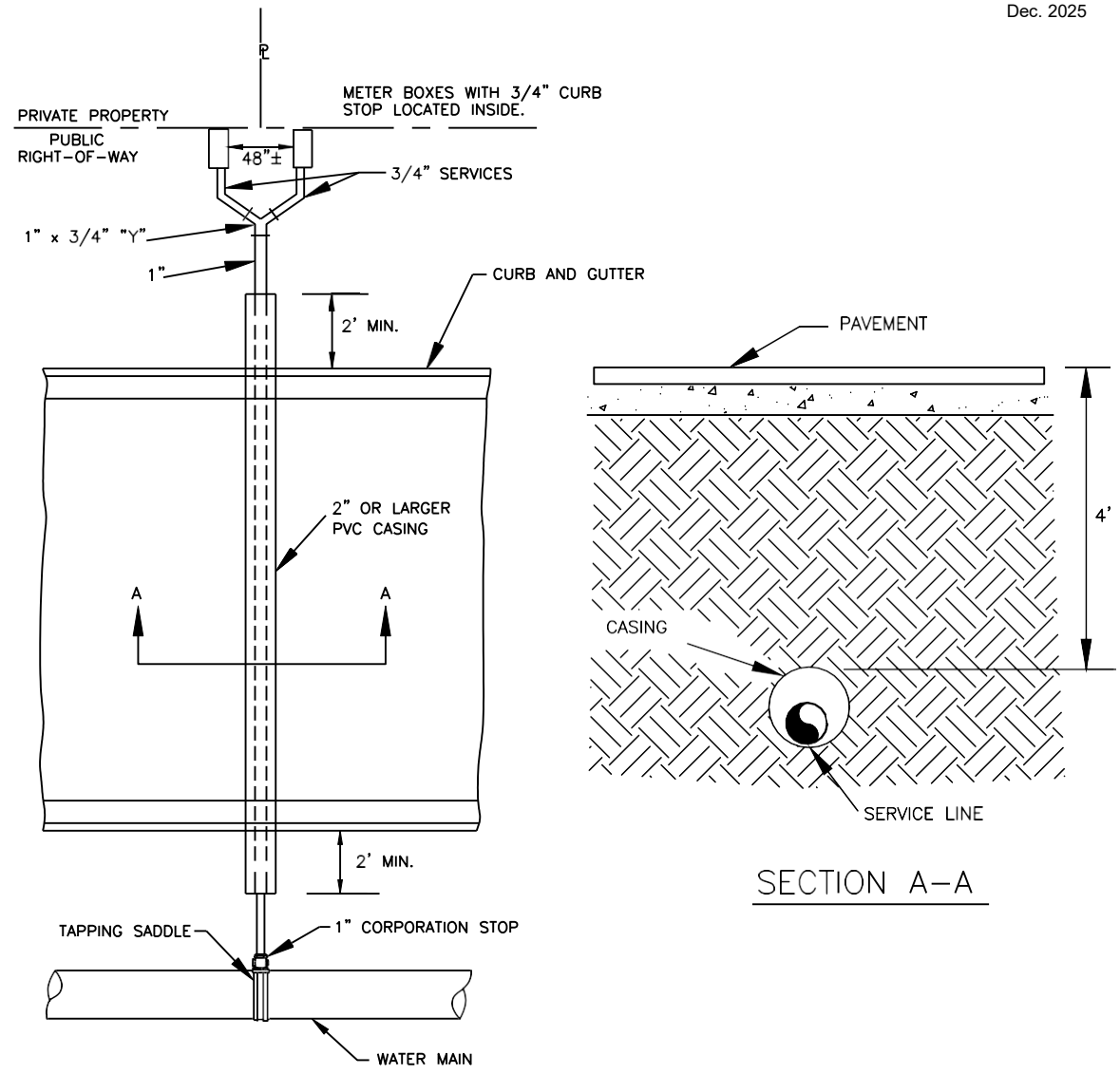


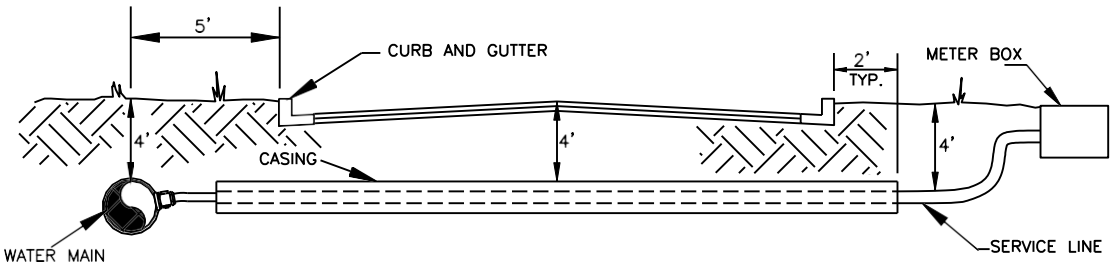
THE VAULT SHALL BE BEDDED ON A MINIMUM OF 12" OF #57 STONE.

DOUBLE CHECK

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

WATER - FIG. 14
Dec. 2025





TYPICAL SIAMESE SERVICE INSTALLATION

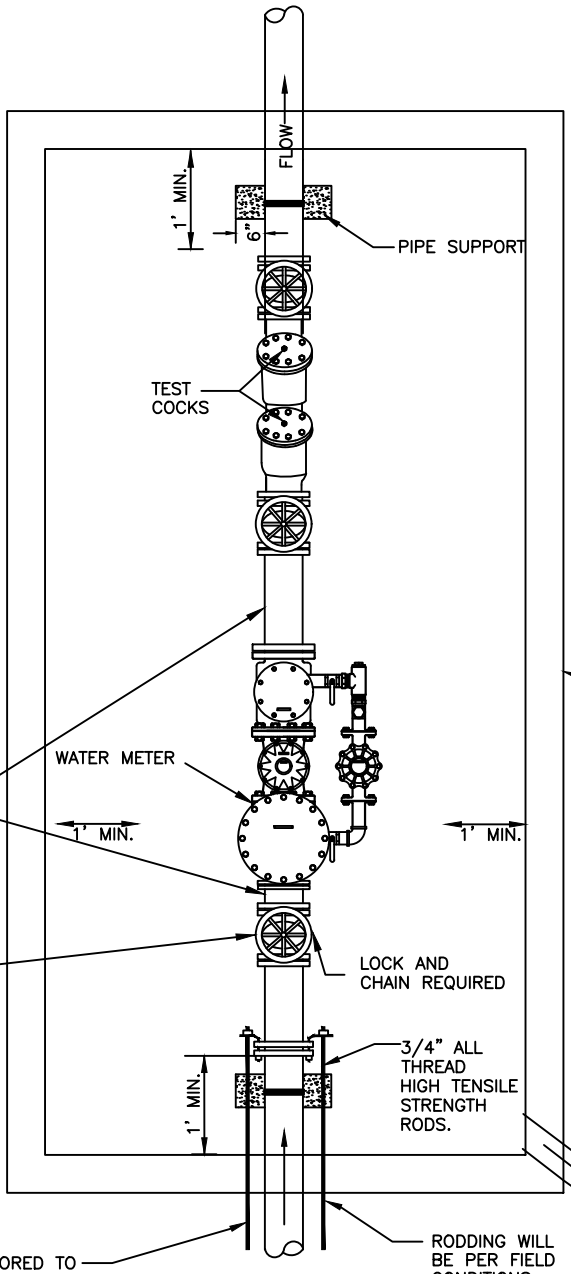
DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

WATER - FIG. 15
Dec. 2025

GDOT REGULATIONS MAY REQUIRE THAT METERING DEVICES, VAULTS OR PRESSURE REDUCING MECHANISMS SHALL BE LOCATED OFF THE RIGHT-OF-WAY. CHECK CITY, COUNTY, AND GDOT REGULATIONS FOR EXACT LOCATIONS.

NOTE: 1) ALL PIPE SHALL BE MINIMUM OF CLASS 50 DUCTILE IRON PIPE

2) UNIFLANGES ARE NOT PERMITTED



METER PIT LID SHALL BE CENTERED OVER METER. HATCH SIZE SHALL BE 3' x 6' OR 4' x 6' FOR METERS 4" AND LARGER. ALL HATCHES SHALL BE ALUMINUM AND SHALL NOT BE HINDERED FROM OPENING FULLY.

DOUBLE CHECK ASSEMBLY MUST BE INSTALLED IN A LEVEL POSITION.

POST INDICATOR VALVE SHALL BE INSTALLED OUTSIDE OF THE PIT.

METER PIT PRECAST

WHEN INSTALLING BADGER METERS WITH A STRAINER, A MINIMUM OF TWO(2) PIPE DIAMETERS DOWNSTREAM AND FIVE(5) PIPE DIAMETERS UPSTREAM OF STRAIGHT RUN PIPE IS REQUIRED.

WHEEL OPERATED O,S, &Y GATE VALVE FL. x FL.

POSITIVE DRAIN: LOCATION TO BE DETERMINED BY PROJECT ENGINEER.

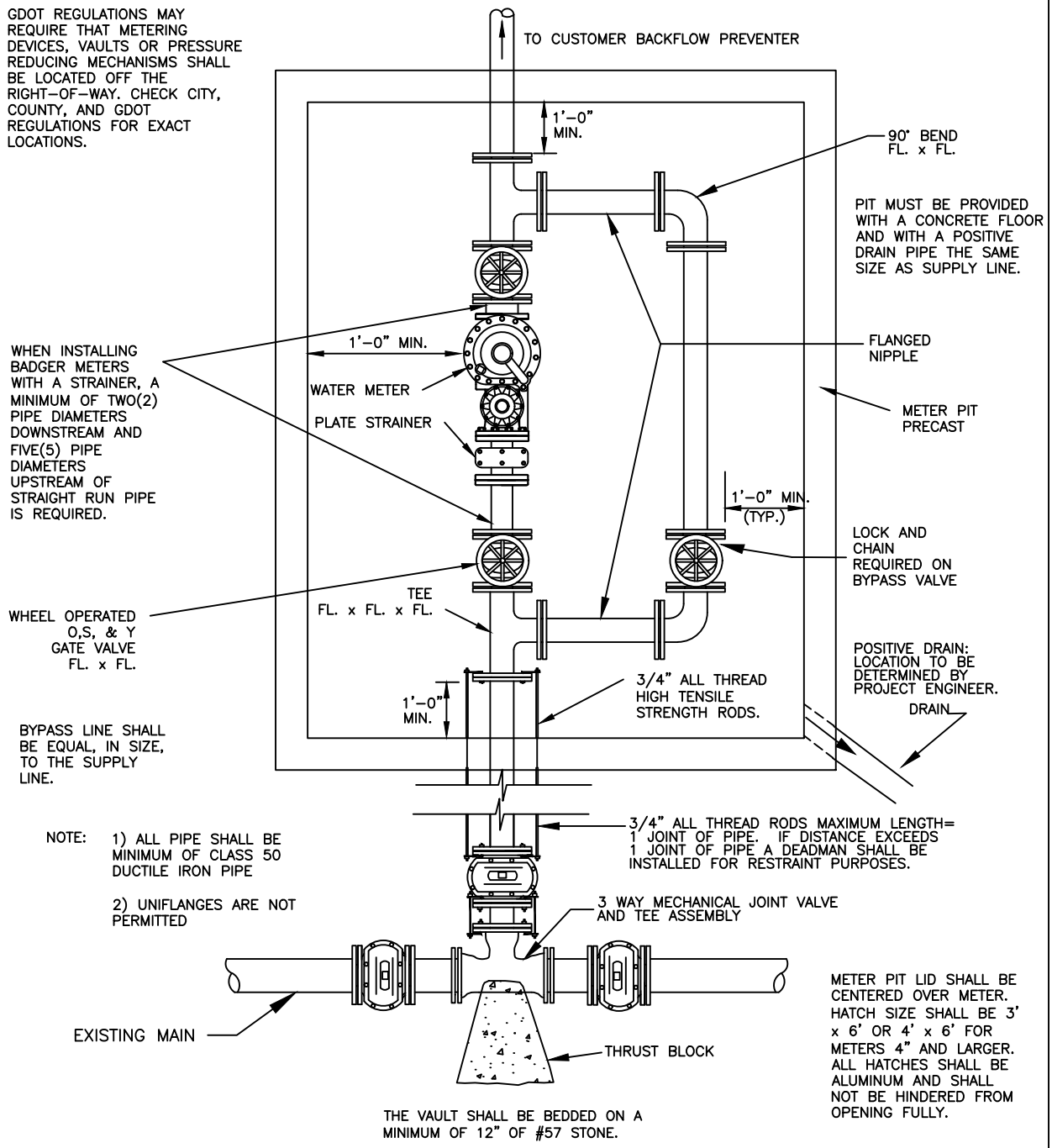
THE VAULT SHALL BE BEDDED ON A MINIMUM OF 12" OF #57 STONE.

PIT MUST BE PROVIDED WITH A CONCRETE FLOOR AND WITH A POSITIVE DRAIN PIPE THE SAME SIZE AS SUPPLY LINE.

TYPICAL FIRE LINE METER AND BACKFLOW PREVENTER INSTALLATION

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

WATER - FIG. 16
Dec. 2025

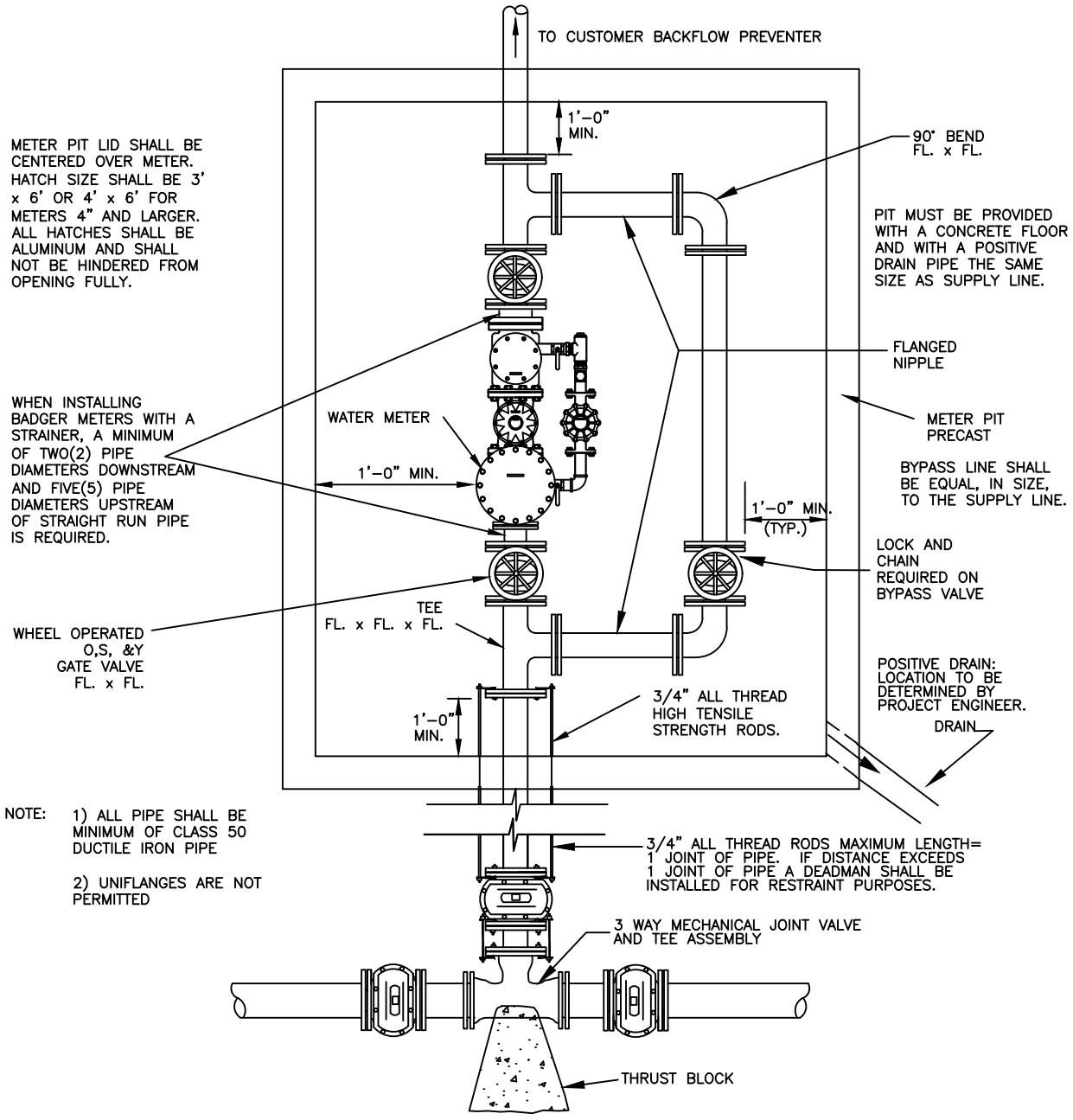


3" THRU 6" METER INSTALLATION (PLAN VIEW)

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

WATER - FIG. 17
Dec. 2025

GDOT REGULATIONS MAY REQUIRE THAT METERING DEVICES, VAULTS OR PRESSURE REDUCING MECHANISMS SHALL BE LOCATED OFF THE RIGHT-OF-WAY. CHECK CITY, COUNTY, AND GDOT REGULATIONS FOR EXACT LOCATIONS.



NOTE:
1) ALL PIPE SHALL BE MINIMUM OF CLASS 50 DUCTILE IRON PIPE

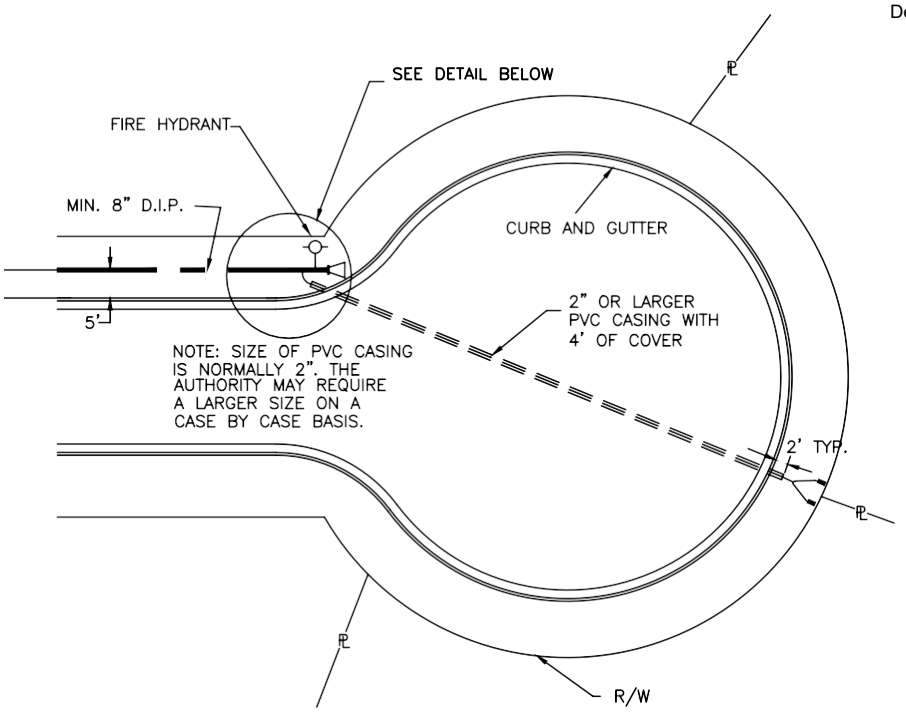
2) UNIFLANGES ARE NOT PERMITTED

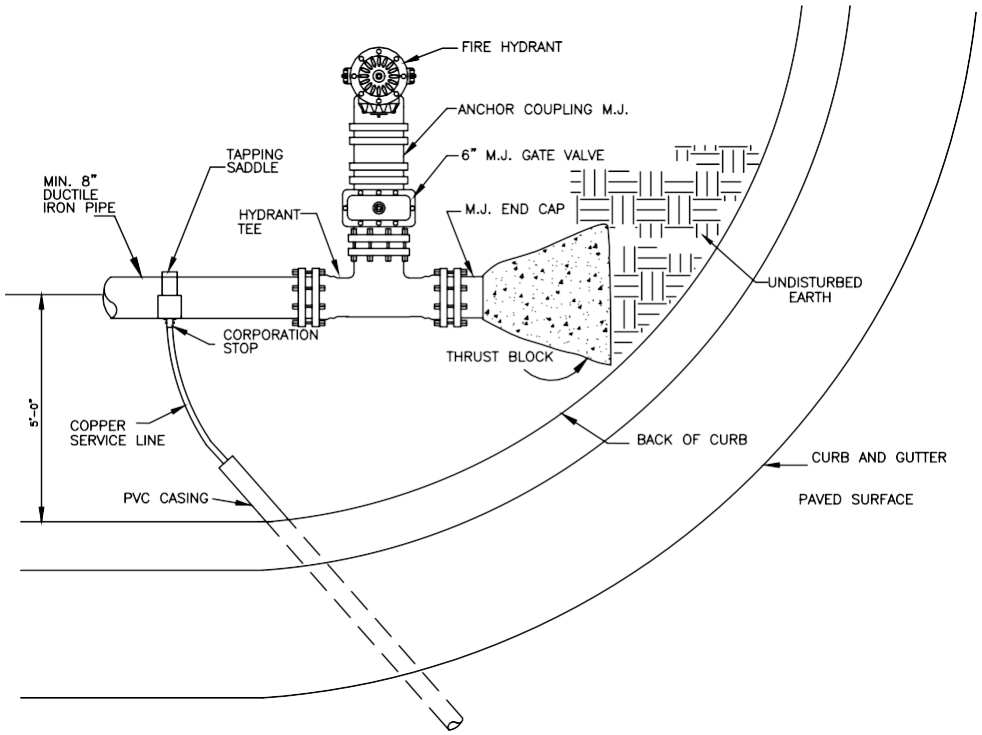
THE VAULT SHALL BE BEDDED ON A MINIMUM OF 12" OF #57 STONE.

8" THRU 10" METER INSTALLATION DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

WATER - FIG. 18
Dec. 2025

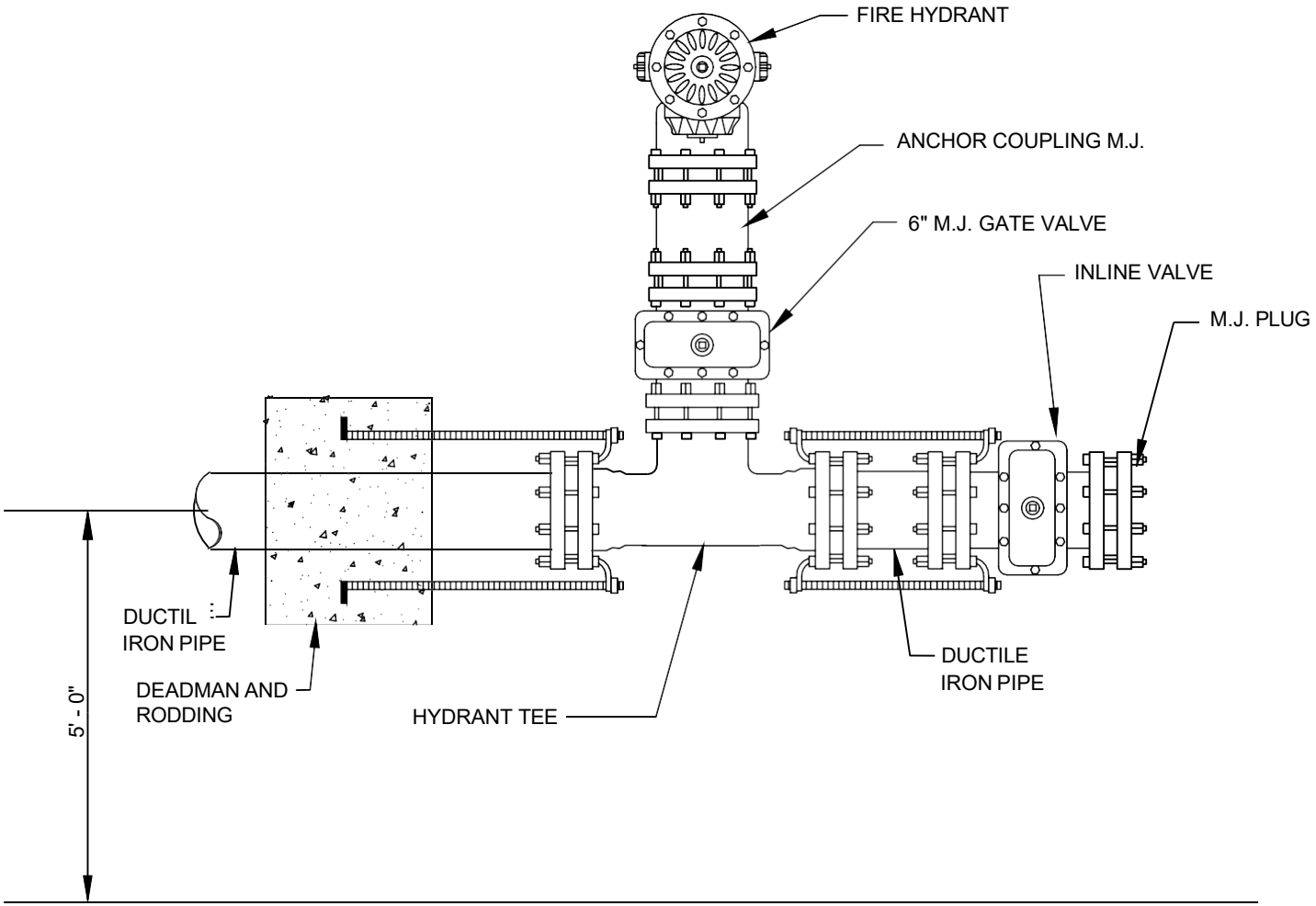




CUL-DE-SAC DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

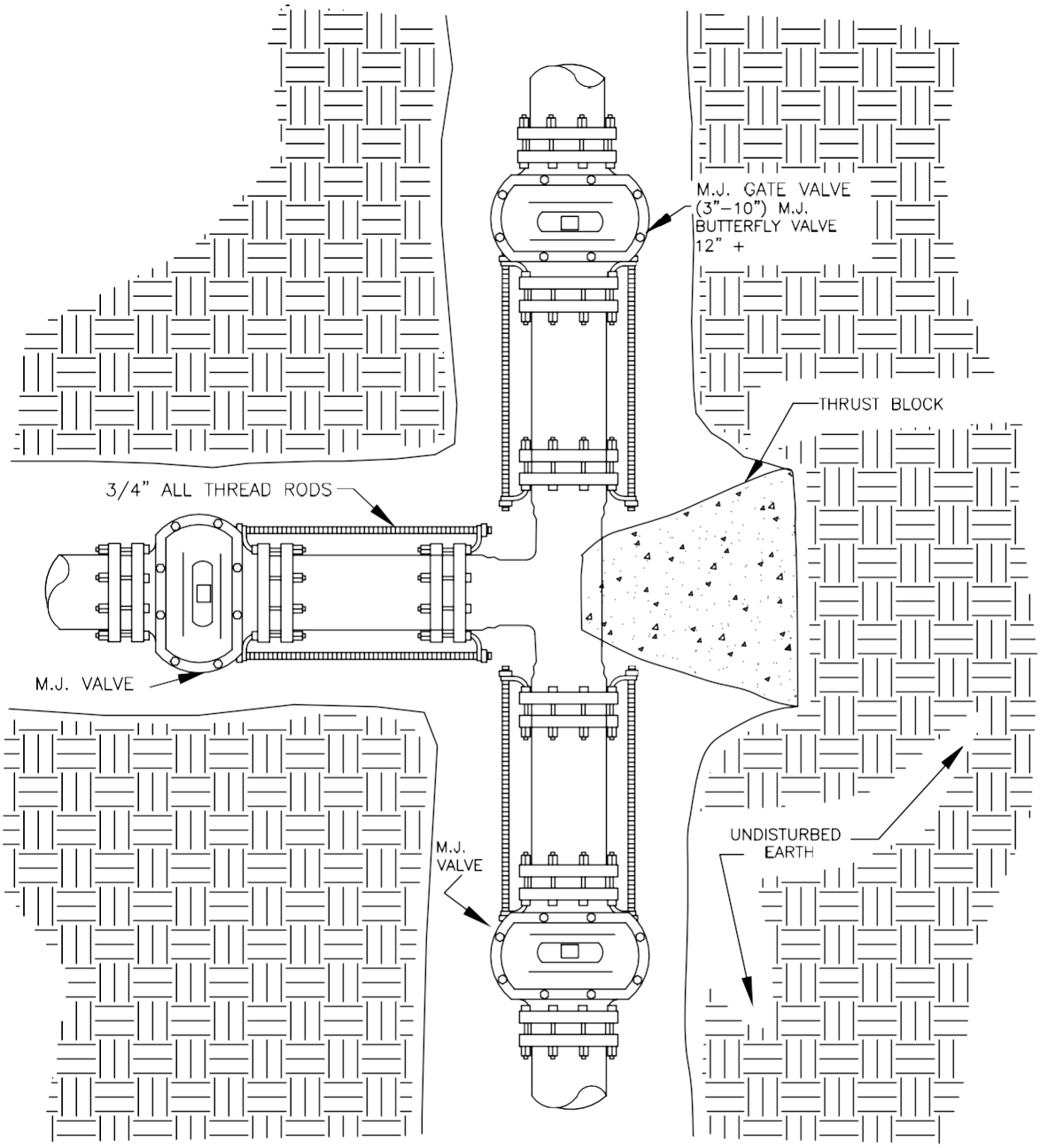
WATER - FIG. 19
Dec. 2025



END OF LINE DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

WATER - FIG. 20
Dec. 2025

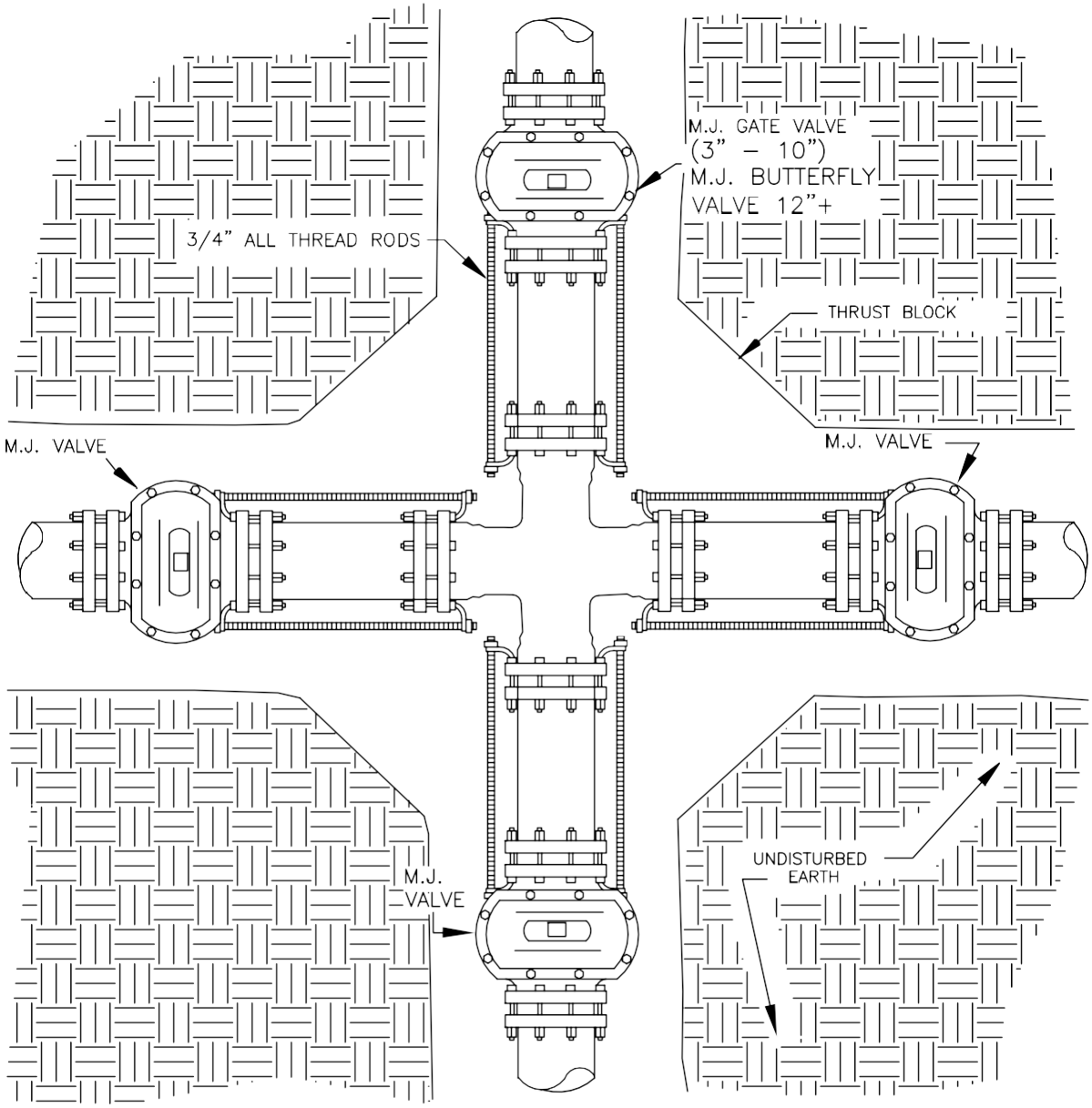


NOTE: GATE VALVES REQUIRED FOR 10" AND SMALLER APPLICATIONS. BUTTERFLY VALVES REQUIRED FOR 12" AND LARGER APPLICATIONS.

