



**DISTRIBUTION SYSTEM
DESIGN PRACTICE MANUAL**

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FAIRFAX WATER

DISTRIBUTION SYSTEM DESIGN PRACTICE MANUAL

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SECTION 1.00 INTRODUCTION

1.01 Glossary of Terms

1.011 Definitions

Board of Directors – The Board of Directors of Fairfax Water

Conceptual Plans – Plans that generally characterize the planned development of the subject lot including, but not limited to; Conceptual Development Plans (CDPs), Generalized Development Plans (GDPs), Final Development Plans (FDPs), and Preliminary Plans (PPs)

Construction – The Construction Department of Fairfax Water

Construction Plans – Plans allowing construction after approval and permitting including, but not limited to; Site Plans (SP), Subdivision Plans (SD), Minor Site Plans (MSP), Public Improvement Plans (PI)

Director – Director of Fairfax Water’s Planning & Water Resources Division

Developer – The entity that is submitting a Plan for Fairfax Water approval

Engineer – The Virginia-Licensed Professional Engineer responsible for preparing the project plans and specifications

Fire Line – A privately owned and maintained line connected to a Fairfax Water main often supporting a building’s internal fire suppression system

General Manager – The General Manager of Fairfax Water

Plan Control –Jurisdiction that routes Plans to Fairfax Water

Planning – Fairfax Water Planning Department

Plans or Site Plans – The detailed engineering drawings of the proposed uses and improvements of the subject lot, site, subdivision, public improvement, or other plan reflecting the design and specifications for the water system

1.012 Abbreviations

ANSI – American National Standards Institute

ASTM – American Society for Testing and Materials

AWWA – American Water Works Association

CL – Class

DIP – Ductile Iron Pipe

FW – Fairfax Water

GDP – Generalized Development Plan

gpm – gallons per minute

HGL – Hydraulic Grade Line

PFM – Fairfax County Public Facilities Manual

psi – pounds per square inch

VDH – Virginia Department of Health

ACP – Asbestos Cement Pipe

PCCP – Prestressed Concrete Cylinder Pipe

1.02 Purpose

The Fairfax Water (FW) Design Practice Manual establishes the technical requirements for design of distribution-sized water mains (12” and smaller) to be owned, operated and maintained by FW; and provides engineers preparing Conceptual and Construction Plans with a set of guidelines to ensure conformance with FW’s design principles. Although the goal of this manual is to be comprehensive, it is understood that a unique situation may arise requiring a modification of FW’s standard design. Final approval of any design, including variances from and exceptions to these guidelines when deemed appropriate, is ultimately at the direction and discretion of Fairfax Water. This manual is a supplemental reference, to be used in conjunction with the Virginia Department of Health Waterworks Regulations, the Fairfax County Public Facilities Manual (PFM) and FW’s Rules and Regulations Governing the Furnishing of Water Service and is not intended to supersede any of these documents.

1.03 History

Fairfax Water was created by the Board of Supervisors in 1957 for the purpose of acquiring, constructing, operating and maintaining an integrated water system for supplying and distributing water. As a separate agency from the county government and governed by a Board of Directors appointed by the Board of Supervisors, FW is financially separate from the county and set-up to operate as a true enterprise fund where water system revenues from the sale of water, not taxes, support daily operations, infrastructure reinvestment and system improvements. By 1967, FW had accomplished its primary goal of integrating several disparate water systems and the focus shifted to maintaining a reliable water supply and distributing safe, clean water to its customers. In the years following, the expansion of FW’s distribution system has been largely attributed to the construction of residential and commercial developments throughout the county. The water main installed as part this development process is ultimately owned and maintained by FW and becomes a critical component in the supply of water for domestic and fire protection purposes to all customers.

1.04 Cost Responsibility

Fairfax Water has a policy of “growth pays for growth” where Developers and individual homebuilders alike are required to fund the water facilities necessary to provide water service and fire protection to their property. If FW desires to install a larger size water main or other facility concurrent with the proposed development – whether onsite or offsite - which are not required for the provision of adequate service to that specific development, FW is responsible for funding these additional expenditures. The standard practice is to determine the appropriate size water main and configuration for present and future anticipated system needs, while maintaining design and construction efficiency.

1.05 References

Sizing Water Service Lines and Meters, Second Edition, AWWA M22, Current Version
(available from AWWA for purchase at www.awwa.org)

Construction Practice Manual, Fairfax Water, Current Version

Fairfax Water Standard Details, Fairfax Water, Current Version

Fairfax Water Approved Products List, Fairfax Water, Current Version

Virginia Department of Health Waterworks Regulations, VAC 590
(available at www.vdh.state.va.us)

Public Facilities Manual of Fairfax County, Fairfax County Department of Public Works and Environmental Services, Current Version
(available at www.fairfaxcounty.gov)

Rules and Regulations Governing the Furnishing of Water Service, Fairfax Water, Current Version

All Fairfax Water documents referenced above are available at www.fairfaxwater.org

1.06 Contact Information

Refer to the Fairfax Water webpage at www.fairfaxwater.org for current contact information.

SECTION 2.00 PLAN REVIEW AND APPROVAL

2.01 Plan Review Process

Fairfax Water review and approval is required for all Construction Plans that could potentially affect FW facilities, regardless of location or water purveyor. In general, FW formally receives Plans as part of the site and subdivision review process submitted to the local jurisdictions. However, FW review is also required for Plans related to federal or state installations, or for other construction activities affecting a FW main in any other federal, state, city, or county jurisdiction.

Plans can be categorized as either Conceptual Plans or Construction Plans. Those of a conceptual nature, including Preliminary Plans preceding the Site Plans, and Development Plans accompanying proposed zoning actions, do not require formal approval. However, comments are provided by FW to provide guidance for the Engineer in preparation of succeeding Construction Plans.

Construction Plans, which include, Site Plans (SPs), Subdivision Plans (SDs), Minor Site Plans (MSPs), Rough Grading Plans (RGPs), Modified Processing Plans, and Fire Line Plans are detailed construction drawings that must be approved by FW prior to starting construction. Appendix A contains a flow chart summarizing the review process for Site Plans/Construction Plans.

Fairfax Water is authorized by the Virginia Department of Health (VDH) under a Local Review Program and General Construction Permit to review and approve water main extensions 30 inches in diameter and smaller. This permit allows FW to act as the reviewing agent for Site Plans. All projects that will be served by FW, including state or federal projects, which are normally exempt from city or county site and subdivision review processes, require review and approval of Construction Plans by Fairfax Water.

The FW Planning Department coordinates review and approval of all Construction Plans and seeks the input from other departments and divisions within the organization as necessary. For federal or state projects, and those Plans that affect FW, but are not processed through local jurisdictions, the procedures described in Sections 2.011 and 2.012 are generally the same, except that all submittals are made directly to Planning and all comments returned directly to the Engineer. The following generally describes the sequence and requirements for processing various plan types through Fairfax Water.

2.011 Conceptual Plans

2.0111 Development Plans

Development Plans are associated with a variety of city and county land use actions, such as rezonings, special use permits, special exceptions or proffered condition amendments. Development Plans are transmitted to FW for analysis and comment by the local jurisdiction and comments are provided at this stage to identify significant issues related to water service at the site. FW's comments are limited to the level of detail and information provided on the Development Plans. If no water facilities are identified, FW will generally note the location of existing facilities and return the Plan without additional comments. A response letter and a

copy of the annotated Development Plans (as applicable) are returned to the local jurisdiction for transmittal to the Engineer.

2.0112 Preliminary Plans

Preliminary Plans are submitted to FW for review and comment only. A Preliminary Plan is a conceptual development layout that should include the proposed horizontal alignment of proposed water facilities. It is FW's goal to identify any issues involving water facilities prior to final engineering. The submission process consists of the Engineer submitting Plans to Plan Control. Plans are routed to all reviewing agencies for concurrent review. Fairfax Water Planning reviews and returns annotated Plans to Plan Control, which returns the Plans to the Engineer.

2.012 Construction Plans

2.0121 First Submittals

A First Submittal is the first submission of the engineered Construction Plans. These Plans shall include all the items specified on the minimum requirements checklist in Section 2.022, and are reviewed for conformance with FW's policies, standards, and specifications. Plans shall include plan and profile view of water mains and fire hydrants and shall be sealed by an Engineer. The standard submission process for the First Submittal is to submit Plans to Plan Control, which distributes the Plans to the appropriate agencies for concurrent review. Upon completion of FW's review, Planning transmits a copy of the marked-up sheets back to Plan Control, which returns the Plans to the Engineer.

2.0122 Final Submittals

Final Submittals are any submittal after the First Submittal. Fire Marshal approval is prerequisite to FW approval. After Fire Marshal approval, the Engineer forwards a set of Fire Marshal-approved Plans to FW. Fairfax Water reviews and either approves or comments on the Plans. This process continues until FW approval is obtained, at which time the Plans may be submitted to Plan Control for jurisdiction approval. Please note that changes to the water system design at Final Submittal may require additional review and approval by the Fire Marshal's office.

2.013 Special Plans

2.0131 Minor Site Plans

Minor Site Plans are defined by Fairfax County, but generally have no public improvements, and only minor modifications to a building or site. The process for MSPs differs from regular Site Plans in that the Engineer is responsible for identifying the need to distribute the Plans to FW for review for First and Final Submissions.

2.0132 Rough Grading Plans

A Rough Grading Plan (RGP) allows earthwork to begin before the rest of the infrastructure and can include the installation of utilities to proceed while full Site Plans are being processed. RGPs are subject to the same FW review process as other Construction Plans.

Please note that FW and jurisdictional approvals of the RGP are necessary prior to commencement of any water main construction. Upon approval, two sets of jurisdiction approved Plans and a copy of the grading permit, stating water main or utility installation are approved, shall be submitted to FW. RGP approval and construction release by FW allows the contractor to begin installation of water mains; however, prior to construction the Developer must submit a letter to FW's Construction Department stating the mains will not be filled, flushed, tested, tapped, sampled, or connected to any active FW line until full Site Plan approval is obtained, and approved Site Plans are transmitted to Fairfax Water. Prior to any construction, all easements must be recorded at Fairfax County's Office of Land Records, and the deed book and page numbers of recordation confirmed.

2.0133 Modified Processing Plans

Modified Processing Plans are processed similarly to RGPs; however, Modified Processing Plans receive priority and are reviewed or distributed as expeditiously as possible.

2.0134 Fire Line Plans

Fire line plans and other fire protection modifications to a building or site, including additions or relocations of on-site fire hydrants, shall be reviewed and approved by Fairfax Water. Plans shall include plan and profile view of the fire line and shall be sealed by an Engineer. The Engineer shall provide two sets of Plans to FW after Fire Marshal and FW approval for distribution and construction. Additionally, the Developer shall obtain all necessary permits from VDOT and the local jurisdiction prior to water main construction.

2.014 Final Plan Approval and Release for Construction

Final Plan approval by the local, state, or federal jurisdiction is required prior to construction of any FW water mains. The Developer will forward two complete stamped-approved Plans and one partial Plan set that consist of the approved site or grading plan sheets showing the meter and service locations on the property to FW prior to starting construction. Prior to construction release, a final check for consistency between the FW approved Plans and the jurisdiction stamped drawing is completed. Inconsistencies requiring FW approval will be noted to the Engineer and processed as a FW Plan revision as described below. Upon satisfactory review, FW Planning staff will distribute the Plans as follows:

1. Technical Services Branch (two full sets) – to update system maps followed by distribution to Construction.
2. Distribution Maintenance (one set of site/grading plan sheets only) – to assist with location and construction of new service lines and meters.

2.015 Revisions

A Revision is any change made to a Plan after jurisdiction approval and may occur at any stage from pre-construction through project completion. Fairfax Water must review and approve all Revisions to the water main design, as well as any Revisions that may affect existing or proposed FW facilities. Examples include proposed changes to the storm or sanitary sewer design affecting water main crossings, revisions to proposed grades over a water main, or changes to street or parking lot alignments. When any Revision is made to a Site Plan,

the Engineer is required to submit the revised sheets directly to Planning. All revised items are to be circled in red and must be described and dated in the Plan revision table. Revisions processed at the Construction release stage may result in delays. Any Revision submitted after FW has accepted the mains shall be processed as a separate FW Plan.