3-WAY VALVE AND TEE INSTALLATION DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

WATER - FIG. 21
Dec. 2025

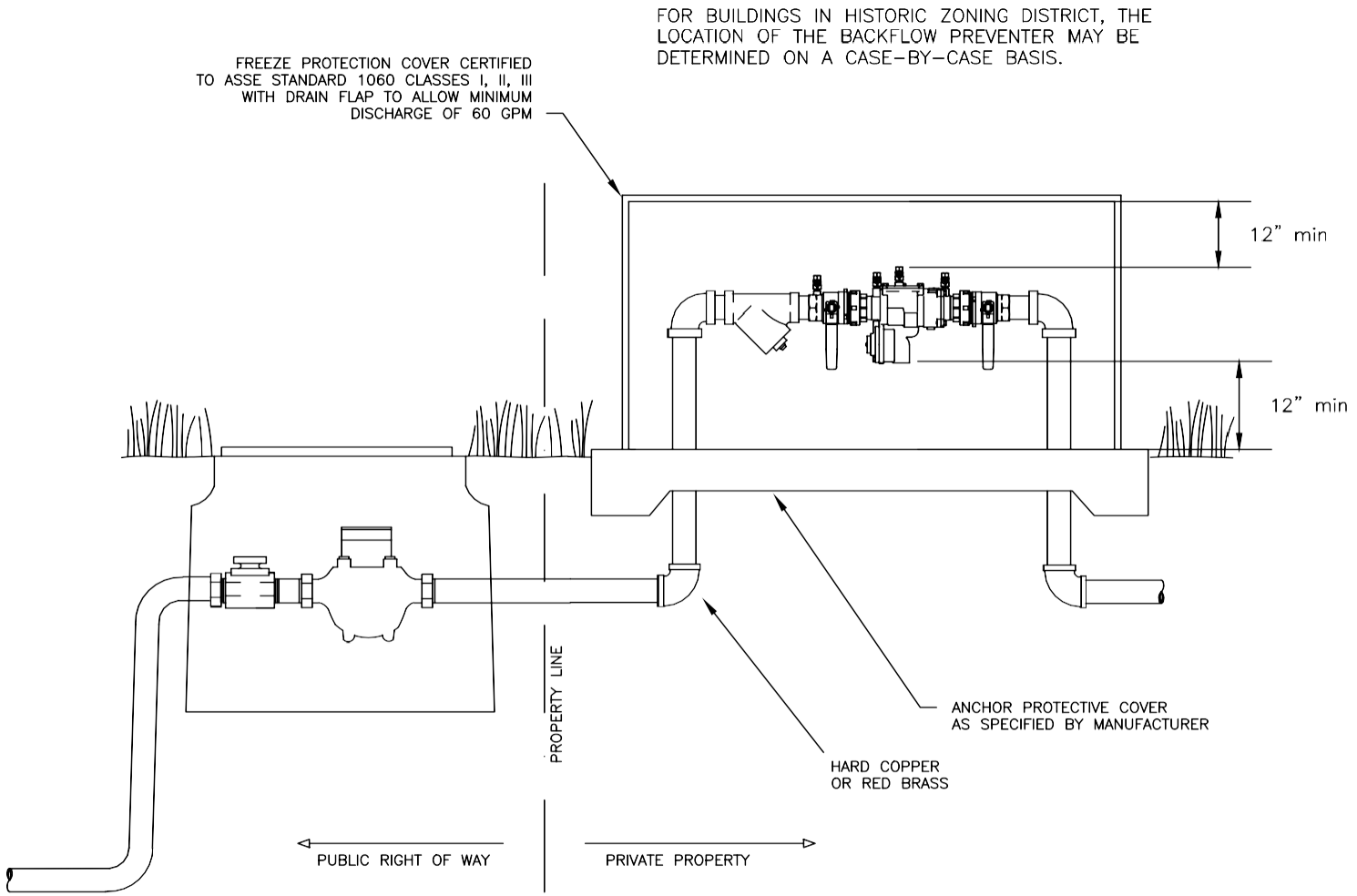


NOTE: GATE VALVES REQUIRED FOR 10" AND SMALLER APPLICATIONS. BUTTERFLY VALVES REQUIRED FOR 12" AND LARGER APPLICATIONS.

4-WAY CROSS INSTALLATION DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

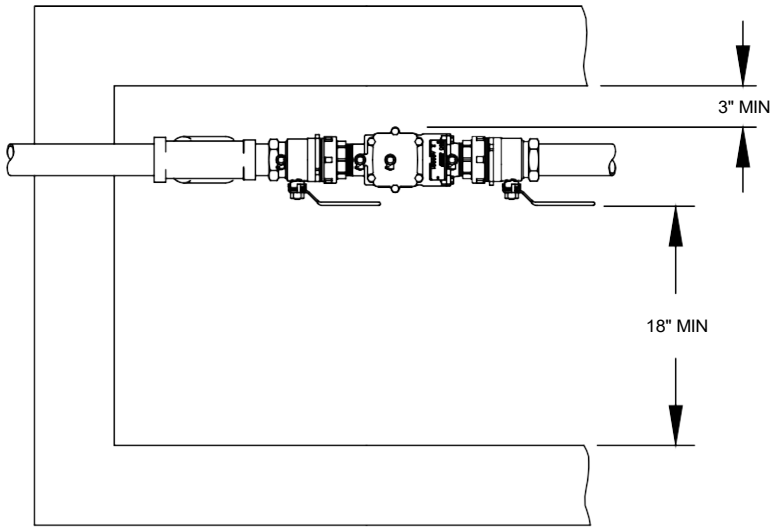
WATER - FIG. 22
Dec. 2025



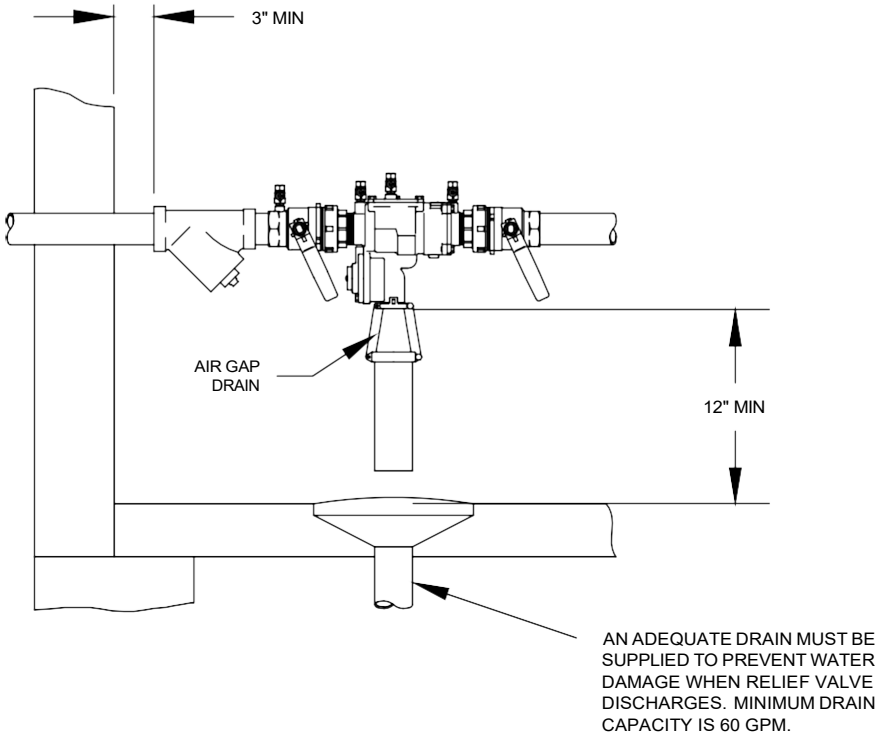
REDUCED PRESSURE ASSEMBLY OUTDOOR INSTALLATION

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

WATER - FIG. 23
Dec. 2025



PLAN VIEW

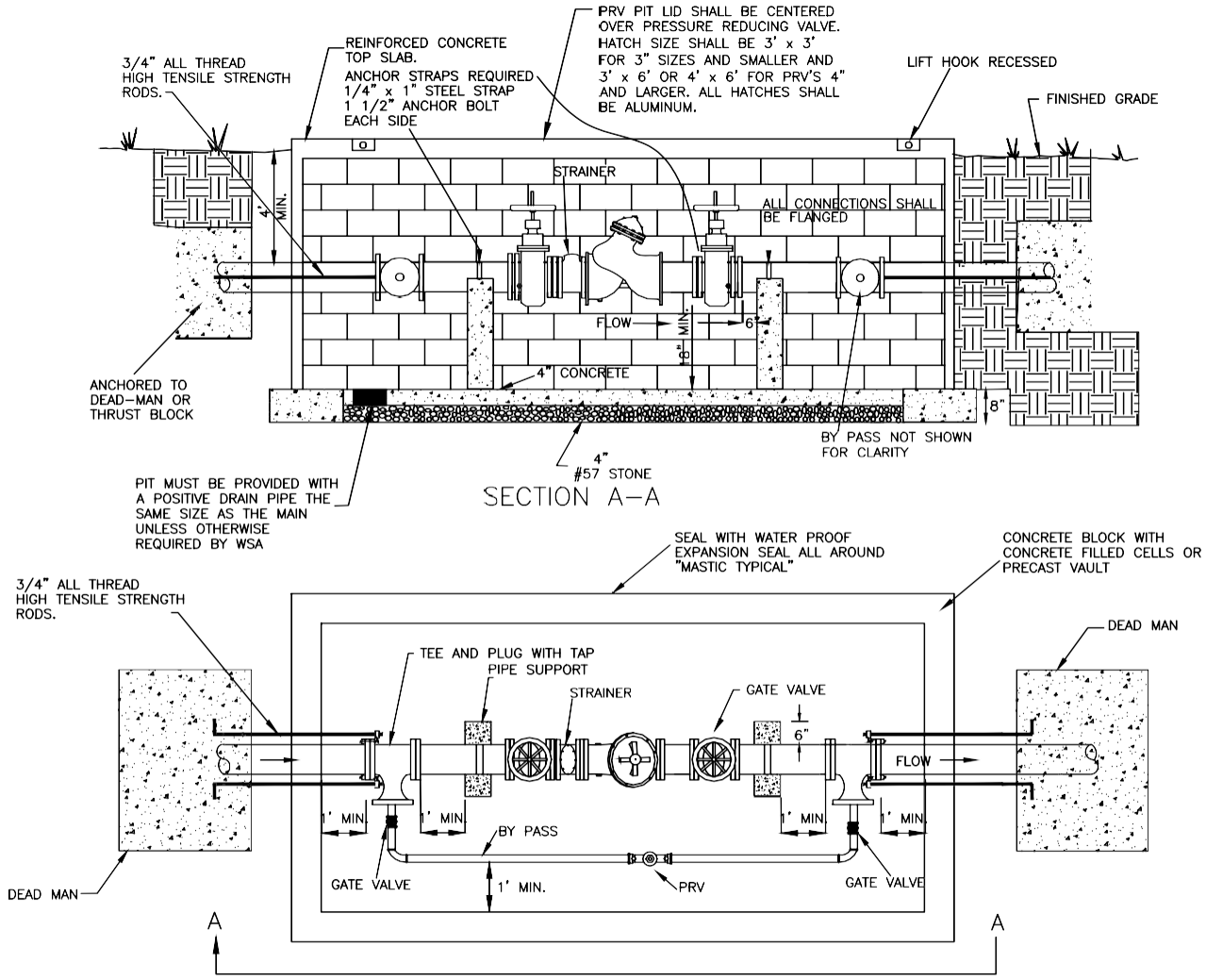


PROFILE VIEW

REDUCED PRESSURE ASSEMBLY INDOOR INSTALLATION

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

WATER - FIG. 24
Dec. 2025



PRESSURE REDUCING VALVE

SECTION SEVEN

CONSTRUCTION STANDARDS - SEWER

1.0 SCOPE

This specification covers the material requirements and installation procedures for all sanitary sewer pipe, structures, and appurtenances to be accepted into the Douglasville-Douglas County Water and Sewer Authority (Authority) sewer system. However, this does not limit the Authority's ability to require and/or accept other materials, construction techniques, or engineering when deemed appropriate by the Authority. Any sewer pipe, structures, or appurtenances which the Authority has reason to believe are not in conformance with these specifications will not be accepted.

2.0 QUALITY ASSURANCE

2.1 Applicable Standards

The contractor shall supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), and American National Standards Institute (ANSI). Latest revisions of all standards are applicable.

2.2 Quality Assurance

If requested by the Authority, the contractor shall submit evidence that manufacturers have consistently produced projects of satisfactory quality and performance for a period of at least two years.

2.3 Substitutions

Whenever a product is identified in the specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, etc., the contractor may freely choose from those referenced products which ones he wishes to provide. Any item or product other than those so designed shall be considered a substitution. The contractor shall obtain prior approval from the Authority for all substitutions.

3.0 PIPE MATERIALS

3.1 Polyvinyl Chloride Gravity Sewer Pipe (6-inch diameter through 36-inch diameter)

3.1.1 Pipe

The Authority will only accept Polyvinyl Chloride (PVC) Pipe totally manufactured in the United States and supplied by Diamond Plastics Corporation, NAPCO Pipe & Fittings, JE Eagle, and National Pipe and Plastics.

PVC gravity sewer pipe (6-inch diameter through 15-inch diameter) shall be SDR 35 for depths of cover up to fifteen feet. SDR 26 shall be used for depths of cover from fifteen feet to twenty-five feet. Pipe shall be manufactured in accordance with ASTM D 3034-2000 or latest revision and supplied in lengths of approximately 13 feet.

PVC gravity sewer pipe (18-inch diameter through 36-inch diameter) shall be PS 46 for depths of cover up to fifteen feet. PS 115 shall be used for depths of cover from fifteen feet to twenty-five feet. Pipe shall be manufactured in accordance with ASTM F 679 or latest revision and supplied in lengths of approximately 13 feet.

3.1.2 Joints

Joints for pipe and fittings shall be of the bell and spigot type with a confined elastomeric gasket having the capability of absorbing expansion and contraction without leakage. The joint system shall be identical for pipe and fittings and performed in strict conformance with ASTM D 3212 and ASTM F 477.

3.1.3 Fittings

Fittings for pipe shall be one piece with no solvent-welded joints. No field fabrication of fittings will be allowed. All such fabrication shall be performed at the factory and the fittings delivered ready for use.

3.2 Ductile Iron Pipe and Fittings (4-inch diameter through 64-inch diameter):

3.2.1 Pipe

The Authority will only accept Ductile Iron Pipe totally manufactured in the United States and supplied by ACIPCO, Griffin, McWane, or U.S. Pipe.

Ductile iron pipe shall conform to AWWA C104 and shall be a minimum Pressure Class 350 thickness for 8-inch diameter pipes and smaller; higher class thickness pipe shall be utilized as per the depth of cover or otherwise specified in the contract documents, project design, or by the design engineer. All ductile iron pipe shall be lined with Tnemec Series 431 Perma-Shield PL or approved equal. Fittings shall conform to AWWA

C110 with a rated working pressure of 150 PSI. The exterior of ductile iron pipe shall be coated with a layer of arc-sprayed zinc. The mass of the zinc applied shall be 200 g/m2 of pipe surface area. A finishing layer topcoat shall be applied to the zinc. The mean dry film thickness of the finishing layer shall not be less than 3 mils with a local minimum not less than 2 mils. All pipe shall be manufactured and coated in the United States at the pipe manufacturer's facility. All pipe with cover depth of 25 feet or greater shall be ductile iron pipe.

Ductile iron pipe fittings shall be produced in accordance with all applicable terms and provisions of ANSI/AWWA C153/A21.53 and ANSI/AWWA C111/A21.11. Fittings shall be lined with Tnemec Series 431 Perma-Shield PL or approved equal and seal coated in accordance with ANSI/AWWA C104/A21.4.

Gaskets shall be yellow or orange in color and color shall be consistent throughout the entire cross-section of the gasket. The color shall not be attained by surface coating; it shall be inherent within the rubber.

3.2.2 Joints

Pipe shall have push-on joints, except for pipe within casing, which shall be restrained joint pipe. All non-restrained fittings shall be mechanical joint type. Joints shall conform to AWWA C111. Restrained joint pipe and restrained joint fitting shall be either the bolted joint type or modified push-on joint type with joint restraint using ductile iron components. Restrained joint pipe on piers shall have bolted joints and shall be specifically designed for clear spans of at least 18 feet. Ductile iron pipe must be approved by the Authority prior to installation and must meet AWWA Standards. The use of locking type gaskets may be allowed where the Authority deems appropriate.

3.3 Reinforced Concrete Pipe (30-inch diameter or greater unless approved by the Authority):

3.3.1 Pipe

Pipe shall be reinforced concrete bell and spigot with type two cement and calcareous aggregate conforming to ASTM C 76 for Wall C pipe. Pipe shall be supplied in lengths of at least 8 feet.

3.3.2 Joints

Pipe shall have rubber gasket type joints with steel end rings conforming to ASTM C 443. A rectangular groove shall be supplied in the spigot end to receive the rubber gasket, and it shall be so formed to a rectangular shape

and confined on all four sides. Bell and spigot surfaces shall be accurately formed and smooth to provide a close sliding fit with a nominal clearance of 1/16-inch.

3.3.3 Testing

Concrete pipe with a diameter of 60 inches or greater shall undergo a certified material test and inspection of manufactured pipe for defects and imperfections as defined in paragraph 4.1.2 of ASTM C 76. Concrete pipe with a diameter between 30 inches and 60 inches shall in addition undergo plant load bearing testing. Test results on pipe, joint material and made-up joints must be performed by an independent testing laboratory approved by the Authority. Results to be supplied shall include materials, absorption, crushing (where applicable), and hydrostatic leakage tests on pipe of each size in accordance with applicable specifications.

3.3.4 Lining

The reinforced concrete pipe shall be epoxy lined.

3.3.5 Contractor Inspection

The contractor shall inspect pipe after delivery for laboratory stamp, shape, cracks, uniformity, blisters and imperfect surfaces, hammer test, damaged ends, and gasket grooves. The contractor will not accept or use repaired or patched pipe or pipe with repaired or patched gasket grooves or shoulders.

3.4 Pipe Material Transitions

Transitions of pipe material are permitted at manholes only. The use of FERNCO and other such couplings designed to allow pipe material transitions between manholes are not acceptable.

3.5 Material Inspection and Acceptance

Acceptance of the material will be based upon the Authority's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with all applicable standards, latest revisions.

Each pipe shall be clearly marked as required by the governing ASTM Standard Specifications to show its class, date of manufacture and the name and trademark of the manufacturer.

Latitudes in workmanship and finish allowed by the ASTM Specifications notwithstanding, all pipe shall be first quality, have smooth exterior and interior surfaces and be free from cracks, blisters and other imperfections, and true to

theoretical shapes and forms throughout each length. All pipe shall be subject to inspection by the Authority at the pipe plant, trench and other points of delivery for, the purpose of, culling and rejecting pipe, independent of laboratory tests. Pipe that does not conform shall be marked as such by the Authority and shall not be delivered or used in the work. On-the-job repairing of rejected pipe will not be permitted.

Any pipe or special items which have been broken, cracked or otherwise damaged before or after delivery or which have failed to meet the required tests, shall be removed from the site of the work and shall not be used therein.

4.0 EXCAVATION

The contractor is to perform all excavation of every description and of whatever substance encountered to the depth shown on the approved construction drawings for all sewers, manholes, piers, conduits, and other appurtenances. All excavation is to be performed in strict conformance with the Occupational Safety and Health Act of 1970 (PL 91-596) or latest applicable revision. The contractor is responsible for acquiring all applicable City and County permits.

Excavation shall be accomplished by open cut unless otherwise directed. No tunneling shall be done, except as approved by the Authority and/or directed by the Douglas County Road Department, the City of Douglasville or the Georgia Department of Transportation. It is the responsibility of the contractor to ascertain all permits required by all governing agencies prior to installing any sewer pipe or appurtenances beneath their roadway pavement.

4.1 Trench Dimensions

The top portion of the sewer pipe trenches may have sloping or vertical sides to widths that will not cause damage to adjoining structures, roadways, pavements, utilities, and private property. For un-timbered trenches and trenches held by stay bracing only, the width of the lower portion of the trench to a height of 2-feet shall be as specified in the "Maximum Trench Widths and Depths" Section of these specifications. Where skeleton and solid sheeting is used, trench width may be increased to dimensions approved by the Authority but shall not be greater than that necessary to clear the walls when lowering pipes into the trench. Where in the opinion of the Authority trench excavation may damage adjoining poles, roadways, utilities, and private property, the Authority may order suitable sheeting to be installed for their protection. Such orders shall in no way relieve the contractor from that responsibility of protection of these facilities, nor shall the lack of those orders relieve the contractor from that responsibility. If trenches are excavated to widths in excess of the above limitations, or collapse because of insufficient bracing and sheeting, the developer will be required to use special methods of constructing pipe foundations and backfilling as specified herein. All construction must meet or exceed OSHA Standards.

Trench excavation shall not advance more than 600 feet ahead of pipe laying, unless approved. The bottom of all trenches shall be smooth and flat and with backfill material affording full bearing of the pipe barrel. The depth and width required shall be as directed by the Authority. Excavation in excess of the depth required for proper trenching shall be corrected by one of the special methods specified herein, as ordered by the Authority. Bell holes shall be excavated in a manner that will relieve pipe bells of all load and ensure support is provided throughout the length of the pipe barrel. Excavation in excess of the depths required for manholes and other structures shall be corrected by placing a sub-foundation of #57 stone, surge stone or some combination thereof.
If trenches are excavated to excessive dimensions or collapse because of inadequate or improperly placed bracing and sheeting, the pipe shall be laid using the next class of bedding. If over excavation for manholes and other structures occurs, the area under the structure or manhole shall be backfilled with granular bedding material to the required grade.

4.2 Bracing and Sheeting

The contractor shall provide bracing and sheeting when required by regulations or to prevent damage to adjoining structures, roadways, pavements, utilities, trees, or private property that are specifically required to remain.

4.2.1 Timber

Timber for shoring, sheeting, or bracing shall be sound and free of large or loose knots and in good condition. Size and spacing shall be in accordance with OSHA regulations.

Remove bracing and sheeting in units when backfill reaches the point necessary to protect the pipe and adjacent property. Leave sheeting in place when in the opinion of the Authority it cannot be safely removed. Cut off sheeting left in place at least two feet below the surface.

4.2.2 Steel Sheet Piling

Continuous lockjoint steel sheet piling may be substituted for timber sheeting when approved by the Authority. Steel piling may be removed, without cutting, provided the rate of removal is kept in pace with the tamping and backfilling operations to assure complete filling of the void created by the withdrawal of the piling. Complete withdrawal of the piling in advance of tamping and backfilling will not be permitted. Piling, where ordered to be left in place by the Authority for reasons of safety, will be cut off where directed.

4.3 Dewatering Trenches

Trenches requiring dewatering shall be dewatered continuously to maintain a water level at least 2 ft. below the bottom of the trench. Dewatering running sand shall be accomplished by well pointing. Where soil conditions do not permit use of well pointing, construct French drains of crushed stone or gravel to conduct water to a gravel filled sump. The contractor shall have a stand-by pump available at all times while conducting dewatering operations. All accumulated water shall be removed from the trench before placing bedding or haunching, laying pipe or placing backfill.

Any problems arising from the dewatering process shall be the responsibility of the contractor. Dewatering wells must be removed, and all voids filled when the job is completed.

4.4 Trench Stabilization

If, in the opinion of the Authority, the sub grade is by nature too soft and/or excessively wet for the proper installation of sewer pipe, the Authority may order the contractor to undercut the ditch and backfill with crushed stone or gravel not larger than 3/4 inch in size and/or may order the contractor to use D.I.P. The stone shall be brought to grade and compacted.

5.0 ROCK EXCAVATION

5.1 Rock (Defined)

Any material that cannot be excavated with a backhoe with equipment having a minimum digging force of 25,000 pounds using a standard 3-foot bucket and occupying an original volume of at least 1/2 cubic yard.

5.2 Excavation

Where rock is encountered in trenches, it shall be excavated to the minimum depth that will provide eight inches or more clearance below the pipe barrel and manholes. Remove boulders and stones to provide a minimum of six inches clearance between the rock and any part of the pipe or manhole.

5.3 Blasting

Only licensed blasting contractors shall be employed and all blasting shall be monitored by seismographs. Liability insurance shall be required in the amount deemed appropriate by the Authority. The contractor shall provide only experienced workmen to perform blasting. All blasting operations shall be conducted in accordance with all existing ordinances and regulations. All structures shall be protected from the effects of the blast. The contractor shall be

responsible for repairing any resulting damage. If the contractor persistently uses excessive blasting charges or blasts in an unsafe or improper manner, the Authority may direct the contractor to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge. The blasting contractor shall be insured.

5.4 Removal of Rock

Excavated rock shall not be used as backfill material. Rock that is surplus or not suitable for use as riprap shall be disposed of.

5.5 Maximum and Minimum Trench Widths

Trench widths for each pipe installation will be dictated by the soil conditions encountered. Trench width for all pipe materials shall be kept to nine inches minimum and 12 inches maximum on both sides of the outside diameter of the pipe.

6.0 BEDDING - FLEXIBLE CONDUIT

The following bedding materials and installation requirements shall be followed for polyvinyl chloride pipe being installed.

6.1 Trench Preparation

The bottom of the trench shall be flat and excavated to the minimum depth below the bottom of the pipe barrel as shown on the drawings. Trench width and pipe bedding shall be per the manufacturer's recommendations.

6.2 Bedding Placement and Compaction

The contractor shall place and compact the bedding material to the proper grade. The bedding material shall be carefully placed by hand and hand tamped to provide full support under the pipe and to the top of the pipe. The contractor shall be cautious when tamping so no voids will be present in the backfill in the haunch area of the pipe. No compaction of the backfill other than hand tamping will be allowed until the backfill above the pipe reaches two feet above the top of the pipe.

6.3 Bedding Material

Crushed stone bedding shall meet the requirements of ASTM C 33 No. 57, No. 6 or No. 67 stone. All pipe shall be installed and bedded per the manufacturer's recommendations.

7.0 BEDDING - RIGID CONDUIT

7.1 Reinforced Concrete Pipe Bedding

Bedding for reinforced concrete pipe shall be in accordance with ASTM C 12. Bedding standards with the depths of installation shown on the approved drawings and in accordance with Table I hereinafter.

7.2 Ductile Iron Pipe Bedding

The contractor shall excavate the trench to 1/4 the nominal pipe diameter below the depth shown on the approved plans. Bedding material shall be placed and compacted by the contractor to the proper grade. Bedding shall then be carefully placed and compacted to provide full support under and up to the center line of the pipe.

7.3 Bedding Material

In most instances, clean native soil meeting the Class I material requirements may be used for bedding of ductile iron pipe. Crushed stone bedding material shall meet the requirements of ASTM C 33 No. 57, No. 6, or No. 67 stone. All pipe shall be installed and bedded per the manufacturer's recommendations.

7.4 Bell Holes

Bell holes shall be provided in all classes of bedding to relieve pipe of all loads. Bell holes are not required for clay plain-end pipe.

7.5 Increase in Bedding Classes

The determination of the bedding class shall be from the actual width of the trench. If the contractor increases the width of the trench for his convenience or due to collapse of trench walls so that a higher class of bedding is required, the increased cost of same shall be borne by the contractor. If the bearing value of the sub grade is determined by the contractor or the Authority to be inadequate for a particular class of bedding, the contractor shall substitute a higher class of bedding. In inundated areas, the contractor shall add the necessary granular bedding material to stabilize the pipe trench as determined by the Authority.

8.0 BACKFILLING

The contractor shall backfill all trenches fully to restore the ground surface to its original condition. Before heavy construction equipment is permitted to cross over a pipe, an earth fill shall be constructed to an elevation of at least three feet over the top of the pipe or to an elevation as required by the manufacturer, whichever is greater.

The contractor shall dispose of all surplus material. Backfill material cannot contain any rock larger than six inches square or any trees, stumps or limbs. The right-of-way shall be cleared of all limbs, brush, trees, stumps, roots and rocks. The right-of-way shall be sloped with the contour of the land so that the right-of-way does not act as a ditch for water runoff.

8.1 Suitable Backfill Material

Suitable backfill material is earth material excavated from the trench that is clean and free of rock, organics and other unsuitable material. The contractor should use extreme care when selecting the initial backfill material to be placed to a depth of 12 inches over the top of the pipe. This initial backfill material shall be free of all rock and clods that could damage the pipe in any way. If the backfill material excavated from the trench is not suitable for use as initial backfill material, the contractor shall obtain suitable materials elsewhere. Unsuitable material shall be disposed of off-site in accordance with applicable regulations.

8.2 Procedures for Backfilling

The contractor shall place the initial backfill material carefully around the pipe or over the bedding material covering PVC or ductile iron pipe in uniform 6-inch layers to a depth of at least 24 inches above the pipe bell. Each layer shall be compacted thoroughly without disturbing or damaging the pipe. Caution should be taken when compacting backfill material above polyvinyl chloride pipe.
The backfill material over PVC pipe should be compacted by hand tamping until a depth of two feet above the top of the pipe is reached. The contractor shall backfill on both sides of all types of pipe simultaneously to prevent side pressures.

8.3 Compaction Methods for Fill More than Two Feet Above the Pipe

The contractor shall compact the backfill in 6-inch layers if using light power tamping equipment, such as a "jumping jack." The contractor shall compact the backfill in 2-foot layers if using heavy tamping equipment, such as a hammer with tamping feet.

8.4 Backfill Under Roads

Backfill to be placed under roads shall be compacted to 95% Standard Proctor Density per ASTM D 698 or as required by all local governmental agencies that have jurisdiction over the road. Compaction tests may be required in existing or proposed streets, sidewalks, drives and other existing or proposed paved areas at varying depths and at intervals as determined by the Authority engineer with a minimum of one test on each job, and a maximum of one required test for each 400 feet of sewer main construction unless soil conditions or construction practices, in the opinion of the Authority, warrants a need for additional tests.

8.5 Settlement

If trenches settle, the contractor shall refill and grade the surface to conform to the adjacent surfaces.

8.6 Surfacing of Trenches in Dirt Streets, Paved Roads and Driveways

Where trenches are along dirt streets and paved roads open to vehicular traffic or across driveways, the remaining 12 inches of backfill up to the traveled surface shall be made with crusher run stone, compacted and maintained until all removed pavement, as necessary, is replaced.

8.7 Additional Material

Where final grades above the pre-existing grades are required to maintain minimum cover, the contractor is to supply additional fill material to meet the final grade requirements shown on the drawings. The contractor may utilize excess material excavated from the trench if the material is suitable. If the excess excavated materials are not suitable or if the quantity available is not sufficient, the contractor shall provide additional fill material.

9.0 MANHOLES

9.1 Acceptable Manhole Materials

9.1.1 New Manholes

Manholes shall be precast per applicable ASTM C 478 standards. Manholes shall be eccentric. Manholes shall have copolymer coated plastic steps on centers between 12 and 16 inches for all manholes over two feet in depth. All manholes shall have flexible boot seals conforming to ASTM C923 where the sewer pipes enter and leave the manhole. A-Lok X-Cel Pipe to Manhole Connectors are considered a suitable alternative. All flexible rubber boot seals shall be jointed to the manhole at the manufacturing plant. Holes for pipe entering or leaving the manhole shall be a minimum of six inches above the base floor of the manhole at the plant or in the field and a rubber boot installed. Vertical manhole sections shall be joined with gaskets conforming to ASTM C443 or with double mastic.

Flexible external manhole chimney seals shall be installed on all manholes in any paved areas and all manholes in the 100-year floodplain. Chimney seals shall be Infi-Shield, SurSeal, Cretex or approved equal. Installation shall be in strict accordance with the manufacturer's instructions.

An epoxy coating shall be required inside all manholes into which a force main discharges. In lieu of an epoxy coating, the manholes may be

constructed of steel reinforced polymer concrete. Construction, installation, and testing shall be in accordance with the following standards, including but not limited to ASTM D 6783, ASTM C 478, ASTMC 443, ASTM C 923, ASTM C 33, and ASTM C 497. The Authority reserves the right to require an epoxy coating or the use of polymer concrete on additional downstream manholes.

Standard Epoxy Coating shall be a 100% solids, solvent-less two-component epoxy resin-coating system with increased bond strength and broad range chemical resistance. Apply a maximum of 40 mils in two applications over a smooth horizontal, vertical or overhead surface. The coverage will vary from 30 to 60 mils depending on the application.

9.1.2 Manholes Encountered During Construction

Existing manholes shall be cored prior to making connections to new sewer lines or laterals. Once the new connection has been made, the existing manhole shall be sealed with Kor-N-Seal or an Authority approved equal. All connections shall conform to ASTM C443.

The Authority, in its sole discretion, may require brick manholes that are encountered during construction to be replaced with new manholes that meet the standards as described in Section 9.1.1 of these specifications.