2.02 Submission Requirements

The following sections list required plan elements for Plan review. For Conceptual Plans, the list is advisory; however, providing the required information can better facilitate subsequent Construction Plan approval. All listed items are minimum requirements for FW review and approval. Additional information may be required for an individual project. Plan and profile views of all proposed water lines are to be provided and may be included on separate sheets. Standard FW notes must be included, and additional FW construction notes are to be provided as warranted by the design. In addition, all Plans must be sealed by an Engineer.

2.021 Conceptual Plan Submissions (Recommended)

- Plan view showing existing water mains and appurtenances
- Proposed water mains, and hydrant layout
- Size, material, and locations of existing and proposed mains
- Proposed meter, fire, and service line locations

2.022 Construction Plans, Fire Line Plans, Modified Processing Plans, and Revisions (Minimum Submission Requirements)

2.0221 Plan View

- All utilities within 50 feet of the proposed water main and the point of connection to existing waterline(s)
- Designated isolation valve(s) in the existing water system
- Normally closed valves called out
- Existing and proposed water mains, valves, fittings, appurtenances and fire lines
- Call outs for size, material, fittings, valves and appurtenances of existing and proposed water mains
- Test hole locations and results as required
- Proposed meter locations and sizes, except for single family detached dwellings fronting public streets
- Proposed service line size and location, except for single family attached and detached dwellings fronting public streets

- Independent stationing for all proposed water mains
- Existing and proposed Fairfax Water easements and Deed Book and Page reference of existing easements
- Plan-specific notes
- Casing pipes as required
- Construction sequence in instances where disruption of existing domestic or fire protection service will occur
- Corrosion protection measures as necessary
- Available Fire Flow on coversheet for Final Submittals (to be completed by Fairfax Water upon receipt of First Submittal)

2.0222 *Profile View*

- Independent Fairfax Water waterline profiles with stationing corresponding to the plan for proposed and existing waterlines
- Independent fire line profiles
- Hydrant laterals greater than 20 feet or where lateral is crossing another utility
- Location, size and type of connection(s) to the existing water system
- Call outs for fittings, valves, appurtenances, and utility crossings at appropriate stations
- Trenchless crossing details, as required
- Call outs for cover over water main (4-feet cover typical)
- Utility crossings, including all sanitary laterals and call outs for minimum clearances
- Test hole locations
- Limits of restrained joint pipe for vertical bends and steep slopes
- Profile specific notes
- Existing and proposed grades
- Water main crossings to be shown on the storm and sanitary profiles
- Cross sections and test pit data as may be required by Fairfax Water where grading is proposed over existing water facilities

2.0223 *Notes and Details*

Standard Water Main Construction Notes are to be provided on all Plans. The standard notes are available on the website at www.fairfaxwater.org. Fairfax Water also has additional notes for various development conditions. These notes will be provided to the Engineer with first submission review comments, as necessary.

2.03 Easements

Water facilities that will become the property of FW and that do not lie wholly within a public right-of-way are required to be located within easements dedicated to Fairfax Water. Other special conditions may warrant easements to be dedicated or quitclaimed at the direction of FW to address future or existing needs. All easements and quitclaims shall be submitted to FW for review and shall be recorded by the Developer after FW approval. A copy of the recorded deed shall be submitted to FW prior to construction. In limited circumstances, FW may authorize construction without recorded easements; however, the water mains cannot be filled, flushed, tested, sampled, or connected to existing mains prior to recordation. The following sections describe the processing requirements for easements, quitclaim of existing easements, and plat preparation.

2.031 *Plat Review and Recordation*

All plats containing FW easements shall be reviewed and approved by FW prior to recordation. The Engineer should submit one PDF, or one hardcopy copy of the easement plat for review prior to recordation. Recordation of any FW easement without requisite review and approval may result in construction delays if plat corrections are deemed necessary.

Two options for easement plats exist –either an independent water-only easement plat may be prepared, or the water main easements may be incorporated into a combined plat for all easements on the site. If water-only easement plats are prepared, following FW approval, the plat along with a standard Fairfax Water Easement Agreement can immediately be recorded by the Developer and Plans can be distributed to the Construction Department. For combined plats, after FW approval, the plat must be processed through the County Attorney’s office prior to recordation. Easements are not considered complete until the easement plat and agreement have been recorded at Fairfax County’s Office of Land Records and the deed book and page numbers of recordation have been submitted to and confirmed by Fairfax Water. Plats for quitclaims may be processed the same as easements; however, quitclaim agreements require the signature of the Fairfax Water General Manager prior to recordation. Refer to Appendix B for a flow chart summarizing the easement recordation process.

For offsite easements, FW will not release Plans for construction until the associated easements are recorded. Upon recordation of all plats, the Developer is required to provide the deed book and page number to FW for verification.

2.032 *Plat and Easement Specifications*

Fairfax Water standard easement agreements shall be used and are available on the FW website at www.fairfaxwater.org. Easement plats are to be drawn on sheets between 8 ½ by 11 inches and 18 by 24 inches in size with a 1-inch minimum top, left, and bottom margin, and a

½-inch minimum right margin. All Fairfax Water easements are to be called out as FCWA Easements. Fairfax Water easements are normally 15 feet wide. For water mains 16 inches in diameter or larger, a 24-foot easement is required. Fire hydrants are normally located in a 10-foot easement, as are water meters that require easements. Fairfax Water easements are for FW facilities only and are not to be combined with “ingress/egress” or “utility” easements.

2.04 Offsite Water Mains

Offsite water mains are defined as any main required to be installed beyond the limits of the property being developed. The Developer is responsible for design and construction of all required water main improvements, both on and offsite. If an offsite water main extension is required, Planning will note this with return of the First Submittal. After the Plans have been approved by FW, Planning will notify FW’s Design Department to prepare a cost proposal detailing the conditions and limits of reimbursement for the design and construction of the offsite water main extension. The proposal will be sent to the Developer as shown on the cover sheet of the Plans for signature. To be considered for reimbursement, the proposal must be executed by the Developer prior to any water main construction. If construction proceeds without execution of the proposal, all rights for reimbursement are waived.