9.1.3 Minimum Diameter

Minimum manhole diameter shall be in accordance with the largest pipe size entering the manhole as prescribed below:

Diameter of Largest Pipe (inches)	Minimum Manhole Diameter (feet)
$\leq$ 24	4
30	4
36	5
42	6
48	7

9.2 Manhole Trench Excavation

Manhole trenches shall be excavated to a minimum of 12 inches below the planned elevation of the base of the manhole. The contractor shall place and compact 12 inches of stone bedding material as a foundation for the manhole and set the bottom of the manhole to the required grade shown on the approved plans before constructing the manhole.

9.3 Bedding Material

All bedding material shall be crushed stone, unless shown or specified otherwise. Crushed stone bedding material shall meet the requirements of ASTM C 33 No. 57 and No. 67 stones.

9.4 Backfilling Around Manholes

Excavated material may be used for backfilling manholes above bedding if suitable and approved by the Authority. Backfill shall be placed in 6-inch layers and compacted to 95% Modified Proctor per ASTM standards.

9.5 Inverts

Manhole inverts shall be carefully constructed using grout and brickwork.

9.5.1 Invert Materials

Cement grout shall be made of one-part cement to three-parts clear sharp sand and hydrated lime equal to 5% to 10% of the volume of cement. Gravel can also be used as a filler material in the formation of inverts. All brick shall be best grade, all hard-burned common in accordance with ASTM C62-01, Grade SW or No. 2 paving brick and have a regular and smooth face. When submerged in water 24 hours, brick shall not absorb more than 10% of their weight of water. Factory precast inverts are also acceptable.

9.5.2 Invert Formation

Invert channels shall be properly formed, rounded, and troweled smooth. Inverts shall be formed to the top of the pipe at the back of the table and 3/4 of the pipe at the channel. The bench shall have a 2-inch in 12-inch slope. Special care shall be taken to lay the channel and adjacent pipes to grade. The minimum fall across the invert shall be 0.2 ft. The inverts shall have a cross section of the exact shape of the pipes to which it connects. Changes in size and grade shall be made gradually and evenly. Changes in the direction of the sewer and entering branch or branches shall have a true curve of a radius as large as the size of the manhole will permit. The connections of the sewer with the wall and channel of the manhole shall be tight and smooth. When brick filler material, not brick pavers, is used in the construction, the depth of grout above the brickwork shall be at least 2 inches thick.

Where velocities in gravity sewer lines greater than 15 fps are attained, the Authority, in its sole discretion, may require special provisions to protect

against displacement by erosion and impact. Drop manholes and/or steel erosion plates can be constructed to reduce high flow velocities.

9.6 Top Elevations

All manholes outside paved areas shall be built to have top elevations approximately two feet above finished grade or as directed by the Authority.

Watertight manhole rings and covers are to be used wherever the manhole top may be flooded by high water (e.g., all manholes located within the 100-year flood plain) or street runoff. Manhole adjustment rings shall be sealed with a flexible rubber seal. Acceptable products include Infi-Shield (Sealing Systems, Inc., Loretto, MN), Cretex (Cretex Specialty Company, Waukesha, WS), Drain Flexrib Manhole Chimney Seals (Trelleborg Pipe Seals Milford, Inc., Milford, NH) or approved equal.

Manholes in paved areas shall be built to top elevations even with the existing grade. Adjustments of ring and covers for street resurfacing shall be accomplished utilizing an adjustment ring allowing vertical adjustments beginning with ¾ inch minimum and increasing at ¼ inch intervals up to 4 inches in height. Concrete grade rings, manufactured by McArthur Concrete Products, Inc. or approved equal, shall be used to adjust manhole top elevations in low lying areas of the roadway. Mastic shall be used to seal between the grade rings. The use of bricks to adjust manhole top elevations shall be limited to the high areas (e.g., the crown) of the roadway. Adjustment rings shall be "clear-span manhole adjusting ring" (manufactured by Cretex Specialty Products) or equal. Ring and cover adjustments in general shall not be greater than 10 inches unless approved by the Authority.

9.7 Drop Connections

9.7.1 Outside Drop Manholes

Drop connections will be required where called for on the drawings. Drop pipes shall be the same size as the sewer that they serve. Openings in walls of precast concrete manholes for drop connections shall not be made at joints. Drop connection fittings and DIP riser pipes shall be supported by a footing of Class "C" concrete, due to the unequal earth pressures that would result from the backfilling operation in the vicinity of the manhole. Drop connections for precast concrete manholes shall conform with the typical details for drop manholes shown in the Appendix. Drop connections shall be carefully backfilled to prevent dangerous side pressures.

9.8 Castings

Manhole rings and covers shall be per the Authority's standard drawings shown in the Appendix. All casting shall be manufactured domestically and shall weigh at

least 95% of the estimated weight specified in the detail drawings. Covers shall be either the non-traffic, traffic, or bolt-down watertight type. Traffic type manhole covers will be used when the manhole is to be placed in pavement and/or will be subjected to vehicular loadings. Bolt-down watertight manhole covers will be used on all manholes to be placed in flood plain areas and other areas as determined by the Authority.

9.9 Future Sewer Connections

Where shown on the drawings, a 12-foot long pipe stub for future sewer connections shall be laid on proper grade and alignment and plugged with a factory plug with the same type joint as used on the sewer pipe. The location of the end of the stub out is to be flagged in the field by the contractor and indicated on the "As-Built" drawings to be supplied to the Authority by the developer.

9.10 Trash Screens

Developers shall install a plug and a trash screen in the existing manhole that ties to all new sanitary sewer line extensions. The plug and trash screen shall not be removed until the Authority has accepted the new sanitary sewer line extension.

10.0 LATERAL SEWERS

10.1 Installation Requirements

The contractor shall install wyes or tees in the locations shown on the plans for connection of existing or future service lines. The contractor shall install service lines with proper grades and alignment to the property line where shown on the drawings or otherwise required. Service lines for future service shall be plugged using Etco Stoppers or equal at the right-of-way line using the stopper of the appropriate size. All laterals shall extend from the sewer line to the edge of the right-of-way (no more than five feet from the edge of the property line). For sewer laterals entering roadway manholes, the curbing shall be cut with the symbol "X" to identify the sewer lateral location. Service line stub-outs shall be wrapped with underground detection / tracer tape. All sewer laterals shall be tapped into any sewer trunk line using the appropriate tapping machine. Romac Type CB sewer saddles or equal shall be used. Dry sewer laterals shall have permanently glued caps.

10.2 Material, Bedding and Backfilling Requirements

Laterals shall be installed using polyvinyl chloride pipe or ductile iron pipe in accordance with the material requirements based on depth of cover. Lateral and sewer mains are to be bedded and backfilled in accordance with bedding requirements shown on the plans and in the Appendix of these specifications.

10.3 Cleanouts

Service lines with cleanouts must have a bronze top with a bronze cap when installed in parking areas. All cleanouts must be kept at surface level or lower (preferably buried).

11.0 PIPE LAYING

11.1 Clearing

The contractor shall clear the entire width of the permanent easement before excavating. The contractor shall remove from the site all trees, growth, debris, stumps, and other objectionable matter. The construction easement should only be cleared if necessary.

11.2 Location and Grade

The drawings shall show the alignment and grade of the sewer and the position of the manholes and other appurtenances. The grade line shown on the sewer profile and called for on the plans shall be the grade of the invert of the pipe. The contractor shall use laser equipment to establish the pipe alignment and grade required on the plans. The pipe shall be laid so that the pipe bells are upstream to the direction of the sewage flow.

11.3 Existing Underground Utilities and Obstructions

It is the responsibility of the contractor to locate all existing utilities along the path of his construction.

The drawings of the developer shall indicate all underground utilities or obstructions that are known to exist. Where unforeseen underground utilities or obstructions are encountered, the location and alignment of the sewer may be changed, upon written approval of the Authority, to avoid interference.

11.3.1 Abandoning Existing Sewer Lines

The Authority must expressly approve all sewer system components that are to be removed from service and abandoned prior to their removal. The requirements for removing sewer system components from service include but are not limited to the following:

1. The replacement pipe must be no less than the size of the existing sewer. The Authority, in its sole discretion, may require the existing sewer to be replaced with a larger sized sewer.

2. The developer shall be responsible for connecting all existing WSA customers that are served by the existing sewer onto the replacement sewer. All costs of connecting existing WSA customers to the replacement sewer, including ancillary costs (e.g., service line relocation, etc.), shall be borne by the developer.

3. The contractor shall formulate a plan to minimize service interruptions to existing WSA customers. Said plan shall be subject to review and approval by the Authority.

4. The replacement line shall meet all construction standards as stipulated in the latest edition of these specifications.

5. The top sections of manholes and lift stations that are to be taken out of service shall be removed and the remaining manhole section shall be backfilled and compacted.

6. Abandoned pipelines shall be cut near the manhole penetration and capped. The Authority, in its sole discretion, may require the developer to fill the abandoned pipeline with grout.

7. Abandoned manholes that are located in the public right-of-way shall be taken out of service according to the following procedures:

   a. The bottom of the structure shall be broken up in order not to retain water.

   b. All pipes entering the manhole shall be plugged.

   c. The top portion of the structure of the structure shall be removed in order to establish a minimum of 3 feet cover from subgrade or finish grade when not under the pavement and filled with granular embankment or suitable backfill.

8. The developer shall remove the pumps and other ancillary equipment from abandoned lift stations and return all lift station components to the Authority.

11.4 Pipe Handling

The contractor shall lower pipe, fittings, and accessories into the trench by suitable means. The contractor shall not drop or dump pipe or accessories into the trench. The contractor shall clean pipe and fittings thoroughly with soap and water before laying. Care shall be taken to keep the pipeline clean until final acceptance.

If any pipe or other material is discovered to be defective or damaged after being laid, the contractor shall remove and replace it.

11.5 Expediting Work

The contractor shall excavate, lay the pipe, and backfill as closely together as possible. Unjointed pipe shall not be left in the trench overnight. The contractor shall backfill and compact the trench as soon as possible after laying and jointing is completed. The exposed end of the installed pipe shall be closed with a mechanical joint plug each day at the close of work and at all other times when work is not in progress. If necessary, to backfill over the end of an uncompleted pipe, the end shall be closed with a mechanical joint plug. However, backfilling shall commence only after inspection.

12.0 CONSTRUCTION ALONG HIGHWAYS, STREETS, ROADWAYS AND STREAMS

12.1 Conformance with Governmental Agencies

The contractor shall comply with all construction operation requirements, safety requirements, traffic control requirements, road maintenance requirements and repair requirements of the City of Douglasville, Douglas County and/or the Georgia Department of Transportation while installing any sewer line and/or appurtenance along highways, streets and roadways. Contractors must obtain permits from the City, the County and/or the State before the construction begins. As required, the WSA shall procure D.O.T. and County permits necessary to complete the project. The contractor shall be responsible for obtaining any and all permits from other governing bodies necessary to complete the project.

These other permitting agencies include but are not necessarily limited to the following:

1. City of Douglasville
2. Douglas County
3. Georgia Environmental Protection Division (EPD)
4. United States Department of Agriculture – Natural Resources Conservation Service (USDA – NRCS)
5. United States Army Corps of Engineers

12.2 Traffic Protection

The contractor is to provide and maintain suitable signs, barricades, and lights for protection of traffic. All highway signs removed for construction shall be replaced as soon as possible. The contractor shall not close or block any highway, street or roadway without first obtaining permission from the proper authorities. The contractor shall provide trained and Georgia D.O.T. certified flagmen to direct and expedite the flow of traffic.

12.3 Construction Operations

The contractor is to perform all work along highways, streets and roadways to minimize traffic interference.

12.3.1 Stripping

Where the pipeline is laid along road shoulders, the contractor shall strip and stockpile all sod, topsoil, and other material suitable for shoulder restoration.

12.3.2 Trenching, Laying and Backfilling

Trench excavation shall not be open cut any further ahead of pipe laying operations than is necessary. The contractor shall backfill and remove excess material immediately behind laying operations. All lines shall be plugged at the end of each day.

12.3.3 Shaping

The contractor shall reshape damaged slopes, side ditches and ditch lines immediately after completing backfilling operations. Topsoil, sod and any other materials removed from shoulders shall be replaced.

12.4 Excavated Materials

The contractor shall not place excavated material along highways, streets and roadways in a manner that obstructs traffic. All scattered excavated material shall be swept off the pavement. If all material cannot be removed from the pavement, the contractor is to notify the governmental agency having jurisdiction over the street or roadway so that they may assist the contractor in clean up efforts. The contractor shall be responsible for any fees or damage resulting from his construction activity.

13.0 REMOVING AND REPLACING PAVEMENT

13.1 Removing Pavement

The contractor shall remove existing pavement as necessary for installing the pipeline and appurtenances. The developer shall accept full responsibility for the pavement/roadway during all construction activities. The developer shall also be responsible for securing all pavement cut permits from City, County, or other governing authority.

WSA may procure permits from D.O.T. upon request from the developer. Prior to obtaining a D.O.T. permit, the Authority, in its sole discretion, may require the developer to post bond up to and including 100% of the cost of replacing the roadway impacted by the proposed construction activity.

13.1.1 Marking

Before removing any pavement, the contractor shall mark the pavement neatly paralleling the pipeline and existing street lines. The marks shall be spaced the width of the trench.

13.1.2 Breaking

The contractor shall break the asphalt pavement along the marks using jack hammers or by scoring with a rotary saw and breaking below the score using jack hammers or other suitable tools.

13.1.3 Machine Pulling

No pavement shall be pulled with machines until it is completely broken and separated from the pavement that is to remain.

13.1.4 Damage to Adjacent Pavement

The contractor shall not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, the contractor is responsible for removing and replacing the damaged pavement.

13.1.5 Sidewalks

Sidewalks shall be removed and replaced to their full width.

13.1.6 Curbs

The contractor shall remove and replace or tunnel under any curb encountered.

13.1.7 Driveways

Driveways shall be removed and replaced to their full width to the satisfaction of the property owner.

13.2 Replacing Pavement

Upon completion of the placing and consolidation of the backfill, the contractor shall arrange to have the compaction tested by an independent testing laboratory approved by the Authority. After the compaction testing has been satisfactorily completed, the contractor shall replace all pavement, sidewalks and curbs that had to be removed.

13.3 Materials to be Replaced

The contractor shall place the materials for pavement replacement to the dimensions shown on the drawings. The following types of sub-bases will be replaced:

13.3.1 Graded Aggregate Base

The contractor shall furnish graded aggregate base (GAB) in two sizes of such quantities that the resulting mixture is well-graded from coarse to fine and meets the gradation requirements of Section 816 of the State Highway of Georgia Department of Transportation Standard Specifications.

13.3.2 Black Base

The base for all paved roadways shall conform to the requirements of the Georgia State Highway Department of Transportation Specifications for the black base (Hot Mix). A pug mix rotary drum type mixer shall be used with a minimum capacity of not less than 50 tons per hour for asphalt production. The base shall be applied and compacted in two courses by asphalt spreader equipment of design and operation approved by the Authority. After compaction, the black base shall be smooth and true to establish profiles and sections.

13.3.3 Surface Course

The surface course for all pavement, including paint or tack coat when required by the governing agency, shall conform to the requirements of the Georgia State Highway Department of Transportation Specifications for Asphaltic Concrete, Section 400, Type "E" (Modified Top). The contractor shall produce the surface course in an asphalt plant of the same type as noted above for black base. The surface course shall be applied and compacted in a manner approved by the Authority. Any high, low or

defective areas shall be immediately corrected by cutting out the course, replacing with fresh hot mix and immediately compacting it to conform and thoroughly bond it to the surrounding area.

13.3.4 Concrete

The contractor shall provide concrete and reinforcing for concrete pavement in accordance with the requirements of the Georgia State Highway Department of Transportation Specifications for Portland Concrete Pavement.

13.4 Supervision and Approval of Pavement Restoration

Pavement restoration shall meet the requirements of the regulatory agency responsible for the pavement. The contractor shall obtain agency approval of all pavement restorations before requesting final payment. The contractor shall obtain the Authority's approval of restoration of pavement not the responsibility of a regulatory agency such as private roads and drives. The contractor shall complete the pavement restoration as soon as possible after backfilling.

13.4.1 Replacement

Prior to replacing the pavement, the contractor shall make a final cut in concrete pavement nine inches back from the edge of the trench. The contractor shall make the cut using a rotary saw. Asphalt pavement shall be removed nine inches back from the edge of the trench using jack hammers or other suitable tools. The contractor shall replace all street and roadway pavement as shown on the drawings. All driveways, sidewalks and curbs shall be replaced with the same material and to the same dimensions as existed prior to construction.

13.4.2 Failure of Pavement

Should any pavement restoration or repairs fail or settle for a period of one year following construction or the warranty period, the contractor shall promptly restore or repair all defects. All paving replacements must be acceptable to the appropriate governing body.

14.0 BORING AND TUNNELING

The Authority may procure all bore permits from the D.O.T. at the request of the developer. Bonding provisions as noted in Section 14.1 shall apply. The developer is responsible for securing all bore permits from City, County, or other governing authorities. The contractor shall furnish and install tunnel liner or pipe casing and install the pipeline therein in accordance with the following specifications.

14.1 Well Pointing

The contractor shall operate well points or drainage systems in the vicinity of the tunnel or casing construction to prevent the accumulation of flood water in the tunnel or casing and to maintain the ground water table below the tunnel or casing invert.

14.2 Damage to Existing Structure

The contractor shall take precautions to construct the tunnel so that no settlement of the over passing roadway, railway or any other structure will occur. To prevent such settlement, the use of poling plates, breast boards, shields and soil solidification or a combination of these methods may be necessary. The Authority shall not be responsible for any damage that results from the tunnel construction.

14.3 Boring

The contractor shall furnish all material and equipment and perform all labor required to install steel pipe casing at the locations indicated on the drawings. Boring design and materials shall be per all AREA, AASHTO, Georgia D.O.T. and other applicable standards.

14.3.1 Casing Material and Size Requirements

Steel casing pipe shall be Schedule 30 steel pipe manufactured from steel conforming to ASTM A 139, Grade B. The steel sleeves shall be coated inside and outside with two coats of bitumastic paint prior to delivery on the job site. All casing size and thickness shall be the greater of D.O.T. standards or as follows:

Casing Requirements Beneath Highways and Railroads
(All dimensions below are inches)

Pipe Diameter	Casing Diameter	Wall Thickness Under Highways	Wall Thickness Under Railroads
4	8	0.25	0.50
6	12	0.25	0.50
8	16	0.25	0.50
10	16	0.25	0.50
12	20	0.25	0.50
14	24	0.25	0.50
16	30	0.375	0.50
18	36	0.375	0.50
20	36	0.375	0.50
24	36	0.375	0.50
30	40	0.50	0.625

14.3.2 Joint Usage of Casing Pipe

The contractor shall not install any pipe in an existing steel casing that is being used for any other purpose without the written approval of the Authority.

14.3.3 Installation of Casing Pipe

The contractor shall install the steel casing pipe by the dry boring method. The contractor shall bore the hole and install the casing through the soil simultaneously by a cutting head on a continuous auger mounted inside the casing pipe to the preceding section in accordance with the AWS recommended procedures. After the boring and installation of the casing is complete, the contractor shall install a cleaning plug on the rig and clean the casing.

14.3.4 Rock Formations

In the event that rock is encountered during the installation of the pipe casing that in the opinion of the Authority cannot be removed through the casing, the Authority shall direct the contractor to complete the crossing by installing a tunnel.

14.4 Tunneling

The contractor shall install the tunnel liner in strict accordance with the Department of Transportation (D.O.T.) and/or railroad company requirements. The contractor shall provide any special insurance coverage required by the governing body. The tunnel installer shall have a minimum of five years of experience in the construction of tunnels of a similar size. The contractor shall submit evidence of the installer's experience for review by the Authority.

14.4.1 Blasting Permits

Prior to any work involving explosives, the contractor shall make application to the D.O.T. or other appropriate agencies for a blasting permit. This permit will be in addition to any tunneling permit not involving explosives. The contractor shall comply with all requirements and conditions of all permits including required submittals.

14.4.2 Traffic Control Requirements

The contractor shall schedule the work so as not to interfere with or in any way endanger traffic flow on the highway or railway. The contractor shall provide all required safety measures as specified in the Georgia Manual on Uniform Traffic Control Devices.

14.4.3 Materials

Tunnel Liner Plates shall be manufactured from steel conforming to AWWA A1011/A1011M with the following mechanical properties before cold forming:

Minimum tensile strength = 42,000 PSI
Minimum yield strength = 28,000 PSI
Elongation, two-inches = 30%

Liner plates shall be 10 gauge, with the neutral axis diameter shown on the drawings for each crossing. Minimum coatings required shall be galvanized in accordance with ASTM A 123 for linear plates and hot-dip galvanizing in accordance with ASTM A153 for all other hardware. Additional protection required shall consist of a full bituminous coating meeting the requirements of AASHTO M 190.

All plates shall be punched for bolting on both longitudinal and circumferential seams or joints and shall be so fabricated as to permit complete erection from the inside of the tunnel. The plates shall be equipped with 2-inch standard pipe half-couplings welded into a hole in the center of the plate for grouting of voids occurring outside of the liner. Couplings shall be fitted with threaded cast-iron plugs. Bolts shall be no less than 5/8-inch diameter. Shop drawings showing details of the plates' size, length of bolts, and section modulus in inches cubed per inch of width shall be furnished by the contractor for review by the engineer, the Authority and Georgia D.O.T.

14.4.4 Tunnel Construction Methods

After the tunnel has been completely constructed, the contractor shall thoroughly clean the interior and shall place structural quality concrete of a strength approved by the Authority within the invert of the tunnel. The contractor shall screen and trowel the top of the concrete to a smooth even surface at the exact level of the exterior of the pipe width placed to proper grade within the tunnel. As the pipe is jointed, it shall be drawn into position inside the tunnel.

Systems of standard pipe, fittings, hose and special grouting outlets embedded in the liner plates shall be provided by the contractor. Care shall be taken to ensure that all parts of the system are maintained free from dirt. Grout composed of cement, sand and water shall be forced under pressure into the grouting connections. Grouting shall be started in the lower connections and shall proceed until grout begins to flow from upper connections. Connections shall then be made to these holes and the operation continued to completion.

Apparatus for mixing and placing grout shall be of a type approved by the design engineer and the Georgia D.O.T. and shall be capable of mixing effectively and stirring the grout and then forcing it into the grout connections in a continuous uninterrupted flow.
Liner plates shall be installed as soon as possible, but no more than five feet of tunnel shall remain unlined while tunneling operations are in progress. No more than one foot of tunnel shall be left unlined at the end of the day's operation. The contractor shall locate the liner plates with grout couplings at the top of the tunnel at intervals not to exceed five feet. Additional plates with grout couplings shall be installed on each side of the tunnel between the top couplings.

After grouting is completed, pressure shall be maintained by means of stop cocks, or other suitable devices until the grout has set sufficiently. After the grout is set, grout holes shall be completely filled with dense concrete and finished neatly without evidence of voids or projections.

14.5 Installation of Pipe

After the installation of the casing or tunnel is complete, the contractor shall install the pipeline by a method that has received prior approval of the designing engineer and the Authority.

14.5.1 Pipe Closure

The contractor shall close the ends of the casing with 4-inch brick walls, plastered with Portland cement mortar. The contractor shall leave a drain opening at the bottom of the lower end.

14.5.2 Tunneling Closure

A brick bulkhead shall be constructed at both ends of the tunnel with a drain at the lower end. The bulkhead shall be a three-course mortared brick wall, plastered with Portland cement mortar and waterproofed with asphaltic roofing cement. Brick and mortar shall meet the requirements for manhole materials.

14.6 Safety During Boring

The contractor shall provide all necessary bracing, bulkheads and shields to ensure complete safety to all traffic at all times during the boring operation. All work shall be performed in such a manner as to not permanently damage the roadbed or interfere with normal traffic over it. The Authority will not be responsible and shall be saved harmless in the event of delays to the contractor's work resulting from any cause whatsoever. All construction must meet or exceed OSHA requirements.

14.7 Safety During Tunneling

The contractor shall begin the tunneling operation in a pit, sheeted and shored as necessary and begin at and proceed from one end. The contractor shall observe all applicable requirements of all governing agencies and shall conduct the operations in such a manner that all work will be performed below the level of the roadbed. All work shall be coordinated and scheduled with all governing agencies. The contractor shall complete all tunneling work at one particular location before work is started at another location. All construction must meet or exceed OSHA requirements.

A temporary bulkhead against the face of the excavation shall be provided and placed during the cessation of work where the heading is within 20 feet of railroad tracks or highway pavement.

In the event that distress occurs to the roadway due to the tunneling operation, the contractor shall be required to submit a plan to repair the roadway. The plan must be acceptable to all governing agencies and the Authority.

14.8 Riprap Material Requirements

The contractor shall use either stone riprap or sand-cement riprap throughout the job. The riprap shall meet the following material requirements.

14.8.1 Stone Riprap

Stone riprap shall be composed of sound, tough, durable stones resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. The stone's specific gravity shall be 2.0 or higher. The minimum weight of each individual stone shall be 50 pounds. The maximum allowable dimension for an individual stone shall be 24 inches. At least 50% of the stones shall have a minimum dimension of 12 inches.

The contractor shall embed the stone riprap neatly to form a compact layer at least 12 inches thick. The riprap shall be placed in such a way that the smaller stones are not segregated but evenly distributed. Chinking stones shall be placed in the crevices between the larger stones so that a dense, well graded mass is produced.

14.8.2 Sand-Cement Bag Riprap

Sand-cement bag riprap shall be composed of cement sacks or burlap bags having a capacity of from one to two cubic feet. Bags previously used for sugar or chemicals will not be acceptable. Bags shall be filled with a mixture or one-part Portland cement to five-parts sand.

The contractor shall embed the bags by hand to form a compact layer at least 12 inches thick. The bags shall be placed to form overlapping joints. The finished surface shall not deviate from that specified by more than three inches at any point.

15.0 STREAM AND DITCH CROSSING

15.1 Underground Stream Crossing

The top of all sewers entering or crossing streams shall be at a sufficient depth below the natural bottom of the streambed to protect the sewer line. In general, the following cover requirements must be met:

1. One foot of cover is required where the sewer is located in rock.

2. A minimum of 3 feet of cover is required where the sewer is not located in rock. The Authority, in its sole discretion, may require additional cover depending on the size and flow rate of the stream.

3. Buoyancy calculations for pipes located below stream channels shall be submitted with the plans for review by the Authority.

4. The top of the sewer line shall be placed at least four inches below the bottom of the channel pavement for paved stream channels.

5. Buried sewer lines beneath streams shall also be encased in concrete a minimum of five feet beyond each stream bank (concrete shall have a minimum 28-day strength of 3,000 psi). Encasements are subject to exceed five feet beyond the stream bank, depending on bank stability.

At points where banks or streams or drainage ditches are disturbed by excavation or where natural vegetation is removed, the contractor shall carefully compact backfill and place riprap to prevent subsequent settlement and erosion.

This requirement applies equally to construction along the sides of a stream or drainage ditch, as well as the crossing of streams or drainage ditches. The contractor shall place riprap a distance of not less than 10-feet upstream and 10-feet downstream from any disturbed area. The actual distance of riprap will be determined by the inspector. Riprap shall be extended from one foot below the stream bed to the top of the bank and shall be placed to conform to the natural slope of the stream bank.

15.2 Aerial Stream Crossing

Restrained-joint pipe within welded steel casing shall be used on all exposed sewer lines including sewer lines that cross streams and drainage ditches, unless the pipe is restrained-joint DIP.

15.2.1 Concrete Piers

Support shall be provided for all joints in pipes utilized for aerial crossings. The support shall be designed to prevent overturning and settlement. Expansion jointing shall be provided between above ground and below ground sewers. For aerial stream crossings, the impact of flood waters and debris shall be considered. The bottom of the pipe should be placed not lower than the elevation of the 50-year flood. Ductile iron pipe, lined with Tnemec Series 431 Perma-Shield PL or approved equal, with restrained mechanical joints or PVC in steel casing is required.

The design of concrete piers shall be stamped and signed by a Professional Engineer licensed in the State of Georgia. Design calculations for concrete piers shall be submitted to the Authority for review and comment. The Authority, in its sole discretion, may require a certified geotechnical engineering firm to inspect and approve any and all phases of pier construction. The developer shall be responsible for hiring and compensating the Authority approved geotechnical engineer as required.

15.2.2 Pedestrian Barriers

Pedestrian barriers shall be installed on all sewer pipe that is 4 feet or more above the stream bed. Barriers shall be of the rod type or screen type having a finish compatible with the project architecture. The pedestrian barriers shall be Custom Fab or approved equal. The size and installation of pedestrian barriers must be approved by the Authority.

16.0 TESTING AND ACCEPTANCE

The Authority reserves the right to continuously and/or periodically inspect construction methods to ensure compliance with these specifications. Unless other provisions have been specifically approved by the Authority, sewer lines and related facilities will be inspected and tested by the contractor with testing certified by the Authority before acceptance or continuity is established with the Authority's system. All lines must be clean and obstructions removed prior to requesting inspection and testing. The contractor shall flush out lines and manholes before testing and inspection. Sewer lines that have not been flushed prior to the arrival of the Authority's TV crew will incur a cost as identified in the Authority's Rules and Regulations, Latest Edition. All pipes not passing testing shall be considered unacceptable and shall be re-laid or replaced by the contractor or developer at the cost of the contractor/owner/ developer.

The contractor shall be required to test the sanitary sewer system for water tightness (and deflection if PVC) and all lines shall be televised.

16.1 Gravity Sewer Infiltration/Exfiltration Test Procedure

The contractor shall conduct tests to determine the water tightness of the gravity sewers when completed. The Authority shall observe the tests with the contractor furnishing all labor, equipment and materials required in connection therewith. It is agreed that the sewer shall be tested in sections, each section extending between two adjacent manholes or from the end of the sewer to the nearest manhole. The contractor may with the Authority's approval elect to use either an infiltration test, an exfiltration test, or the low-pressure air test.

16.1.1 Pipeline Infiltration Test

Each section shall be covered with no less than two feet of water above the top of the pipe at the highest point. The infiltration will be measured by means of a weir located in the downstream manhole. The above head of two feet shall be maintained for a period of not less than 24 hours before the weir measurements are made.

16.1.2 Pipeline Exfiltration Test

The sewer at the upstream side of the lower manhole and the upstream side of upper manhole in each section shall be closed with a watertight bulkhead and the sewer filled with water until the water elevation in the upstream manhole is not less than two feet above the top of the sewer pipe or two feet above ground water elevation in the trench, whichever is higher. The exfiltration will be determined by measuring the amount of water required to maintain the above stated water elevation for a period of one hour from the start of the test. The entire length of section to be tested shall be filled and maintained full of water for a period of approximately 24 hours prior to the start of the test.

16.1.3 Allowable Infiltration and Exfiltration

The amount of infiltration shall not exceed 50 gallons per inch of pipe diameter per 24 hours per mile of sewer in each and every section tested in accordance with the above.

16.1.4 Testing Requirements

In the event the allowable leakage rates are not met, the contractor shall determine the location(s) where excess water is entering or leaving the sewer. The sewer and/or the manholes shall be repaired in a manner

satisfactory to the Authority and retested until the leakage in the sewer is within the allowable limits. All leakage tests shall be conducted under the supervision of the Authority or its representative.

16.1.5 Low Pressure Air Test Procedures

In lieu of performing an infiltration or exfiltration test to determine the water tightness of the sewer laterals, the contractor may elect to perform a low-pressure air test as specified in ASTM C828 for clay pipe, ASTM C924 for concrete, Uni-bell UNI-B-6-98 for PVC.

16.2 Deflection Testing of Gravity Sewers

All polyvinyl chloride gravity sewer lines shall be tested for excessive deflection. Testing for deflection shall be accomplished by the ability of the installed gravity sewer line to pass a go, no go mandrel test. A mandrel of not less than 5% allowable deflection shall be pulled through each section of sewer pipe at least 15 to 30 days after installation. All pipes not passing this mandrel shall be considered to have reached the limit of its serviceability and shall be re-laid or replaced by the contractor or developer at no additional cost to the Authority. The Authority at its discretion reserves the right to have the PVC line retested for deflection utilizing a mandrel allowing 7.5% deflection at one year from acceptance, (ASTM D2122). No mechanical pulling devices will be used.

16.2.1 Mandrel Sizing

The outside diameter of the mandrel shall be based upon 5% of the internal base diameter of PVC pipe stated in ASTM D 3034, Table 1, latest revision, and have dimension calculated by using the outside dimensions and the minimum wall thickness listed. The Authority shall approve all mandrels used by the contractor before the testing is performed.

16.3 Televising of Gravity Sewers

All new sewer lines shall be inspected via televising. The contractor shall thoroughly clean the entire sewer system by jetting or applicable methods prior to filming to avoid re-filming costs (see above). If conditions indicate repairs are necessary, re-filming may be required. However, the contractor may avoid re-filming by performing all corrective work in the presence of an Authority inspector upon the Authority's discretion. The initial filming shall be scheduled by the Engineering Department of the Authority when the contractor or developer advises that all lines are ready. The initial filming will be performed by the Authority at the expense of the Authority to the extent the sewer system is accessible by Authority equipment. If any portion of the system is not accessible by Authority equipment or if any additional televised inspection is required after the initial filming, the televised inspection will be performed at the expense of the

developer/owner/contractor reimbursable to the Authority at crew rates as specified in Chapter 4 of the Authority's Rules and Regulations. All filming shall be done by persons and/or firms qualified in such work, if required. The contractor shall perform all filming (video taping) in accordance with the following requirements:

1. Filming shall proceed from the downstream end of the pipe segment to the upstream end.

2. All filming shall be on digital format with speed as required to obtain optimal observation of any defects in the sewer line.

3. Film shall be in good focus with a 5-foot minimum depth of field with adequate but not excessive lighting. A footage counter on the film must be provided.

4. The camera drag line shall not obstruct the view of the flow line of the sewer pipe.

5. The film, if performed by a firm other than the Authority, shall be submitted to the Authority in cassettes complete with a brief report as to the findings. The location and condition of service connections, water, debris, mud, etc., for each section between manholes and any observation of the videographer should be reported. A brief map or sketch on an 8 ½ inch x 11 inch sheet of paper of the improvements shall be supplied. The sketch shall indicate the following:

   a. The firm doing the filming
   b. North arrow
   c. Manhole number
   d. Project name
   e. Distance between manholes
   f. Date of filming
   g. Flow direction
   h. Distance to defects/problems
   i. Street names

6. Each manhole on the film shall be marked with the following information:

   a. Manhole number

   b. Manhole to which the camera is traveling

   d. Size and material of the pipe

e. Street name

f. Date of filming

16.4 Force Main Testing

The contractor shall furnish, install, and remove all temporary bulkheads, flanges, or plugs required to perform the pressure tests, and furnish all equipment and labor to carry out the tests. The contractor shall pressure test force mains at the pressure specified by the Authority measured at the lowest point. Tests shall be performed for a minimum of two hours at 250 PSI. Leakage shall not exceed the AWWA standards.

If leaks are detected the contractor shall locate, repair, and retest the force main. The repair methods must be approved by the Authority. If the results are not totally satisfactory, the Authority may require testing for a longer period of time.

16.5 Vacuum Testing Manhole Structures

The contractor shall make arrangements to have each manhole tested under negative pressure (vacuum) in accordance with ASTM C1244 prior to acceptance by the Authority. For manholes located beneath pavement, vacuum tests shall be conducted after the base coat of asphalt has been laid. Cement based products such as grout and other brittle materials shall not be used to repair manholes that have failed a vacuum test. Acceptable repair products include Rubber Neck by K. T. Snyder or approved equal, applied to the clean exterior of the manhole.

The Authority, in its sole discretion, may require manholes that fail vacuum tests to be replaced in their entirety and retested.

16.6 Exfiltration Testing Manhole Structures

The Authority, in its sole digression, may also require contractors to perform an exfiltration test on manholes in addition to the vacuum test described above. All exfiltration tests shall be witnessed by an Authority representative. Once all inlets have been plugged, the manhole shall be filled with potable water to the top of the ring. To pass the exfiltration test, the water surface in the manhole shall be no lower than ½ inch below the top of the ring after one hour.

Cement based products such as grout and other brittle materials shall not be used to repair manholes that have failed an exfiltration test. Acceptable repair products include Rubber Neck by K. T. Snyder or approved equal, applied to the clean exterior of the manhole.

17.0 PROTECTION AND RESTORATION OF THE WORK AREA

17.1 General

The contractor shall return all items and all areas disturbed, directly or indirectly, by work under these specifications to their original condition or better as quickly as possible after work is started.

17.2 Restoration of Man-Made Improvements

The contractor shall protect or remove and replace with the Authority's approval all fences, piers, docks, walkways, mailboxes, pipelines, drain culverts, power and telephone lines and cables and other improvements that may be encountered in the work.

17.3 Cultivated Growth

The contractor shall not disturb cultivated trees or shrubberies unless approved by the Authority. Any such trees or shrubberies that must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.

17.4 Cutting Trees

The contractor shall not cut trees for the performance of the work except as absolutely necessary. Trees that shall remain in the vicinity of the work area shall be protected from damage from equipment. The contractor shall remove excavated material stored over the root system of all trees within 30 days to allow proper natural watering of the root system. All damaged trees over three inches in diameter shall be repaired by an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the contractor. No stumps, wood piles, or trash piles will be permitted on the work site.

17.5 Grassing

The contractor shall replant grass removed or damaged in residential areas using the same variety of grass when the first appropriate season occurs. Outside of developed areas, the contractor shall plant the entire area disturbed by the work in rye, fescue, Bermuda, or other suitable ground cover upon the completion of work in the area. In all areas, the contractor shall promptly re-establish permanent grass to match or exceed original conditions.

17.6 Erosion Control

Erosion and sedimentation control shall be per Georgia Environmental Protection Division standards and per the requirements of applicable local governmental

standards. The contractor shall plan excavation work to prevent erosion and the washing of soil into adjacent streams. The contractor shall limit the amount of open excavation at any one time. Spoil shall be placed in the proper place and all natural water routes shall be kept open. Contractors must fully comply with erosion and sedimentation control act, and the National Pollutant Discharge Elimination System general permit where applicable.

17.7 Rubbish Disposal

The contractor shall dispose of all materials cleaned and grubbed during the construction of the project in accordance with the applicable codes and rules of the appropriate regulatory agencies, County, State and Federal.

17.8 Pollution Prevention

Contractors must prevent discharges of pollutants onto soils and into surface water where applicable. Contractors shall comply with Federal Petroleum Spill Prevention rules set forth in 40 CFR 112.

18.0 GREASE TRAPS

18.1 Design Criteria

The following are the requirements for the Douglasville-Douglas County Water and Sewer Authority relating to grease traps:

Minimum grease trap size is 1000 gallons.

Multiple grease traps shall be plumbed in parallel with equal amounts of wastewater going to each grease trap.

18.1.1 Automotive Facilities

All garages, car washes, and auto repair facilities shall install a grease trap or oil separator. A Professional Engineer licensed in the State of Georgia must design traps and design calculations must be submitted to the Authority for review.

18.1.2 Food Preparation Establishments

1. Grease traps are to be located outside of the building. For food preparation establishments located where there is insufficient space between the right-of-way and the building, a variance to use an indoor grease trap may be granted on a case-by-case basis at the sole discretion of the Authority.

2. Grease traps are to process kitchen type waste only. Drains from all grease generating areas shall drain to the grease trap. Sanitary sewage shall not enter the grease trap. A plumbing drawing may be required for review at the Authority's discretion.

3. Grease trap volume shall be designed to ensure compliance with pretreatment standards as specified in the Authority's Rules and Regulations, latest edition. The minimum grease trap volume is 1,000 gallons, provided all pretreatment standards are met. The developer shall submit all necessary calculations to justify the proposed grease trap volume. All calculations shall be certified by a Professional Engineer registered in the State of Georgia.

4. All outdoor grease traps shall fall to a dedicated manhole that will be used for testing purposes (a.k.a. a test manhole). The test manhole shall have a single invert in from the grease trap and a single invert out to the sanitary sewer lateral. Sanitary sewage shall not be plumbed through the test manhole.

18.1.3 Food Preparation Establishments with no Inside Cooking

1. The Authority, in its sole discretion, may consider approving smaller indoor grease traps provided the restaurant has no indoor cooking facilities and the indoor grease trap is at least a 40-pound unit with a test port and is located away from the sink.

2. The developer shall submit all necessary calculations to justify the proposed grease trap volume. All calculations shall be certified by a Professional Engineer registered in the State of Georgia.

18.1.4 Miscellaneous Oil and Grease Generators

The Authority, in its sole discretion, may require the installation of a grease trap if the development has the potential to discharge oil or grease to the wastewater collection system (e.g., industrial facilities, food distribution centers, etc.).

18.1.5 Provisions for Larger Grease Traps

In case of certain fast food restaurants, or establishments that are operating 24-hours or with the potential to discharge large quantities of oils, grease, solids or wastewaters, larger grease trap capacities may be required. The Douglasville-Douglas County Water and Sewer Authority may approve pre-packaged or manufactured grease traps with proper engineering and application review.

19.0 SAND AND GRIT SEPARATORS

The Authority, in its sole discretion, may require the installation of sand and grit separators if the development provides an opportunity for sand and/or grit to enter the sanitary sewer collection system.

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APPENDIX

SEWER DETAILS, INCLUDING LIFT STATIONS

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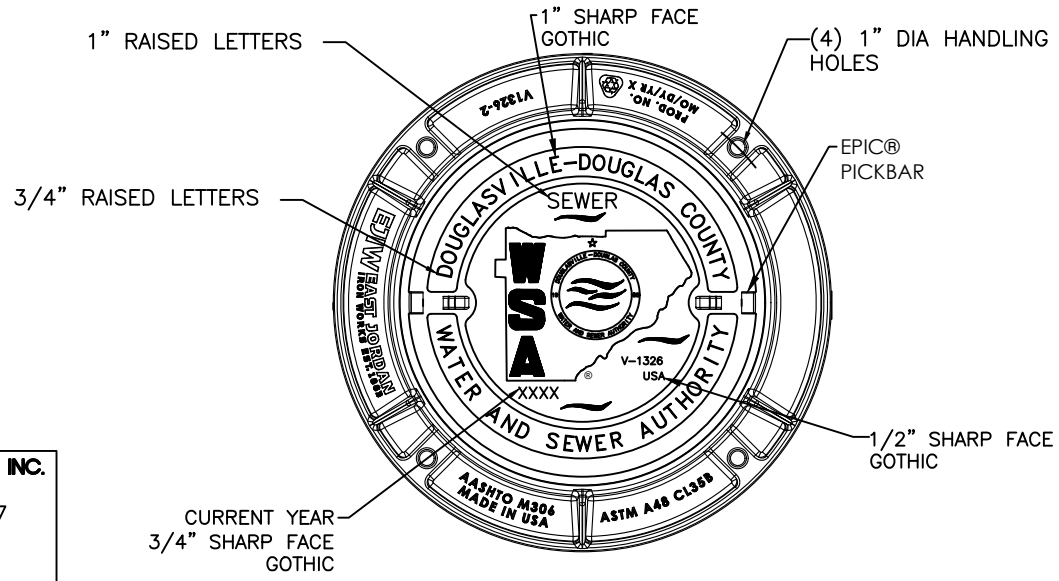
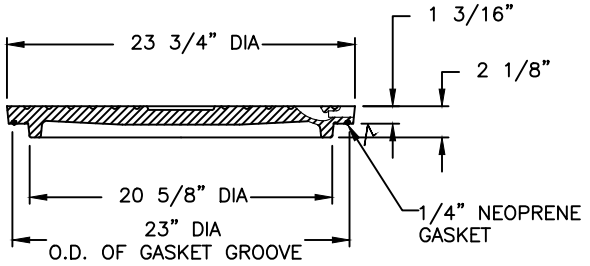
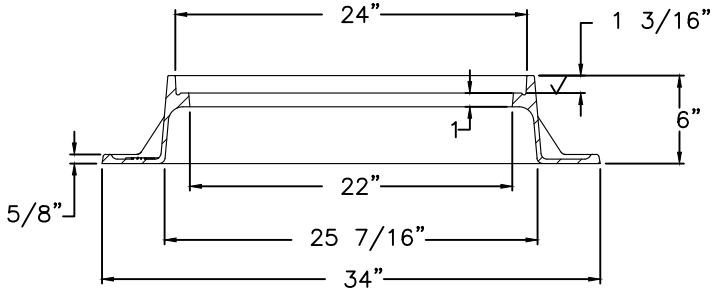
DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

SEWER - FIG 1
Dec. 2025

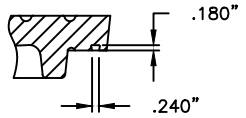




COVER SECTION



FRAME SECTION



GASKET GROOVE DETAIL

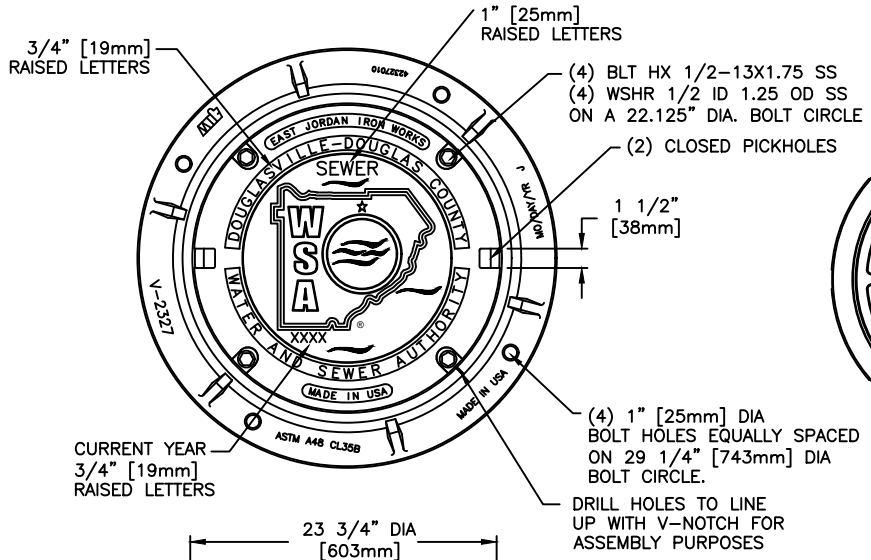
EAST JORDAN IRON WORKS, INC. P.O. BOX 439 EAST JORDAN, MI. 49727 1-800-874-4100 FAX 231-536-4458
V1326 & V1326-3 ASSEMBLY
LOAD RATING HEAVY DUTY
MATERIAL SPECIFICATION ASTM A 48 CLASS 35
OPEN AREA : N/A COATING : UNDIPPED
ESTIMATED WEIGHT - LBS. COVER 135 FRAME 214 TOTAL 349
MAJOR COMPONENTS 41326025 41326311
PRODUCT NUMBER
41326025A02
COUNTRY OF ORIGIN: USA
OR EQUAL AS APPROVED BY THE AUTHORITY

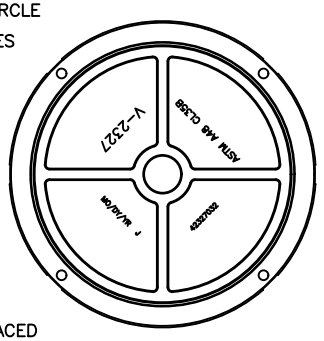
NON-TRAFFIC TYPE COVER

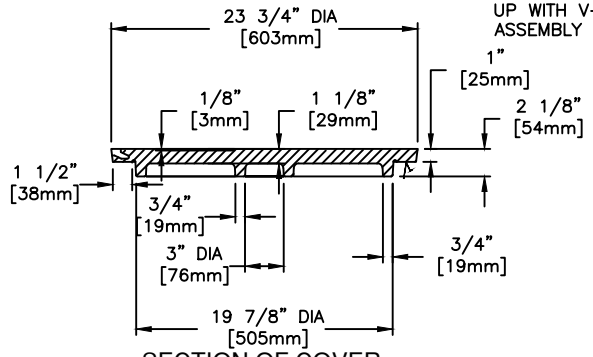
√ MACHINED SURFACE

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

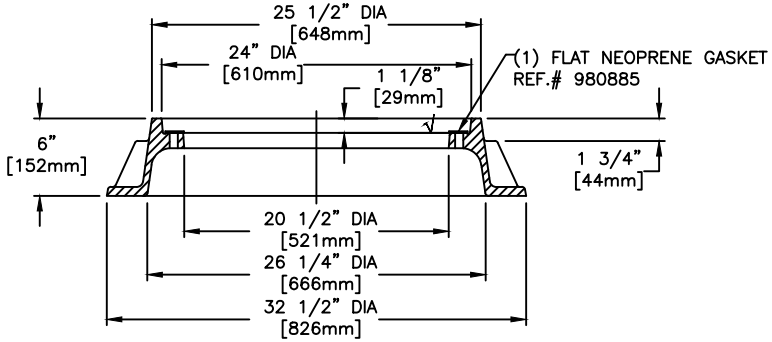
SEWER - FIG 2
Dec. 2025



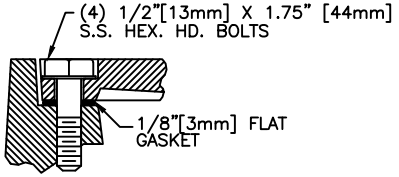




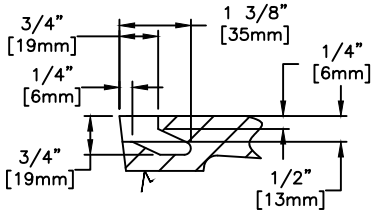
SECTION OF COVER



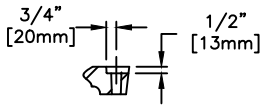
SECTION OF FRAME



WATERTIGHT DETAIL



PICKHOLE DETAIL



BOLT HOLE DETAIL

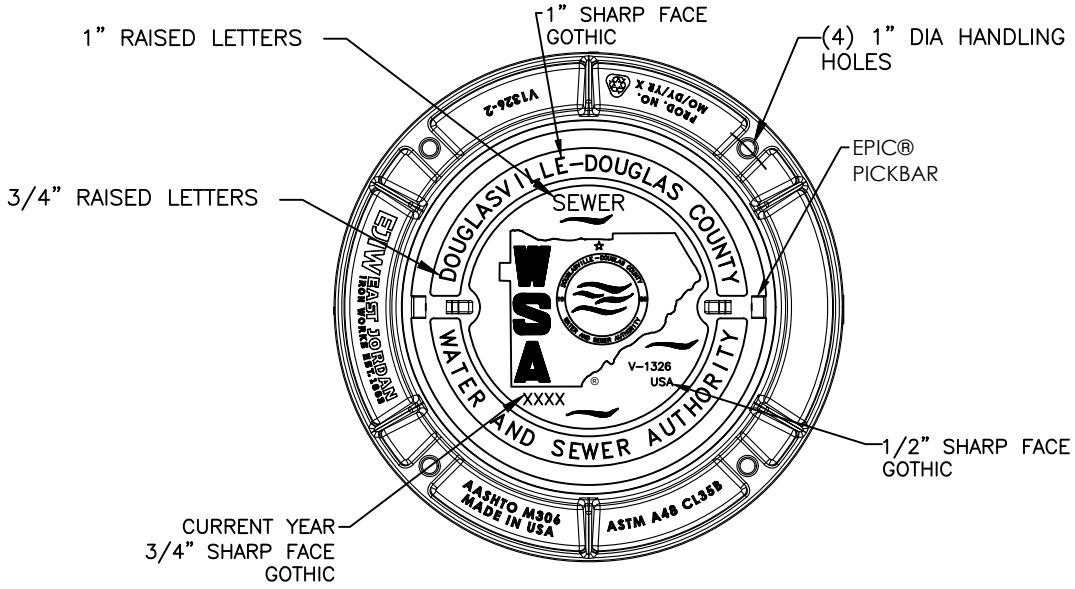
√ MACHINED SURFACE

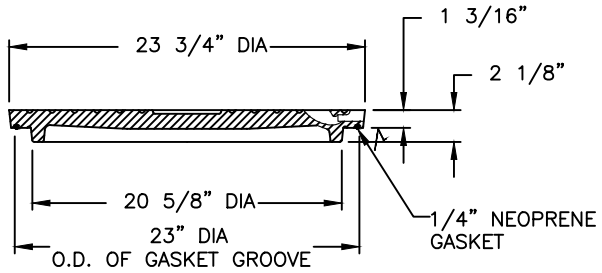
EAST JORDAN IRON WORKS, INC. P.O. BOX 439 EAST JORDAN, MI. 49727 1–800–874–4100 FAX 231–536–4458
V2327 ASSEMBLY
LOAD RATING HEAVY DUTY
MATERIAL SPECIFICATION ASTM A 48 CLASS 35
OPEN AREA : N/A COATING : UNDIPPED
ESTIMATED WEIGHT – LBS. COVER 140 FRAME 170 TOTAL 310
MAJOR COMPONENTS 42327010 42327032
PRODUCT NUMBER
42327168
COUNTRY OF ORIGIN: USA
OR EQUAL AS APPROVED BY THE AUTHORITY

WATER TIGHT RING AND COVER

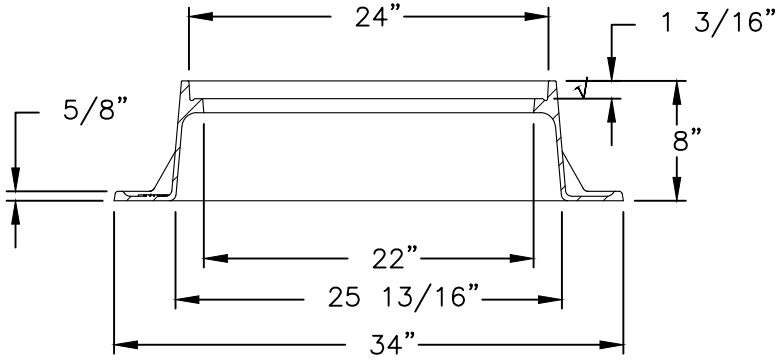
DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