If an offsite water main requires an easement, it will be the Developer’s responsibility to acquire the easement. The Developer must prepare and record the easement agreement and plat after FW approval. Prior to construction, the Developer shall provide FW the deed book and page number of all recorded easements needed for the project.

The Plans for the offsite water main may be included with the Site Plan, on a separate Plan for the offsite water main only, or as part of a Public Improvement Plan. Fairfax Water prefers that the water main be included as part of the Site Plan. All offsite water main extensions become FW projects for the purpose of tracking expenditures and monitoring reimbursements.

In the case where a homeowner wishes to extend a water main to obtain a single service, a cost proposal is prepared but with the option of either the homeowner or FW completing the design and construction the offsite water main. If the homeowner chooses to do the work, they will be required to submit a Plan to the local jurisdiction for approval. When the homeowner chooses to complete the design, they will be responsible for obtaining any required easements, permits, and approvals. If FW is chosen to do the work, the design and construction will be handled by FW including obtaining all required permits and approvals. However, if an easement is required, it will be the responsibility of the homeowner to negotiate and acquire the proper easements, but FW will prepare and record the associated easement plats. Fairfax Water will not begin the design of the offsite water main extension until the proposal is signed and all costs are paid. Additional information regarding the water main extensions process can be obtained from the contacts listed on the FW website.

2.041 Reimbursement Policy

Fairfax Water’s reimbursement of offsite water main installation costs is based on the number of service connections associated with the development and future service connections to the offsite main. The total reimbursement cannot exceed FW’s estimated cost to design and construct the offsite water main extension, details of which are included in the cost proposal.

The date that the offsite water main is placed in-service becomes the anniversary date for the project. Each year thereafter on that date, the Developer will be reimbursed, based on the number and size of onsite meter installations the preceding year. Fairfax Water inspection costs for the offsite portion of main will be deducted from any eligible reimbursements until that obligation is satisfied. Reimbursements are limited to the five-year period following the date on which the offsite water main was placed in-service. Additional information regarding the reimbursement process can be obtained from the Water Main Extension Policy on the FW website.

SECTION 3.00 WATER SYSTEM DESIGN

3.01 Water Supply, Pressure and Capacity

Water distribution systems shall be designed to supply the projected peak day flow while maintaining a residual pressure of at least 35 psi at all points in the subdivision. The system must also be designed to provide fire flows as specified by the local jurisdiction while maintaining a minimum residual pressure of 20 psi at all points in the distribution system.

If the maximum working pressure for the site is 80 psi or greater, a pressure-reducing valve (PRV) will be required consistent with the plumbing code and FW's rules and regulations. The owner must install the PRV in the building plumbing system to eliminate water hammer and unnecessary wastage of water.

3.02 Fire Flows

Fire flow requirements are determined by the local jurisdiction and should be provided on all Plans. Planning will perform a fire flow analysis during the first review and provide the available fire flow to the Engineer. In the event of insufficient fire flow, FW will provide direction to the Engineer on what improvements are needed to achieve adequate flows.

For sprinklered structures, the Fire Marshal's Office requires flow information from an existing hydrant and the minimum hydraulic grade line (HGL) for the area where the development is located. This information is required as part of the building mechanical plan submission. Hydrant flow data and minimum HGL information may be obtained from FW's Planning department as shown in the contact list.

3.03 Water Main Size

The standard sizes of water main in our distribution system include 4-inch, 6-inch, 8-inch, and 12-inch diameter pipe, with 4-inch mains being the minimum accepted size. Generally, water mains shall be 8 inches in diameter when located in local streets, and 12 inches in diameter when located in collector or arterial roadways. Where fire protection is to be provided or required, the minimum diameter pipe shall be 6 inches. The minimum line size used in dead ends, cul-de-sacs, or pipestems beyond the last fire hydrant, when only domestic service is required is 4 inches. A minimum 4-inch line is also required for pipestems serving more than two lots, as well as water main extensions less than 300 feet in length serving individual residential connections. All pipe size requirements are dependent on the ability to deliver adequate flows and pressures.

3.04 Material

All water mains shall be thickness class 52 ductile iron pipe unless otherwise specified. A complete listing of approved products by manufacturer for pipes, valves, fittings, and other items can be found at www.fairfaxwater.org.

3.05 Depth of Cover

Standard depth of cover for all water main installation is 4 feet. The cover can be reduced to a minimum of 3 feet at utility crossings to avoid excessive overdepth associated with going under sewers or other utilities; valves may not be placed in areas of reduced cover. The maximum allowable cover is 7-½ feet. In situations where the cover would exceed 7-½ feet, alternate designs that avoid excessive cover shall be investigated. Where a Plan alters the cover on an existing water main, a minimum of 3 feet and a maximum of 7-½ feet shall be provided. Test holes will be required prior to FW Plan approval to verify final cover over the existing water main is within these limits. If the proposed cover falls outside these limits, water main relocation is normally required. Refer to sections 3.15 and 3.16 for additional information on relocations.

3.06 Water System Layout

Water supply systems should be designed to minimize the occurrence of dead-end lines for water quality and reliability purposes. At the discretion of FW staff, Developers may be required to close loops or provide stub outs for future system looping, access, extensions and/or additional supply sources. Easements may be required to accommodate future water main installation, or to provide access to FW facilities through adjacent properties. Where dead-end lines are unavoidable, the Engineer should attempt to locate service connections as close to the termination as possible. A blow-off assembly for line flushing is required on all dead-end lines where warranted and feasible.

Waterlines should normally be designed to run within streets and travel ways on the North or East side of the street centerline. In streets, waterlines are to be located a minimum of 5 feet from the edge of the gutter pan. Additional separation from the gutter pan is preferred subject to adequate separation from other utilities as well as VDOT location requirements. The water main should remain on the same side of the centerline for the entire length of the street. Additional information regarding water main location requirements can be found in Section 9 of the PFM.