SEWER - FIG 3
Dec. 2025

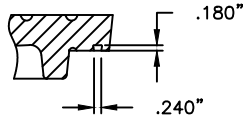




COVER SECTION



FRAME SECTION



GASKET GROOVE DETAIL

EAST JORDAN IRON WORKS, INC.
P.O. BOX 439
EAST JORDAN, MI. 49727
1–800–874–4100
FAX 231–536–4458

V1326 & C1326–2
ASSEMBLY

LOAD RATING
HEAVY DUTY

MATERIAL SPECIFICATION
ASTM A 48 CLASS 35

OPEN AREA : N/A
COATING : UNDIPPED

ESTIMATED WEIGHT – LBS.
COVER 135
FRAME 225
TOTAL 360

MAJOR COMPONENTS
41326025
41326211

PRODUCT NUMBER

41326025A01

COUNTRY OF ORIGIN: USA

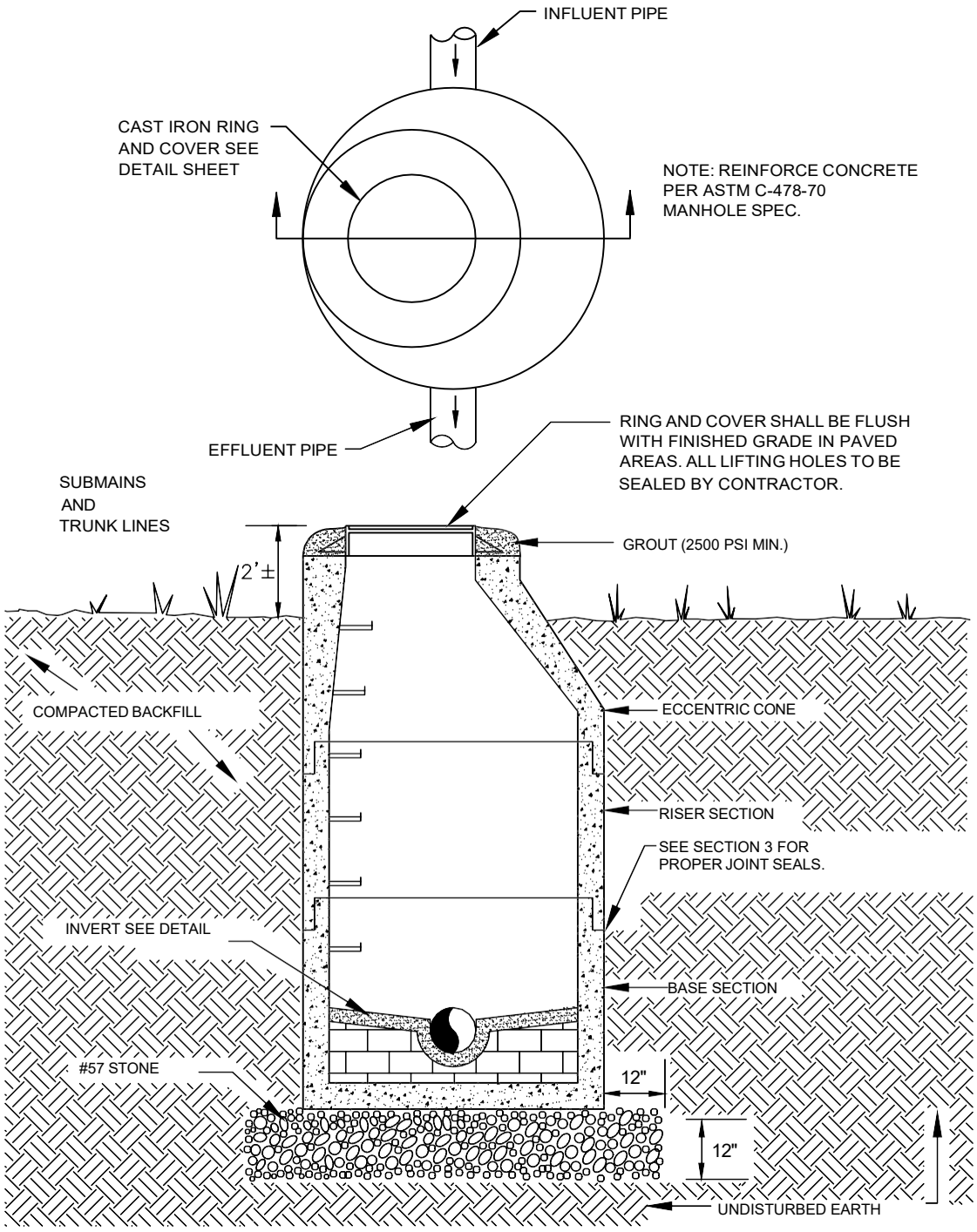
OR EQUAL AS APPROVED BY THE AUTHORITY

TRAFFIC TYPE COVER

√ MACHINED SURFACE

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

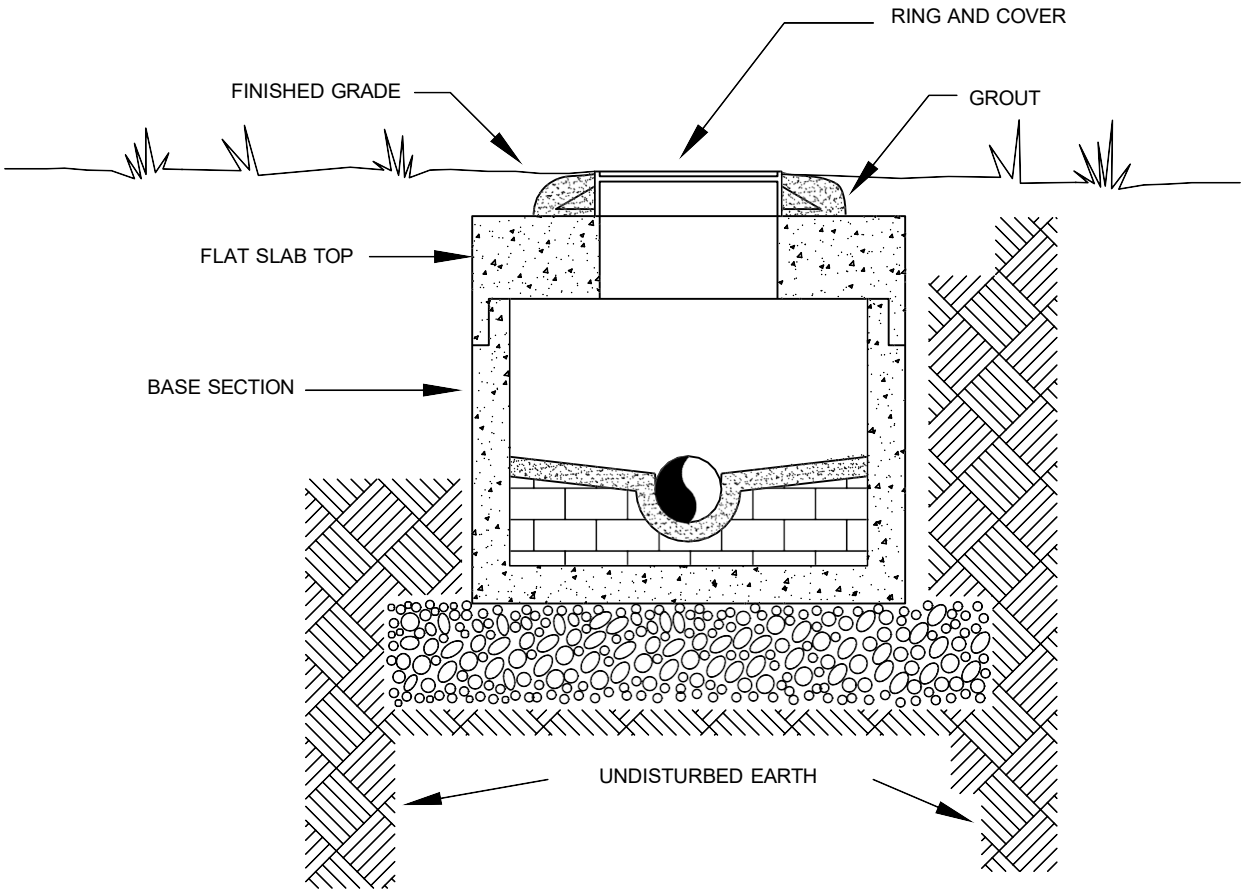
SEWER-FIG 4
Dec. 2025



STANDARD PRECAST MANHOLE

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

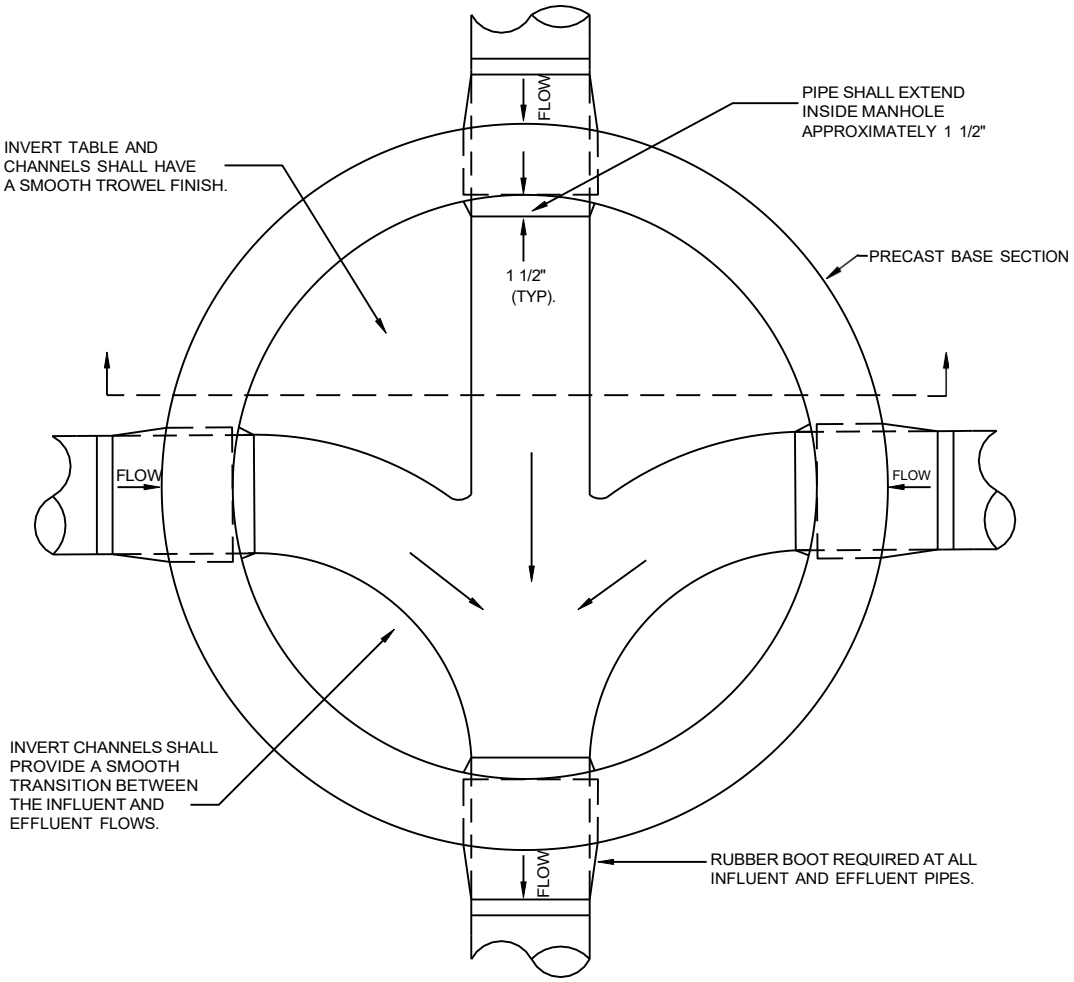
SEWER-FIG 5
Dec. 2025

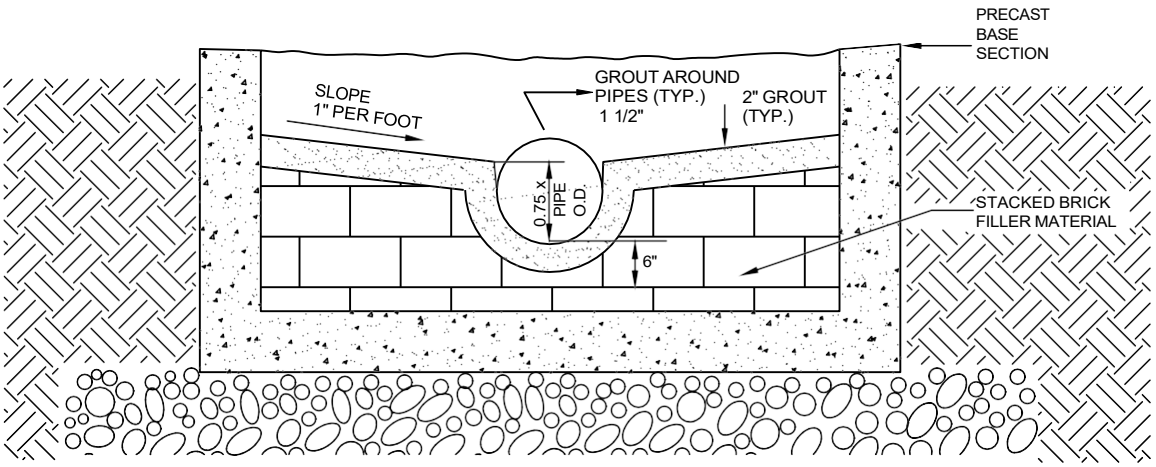


SHALLOW MANHOLE DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

SEWER-FIG 6
Dec. 2025

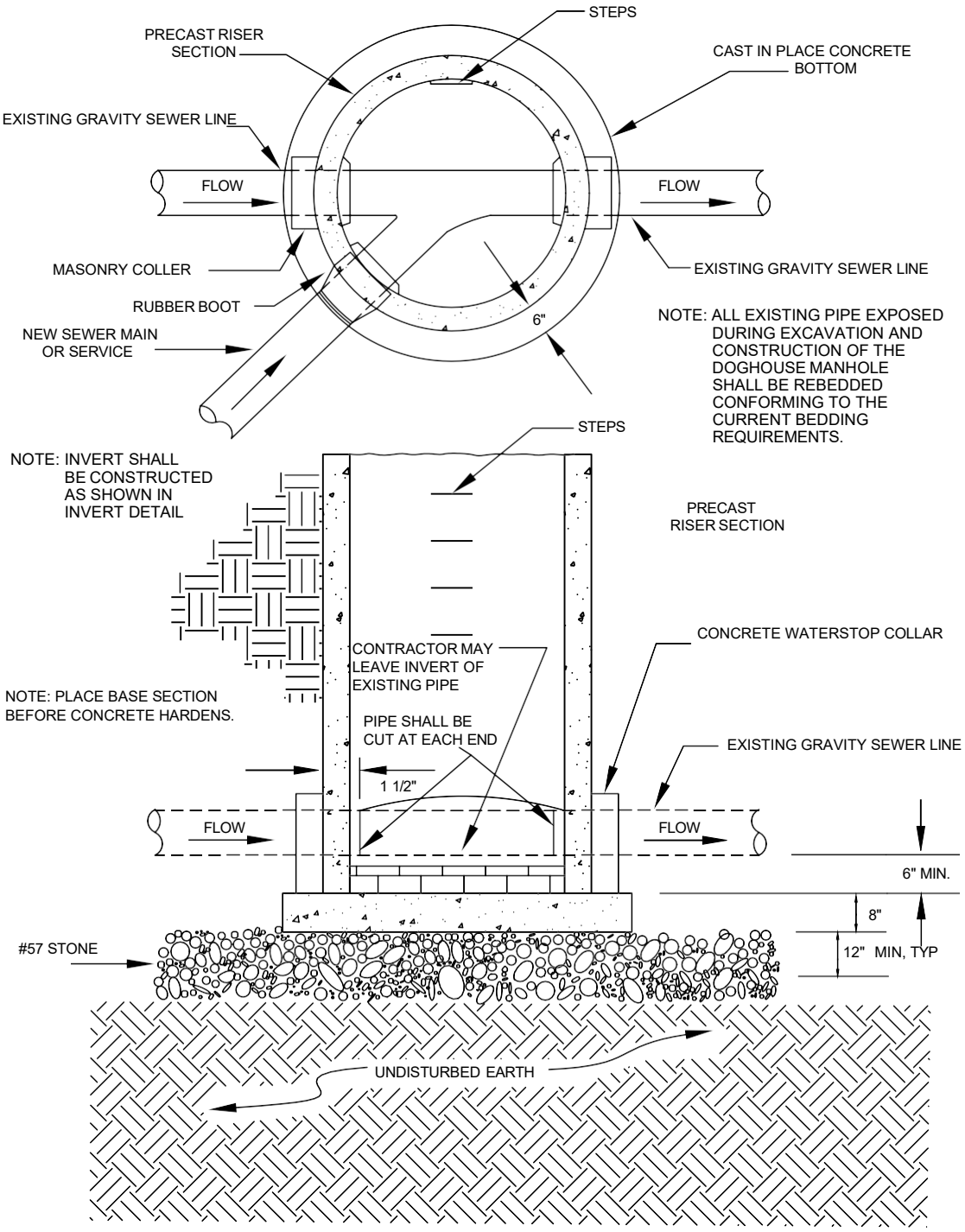




INVERT DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

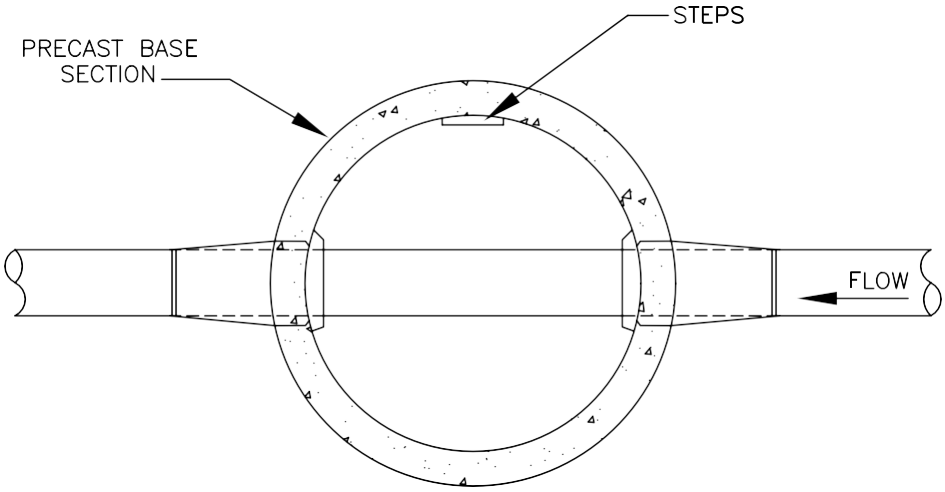
SEWER-FIG 7
Dec. 2025



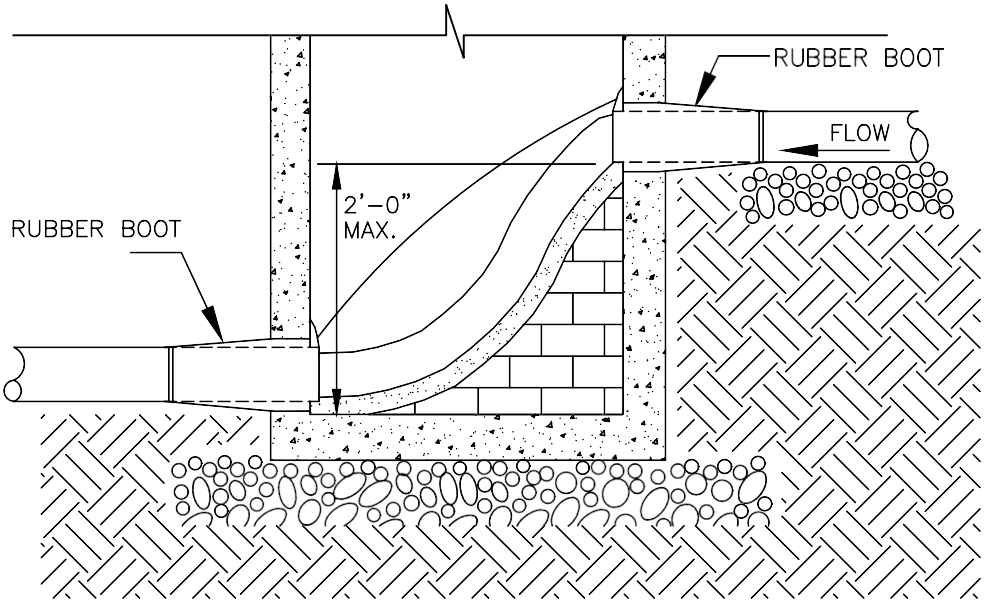
DOGHOUSE MANHOLE DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

SEWER-FIG 8
Dec. 2025



PLAN VIEW

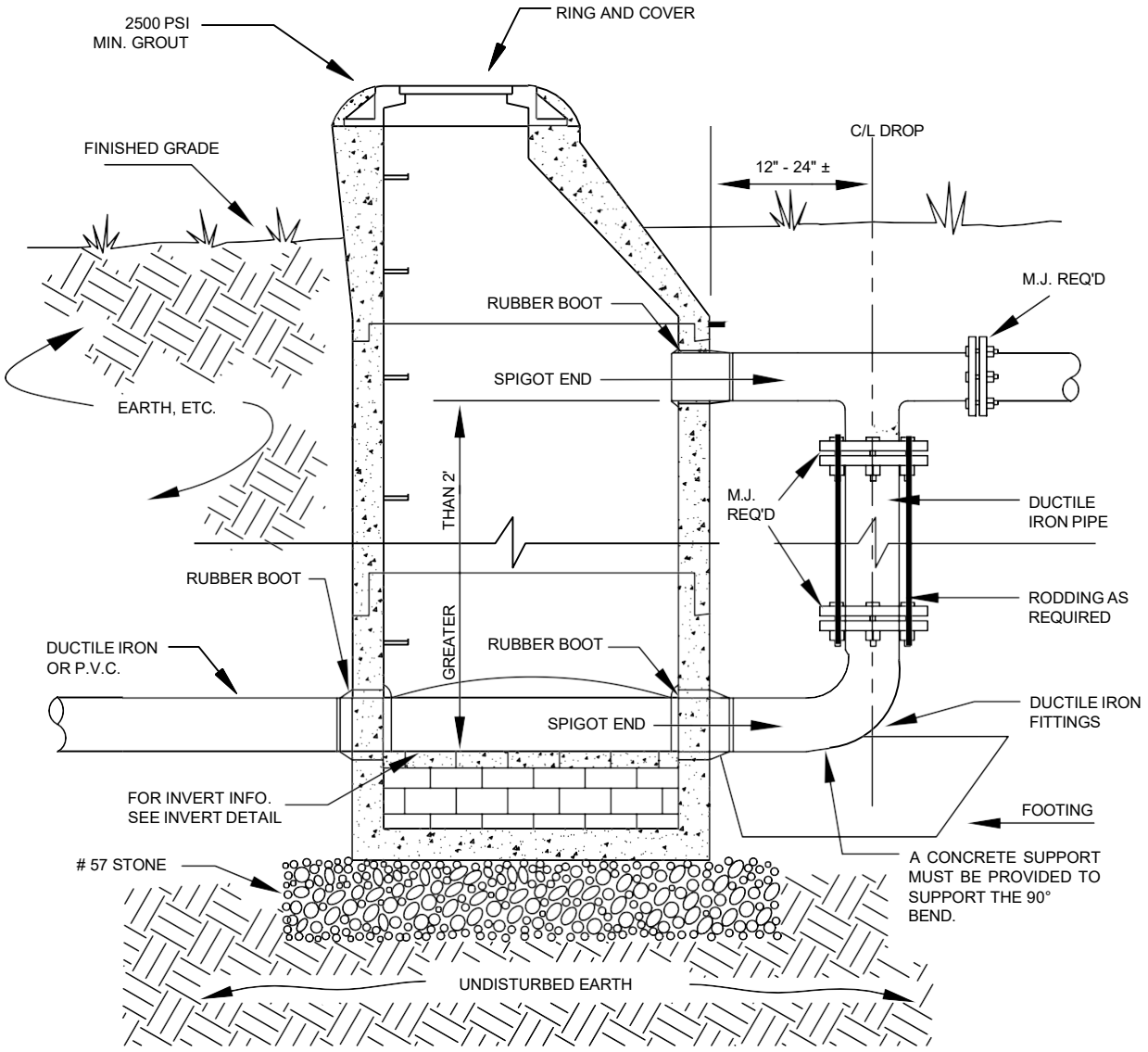


CROSS SECTION

TYPE "B" DROP MANHOLE

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

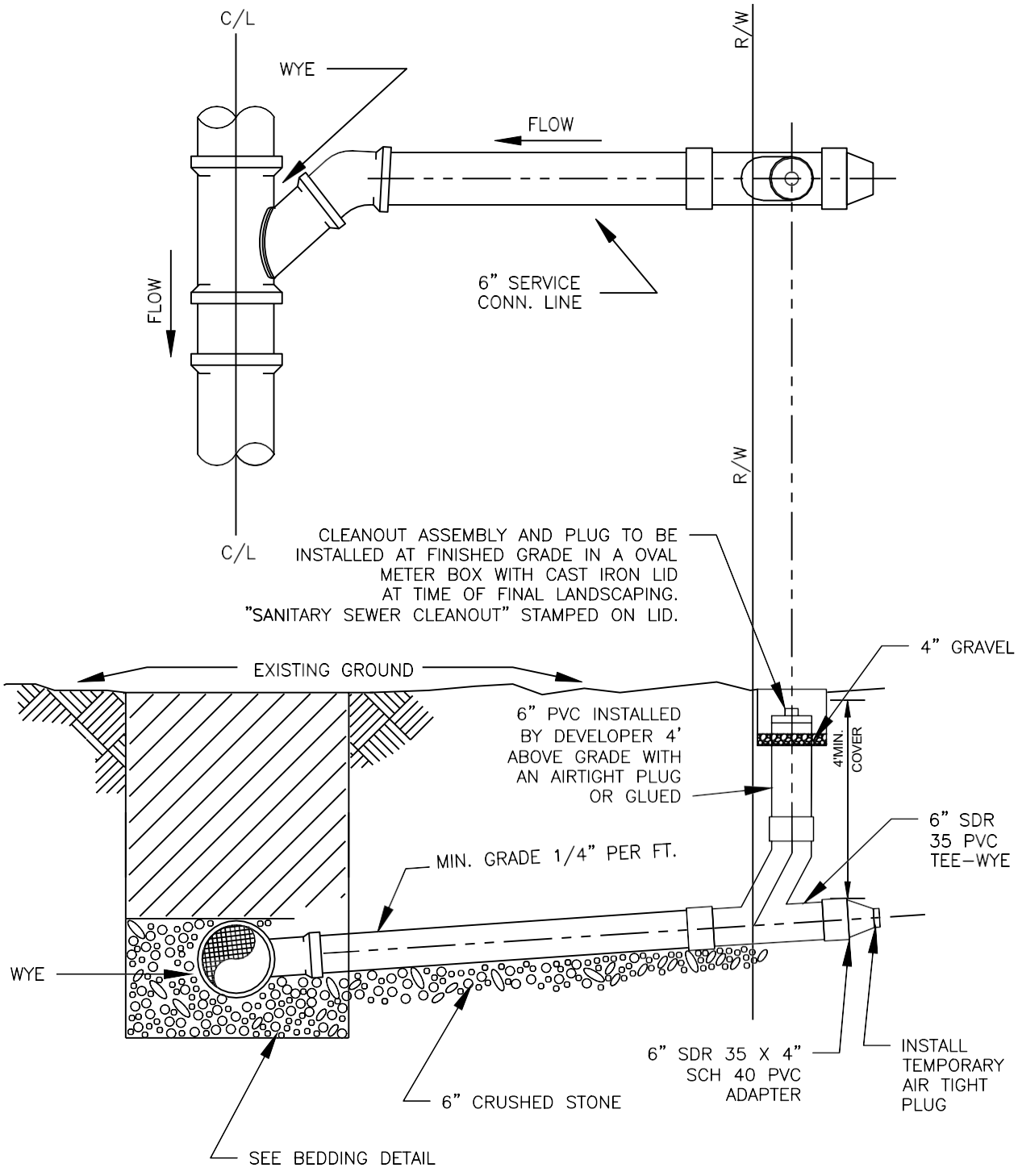
SEWER-FIG 9
Dec. 2025



OUTSIDE DROP DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

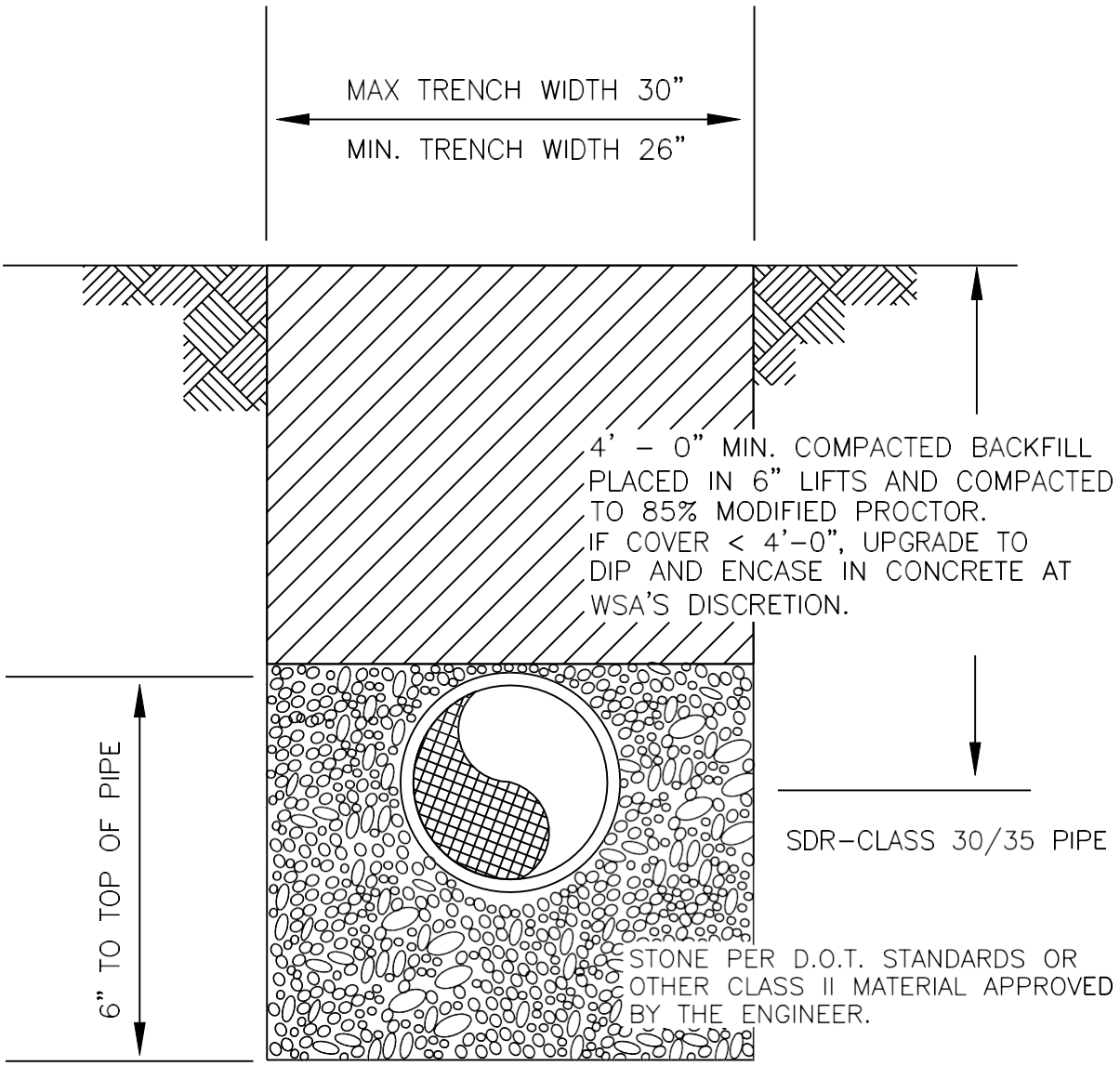
SEWER-FIG 10
Dec. 2025



SERVICE CONNECTION DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

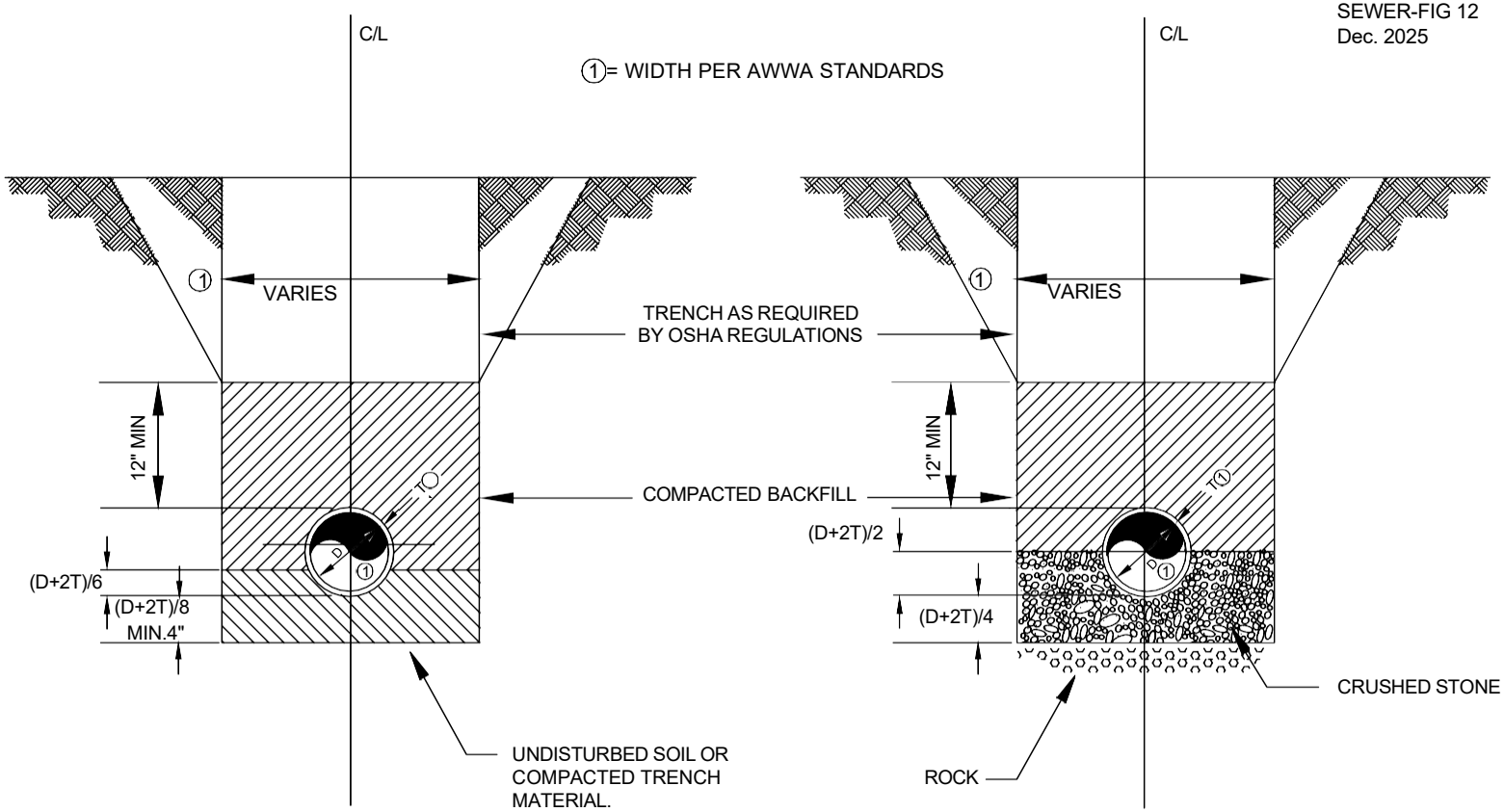
SEWER-FIG 11
Dec. 2025



TYPICAL PVC PIPE BEDDING DETAILS

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

SEWER-FIG 12
Dec. 2025



D = INSIDE DIAMETER

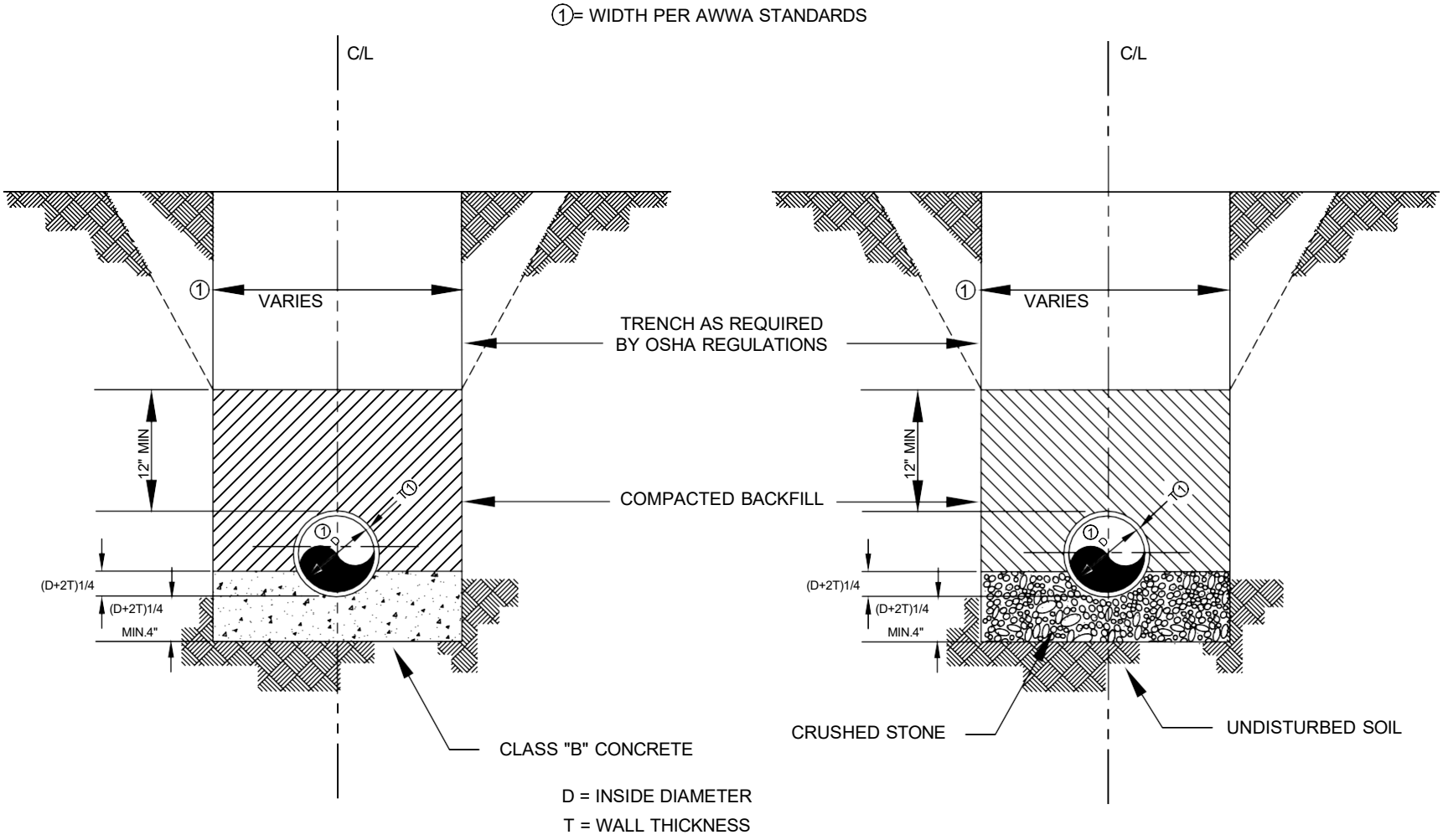
T = WALL THICKNESS

BEDDING DETAIL FOR RCP AND DIP

ROCK TRENCH DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

SEWER-FIG 13
Dec. 2025

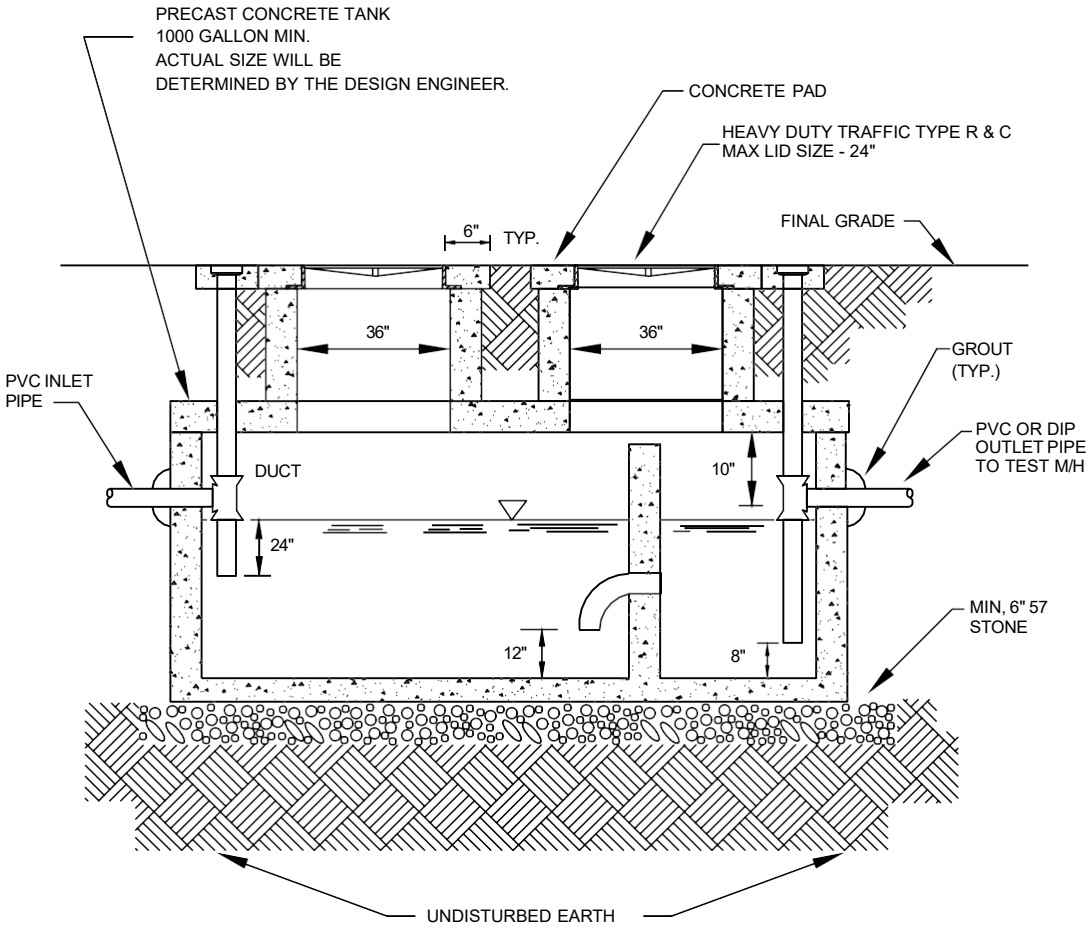


BEDDING DETAIL

BEDDING DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

SEWER-FIG 14
Dec. 2025

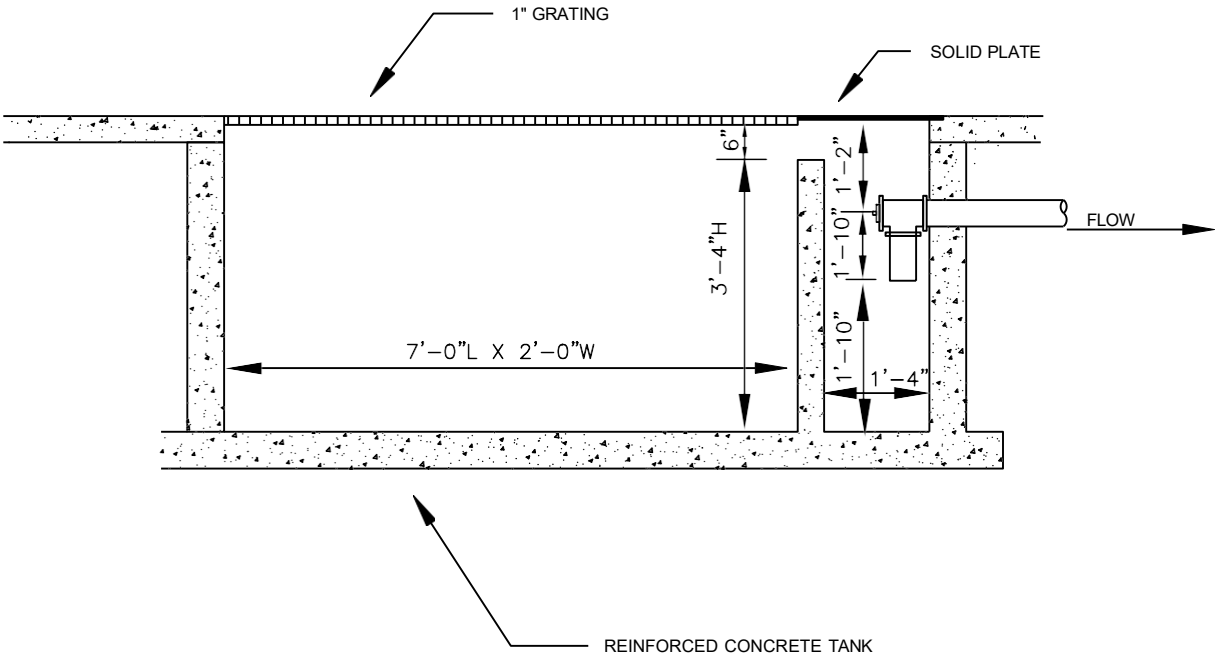


GREASE TRAP DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

SEWER-FIG 15
Dec. 2025

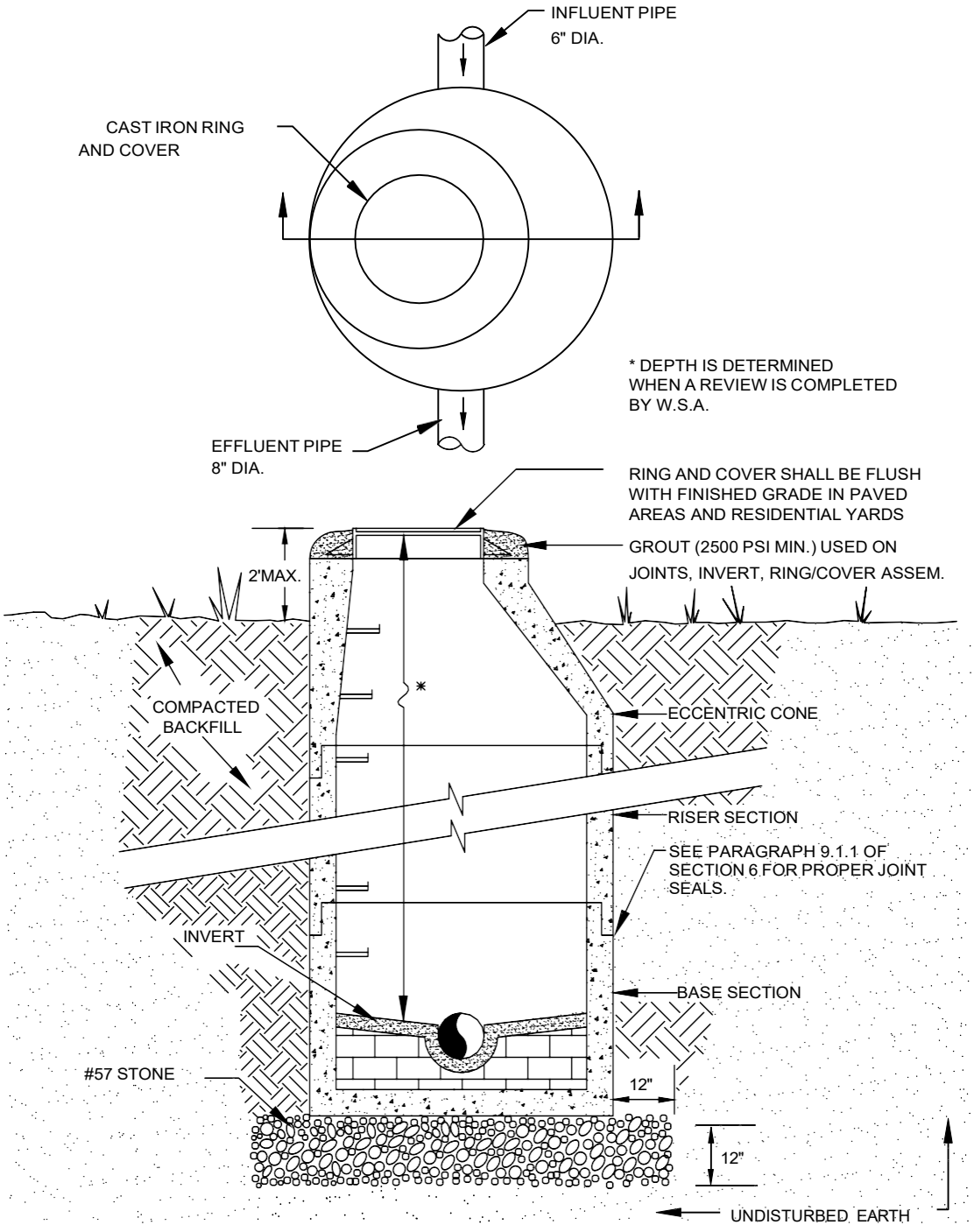
THIS UNIT IS FOR INDOOR USE ONLY.