Where VDOT requires the Developer to perform frontage improvements, future disturbance to the improvements should be minimized. The water main design should terminate such that future extensions and tie-ins do not disturb the recent VDOT improvements.

Where a deceleration lane exists, the water main generally should not bend to follow the alignment of the turn lane's gutter pan but should continue along the same alignment maintaining 5 feet from the gutter pan before and after the deceleration lane. In townhouse or commercial developments, the water main is to be centered in a 15-foot easement on one side of the travel way. The edge of the easement should be contiguous with the edge of the gutter pan and the main should remain on one side of the travel way as in a street. Water mains should be aligned, to the extent possible, through drive aisles, and not through parking spaces in lots. Public water mains shall be a minimum of 20 feet from any building.

3.07 Valves

Valving shall be provided to allow for adequate isolation of the water system, and at a minimum, every 1,000 feet or at every intersection whichever is less. For water mains 12

inches and less in diameter, resilient seated gate valves shall be utilized. Butterfly valves shall be used for all mains 16 inches and larger.

Unless otherwise directed, three valves are to be provided at tees, and four valves at crosses. At a stub out or a temporary termination of a water main, a restrained valve is to be located beyond the last service connection if applicable, and within 40 feet of the end of the line. Valves are always used to isolate fire hydrants and should be proximate to the hydrant. Where the hydrant comes off a tee, a restrained valve is required on the branch at the connection to the main. On long hydrant leads, it may be necessary to place a second restrained valve within 10 feet of the fire hydrant. Mainline valves are typically not required at hydrant tees, unless necessary to meet isolation requirements (approximately every 1,000 feet). Restrained valves shall also be provided on all private fire lines at the connection to the main and all valves at domestic take offs from fire lines. Valves are to be in either paved or green areas and should not fall within curb and gutter or sidewalk areas. Valves are not permitted in parking spaces. When valves are called for on the plan view, the water main must be parallel to the grade at the corresponding station on the profile.

3.08 Fire Hydrants

Hydrants are to be provided per local jurisdiction requirements to meet the coverage requirements of the Fire Marshal, and at high points and low points in the system on mains 12 inches and larger for air release and blow-off purposes. The Engineer should try to satisfy fire coverage requirements and air release/ blow-off requirements simultaneously to minimize the number of hydrants. Offset tees shall not be used for air release and blow-off hydrants in mains 16 inches and smaller. Fire hydrants are to be placed as close to the main as practical and are to be located upstream of the last service connection on dead-end lines for water quality purposes. On residential streets, hydrants should be placed at the lot line between properties and are not to be placed in a cul-de-sac. Additional information on hydrant placement can be found in FW's Standard Details and Section 9 of the PFM.

3.09 Utility Clearances

3.091 Sanitary Sewers

Section 12VAC5-590-1150 of the Virginia Department of Health (VDH) Waterworks Regulations governs sanitary sewer crossings and must be consulted for all requirements. In general, the minimum horizontal separation between a water main and a sanitary sewer or sewer manhole is 10 feet, measured edge to edge. At crossings of waterlines and sanitary sewer, including sanitary laterals, a minimum vertical clearance of 18 inches is required between the bottom of the water line and the top of the sewer. If this minimum clearance is not possible, ductile iron sewer pipe and other provisions as established by VDH are required. Sanitary crossings are to be called out on the water main profile, and water main crossings are to be shown on the sanitary profile. Where minimum clearances cannot be maintained, a full length of pipe must be used at the crossing location and centered at the crossing with its joints equidistant from the sewer line; other provisions must be provided as required by Section 12VAC5-590-1150 of the VDH Waterworks Regulations.

3.092 Storm Sewers

The minimum horizontal separation between a storm sewer and a waterline is 6 feet, measured edge-to-edge. Where a water main crosses above a storm sewer, a minimum clearance of 6 inches is required. Where the water main crosses below the sewer, 12 inches of clearance is required. These clearances are to be called out on the water main profile. The water main crossings are to be shown on the storm sewer profile.

3.093 Gas Mains

The minimum horizontal separation between water mains and appurtenances including but not limited to service lines, meter boxes, valve boxes, and hydrants and gas mains shall be 5 feet. A minimum vertical clearance of 12 inches is required when crossing a gas main. The large petroleum product pipeline companies (e.g., Colonial and Columbia) may impose a minimum vertical separation greater than 12 inches, along with concrete pads above their pipelines. Consult the pipeline companies for additional information when working within their right-of-way.

3.094 Other

No other utilities are permitted in waterline easements, although as space constraints warrant, easements may overlap. When a water main crosses below another utility, water main valves shall be placed so as not to conflict with the other utility. In general, this means not locating any valves in the other utility's easement. Utility crossings should be designed as close to ninety degrees as possible. Plan and profiles of all utility crossings of water mains within easements shall be submitted to FW for approval prior to construction.

3.10 Thrust Restraint

All tees, bends, plugs, caps, and fire hydrants are to be restrained against movement in accordance with FW Standard Details, available at www.fairfaxwater.org. Thrust blocks are to be constructed in accordance with FW's Standard Details and must rest against undisturbed soil. Horizontal bends are not to be placed above a storm or sanitary sewer, or in such a manner as to cause the blocking for the bend (or tee) to be in disturbed earth. Thrust blocking, restraining glands, or restrained joint pipe may be required at the discretion of the FW inspector in the field even if not reflected in the approved Plan. All fire hydrant, fire line, and stub-out valves shall be restrained. Swivel fittings are optional in place of restraining for fire hydrant valve installations. These valves shall be identified as restrained on both the plan and profile view. Hydrants, which are on a dead-end line with a ninety-degree bend instead of a tee, shall have a restrained valve located prior to the bend. Restrained joint pipe shall be used before and after vertical bends per FW Standard Details.

3.11 Casing Pipe

All trenchless crossings require pipe to be installed within a casing. Casings are to be shown on the plan and profiles, and the size of the casing is determined by the size of the carrier pipe. Refer to FW Standard Details when specifying the size of the casing pipe. Due to state regulations, trenchless crossings should have a minimum 24" vertical separation when crossing water or other utilities.