SAND SEPARATOR DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

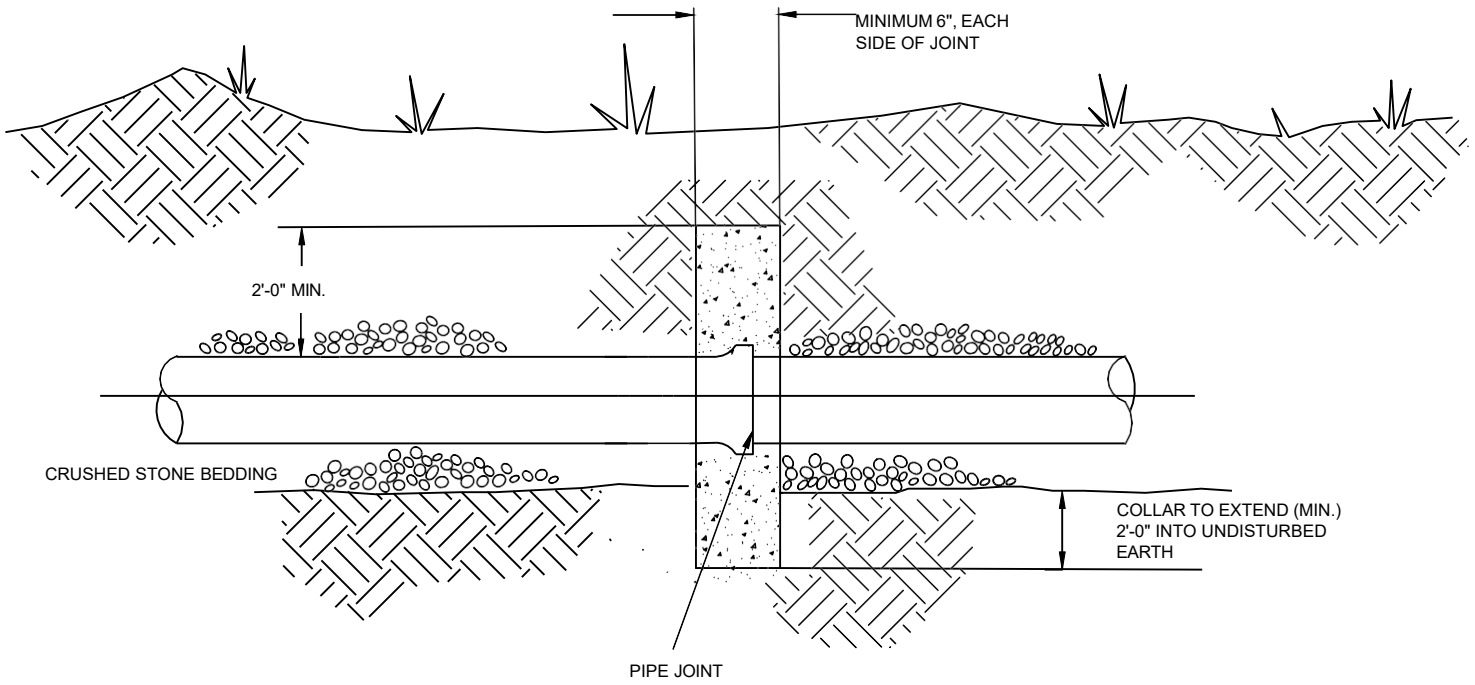
SEWER-FIG 16
Dec. 2025



TEST MANHOLE

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

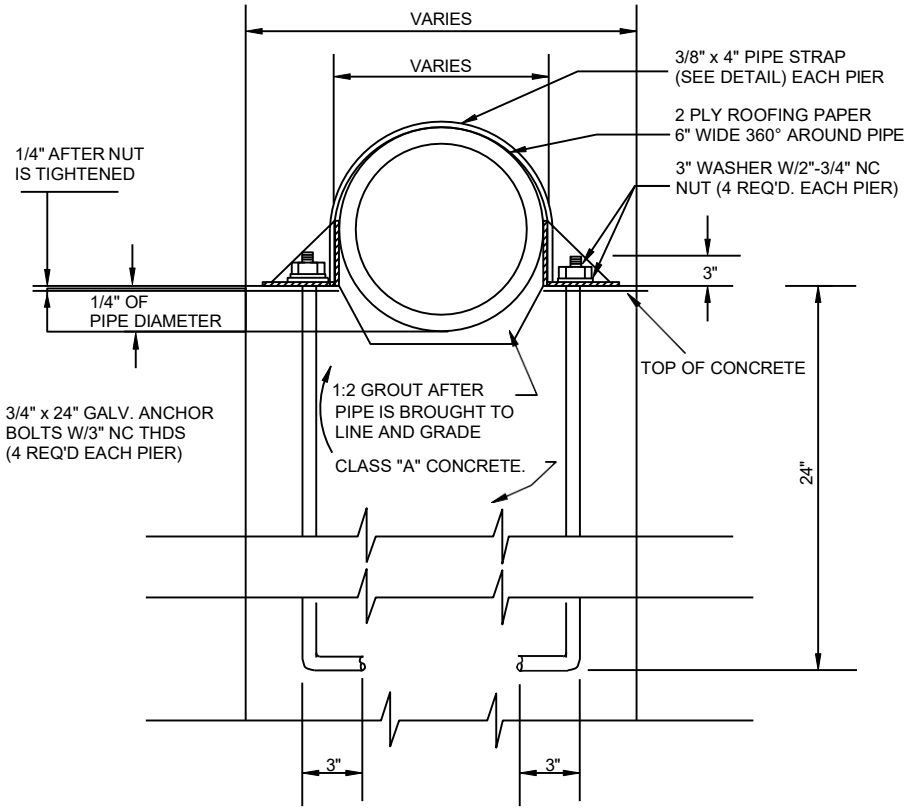
SEWER-FIG 17
Dec. 2025



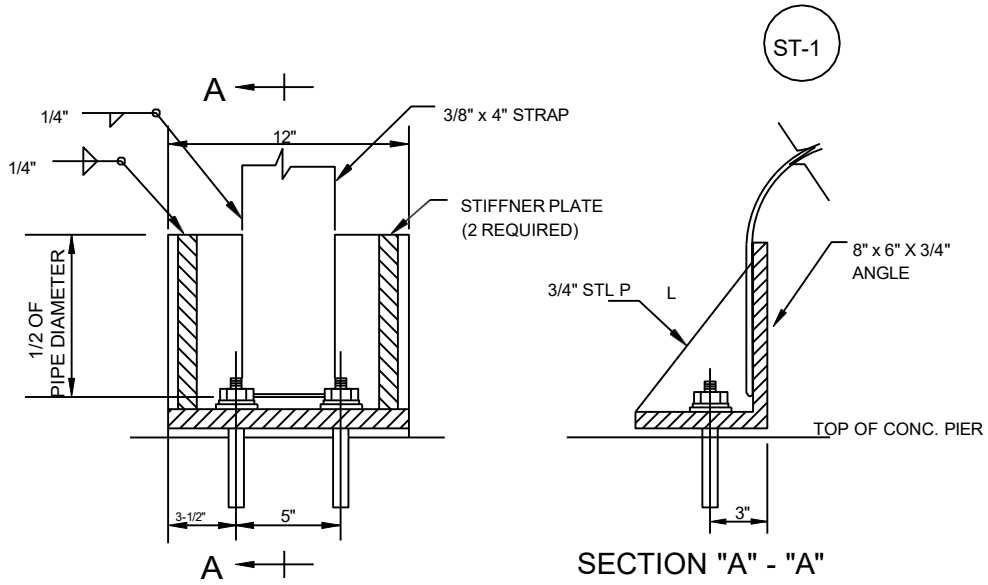
CONCRETE COLLAR DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

SEWER-FIG 18
Dec. 2025



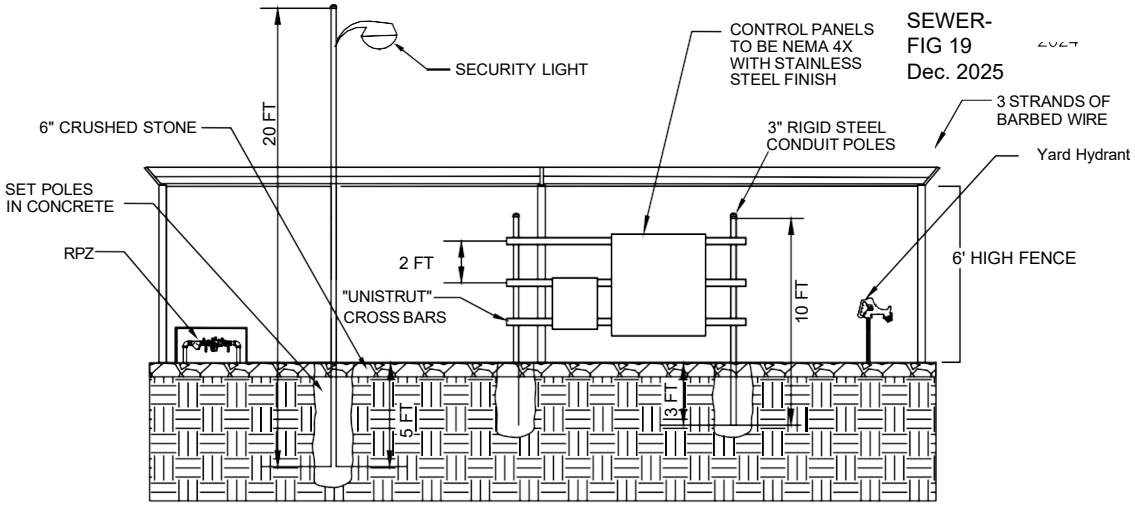
PIPE STRAP DETAIL



TYPICAL PIER TOP DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

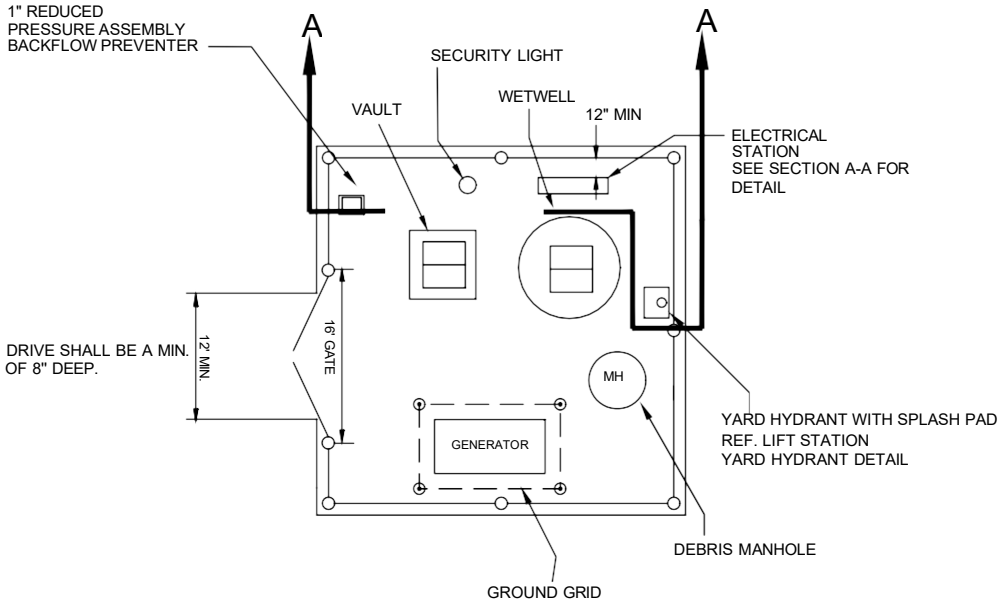
SEWER-
FIG 19
Dec. 2025



LIFT STATION ELECTRICAL STATION - ELEVATION
N.T.S.
SECTION A-A

NOTES:

1. DEEDED LOT SIZE TO BE 40' X 40' MINIMUM.
2. STATION TO BE FENCED 30' X 30' MINIMUM.
3. GRAVEL SHALL EXTEND 6" OUTSIDE FENCE.
4. DIESEL GENERATOR ON CONCRETE PAD (IF REQUIRED).
5. REF. CONSTRUCTION STANDARDS SECTION 3 FOR GENERATOR DETAILS.
6. SEE LIFT STATION DETAIL FOR WET WELL AND VAULT.
7. ELECTRICAL SERVICE POLE WITH METER TO BE LOCATED OUTSIDE FENCE WITH UNDERGROUND FEEDER TO ELECTRICAL DISTRIBUTION.
8. GROUND GRID TO BE 24" BELOW GRADE.



NOTE: THIS IS A GENERAL SCHEMATIC LAYOUT. LOCATIONS MAY VARY ACCORDING TO EQUIPMENT SIZE AND SITE REQUIREMENTS.

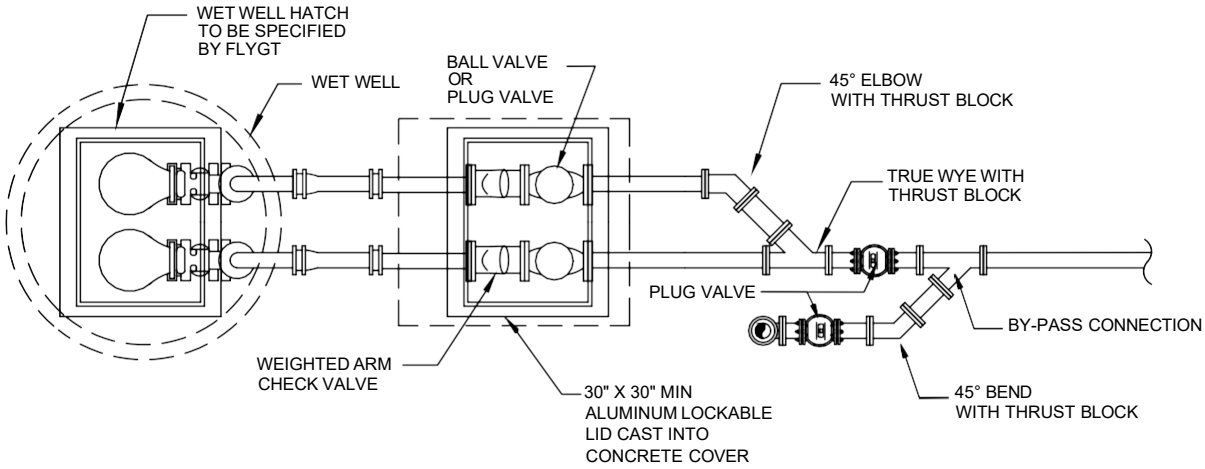
LIFT STATION LAYOUT AND DETAIL

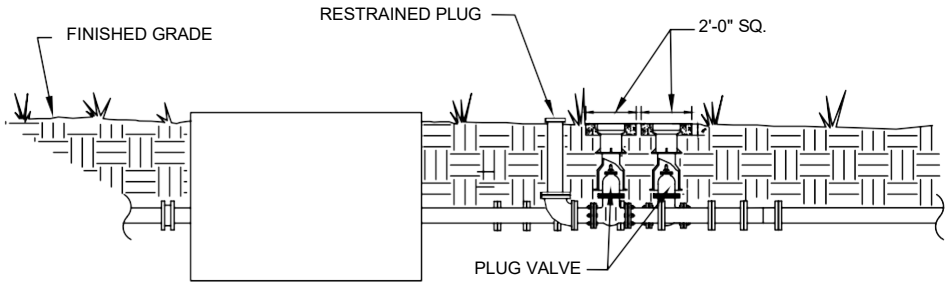
DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

SEWER-FIG 20
Dec. 2025

SPECIFICATIONS:

1. VALVE PIT TO BE BEDDING ON MIN 12" OF #57 STONE.
2. ALL FITTINGS INSIDE LIFT STATION TO HAVE FLANGE TO FLANGE JOINTS.
3. TOP OF VALVE PIT AND WET WELL SHALL EXTEND 6" ABOVE FINSHED GRADE.
4. PUMP POWER CABLES TO ENTER WET WELL ABOVE FORCE MAIN AND BEHIND PUMP GUIDE RAILS.
5. SECURITY LIGHT TO BE DIRECTIONAL STYLE AND SHALL BE WIRED TO SWITCH OR BREAKER INSIDE PUMP CONTROL PANEL.
6. LIFT STATION SHALL HAVE FUSED DISCONNECT.
7. SECURITY LIGHT SHALL BE A SODIUM VAPOR LIGHT WITH 150 WATT HIGH PRESSURE SODIUM LUMINAIRE WITH 120 VOLT BALLAST, AND HEAT AND IMPACT RESISTANT LENS.
8. PUMP CONTROLS TO BE MULTITRODE.
9. EITHER A ROUND OR SQUARE VAULT CAN BE BE USED.



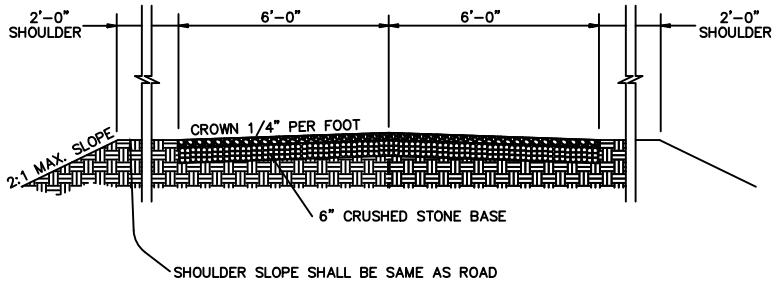


BY–PASS CONNECTION PROFILE

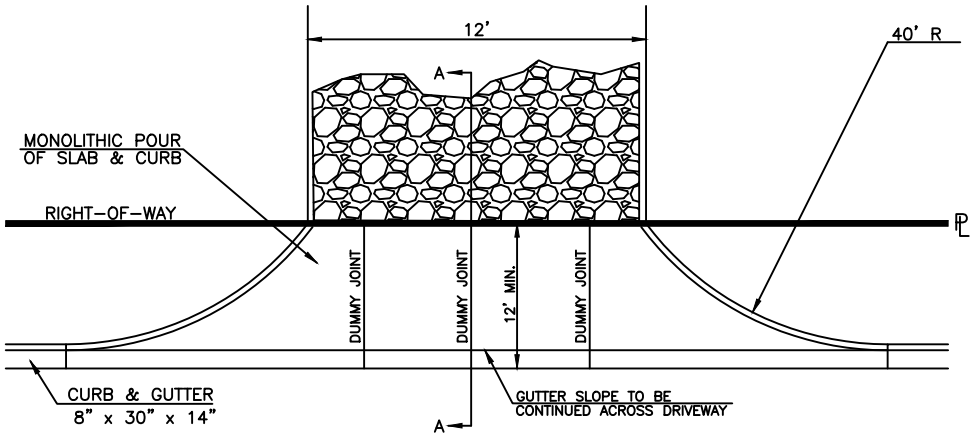
LIFT STATION DETAILS

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

SEWER-FIG 21
Dec. 2025

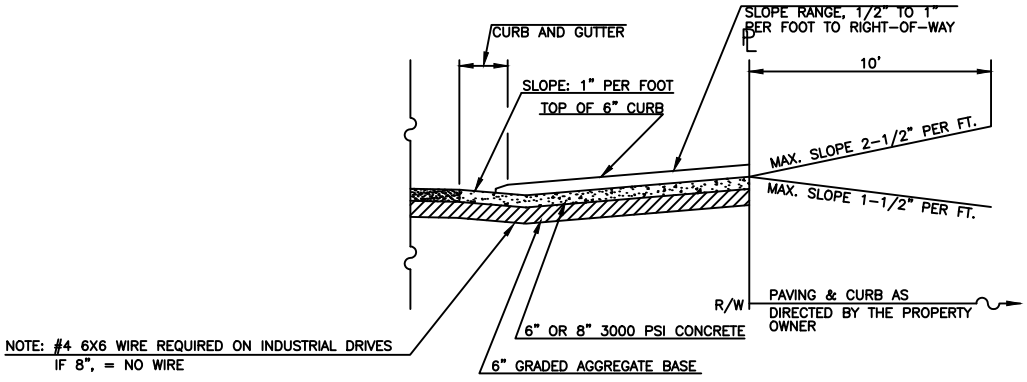


CROSS SECTION
N.T.S.



ORIGINAL CURB AND GUTTER TO BE REMOVED.
ASPHALT TO BE PATCHED AS REQUIRED.

CONCRETE APRON
N.T.S.



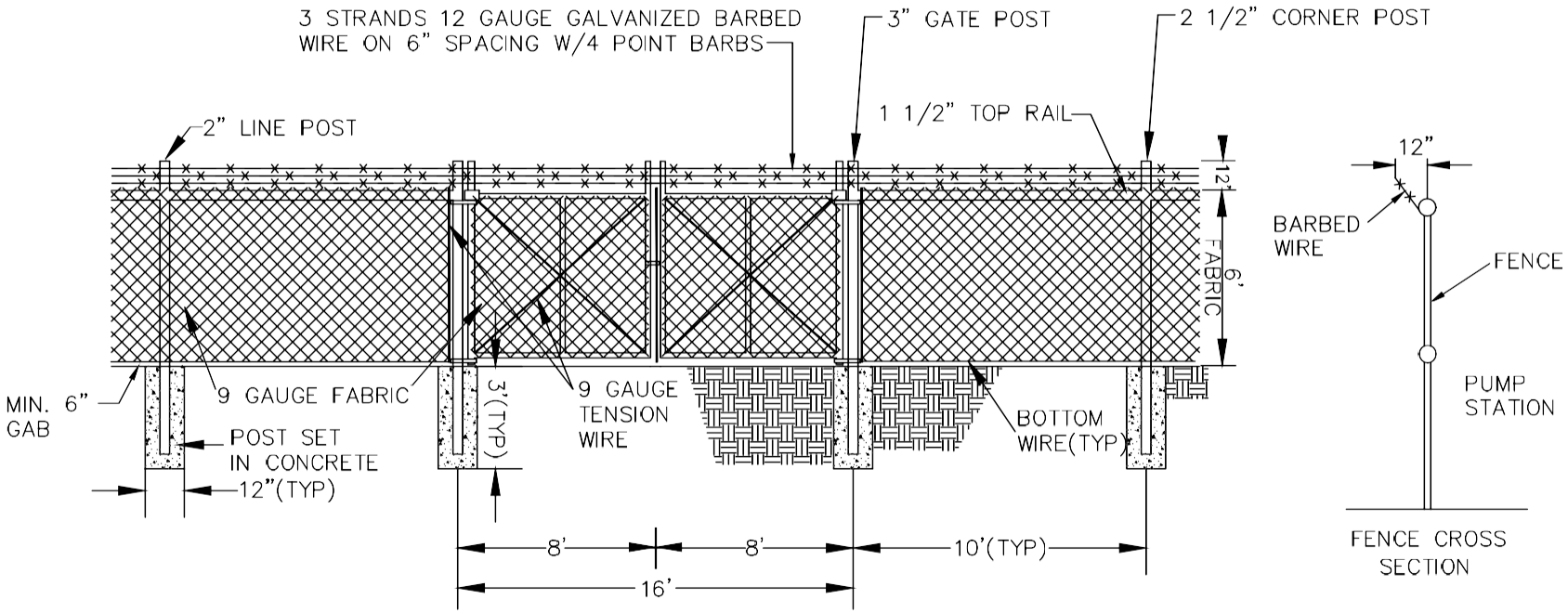
SECTION A-A
N.T.S.

LIFT STATION ACCESS DRIVE

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

SEWER-FIG 22
Dec. 2025

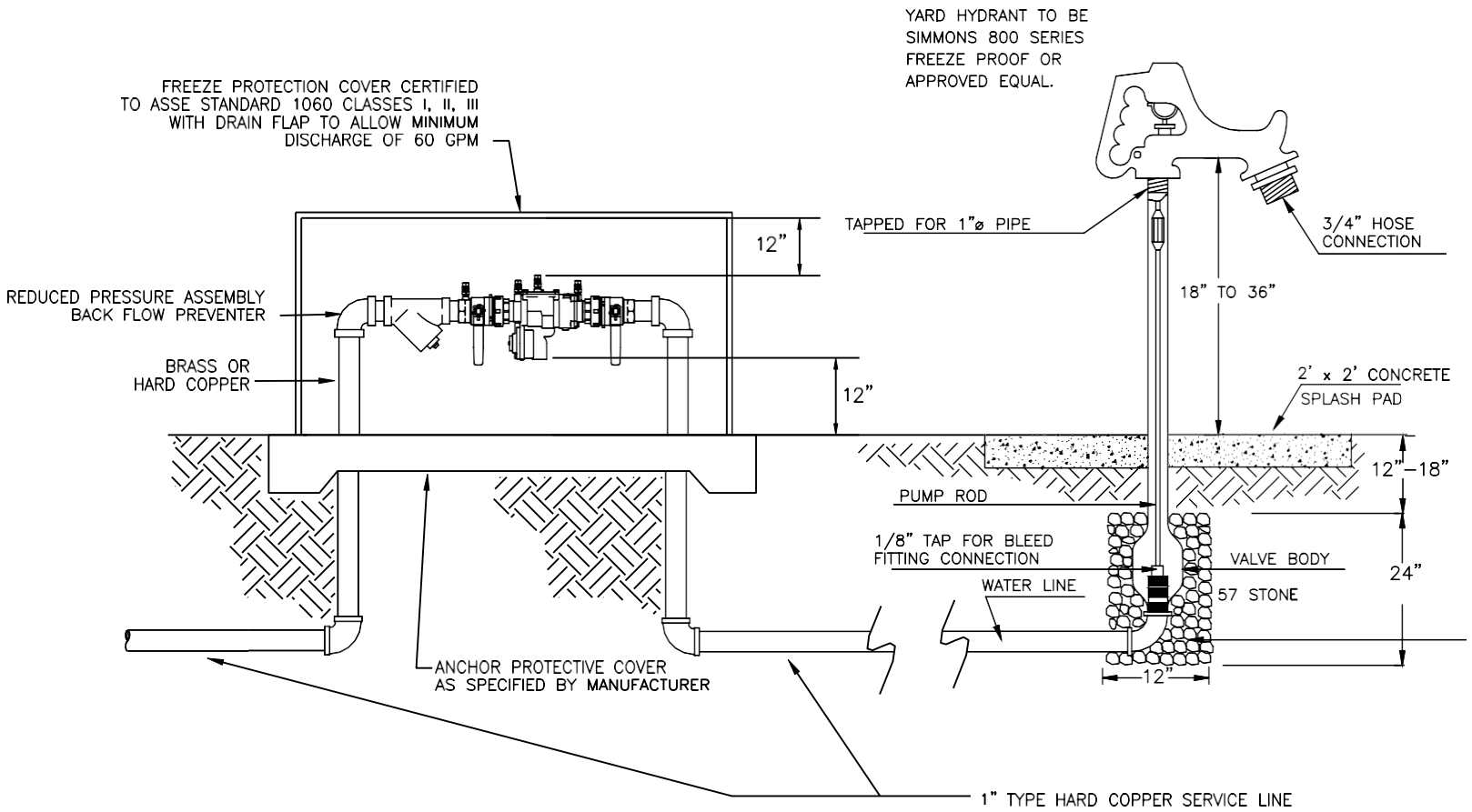
N.T.S.