3.12 Wet Taps

Wet taps connections are generally preferred to avoid interruption of existing water service, except when there is inadequate isolation valving on existing mains. Size-on-size wet taps are permitted on ductile iron pipe (DIP) 12 inches and smaller in diameter. Taps on prestressed concrete cylinder pipe (PCCP) are limited to half the diameter of the pipe being tapped. Taps on cast iron pipe (CIP) and asbestos cement (ACP) pipe shall be at least one size smaller than the diameter of the pipe being tapped. Tapping sleeves are required on all taps 12 inches and smaller, while saddles are permitted on taps 16 inches and larger. When saddles are used, the proposed connecting line is limited to half the diameter of the pipe being tapped.

3.13 Corrosion Control

Corrosion control measures are based upon field conditions, pipe size, and type of installation. Generally, polyethylene encasement is sufficient; however, additional measures may be required for water mains crossing pipelines with impressed current cathodic protection and pipes in trenchless crossings. Examples of pipelines that typically have impressed current cathodic protection are larger diameter gas/petroleum pipelines owned by Colonial, Transco, Columbia, or Washington Gas Light Company. Corrosion may also present a problem in areas with what are described as “hot” soils or in areas where stray electrical current is present (e.g., near Metrorail track). Specific requirements in these areas are handled on a case-by-case basis.

Polyethylene encasement shall be in accordance with ANSI/AWWA C105/A21.5 – American National Standard for Polyethylene Encasement for Ductile Iron Pipe Systems, and the FW Standard Trench Detail. The flat tube form shall be used with minimum width based on nominal pipe diameter in accordance with ANSI/ AWWA C105/A21.5.

3.14 Cross-Connections

An approved testable backflow prevention assembly is required on all residential, commercial, industrial, or institutional use that handles hazardous materials or has potential cross connections with other plumbing systems. For all Federal, State, or secure facilities, a high-hazard Reduced Pressure Principle (RP) backflow prevention assembly must be installed on the service line, immediately downstream of the water meter. The assembly must be located outside the secure area or beyond the exterior security fence, enclosed in an above-ground, heated enclosure, and positioned as close as practicable to the service connection. All installation, inspection and testing shall be in accordance with all applicable state or local codes and standards. The property owner is responsible for all costs associated with the installation and ongoing maintenance of the assembly.

Fairfax Water reserves the right to require additional backflow prevention above and beyond state and local requirements on any service line if it is determined that a potentially hazardous condition exists that could contaminate the distribution system. Please refer to the FW Cross Connection Control and Backflow Prevention Program Manual online for more information.

3.15 Distribution System Relocations

The Developer is responsible for any relocation or removal of water mains and appurtenances (including hydrants) due to the development of the site. Water mains to be abandoned in paved areas shall be removed as needed to ensure there is a 10-foot minimum horizontal clearance between any remaining abandoned main and proposed new main. In non-paved areas, the abandoned line shall be removed such that a minimum 20-foot horizontal clearance is achieved between remaining abandoned main and proposed main. Abandoned water mains that remain in the ground shall be plugged or capped in accordance with FW's standard specifications. Hydrants that require relocation shall only be reused at the direction of FW's inspector. In most cases, the hydrant to be relocated will require replacement due to its age or excessive maintenance requirements. Service lines which will no longer be used shall be removed and disconnected at the water main by the Developer, and the corporation stop shut-off and capped, or removed and plugged as directed by a FW inspector.

3.16 Transmission Main Relocations

Water mains larger than 16 inches in diameter constitute the backbone of the FW transmission system. Their continuous operation is necessary to ensure adequate flow and pressure throughout the system for the provision of domestic service and fire protection, therefore all proposed relocations of water mains larger than 16 inches in diameter initiated by private development activity must be requested in writing and approved by the Fairfax Water Board of Directors.

The Developer shall submit a letter to the attention of the Director, requesting permission to relocate the existing transmission main. Submission of such a request, if necessary, is recommended as soon as possible to avoid subsequent project delays or rework. Relocation of the transmission main, if approved, will be at the Developer's expense. For all approved transmission relocations, FW requires the Developer to enter into a written agreement that obligates the Developer to complete all work in accordance with the Plans approved by Fairfax Water.

SECTION 4.00 METERS, SERVICES AND PRIVATE FIRELINES

4.01 Meter Locations

4.011 *General*

Fairfax Water shall determine meter locations and special metering requirements at Plan review. Fairfax Water will maintain the service line from the connection at the water main up to and including the meter for single-family residential properties. For this reason, water meters are to be located as close to the main as possible. Note that one continuous piece of copper is required between the main and the meter, which limits the length of the service line from the main in the street to the meter to 50 feet. For multi-family and non-residential meters, FW will maintain that portion of the service line within the easement as well as the meter. In the case of domestic services connected directly to private fire lines, FW maintains no portion of the service line, and only the meter itself.

Water meters are to be located at least 5 feet from sanitary sewer laterals and storm sewer inlets. A water meter may be located above a storm sewer only if the sewer has a minimum of 3 feet of cover.

4.012 *Detached Single-Family Units*

Water meter locations are typically not shown on Plans for single-family detached developments fronting public streets. These locations will be established by FW at the time of construction. Water meters on pipestems or private streets require FW easements, and need to be shown on the Plans. In the case of private streets, meters are to be set at the property line or behind the sidewalk within the FW easement. In pipestems and other private streets without curb and gutter, meters are to be located on the property they are serving in a green area as close to the main as possible, beyond the ditch or shoulder in an easement. A 10-foot easement must encompass the service line and meter.

4.013 *Attached and/or Townhouse Units*

For townhouse developments, water meters normally are installed in the utility strip. Where no utility strip is provided, meters should go behind the sidewalk within a FW easement. Meters should be located on the property line in pairs where possible.

4.014 *Large Meter Installations*

All water meters 3 inches and greater are to be installed inside a building within a heated area with a remote readout on the building's outside wall. All smaller meters shall normally be installed outside in a grassy space, soil, or vegetative area without obstructions in a FW approved crock.

4.015 *Submeters*

For certain applications, it may be cost effective to install a submeter (sewer subtraction meter) for purchased water that will not be discharged into the public sewer system, such as for irrigation. The submeter, which is installed downstream of the main meter is also read by FW,

however, FW will not maintain the submeter. The submeter should be located as close to the main meter as possible, but in a separate crock.

Submeters may also be used for commercial or mixed-use developments to measure consumption of individual tenants when the building has only a single billing meter.

4.02 Sizing of the Service Line and Meter

For single-family residential units, the service line between the main and the meter shall be 1-inch type K copper, and the meter shall be 5/8-inches. For other development types, sizing of the service lines and meters will be the Engineer's responsibility and shall be based upon the fixture loading imposed by the building in accordance with AWWA Manual No. M22, Sizing Water Service Lines and Meters. It is the Engineer's responsibility to ensure this is accomplished and the size is included on the site plans. It is advantageous in non-residential construction to use the smallest meter that will accommodate expected demands, as Availability Fees are based upon meter size and costs can be significant.

Except in the case of a sprinklered building, every meter shall have an independent service line connecting to a FW main. For sprinklered buildings, domestic service lines are connected to the private fire line outside the building, rather than a separate connection to the public main. A minimum 3-inch gate valve on the domestic line at the point of connection to the fire line must be provided for isolation purposes. Domestic service lines may be reduced beyond the isolation valve if needed. If the meter and service are located on the property that it serves, no easements are required. See FW Standard Details for meter and service line configuration details.

4.03 Fire Lines

Private fire lines are generally required when a building has an internal fire protection system. Where private fire lines are installed, FW requires a restrained valve to be installed at the point where the fire line connects to the FW water main, beyond which the fire line is privately owned and maintained. This is to be clearly labeled as "private fire line" on the Plans. An independent profile of the fire line is to be provided.

SECTION 5.00 PRE-CONSTRUCTION

5.01 Contractor Approval

Experience in the installation of ductile iron pipe is required. The Contractor shall thoroughly familiarize himself with all specific manufacturing and installation requirements of the pipe material shown on the approved Construction Plans.

Upon request, the Contractor shall submit the pipe superintendent's and pipe installation crew's experience in installing the pipe material and joint types to be used. Give project titles, pipe diameter and length, locations, reference contacts, addresses, and telephone numbers. When requested, information should be sent to:

Chief Construction Engineer
Fairfax Water
8560 Arlington Boulevard
Fairfax, VA 22031
FAX 703-289-6351

5.02 Pre-Construction Checklist

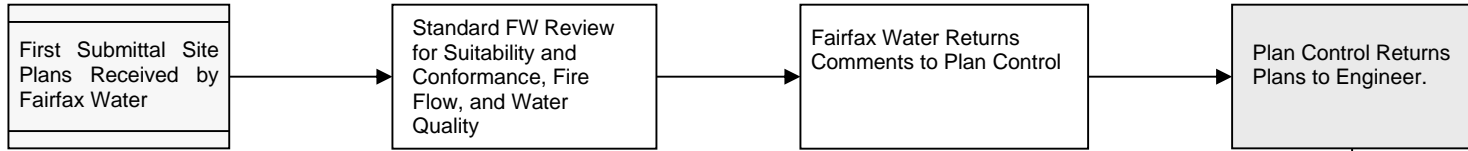
Prior to beginning the construction of water mains, the Construction Department requires the following:

1. Hard copies of the Plans approved by the state/local jurisdiction
2. Cut sheets with Virginia P.E. or L.S. seal and signature
3. 72-hour notice prior to beginning work
4. Deed Book and Page number of recorded easements
5. For Rough Grading Plans and Modified Processing Plans:
 - a. A letter from the Developer stating that the water mains will not be filled, tested, tapped, flushed, or sampled until Construction Plans are received
 - b. A copy of the Rough Grading Permit with approval for water main installation
6. Executed Offsite Proposal (if applicable)