LIFT STATION FENCE AND GATE

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

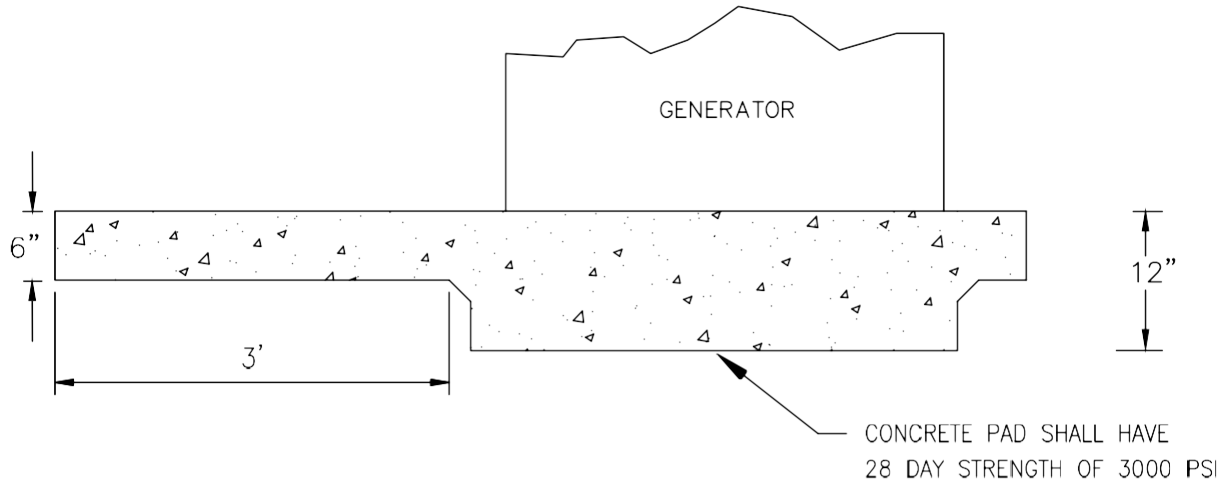
SEWER-FIG 23
Dec. 2025

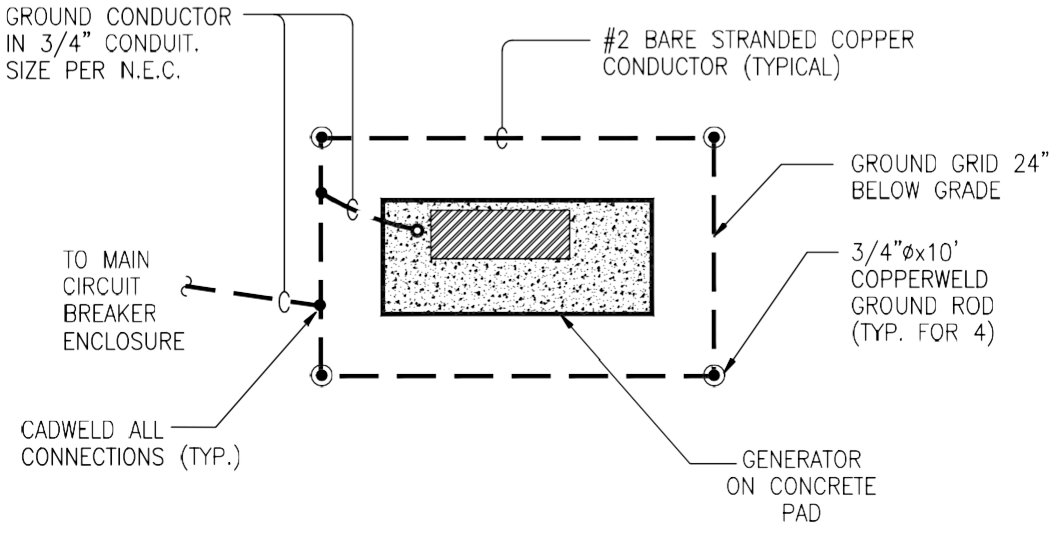


LIFT STATION YARD HYDRANT

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

SEWER-FIG 24
Dec. 2025

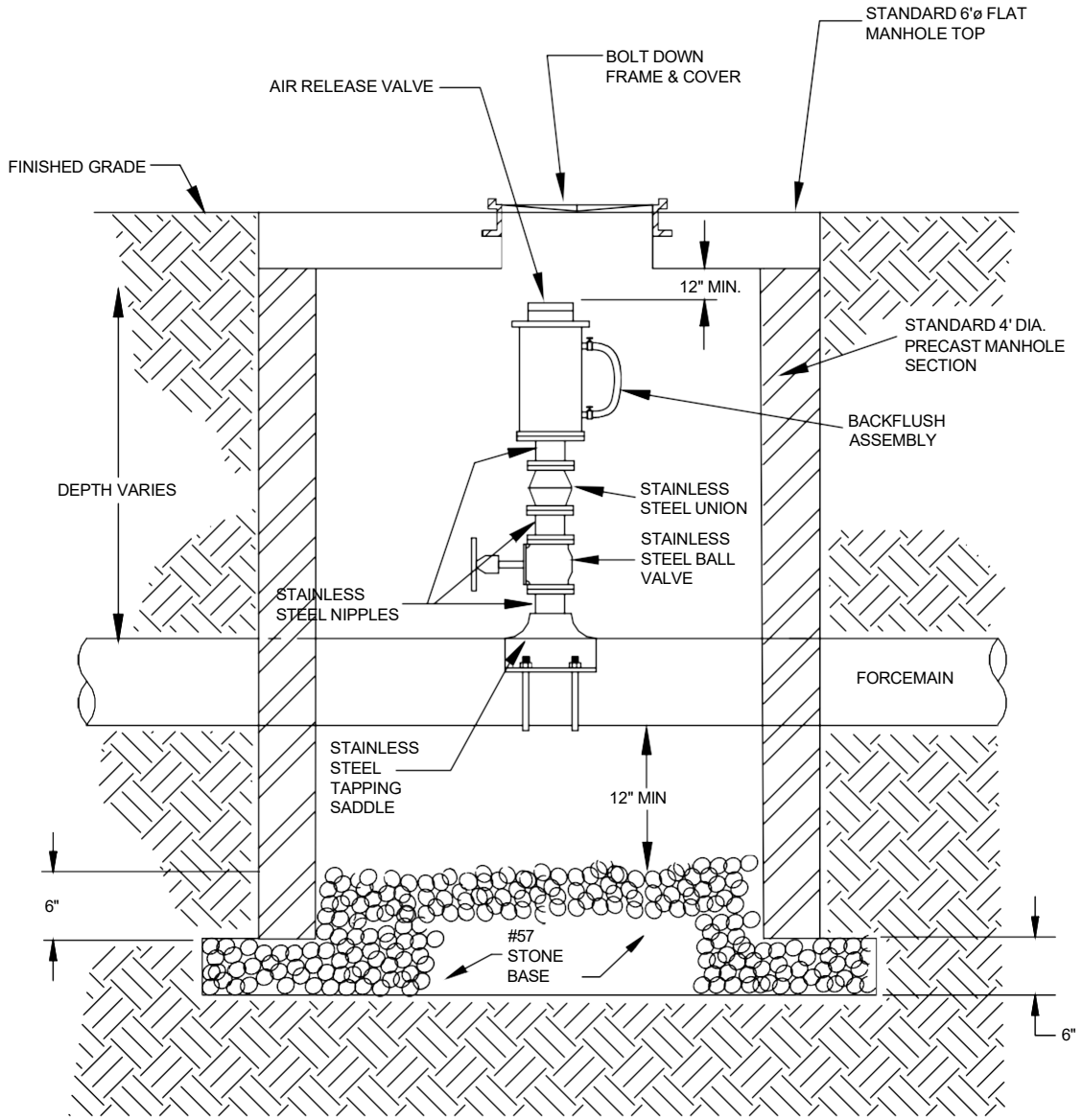




LIFT STATION GENERATOR DETAIL

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

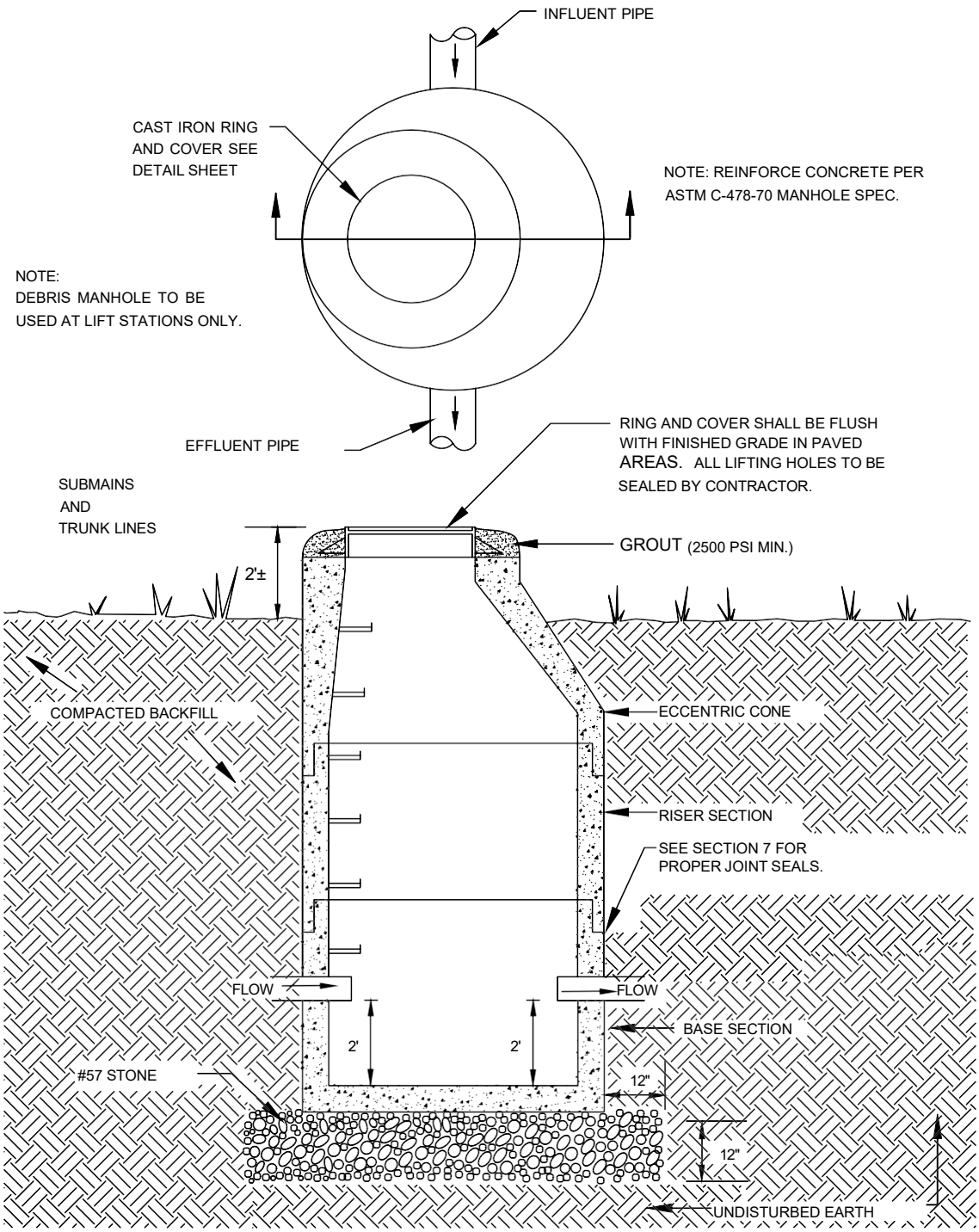
SEWER-FIG 25
Dec. 2025



AIR RELEASE VALVE - SEWER FORCE MAIN

DOUGLASVILLE-DOUGLAS COUNTY WATER AND SEWER AUTHORITY

SEWER-FIG 26
Dec. 2025



DEBRIS MANHOLE

SECTION EIGHT

CONSTRUCTION STANDARDS - STORMWATER

1.0 SCOPE

This specification covers the material requirements and installation procedures for all pipe, structures, and appurtenances to convey, detain, or treat stormwater runoff to be accepted into the Douglasville-Douglas County Water and Sewer Authority (Authority) storm sewer system. However, this does not limit the Authority's ability to require and/or accept other materials, construction techniques, or engineering when deemed appropriate by the Authority. Any pipes, structures, or appurtenances which the Authority has reason to believe are not in conformance with these specifications will not be accepted. Where discrepancies may inadvertently occur between this document and the Authority's Rules and Regulations, the Rules and Regulations shall govern**.**

2.0 QUALITY ASSURANCE

2.1 Pre-qualified Contractors

All contractors performing work on the stormwater conveyance system (including grading, paving, and curb & gutters) shall be on the WSA's Approved Contractor List.

2.2 Erosion Control

All developers, owners, and contractors are expected to comply with requirements to control erosion and sedimentation as set forth in local land disturbance permits and site design drawings. Erosion and sedimentation control measures shall be designed, installed, and maintained in accordance the Manual for Erosion and Sediment Control in Georgia, Latest Edition.

Developers, owners, and contractors must also comply with current requirements of the Georgia Rules and Regulations for Erosion and Sedimentation Control (Chapter 391-3-7) and the Georgia NPDES General Permit for Stormwater Discharges Associated with Construction Activities. Documents prepared for NPDES compliance such as Erosion Sedimentation and Pollution Control Plans, Monthly Reports, and other data collected for NPDES compliance such as rainfall measurements must be provided to the Authority upon request.

2.3 Pollution Prevention

Pollutants shall not be discharged into receiving waters of the storm sewer system. All discharges to the storm sewer system shall be composed entirely of storm water. Developers, owners, and contractors must comply with the Georgia Rules and Regulations for Water Quality Control (Chapter 391-3-6).

2.3.1 Petroleum

Petroleum shall be stored, used, and handled in full accordance with the Federal Spill Prevention, Control, and Countermeasure (SPCC) Rule found in 40 CFR Part 112. Sampling and remediation shall be performed in accordance with Georgia Underground Storage Tank Rules in the event of a spill. All fuel nozzles shall have fully functional automatic shut off devices to prevent overspills. Fuel tanks shall be placed to be as far as possible from receiving waters or storm drains. The Authority may prohibit on-site storage of petroleum based products in proximity to receiving waters or wetlands. If any amount of petroleum impacts a body of surface water, the spill must be reported to the National Response Center at 1-800-424-8802 and the Georgia EPD at 1-800-241-4113. The Authority shall also be notified of any reportable spills or releases.

2.4 Applicable Standards

The contractor shall supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), and American National Standards Institute (ANSI) standards. Latest revisions of all standards are applicable.

2.5 Materials

All materials must fully comply with construction standards of the appropriate local governing authority(s). Materials that are not specified by the local governing authority(s) shall fully comply with construction standards of the Georgia Department of Transportation (D.O.T.). Storm drain lids in streets and the public right-of-way, including driveways, shall be traffic rated.

2.6 Substitutions

Whenever a product is identified in the specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, etc., the contractor may freely choose from those referenced products which ones he wishes to provide. Any item or product other than those so designated shall be considered a substitution. The contractor shall obtain prior approval from the Authority for all substitutions.

3.0 PIPE MATERIALS

The contractor shall notify the Authority when pipe is delivered so that Authority inspectors can inspect pipe for laboratory stamp, shape, cracks, uniformity, blisters and imperfect surfaces, damaged ends, and gasket grooves. The Authority will not accept or use repaired or patched pipe or pipe with repaired or patched gasket grooves or shoulders.

All pipe materials shall comply with standards of the local governing authority(s). If not specified by the local governing authority(s), materials must meet Georgia D.O.T. standards.

Transitions of pipe materials are permitted only at manholes, junction boxes, catch basins, etc. Direct coupling of different pipe materials is not allowed. Pipes shall be sealed, outside and inside, to manholes, junction boxes, catch basins, etc. with non-shrink grout.

4.0 EXCAVATION

The contractor shall perform all excavation of every description and of whatever substance encountered to the depth shown on the approved construction drawings for all pipes, manholes, piers, conduits, and other appurtenances. All excavation is to be performed in strict conformance with current OSHA regulations. It is the responsibility of the contractor to familiarize himself with applicable safety regulations. The Authority cannot be held responsible for job site safety. The contractor is responsible for acquiring all applicable permits from the local governing authorities.

Excavation shall be accomplished by open cut unless otherwise directed. No tunneling shall be done, except as approved by the Authority and/or directed by the local governing authorities or the Georgia D.O.T. It is the responsibility of the contractor to ascertain all permits required by all governing agencies prior to installing pipe or appurtenances beneath roadway pavement.

4.1 Trenches

All construction must meet or exceed OSHA Standards. WSA may order the installation of suitable sheeting protect adjoining poles, roadways, utilities, and private property when, in the opinion of the Authority, trench excavation may damage these structures. Such orders or lack thereof shall in no way relieve the contractor from the responsibility of protecting these structures.

Trench excavation shall not advance more than 200 feet ahead of pipe laying without prior approval. The bottom of all trenches shall be smooth and flat and with backfill material affording full bearing of the pipe barrel. The depth and width required shall be as specified in the design documents. Bell holes shall be excavated in a manner that relieves pipe bells of all loads and ensures support throughout the length of the pipe barrel. Excavation in excess of the depths required for manholes and other structures shall be corrected by placing a sub-foundation of #57 stone, surge stone or some combination thereof.

No trench shall be left open overnight. Backfilled trenches shall be stabilized with seed and mulch by the end of each day.

4.2 Subgrade Stabilization

Where, in the opinion of the Authority, subgrade is too soft and/or excessively wet for proper pipe installation, the Authority may order the contractor to undercut the ditch and backfill with #57 stone to grade.

5.0 ROCK EXCAVATION

5.1 Rock (Defined)

Any material that cannot be excavated with equipment having a minimum digging force of 25,000 pounds using a standard 3-foot bucket and occupying an original volume of at least 1/2 cubic yard.

5.2 Excavation

Where rock is encountered in trenches, it shall be excavated to the minimum depth that will provide eight inches or more clearance below the pipe barrel and manholes. Remove boulders and stones to provide a minimum of six inches clearance between the rock and any part of the pipe or manhole.

5.3 Blasting

Only licensed blasting contractors shall be employed and all blasting shall be monitored by seismographs. Liability insurance shall be required in the amount deemed appropriate by the Authority. The contractor shall provide only experienced workmen to perform blasting. All blasting operations shall be conducted in accordance with all existing ordinances and regulations. All structures shall be protected from the effects of the blast. The contractor shall be responsible for repairing any resulting damage. If the contractor persistently uses excessive blasting charges or blasts in an unsafe or improper manner, the Authority may direct the contractor to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge. The contractor blasting shall be insured and bonding may be required at the discretion of the Authority.

5.4 Removal of Rock

Excavated rock shall not be used as backfill material. Rock that is surplus or not suitable for use as riprap shall be disposed of.

6.0 BACKFILLING

The contractor shall backfill all trenches fully to restore the ground surface to its original condition. Before heavy construction equipment is permitted to cross over a pipe, an earth

fill shall be constructed to an elevation of at least three feet over the top of the pipe or to an elevation as required by the manufacturer, whichever is greater.
The contractor shall dispose of all surplus material. Backfill material cannot contain any rock larger than six inches square or any trees, stumps, or limbs. The right-of-way shall be cleared of all limbs, brush, trees, stumps, roots, and rocks.

6.1 Suitable Backfill Material

Suitable backfill material is earth material excavated from the trench that is clean and free of rock, organics, and other unsuitable material. The contractor should use extreme care when selecting the initial backfill material to be placed to a depth of 12 inches over the top of the pipe. This initial backfill material shall be free of all rock and clods that could damage the pipe in any way. If the backfill material excavated from the trench is not suitable for use as initial backfill material, the contractor will obtain suitable materials elsewhere.

6.2 Procedures for Backfilling

The contractor shall place the initial backfill material carefully around the pipe or over the bedding material covering pipe in uniform 6-inch layers to a depth of at least 24 inches above the pipe. Each layer shall be compacted thoroughly without disturbing or damaging the pipe. Caution should be taken when compacting backfill material above HDPE.

HDPE pipe shall be backfilled on both sides of all types of pipe simultaneously to prevent side pressures. Soil backfill shall be compacted by hand tamping until a depth of two feet above the top of the pipe is reached.

6.3 Compaction Methods for Fill More than Two Feet Above the Pipe

The contractor shall compact the backfill in 6-inch layers if using light power tamping equipment, such as a "jumping jack." The contractor shall compact the backfill in 1-foot layers if using heavy tamping equipment, such as a hammer with tamping feet.

6.4 Backfill Under Roads

Backfill to be placed under roads shall be compacted to 95% Standard Proctor Density per ASTM D 698 or as required by all local governmental agencies that have jurisdiction over the road. Compaction tests may be required in existing or proposed streets, sidewalks, drives, and other existing or proposed paved areas at varying depths and at intervals as determined by the Authority with a minimum of one test on each job, and a maximum of one required test for each 400 feet of storm pipe installed unless soil conditions or construction practices, in the opinion of the Authority, warrant a need for additional tests.

6.5 Settlement

If trenches settle, the contractor shall remove bad material, fill and re-tamp to match adjacent grade.

6.6 Surfacing of Trenches in Dirt Streets, Paved Roads and Driveways

Where trenches are along dirt streets and paved roads open to vehicular traffic or across driveways, the remaining 12 inches of backfill up to the traveled surface shall be made with crusher run stone, compacted and maintained until all removed pavement is replaced.

6.7 Additional Material

Where final grades above the pre-existing grades are required to maintain minimum cover, the contractor is to supply additional fill material to meet the final grade requirements shown on the drawings. The contractor may utilize excess material excavated from the trench if the material is suitable. If the excess excavated materials are not suitable, or if the quantity available is not sufficient, the contractor shall provide additional fill material.

7.0 COLLECTION AND DISTRIBUTION STRUCTURES

All stormwater collection structures including inlets, catch basins, junction boxes, and flared-end sections shall comply with applicable standards of the local governing authorities. Materials not specified by the local governing authorities must comply with standards of the Georgia Department of Transportation.

8.0 HEADWALLS

For pipe outlets where the 100-year, 24-hour storm discharge velocity exceeds 5 feet per second, install a pre-cast, reinforced concrete headwall and adequate outlet protection. Headwalls shall be pre-cast and delivered without damage. Cracked or pitted surfaces are not acceptable. Seal pipe to headwall with non-shrink grout. Concrete shall have 28-day strength of 4000 psi and reinforcing bars shall be #4 bars with a yield strength of 6000 psi.

Install so that headwall spills onto outlet protection to dissipate energy and reduce velocity as needed to prevent erosion. Outlet protection shall conform to the Manual for Erosion and Sediment Control in Georgia, latest edition.

Pipe outlets with 100-year, 24-hour storm discharges greater than 5 feet per second shall have headwalls or flared end sections along with reinforced vegetation (permanent erosion control blankets).

9.0 RIPRAP STONE

Stone riprap shall be composed of field stone or quarry stone. Stone shall be hard, angular, durable, and highly resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. The stone's specific gravity shall be 2.5 or higher. At least 50% of the stones shall be 50 lbs. or greater. All rip rap shall be placed over geotextile filter fabric.

The contractor shall embed the stone riprap neatly to form a compact layer at least 12 inches thick. The riprap shall be placed in such a way that the smaller stones are not segregated but evenly distributed. Chinking stones shall be placed in the crevices between the larger stones to produce a dense, well-graded mass.

10.0 INSTALLATION

10.1 Clearing

The contractor shall clear the permanent easement before excavating. The contractor shall remove all trees, growth, debris, stumps, and other objectionable matter from the site. The construction easement should only be cleared if necessary.

10.2 Location and Elevation

The drawings shall show the alignment and grade of the storm sewer and the position of the manholes, headwalls, and other appurtenances. The grade line shown on the storm sewer profile and called for on the plans shall be the grade of the invert of the pipe. Pipe shall be laid so that the pipe bells are upstream to the direction of the flow. Inlets, catch basins, ponds, and other structures shall be installed so that locations and invert elevations match those shown on the design drawings.

10.3 Existing Underground Utilities and Obstructions

It is the responsibility of the contractor to locate all existing utilities along the path of construction.

The developer's drawings shall indicate all known underground utilities and obstructions. Where unforeseen underground utilities or obstructions are encountered, the location and alignment of the storm structures may be changed to avoid conflict(s) upon written approval of the Authority.

10.4 Handling

The contractor shall lower pipe, fittings, and accessories into the trench by suitable means. The contractor shall not drop or dump pipe or accessories into the trench.

Care shall be taken to keep the inlets, pipes, appurtenances, and other structures clean until final acceptance. The contractor shall remove and replace defective or damaged pipe sections, riser sections, cover, headwalls, or other installed materials.

10.5 Expediting Work

The contractor shall excavate, lay the pipe, and backfill as closely together as possible. Unjointed pipe shall not be left in the trench overnight. The contractor shall backfill and compact the trench as soon as possible after laying and jointing is completed. The exposed end of the installed pipe shall be covered with plywood or filter fabric each day at the close of work and at all other times when work is not in progress. If necessary, to backfill over the end of an uncompleted pipe, the end shall be closed with a mechanical joint plug, however, backfilling shall commence only after inspection.

11.0 CONSTRUCTION ALONG HIGHWAYS, STREETS, ROADWAYS AND STREAMS

11.1 Conformance with Governmental Agencies

The contractor shall comply with all construction operation requirements, safety requirements, traffic control requirements, road maintenance requirements and repair requirements of the local governing authorities and/or the Georgia Department of Transportation while installing any structures, storm sewers or appurtenance along highways, streets and roadways. Contractors must obtain permits from the local governing authorities and/or the State before the construction begins. As required, WSA shall procure D.O.T. and County permits necessary to complete the project. The contractor shall be responsible for obtaining any and all permits from other governing bodies necessary to complete the project.

These other permitting agencies include but are not necessarily limited to the following:

1. City of Douglasville

2. Douglas County

3. Georgia Environmental Protection Division (EPD)

4. United States Department of Agriculture – Natural Resources Conservation Service (USDA – NRCS)

5. United States Army Corps of Engineers

11.2 Traffic Protection

The contractor is to provide and maintain suitable signs, barricades, and lights for traffic protection. All highway signs removed for construction shall be replaced as soon as possible. The contractor shall not close or block any highway, street, or roadway without first obtaining permission from the proper authorities. The contractor shall provide trained and Georgia D.O.T. certified flagmen to direct and expedite the flow of traffic.

11.3 Construction Operations

The contractor is to perform all work along highways, streets and roadways to minimize traffic interference.

11.3.1 Stripping

Where the pipeline is laid along road shoulders, the contractor shall strip and stockpile all sod, topsoil, and other material suitable for shoulder restoration.

11.3.2 Trenching, Laying and Backfilling

Trench excavation shall not be open cut any further ahead of pipe laying operations than is necessary. The contractor shall backfill and remove excess material immediately behind laying operations.

11.3.3 Shaping

The contractor shall reshape damaged slopes, side ditches and ditch lines immediately after completing backfilling operations. Topsoil, sod, and any other materials removed from shoulders shall be replaced. The Authority, in its sole discretion, may require contractors to place erosion control blankets in ditch lines to promote a permanent stand of grass.

11.4 Excavated Materials

The contractor shall not place excavated material along highways, streets, and roadways in a manner that obstructs traffic. All scattered excavated material shall be swept off the pavement. If all material cannot be removed from the pavement, the contractor is to notify the governmental agency having jurisdiction over the street or roadway so that they may assist the contractor in cleanup efforts. The contractor shall be responsible for any fees or damage resulting from construction activity.

12.0 REMOVING AND REPLACING PAVEMENT

12.1 Removing Pavement

The contractor shall remove existing pavement as necessary for installing pipe line and appurtenances. The developer shall accept full responsibility for the pavement/roadway during all construction activities. The developer shall also be responsible for securing all pavement cut permits from the appropriate local governing authority.

WSA may procure permits from D.O.T. upon request from the developer. Prior to obtaining a D.O.T. permit, the Authority, in its sole discretion, may require the developer to post bond up to and including 100% of the cost of replacing the roadway impacted by the proposed construction activity.

12.1.1 Marking

Before removing any pavement, the contractor shall mark the pavement neatly paralleling the pipeline and existing street lines. The marks shall be spaced the width of the trench.

12.1.2 Breaking

The contractor shall break the asphalt pavement along the marks using jack hammers or by scoring with a rotary saw and breaking below the score using jack hammers or other suitable tools.

12.1.3 Machine Pulling

No pavement shall be pulled with machines until it is completely broken and separated from the pavement that is to remain.

12.1.4 Damage to Adjacent Pavement

The contractor shall not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, the contractor is responsible for removing and replacing the damaged pavement.

12.1.5 Sidewalks

Sidewalks shall be removed and replaced to their full width.

12.1.6 Curbs

The contractor shall remove and replace or tunnel under any curb encountered.

12.1.7 Driveways

Driveways shall be removed and replaced to their full width to the satisfaction of the property owner.

12.2 Replacing Pavement

The contractor shall schedule a compaction test by an independent testing laboratory approved by the Authority upon completion of backfilling operations. After the compaction and compaction testing has been satisfactorily completed, the contractor shall replace all pavement, sidewalks and curbs that were removed.

12.3 Materials to be Replaced

The contractor shall place the materials for pavement replacement to the dimensions shown on the drawings. The following types of sub-bases will be replaced:

12.3.1 Graded Aggregate Base

The contractor shall furnish graded aggregate base (GAB) in two sizes of such quantities that the resulting mixture is well-graded from coarse to fine and meets the gradation requirements of Section 816 of the State Highway of Georgia Department of Transportation Standard Specifications.

12.3.2 Black Base

The base for all paved roadways shall conform to the requirements of the Georgia State Highway Department of Transportation Specifications for the black base (Hot Mix). A pug mix rotary drum type mixer shall be used with a minimum capacity of not less than 50 tons per hour for asphalt production. The base shall be applied and compacted in two courses by asphalt spreader equipment of design and operation approved by the Authority. After compaction, the black base shall be smooth and true to establish profiles and sections.

12.3.3 Surface Course

The surface course for all pavement, including paint or tack coat when required by the local governing authority, shall conform to the requirements of the Georgia State Highway Department of Transportation Specifications for Asphaltic Concrete, Section 400, Type "E" (Modified Top). The contractor shall produce the surface course in an asphalt plant of the same type as noted above for black base. The surface course shall be applied and compacted in a manner approved by the Authority. Any high, low, or defective areas shall be immediately corrected by cutting out the course,

replacing with fresh hot mix and immediately compacting it to conform and thoroughly bond it to the surrounding area.

12.3.4 Concrete

The contractor shall provide concrete and reinforcing for concrete pavement in accordance with the requirements of the Georgia State Highway Department of Transportation Specifications for Portland Concrete Pavement.

12.4 Supervision and Approval of Pavement Restoration

Pavement restoration shall meet the requirements of the regulatory agency responsible for the pavement. The contractor shall obtain agency approval of all pavement restorations before requesting final payment. The contractor shall obtain the Authority's approval of restoration of pavement not the responsibility of a regulatory agency such as private roads and drives. The contractor shall complete the pavement restoration as soon as possible after backfilling.

12.4.1 Replacement

Prior to replacing the pavement, the contractor shall make a final cut in concrete pavement nine inches back from the edge of the trench. The contractor shall make the cut using a rotary saw. Asphalt pavement shall be removed nine inches back from the edge of the trench using jack hammers or other suitable tools. The contractor shall replace all street and roadway pavement as shown on the drawings. All driveways, sidewalks, and curbs shall be replaced with the same material and to the same dimensions as existed prior to construction.

12.4.2 Failure of Pavement

Should any pavement restoration or repairs fail during a period of one year following construction or the warranty period, the contractor shall promptly restore or repair all defects. All paving replacements must be acceptable to the appropriate governing body.

13.0 BORING

Where necessary all stormwater pipes under roads shall be installed by horizontal boring. The Authority may procure all bore permits from the D.O.T. at the request of the developer. Bonding provisions as noted in Section 12.1 shall apply. The developer is responsible for securing all bore permits from the appropriate local governing authority. The contractor shall furnish and install tunnel liner or pipe casing and install the pipeline therein in accordance with the following specifications.

13.1 Well Pointing

The contractor shall operate well points or drainage systems in the vicinity of the boring to prevent the accumulation of flood water or ground water in the bore pits or the pipe.

13.2 Damage to Existing Structure

The contractor shall take precautions to construct the tunnel so that no settlement of the overpassing roadway, railway or any other structure will occur. In order to prevent such settlement, the use of poling plates, breast boards, shields, and soil solidification or a combination of these methods may be necessary. The Authority shall not be responsible for any damage that may result from the tunnel construction.

13.3 Boring

The contractor shall furnish all material and equipment and perform all labor required to install steel pipe casing at the locations indicated on the drawings. Boring design and materials shall be per all AREA, AASHTO, Georgia D.O.T., and other applicable standards. Pipe under roadways must be reinforced concrete or ductile iron with a minimum inside diameter of 24 inches.

13.4 Safety During Boring

The contractor shall provide all necessary bracing, bulkheads and shields to ensure complete safety to all traffic at all times during the boring operation. All work shall be performed in such a manner as to not permanently damage the roadbed or interfere with normal traffic patterns. The Authority will not be responsible and shall be saved harmless in the event of delays to the contractor's work resulting from any cause whatsoever. All construction must meet or exceed OSHA requirements.

14.0 DETENTION OF RUNOFF

Every project that requires detention shall install structures to detain stormwater runoff with controlled release so that post- developed discharges do not exceed pre-developed discharges for the 1-year, 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year, 24-hour storms. The outlet control structure shall release the 1-year storm runoff over a minimum 24-hour period. All detention facilities shall be designed by a Professional Engineer licensed in the State of Georgia. Facilities shall be designed in accordance with the Georgia Stormwater Management Manual, Volume 2, latest edition.

The design shall provide for extended detention of the 1-year storm to protect downstream channels from flows and velocities that accelerate channel degradation and over bank flood protection by adequate detention of the 100-year, 24-hour storm events.

14.1 Above Ground Detention

All properties larger than 10 acres shall have above ground detention facilities. Pond slopes 3:1 or steeper shall be fenced. Ponds shall be stocked with perennial vegetation. Interior slopes steeper than 4:1 shall have erosion control blankets installed and durable perennial vegetation to prevent erosion. The minimum top width of dams is 10 feet and fill material shall be compacted to 98% standard proctor test.

14.2 Underground Detention

Highly impervious properties smaller than 10 acres may have underground detention facilities provided that the Authority determine that available space is insufficient for above ground detention. Publicly owned detention structures may not be located underground. Detention facilities under parking lots must be able to support high traffic loads. Outlet control structures must have a standard manhole for access.

15.0 TREATMENT OF RUNOFF

Projects that require detention, stormwater runoff reduction and/or water quality treatment shall be designed and constructed in accordance with the Georgia Stormwater Management Manual, latest edition. The primary method of water quality treatment will be Runoff Reduction. Best management practices (BMPs) for runoff reduction must retain onsite the first 1.0 inches of rainfall to the maximum extent practicable. If the entire volume from the first 1.0 inches cannot be retained onsite, the difference between the volume retained onsite and the volume of the first 1.2 inches of rainfall (Water Quality Volume) shall receive Water Quality Treatment to provide an 80% reduction in Total Suspended Solids (TSS) loads. More details are provided in Section 4 of these Standards.

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The Authority may require additional testing for other pollutants of concern such as petroleum hydrocarbons, pesticides, metals, or other chemicals to demonstrate adequate removal.

Even if a project does not require detention, the Authority may require installation of BMPs to treat runoff if the property is reasonably expected to contribute significant pollutant load as indicated by the on-site storage and/or use of petroleum or hazardous chemicals, inadequate stormwater management for existing improvements, proximity to receiving streams or impairment of receiving streams.

15.1 Structural Best Management Practices (High Efficiency)

A Professional Engineer registered by the State of Georgia shall design structural BMPs. Design shall conform to the Georgia Stormwater Management Manual, latest edition. These practices are generally considered to significantly reduce

pollutants and, depending on site conditions, could potentially remove 80% of TSS from runoff without further treatment.

15.1.1 Retention Ponds

Projects larger than 25 acres in size may provide stormwater retention in the form of a wet pond with a normal dry weather pool depth of at least 36 inches. Pond slopes shall not be steeper than 3:1 and the maximum elevation may not exceed 8 feet. The minimum length to width ratio is 1.5:1 and a sediment forebay must be installed upstream of the wet pond. Controls must be included to reduce mosquito populations such as natural predators or physical agitation such as a fountain. Depending on soil type, a pond liner may be required. The normal pool shall be sized for 1.2 inches multiplied by the volumetric runoff coefficient and the size area.

15.1.2 Constructed Wetlands

Constructed wetlands may be installed in extended dry detention facilities for the purpose of treating runoff. The wetland area shall consist of 10% – 20% permanent water pool (micropool) with a minimum depth of 18 inches. The remaining wetland area shall have no more than 6 inches of standing water. The wetland shall have a length to width ratio of 2:1 and a sediment forebay must be installed upstream of the wetland. Depending on soil type, a pond liner may be required. Wetland vegetation must be durable perennial vegetation such as grass and shrubs. Understory trees such as willows or maples may be used where approved by the Authority. Overstory trees such as poplars and sweet gum may not be used in constructed wetlands.

15.1.3 Bioretention Areas

Bioretention areas may be installed with engineered soils and landscaped vegetation to treat stormwater runoff. No more than 2 acres may drain to a bioretention area. Any property may have multiple bioretention areas. Runoff shall enter bioretention areas as sheet flow. Concentrated flow must be converted to sheet flow prior to entering a bioretention area. Length to width ration is 2:1 minimum. No bioretention areas less than 20 ft x 10 ft will be installed. The soil planting bed must be at least 4 feet deep and shall have drain time of 48 hours and a coefficient or permeability (k) of 0.5 ft/day. Soil shall be sandy loam with infiltration rate of 0.5 inches per hour, a pH between 5.5 and 6.5, an organic content between 1.5% and 3% and a maximum 500 ppm concentration of soluble salts.

Vegetation may include grass, flowers, shrubs, and small trees such as maple, pear or crepe myrtle. Beneath the planting bed shall be a sand bed at least 12 inches deep with less than 15% silt or clay content. Beneath the

sand bed shall be an underdrain system consisting of 6-inch perforated PVC pipe (AASHTO M 252) in an 8-inch gravel layer. The pipe shall have 3/8-inch perforations, spaced at 6-inch centers, with a maximum 4 holes per row. If two or more parallel pipes are used, spacing shall be 10 feet maximum and pipe slopes must be at least 0.5%. Gravel shall be clean washed stone 1.5 – 3.5 inches in size (GADOT No. 3 Stone). Underdrains shall discharge to an adequate detention facility.

15.1.4 Sand Filters

Sand filters are well suited for properties with high percentages of impervious surface such as urban development. Sites without high percentages of impervious surfaces or where significant clay and silt concentrations are expected may have reduced treatment efficiencies.

15.1.4.1 Surface Sand Filters

Surface sand filters may treat runoff from up to 10 acres. The filter shall consist of a sediment forebay and a filter bed. The forebay shall be sized to hold 0.6 inches multiplied by the volumetric runoff coefficient and the area size. The filter bed shall be at least 24 inches deep and filled with clean washed medium sand meeting ASTM C-33 concrete sand or GA D.O.T. Fine Aggregate Size No. 10. The filter bed shall drain completely in 40 hours or less. Beneath the sand bed shall be an underdrain system separated by a permeable filter fabric. Six-inch perforated PVC pipe (AASHTO M 252) at a minimum slope of 0.5 % shall discharge filtered runoff at a non-erosive velocity. The pipe shall have 3/8-inch perforations, spaced at 6-inch centers, with a maximum 4 holes per row. If two or more parallel pipes are used, spacing shall be 10 feet maximum. Gravel shall be clean washed stone 1.5 – 3.5 inches in size (GA D.O.T. No. 3 Stone).

15.1.4.2 Perimeter Sand Filters

Perimeter filters may be located in trenches around impervious areas such as parking lots. Perimeter filters shall consist of concrete trenches with trench grates to receive runoff into a sediment chamber. Runoff shall be directed over a weir into the sand filter, which shall consist of at least 18 inches of clean washed medium sand meeting ASTM C-33 concrete sand or GA D.O.T. Fine Aggregate Size No. 10. A 4-inch perforated PVC pipe (AASHTO M 252) in a 6-inch, gravel bed at a minimum slope of 1.0 % shall discharge

filtered runoff to an outlet pipe. The discharge must drain to a detention facility.

15.1.4.3 Underground Sand Filters

The underground sand filter may be used in sequence with underground storage in urban areas where space is limited. Underground facilities have a high maintenance burden and should be avoided where possible. Underground facilities may only be installed on highly impervious sites less than 5 acres in size where the Authority determines sufficient space does not exist for above ground treatment structures. Publicly owned treatment facilities may not be located underground. The filter shall consist of a 3-chamber concrete structure made with Class A concrete with a 28 day compressive strength of 4000 psi reinforced with #4 rebar (or thicker) with minimum yield stress of 6000 psi. The walls, baffles, base, and cover shall have a minimum thickness of 6 inch. Each chamber shall have a standard manhole cover and copolymer coated plastic steps on centers between 12 and 16 inches. Filters shall be designed to treat 1.2 inches and shall maintain a permanent pool of 3 feet in the first chamber and allow additional volume as needed for the 100-year, 24-hour storm event to pass through with surcharging inlet pipe. The second chamber shall contain the sand filter consisting of 24 inches minimum of clean washed medium sand meeting ASTM C-33 concrete sand or GA D.O.T. Fine Aggregate Size No. 10. A 6-inch perforated PVC pipe (AASHTO M 252) in an 11-inch gravel bed (minimum slope of 1.0 %) shall discharge filtered runoff to the third chamber and subsequently to the outlet pipe. An overflow weir shall allow the 100-year, 24-hour storm to pass through the second chamber to the outlet pipe.

15.1.5 Infiltration Trenches

Infiltration may be used to discharge runoff to ground water. Infiltration rates of on-site soils beneath infiltration trenches must be 0.5 in/hour or greater. Trenches shall be between 3 feet and 8 feet deep and shall not be more than 25 feet wide. The bottom of the trench shall be at least 4 feet above the seasonally high-water table. The trench bottom shall be flat across its length and width. The top layer shall be at least two inches of pea gravel to filter runoff. The intermediate layer shall be clean washed, bank run gravel, 1.5 – 2.5 inches in size with about 40% void space (GA D.O.T. No. 3 Stone). The bottom layer shall be at least 6 inches of clean washed medium sand (GA D.O.T. Fine Aggregate No. 10). An observation well

must be installed in every trench consisting of a perforated 6-inch PVC pipe (schedule 40) placed vertically to extend to the bottom of the trench. The well shall be securely capped to prevent tampering. A compacted and vegetated earth berm shall be placed around the down gradient borders of the trench to contain runoff. A spillway shall divert excess runoff to a detention facility. Excavation shall be limited to width and depth specified in the design drawings. The bottom and sides of the excavation shall not be loaded in a way that causes soil compaction and shall be free of voids and large roots. Scarify bottom and sides of excavation prior to filling.

15.1.6 Enhanced Swales

Enhanced swales are vegetated open channels designed and constructed to capture and treat stormwater runoff with cells formed by check dams. The bottom width shall be between 2 feet and 8 feet and longitudinal slope shall not exceed 4%. Side slopes shall no be steeper than 2:1. Enhanced swales can treat runoff from areas of 5 acres or less. Swales should be sized to treat 1.2 inches of rainfall with a maximum depth of 12 inches and a velocity not exceeding 5 feet per second. Swales shall safely convey larger flows up to and including the 100-year, 24-hour storm with a minimum freeboard of 6 inches.

15.1.6.1 Dry Enhanced Swales

A dry enhanced swale is a vegetated channel that overlays a prepared soil bed with an underdrain system. The soil bed shall consist of at least 30 inches of permeable soil with an infiltration rate between 1.0 foot per day and 1.5 feet per day. Underneath the soil bed shall be a 6 in layer of clean washed GA D.O.T. No. 3 Stone with 4-inch perforated PVC pipe (AASHTO M 252) with 3/8-inch perforations. Filter fabric shall be placed between the soil bed and gravel layer. Excavation shall be limited to the width and depth specified in the design drawings. The bottom and sides of the excavation shall not be loaded in a way that causes soil compaction and shall be free of voids and large roots. The bottom and sides of excavation shall be scarified prior to filling.

15.1.6.2 Wet Enhanced Swales

A dry enhanced swale is a vegetated channel that is excavated to the water table or to poorly drained soils. Check dams shall be installed to form multiple miniature wetland cells. Check dams can be compacted earth berms or concrete structures with v-notch weirs. Check dams shall not be more than 18 inches in height. Wetland cells shall be

stocked with durable perennial wetland vegetation tolerant to frequent inundation. Grasses, herbs, shrubs, and understory trees may be used subject to approval by the Authority. Overstory trees may not be used.

15.2 Structural Best Management Practices (Low Efficiency)

A Professional Engineer licensed in the State of Georgia shall design structural BMPs. The design shall conform to the Georgia Stormwater Management Manual, Volume 2, latest edition. Although these practices are generally considered to reduce pollutants, depending on site conditions, runoff typically will require additional treatment to remove 80% of TSS from stormwater runoff.

15.2.1 Filter Strips

Filter strips are vegetated areas that filter sheet flow. Filter strips shall be at least 15 wide, uniformly graded and densely vegetated. The flow length of runoff onto the filter strips shall not exceed 75 feet for impervious surfaces and 150 feet for pervious surfaces. Slopes draining to the filter strips shall not be steeper than 6%. For concentrated flow, a level spreader shall be installed at the upgradient edge of the filter consisting of a diaphragm of pea gravel conforming to ASTM D 448 size No. 6 (1/8 inch – 3/8 inch). The contact time of runoff shall be a minimum of 5 minutes. Filter strips may be used as pretreatment or as buffers to receiving waters.

15.2.2 Grassed Channels

Grassed channels are open vegetated water ways to convey runoff and filter low flows. Channels shall have a trapezoidal or parabolic cross section and shall be grassed with tall fescue. The channel bottom width shall be between 2 feet and 6 feet. The channel bottom shall be at least 24 inches above the seasonally high-water table. For adequate filtering, runoff for the 1.2-inch event shall not have a velocity that exceeds 1.0 feet per second. The channel shall be sized to safely convey larger storms up to and including the 100-year, 24-hour storm event with a minimum freeboard of 6 inches. If the velocity for any 24-hour storm event (1 year – 100 year) exceeds 5 feet per second, vegetation shall be reinforced with polyethylene matting. The maximum velocity for channels is 10 feet per second. Grass shall be maintained at a minimum height of 4 inches.

15.2.3 Submerged Gravel Wetlands

Submerged gravel wetlands are small wetland cells with wetland vegetation established on a bed of submerged gravel. Runoff flows horizontally through the gravel to the outlet. The wetland shall be sized to treat the first 1.2 inches of rainfall. Additional runoff must bypass the wetland into a detention facility. The filter bed consists of 36 inches of clean washed

stone (GA D.O.T. No. 57 stone) with a 6-inch layer of clean medium sand above and below. If the filter bed is not below the water table, the bottom of the wetland shall be lined with an impermeable liner. Runoff shall enter a sediment forebay prior to discharging to the wetland. Runoff shall enter the filter bed at mid depth through 4-inch perforated PVC pipe. Discharge shall leave the filter bed through a perforated standpipe at the opposite end and drain to an approved detention facility. The minimum length to width ratio of the filter bed is 2:1. The filter shall be stocked with durable native wetland vegetation such as grasses and herbaceous plants. Shrubs and trees are not acceptable.

15.2.4 Gravity Separators (Oil – Grit)

Gravity separators are hydrodynamic separation devices that are designed to remove grit and heavy sediments, oil and grease, debris and floatable matter from runoff. Units typically consist of an inlet chamber where heavy sediment drops out, a main chamber where lighter sediment settles and oils and floatables are skimmed and diverted to a storage area for future removal, and outlet chamber. Since removal efficiencies for solids are typically low, gravity separators can only be used for pretreatment of runoff. No more than 1.0 acre may drain to a gravity separator. The separator shall be sized to treat the first 1.2 inches of rainfall. Additional runoff shall bypass the separator. The total wet storage of the separator shall not be less than 400 cubic feet. Each chamber must have a standard manhole cover for access. Horizontal velocity through the separator shall be less than 3 feet per minute.

15.2.5 Pervious Surfaces

Pervious surfaces include porous asphalt, pervious concrete, and permeable paver systems. These surfaces may be installed to infiltrate runoff into an underlying stone aggregate reservoir to provide subsurface detention, and in some cases, increase infiltration and decrease runoff volume. The stone aggregate reservoir underlying these surfaces may be drained by an underdrain system that discharges to a conventional stormwater management system and/or be designed to infiltrate water into the surrounding soil. For installations designed to infiltrate runoff into the surrounding soil, data shall be provided to demonstrate that the soil at the location of the proposed installation has an infiltration rate of at least 0.5 inches per hour and clay content less than 30%. Because pervious surfaces are often employed in areas that support vehicular traffic and require compaction of the underlying soil, infiltration data provided shall reflect the infiltration rate of the soil at its compacted density. Infiltration data shall be certified by a Professional Engineer licensed in the State of Georgia and shall include laboratory or field test reports demonstrating soil compaction and infiltration rate. Pervious surfaces shall be separated from potentially

erodible sediment sources by a fully stabilized vegetated strip or other form of pretreatment. Pervious surfaces shall not be used to meet 80% TSS removal requirement. Though initially effective, porous surfaces have a high maintenance burden and a high failure rate. Depending on site conditions, the Authority may not allow the use of pervious surfaces.

15.2.5.1 Porous Asphalt and Pervious Concrete

Porous asphalt is a mix of regular bituminous asphalt from which fine particles have been removed, resulting in approximately 15% void space. Porous concrete is a mixture of coarse aggregate, Portland cement, and water with 15% - 22% void space. The paved surface slope may not exceed 5%. During construction and preparation of the subgrade, avoid unintended loading of the subsoil in a way that may cause compaction. Porous Asphalt and Pervious Concrete surfaces shall be designed to provide the above-referenced void space and meet the structural and durability requirements of the intended traffic load. Beneath the asphalt or concrete layer shall be a 2-inch thick layer of clean washed crushed stone with average size of 0.5 inches. The reservoir layer shall consist of clean washed bank run gravel, 1.5 inches – 2.5 inches in size with a void space of about 40% (GA D.O.T. No. 3 Stone). The depth of this layer shall be deep enough to contain 1.2 inches of rainfall. Runoff from additional rainfall up to and including the 100-year 24-hour storm shall overflow or bypass porous pavement to a detention facility. Beneath the reservoir layer shall be a 6-inch layer of clean washed medium sand meeting ASTM C-33 concrete sand or GA D.O.T. fine aggregate No. 10. Before placing sand and aggregate, line the bottom and sides of the excavation with filter fabric meeting MIRFI #14 N or equivalent. An underdrain system may be used consisting of perforated PVC pipe in the reservoir layer. An observation well must be installed consisting of a perforated 6-inch PVC pipe (schedule 40) placed vertically to extend to the bottom of the trench. The well shall be located in a non-traffic area and securely capped to prevent tampering.

15.2.5.2 Modular Permeable Paver Systems

Modular permeable paver systems are used to pave a surface with structural units separated by void areas that are filled with chipped stone, sand, or grass turf. Modular permeable paver systems shall be designed to provide appropriate void space in the fill between the pavers and meet the structural

and durability requirements of the intended traffic load. Paved surface slopes may not exceed 5%. During construction and preparation of the subgrade, avoid unintended loading of the subsoil in a way that may cause compaction. Beneath the layer of porous pavers shall be a 2-inch thick layer of clean washed medium sand meeting ASTM C-33 concrete sand or GA D.O.T. fine aggregate No. 10. Beneath the sand layer shall be a filter fabric meeting MIRFI #14 N or equivalent. Beneath the fabric shall be a reservoir layer consisting of clean washed bank run gravel, 1.5 inches – 2.5 inches in size with a void space of about 40% (GA D.O.T. No. 3 Stone). The depth of this layer shall be deep enough to contain 1.2 inches of rainfall. Runoff from additional rainfall up to and including the 100-year, 24-hour storm shall overflow or bypass the porous pavement to a detention facility. Beneath the reservoir layer shall be another layer of filter fabric meeting MIRFI #14 N or equivalent.

15.2.6 Landscaped Roofs

Landscaped roofs can be incorporated into building design to provide benefits including collection, storage, and evapotranspiration of precipitation. In addition, these systems provide filtering of precipitation as it infiltrates the planting media, moderation of runoff temperature, insulation, and protection of the roof membrane, and can provide an aesthetic benefit as well.

A landscape plan shall be submitted for landscaped roofs. Plant species selected shall be tolerant of well drained soils and partial to full sun exposure. Planting media shall have less than 2% fines (silt and clay) and thickness between 3 inches and 3 feet. The media shall be free draining and capable of supporting plant growth. A root barrier shall be installed below the planting media to prevent intrusion of roots into the drainage layer below. The root barrier shall have a high enough permeability so as not to limit infiltration from the planting media. Below the root barrier shall be a drainage layer comprised of clean washed crushed stone with average size of 0.5 inches or a layer of geosynthetic composite. The drainage layer shall be sized to collect and store 1.2 inches of precipitation with a 40% void space. The drainage layer can be sized to store more than 1.2 inches of precipitation to provide additional detention, however the additional structural load must be accounted for in the structural design of the roof. The drainage layer shall direct infiltrated water to a gutter system or other form of collection system. An impermeable membrane shall be applied below the drainage layer to prevent water from leaking through to the roof decking. Care must be taken to ensure the filter layer media does not

puncture or damage the membrane. If stone is used as the filter media, a protective layer of material should be placed between the filter layer and impermeable membrane to protect the membrane.

Because landscaped roofs provide filtering of precipitation that falls on them and do not receive sediment loads from upstream contributing drainage area or vehicular traffic, the area of landscaped roof on a site may be subtracted from the total site area requiring water quality treatment.

Because landscaped roofs put an additional structural load on building roofs, a Professional Engineer licensed in the State of Georgia shall certify that the building's structural design will support the proposed landscaped roof.

15.2.7 Cisterns and Rain Barrels

Cisterns and rain barrels are designed to capture and store stormwater runoff for non-potable uses such as irrigation. They can be designed as above ground or underground vessels that drain via an open or valved outlet, or through a pump system. These devices can be used to help meet detention and water quality requirements on a site if properly designed.

Cisterns and rain barrels shall be designed with a screen or other means of pretreatment to catch leaves and large debris. These devices shall also include an overflow outlet to bypass flows that exceed their storage capacity. Access shall be provided to allow for cleaning and maintenance of the devices. Design considerations should include making cisterns and rain barrels childproof and covering them to prevent breeding of mosquitoes.

The storage volume of cisterns and rain barrels on a site can be used to provide detention of runoff if they are designed to completely drain within 48 hours (thereby making the storage volume available for subsequent storm events). Cisterns and rain barrels that store runoff for indeterminate periods of time to accommodate intermittent uses of the water shall not be used for detention of runoff.

Cisterns and rain barrels can be used to provide up to 25% TSS removal through solids settling for the areas from which they capture runoff, as long as they are designed to capture the water quality volume and detain it for a minimum of 24 hours. Additional water quality treatment can be provided by discharging runoff from these devices to other BMPs such as bioretention areas, swales, and filter strips. Cisterns and rain barrels that employ filters and other means of additional internal water quality treatment will be evaluated on a site-specific basis.

Facilities using cisterns and rain barrels to provide reuse water that will be discharged to the public sewer system will be subject to sewer charges for this discharge. Depending on the source of the runoff water being captured, some pretreatment may be required prior to discharge to the public sewer system.

15.2.8 Other Structural BMPs and Treatment Methods

The Authority reserves the right to accept or reject the use of any structural BMP or treatment method not included in this document, including Low Impact Development (LID) practices and proprietary devices. The Authority will review such BMPs and treatment methods on a case-by-case basis. Developers wishing to use such BMPs and/or treatment methods shall submit information to demonstrate applicability to the Douglas County region and shall certify the use of said BMPs and/or treatment methods by a Professional Engineer registered in Georgia.

16.0 INSPECTING AND ACCEPTANCE

The Authority reserves the right to continuously and/or periodically inspect construction methods to ensure compliance with these specifications. Unless the Authority has specifically approved other provisions, culverts, pipes, drains, manholes, inlets, structures, and related facilities will be inspected by the Authority before acceptance of the project. All structures must be cleaned, and debris and sediment removed prior to inspection. When requested by the Authority, the contractor shall flush out lines and manholes before re-inspection. Wash water from flushing systems shall not be discharged untreated into State waters or any part of the storm sewer system owned and maintained by the Authority. All pipes and structures that present a safety hazard, are not properly installed, are found to damaged, or are otherwise unable to function as designed shall be considered unacceptable and shall be re-laid or replaced by the contractor or developer at the cost of the contractor/owner/ developer.

In the event that the Authority believes there to be material and/or installation defects that are not readily ascertainable from manual inspection, the Authority may require the storm sewer system be televised. Televising of stormwater pipes shall be done by the contractor at no expense to the Authority. The tapes in their entirety shall be submitted to the Authority for review. Tapes shall be identified as described in the Sewer Construction Standards Section of these Specifications.

17.0 PROTECTION AND RESTORATION OF THE WORK AREA

17.1 General

The contractor shall return all items and all areas disturbed, directly or indirectly, by work under these specifications to their original condition or better as quickly as possible after work is started.

17.2 Restoration of Man-Made Improvements

The contractor shall protect or remove and replace with the Authority's approval all fences, piers, docks, walkways, mailboxes, pipelines, drain culverts, power lines, telephone lines, cables and other utilities and improvements that may be encountered during construction.

17.3 Cultivated Growth

The contractor shall not disturb cultivated trees or shrubberies unless approved by the Authority. Any such trees or shrubberies that must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.

17.4 Cutting Trees

The contractor shall not cut trees for the performance of the work except as absolutely necessary. Trees that shall remain in the vicinity of the work area shall be protected from damage from equipment. The contractor shall remove excavated material stored over the root system of all trees within 30 days to allow proper natural watering. An experienced nurseryman shall repair all damaged trees over three inches in diameter. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the contractor. No stumps, wood piles or trash piles will be permitted on the work site.

17.5 Grassing

The contractor shall replant grass removed or damaged in residential areas using the same variety of grass when the first appropriate season occurs. Outside of developed areas, the contractor shall plant the entire area disturbed by the work in rye, fescue, Bermuda, or other suitable ground cover upon the completion of work in the area. In all areas, the contractor shall promptly re-establish permanent grass to match or exceed original conditions.

17.6 Erosion Control

Erosion and sediment control shall follow practices set forth in the Manual for Erosion and Sediment Control, Latest Edition published by the Georgia Soil and Water Conservation Commission. Where applicable, owners; developers; and contractors shall comply with the Georgia NPDES General Permit for Stormwater Discharges Associated with Construction Activity issued and enforced by the Georgia Environmental Protection Division. When requested by the Authority, owners, developers, and contractors shall provide copies of documents prepared for compliance such as rainfall measurements, monthly monitoring reports, monthly inspection reports, notices of intent, notices of termination and other pertinent records.

Where applicable, owners, developers and contractors shall obtain a locally issued Land Disturbance Permit (LDP) that shall be posted on the job site. The general contractor shall have the primary responsibility to make sure that LDP requirements are met by all contractors and subcontractors. The Authority shall perform frequent inspections during dry weather and wet weather to evaluate compliance with LDP requirements and assess installation and maintenance of best management practices.

Structural and vegetative best management practices shall be installed to control erosion and sedimentation as specified on the erosion control drawings and the Erosion Sedimentation and Pollution Control Plan. If the Authority's Inspector determines that BMPs have not been properly installed or maintained as designed, the inspector may order whatever actions are deemed necessary to bring erosion control measures into compliance up to and including full replacement of the BMPs. If the Authority's inspector determines that properly installed and maintained erosion control measures are not adequate to protect receiving waters, the inspector may order additional measures to be taken. Improvements ordered by the Authority must be made within 48 hours or a Stop Work Order will be issued.

17.7 Rubbish Disposal

The contractor shall dispose of all materials cleaned and grubbed during the construction project in accordance with the applicable codes and rules of the appropriate regulatory agencies, County, State and Federal.

APPENDIX
STORMWATER DETAILS

Figure #	Description
1.	Stormwater Manhole Cover – Non-Traffic Rated
2.	Stormwater Manhole Cover – Traffic Rated

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Fig. 1
Dec. 2025

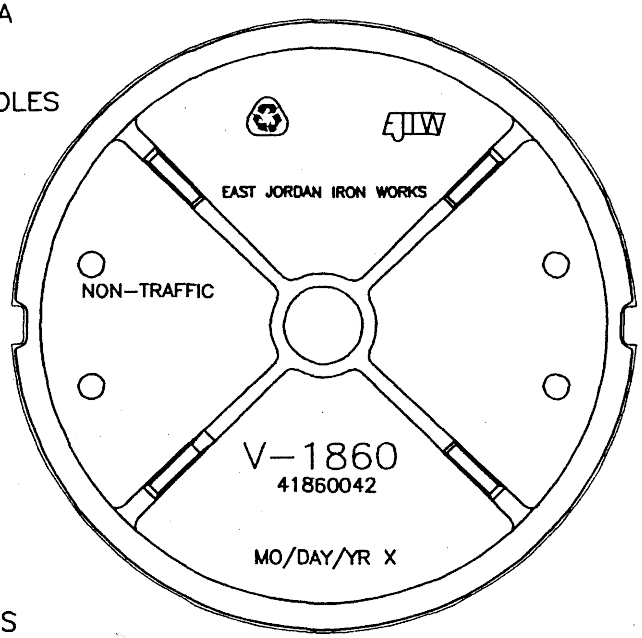
3/4" (19mm) LETTERING
(RECESSED FLUSH)

(4) 1" [25mm] DIA
VENT HOLES

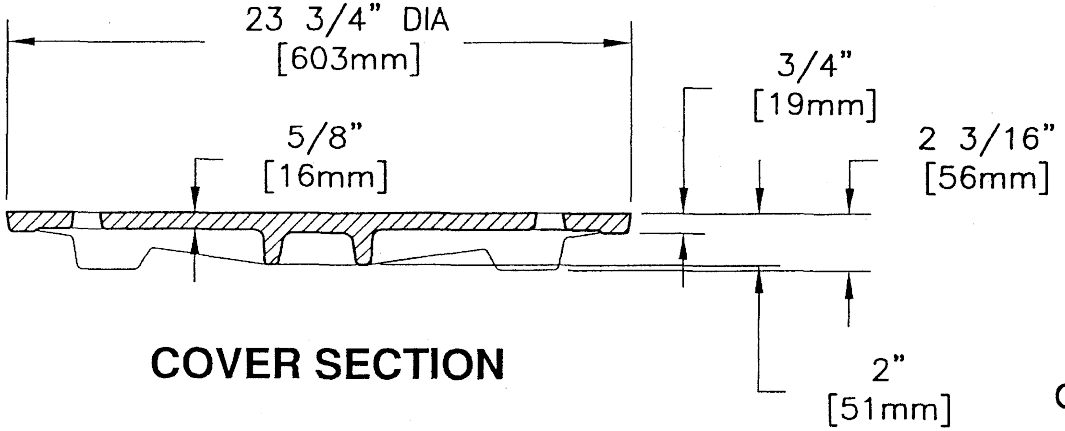
(2) OPEN PICKHOLES
TYP SEE DETAIL

1 1/2"
[38mm]

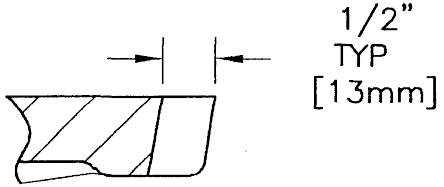
1/2" [13mm] LETTERS



BOTTOM VIEW



COVER SECTION



OPEN PICKHOLE DETAIL

EJIW EAST JORDAN IRON WORKS EST.1883
800-626-4653
www.ejiw.com
MADE IN USA

PRODUCT NUMBER
NCR07-631E

CATALOG NUMBER
V-1860

COVER

LOAD RATING
NON TRAFFIC

COATING
UNDIPPED

ESTIMATED WEIGHT
COVER: 70 LBS 32kg

MATERIAL SPECIFICATION
COVER – GRAY IRON
ASTM A48 CL35B

OPEN AREA
N/A

√DESIGNATES MACHINE SURFACE

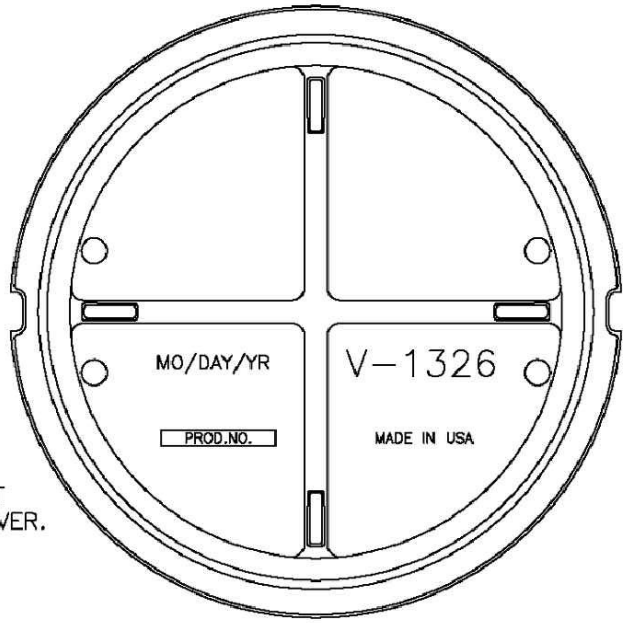
DRAWN	DATE
SMH	06/05/03
LAST REVISED	DATE
SMH	08/31/06

REFERENCE INFORMATION
41860042.1C
41860042.1D

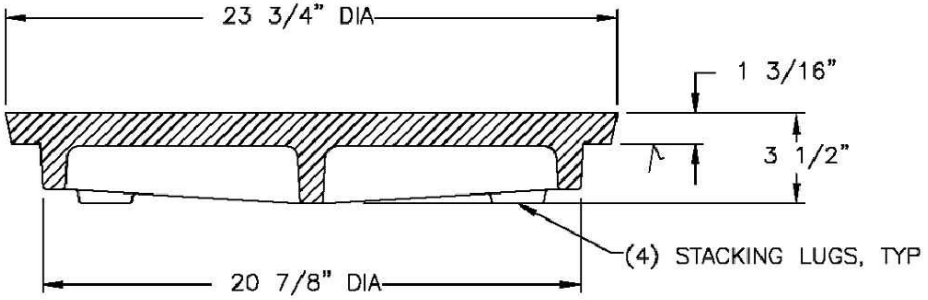
Fig. 2
Dec. 2025

(2) OPEN PICKHOLES

(4) 1" DIA. VENT HOELS THRU COVER.



BOTTOM VIEW OF COVER



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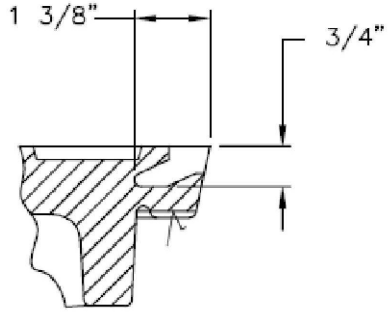

PICKHOLE DETAIL

EJIW EAST JORDAN IRON WORKS EST.1883
800-626-4653
www.ejiw.com
MADE IN USA

PRODUCT NUMBER
NPR13-5213

CATALOG NUMBER
V-1326

COVER

LOAD RATING
HEAVY DUTY

COATING
UNDIPPED

ESTIMATED WEIGHT
N/A

MATERIAL SPECIFICATION
COVER – GRAY IRON
ASTM A48 CL35B

OPEN AREA
N/A

√DESIGNATES MACHINE SURFACE

DRAWN	DATE
SMH	06/05/03
LAST REVISED	DATE
SMH	12/02/13

REFERENCE INFORMATION
N/A