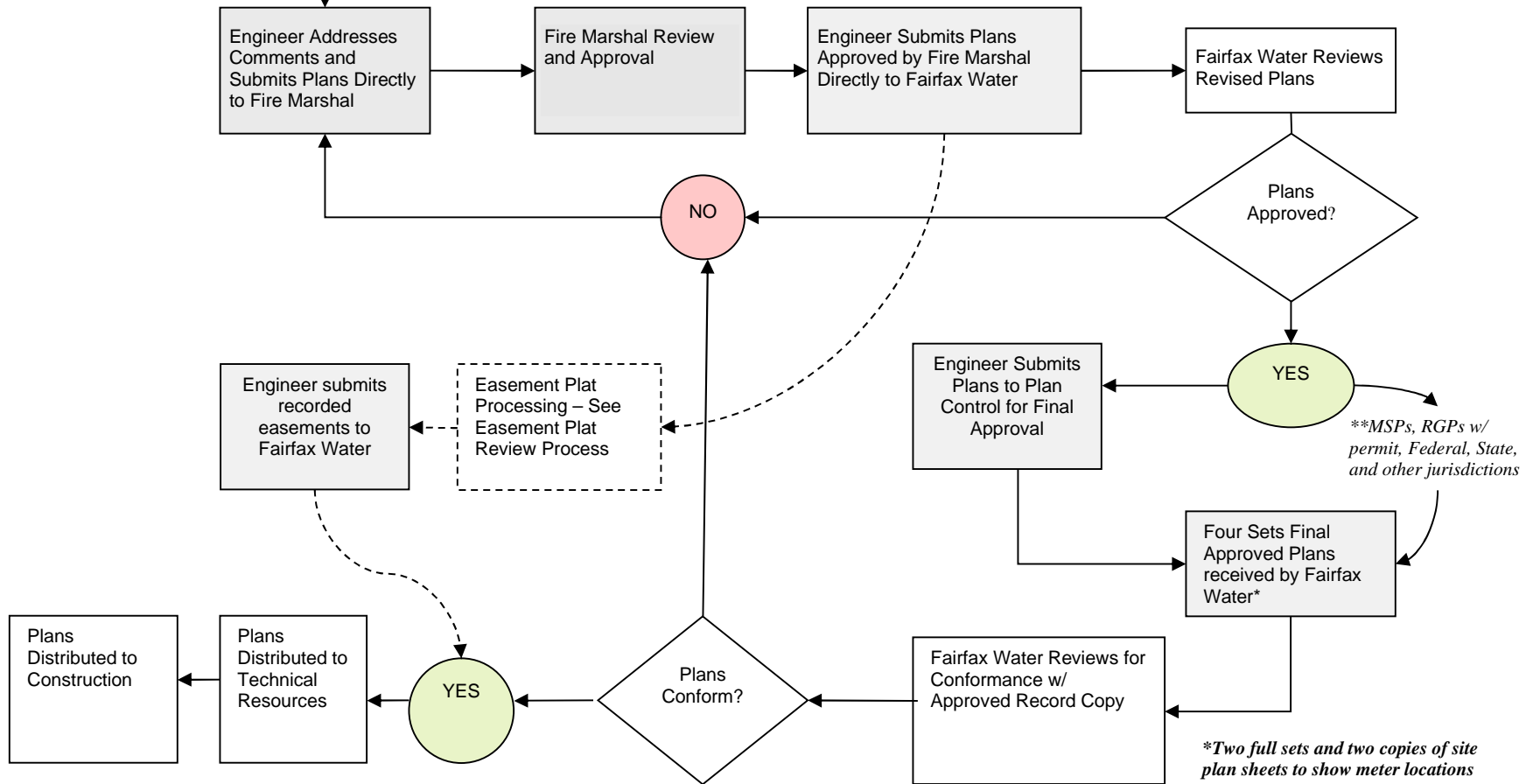
APPENDIX A
FAIRFAX WATER SITE PLAN REVIEW PROCESS

Fairfax Water Site Plan Review Process

First Submittals



Second and Additional Submittals



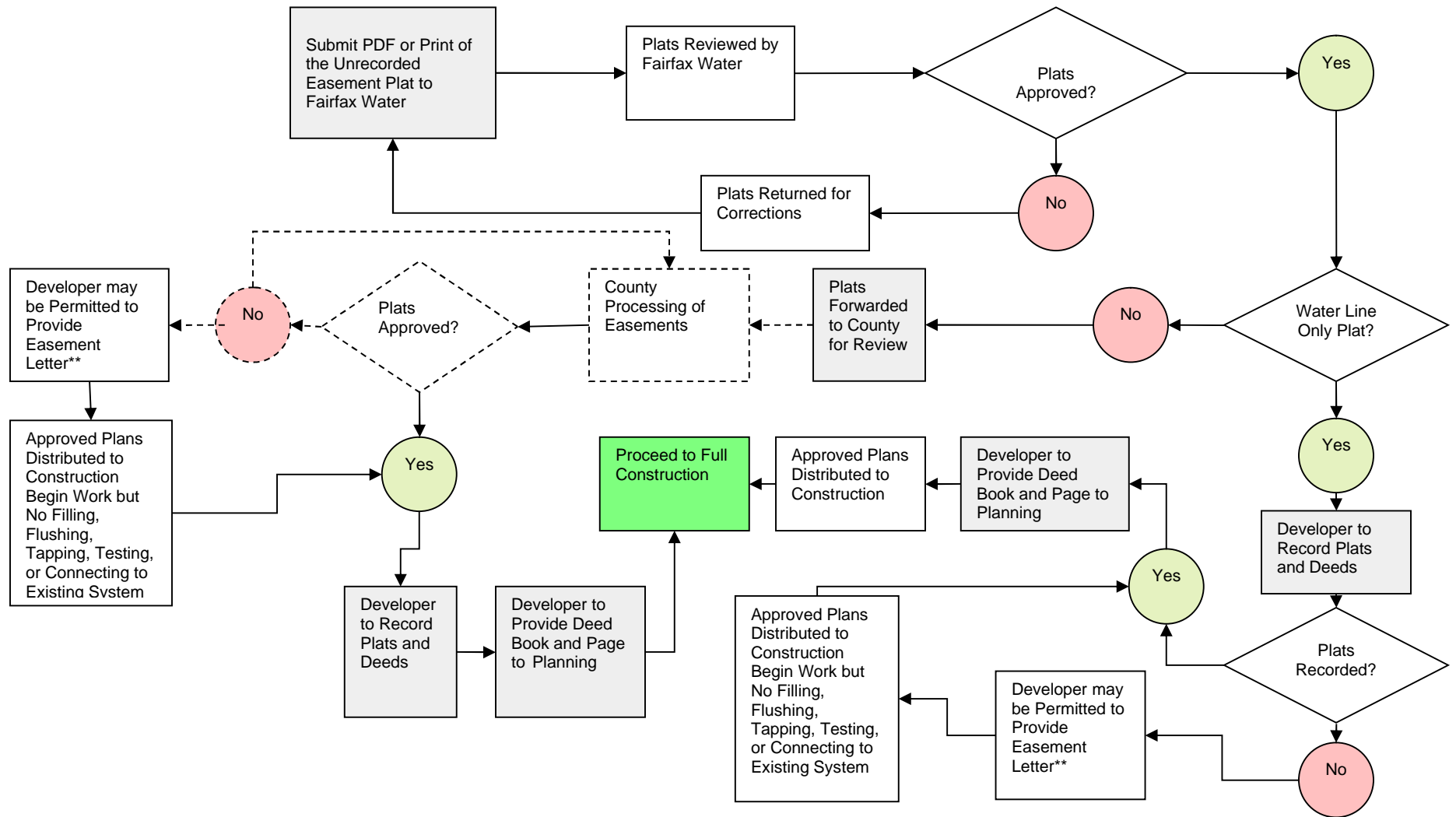
****MSPs, RGP's w/ permit, Federal, State, and other jurisdictions**

***Two full sets and two copies of site plan sheets to show meter locations**

****Engineer is responsible for MSPs, RGP's, or state/federal jurisdiction submissions to FW**

APPENDIX B
FAIRFAX WATER EASEMENT PLAT REVIEW PROCESS

Fairfax Water Easement Plat Review Process



**Applies to Modified Processing Plans and RGPs Prior to Final Plan Approval

