Engineering Guidelines

City of Farmington

April 2019

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Forward

It is the goal and objective of the city of Farmington to provide high quality and cost effective infrastructure for the current and future citizens of Farmington. To accomplish this, it is necessary to assure quality development through uniform performance standards for the design and construction of the City's infrastructure. To implement this objective, it is important that certain guidelines be adopted in order to standardize engineering requirements for Developers and their Consultant Engineers within the city of Farmington.

This manual outlines certain requirements, materials and standards that should be incorporated into the preparation of plans and specifications for sanitary sewer, storm sewer, water main, street construction and grading within the city of Farmington.

This manual is NOT a specification in itself. Developers and their Engineers in charge of construction activity within the City are expected to prepare a complete and competent set of specifications for their work.

This manual is intended as a reference source of information, standards and data. Particular sections or information in this manual may be incorporated into project specifications by reference as deemed appropriate by the writer, provided this manual is made available to those to whom the reference is intended. Developers and their Engineers must comply with the requirements outlined in this manual.

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

Matthew J. Decur, P.E.

Date: April 1, 2019 Registration No. 46372

Definition of Terms

Approved Plat:	Shall mean a final plat that has been accepted by the City Council and is recorded with the Dakota County Recorder's Office.
Benchmark:	Shall mean a permanent or semi-permanent physical mark of known elevation. The elevation shall be tied to the U.S.G.S. Sea Level Datum.
Builder:	Shall mean the person applying for and receiving a building permit to perform the work requested in said permit.
Building Official:	Shall mean the duly appointed Building Official of the city of Farmington or his/her designated representative.
CEAM:	Shall mean the City Engineer's Association of Minnesota.
City:	Shall mean the city of Farmington, Dakota County, Minnesota.
City Administrator:	Shall mean the duly appointed City Administrator of the city of Farmington or his/her designated representatives.
City Council or Council:	Shall mean the City Council of the city of Farmington.
City Engineer:	Shall mean the duly appointed City Engineer of the city of Farmington or his/her designated representatives.
City Inspector:	Shall mean duly appointed City Inspector of the city of Farmington or his/her designated representatives.
Community Development Director:	Shall mean the duly appointed Community Development Director of the city of Farmington or his/her designated representatives.
Contract Documents:	Shall mean, unless the context provides otherwise, either a Development Contract entered into between the City and the Developer, or any Agreement existing between two or more persons, whether written or oral, setting forth the obligations of each party.
CMP:	Shall mean corrugated metal pipe.
Contractor:	Shall mean, depending on the context, a person under contract with the City to perform labor or work for the City; or a person under contract with a Developer to install municipal improvements required by the subdivision regulations of the City.

Construction: Shall mean the total process of furnishing labor, material and equipment to arrange and combine the parts into a completed project in accordance with the approved plans and specifications.

Developer: Shall mean the person who has, or proposes to, execute a developers agreement with the city of Farmington for the purpose of subdividing land within the City; and shall, where appropriate, include Developer, Developer's Engineer, Contractor Agents or Employees either individually or collectively.

DIP: Shall mean ductile iron pipe.

EOF or NOF: Shall mean the emergency or natural overflow location and/or elevation for any storm water basin (pond, wetland, infiltration basin, etc.).

Finance Director: Shall mean the duly appointed Finance Director of the city of Farmington or his/her designated representatives.

Freeze-thaw cycle: Shall mean one winter season, typically from November 1st through April 30th.

HWL: Shall mean the 100-year high water elevation for any storm water basin (pond, wetland, infiltration basin, etc.).

MPCA: Shall mean the Minnesota Pollution Control Agency.

NPDES: Shall mean the National Pollutant Discharge Elimination System.

OE: Shall mean the outlet elevation for any storm water basin (pond, wetland, infiltration basin, etc.).

OHWL: Shall mean the ordinary or normal water elevation for any storm water basin (pond, wetland, infiltration basin, etc.).

PE Shall mean polyethylene pipe

Person: Shall mean an individual, corporation, partnership or any combination thereof.

PIN: Shall mean the property identification number.

Plans: Shall mean the approved drawings which include plan views, profiles, cross sections, working drawings, details, and supplemental drawings, or exact reproductions thereof, which show the location, character, dimensions, extent, limits and all else necessary to complete the work covered by the

project.

PVC: Shall mean polyvinyl chloride pipe.

RCP: Shall mean reinforced concrete pipe.

Record Plans: Shall mean the corrected or adjusted construction plans that accurately show the distances, elevations, dimensions, details and all other changes to reflect the actually completed work as constructed.

Specifications: Shall mean the body of written directives, provisions, and requirements made pertaining to the methods or manner of performing the work, the quantities, and the quality of materials to be furnished under the contract; and outlining the obligations and responsibilities of the parties to the contract; and setting forth the method of payment and the duration of the work.

Standard Detail Plates: Shall mean those detail drawings or plates prepared for and approved by the city of Farmington. Such plates can be obtained at the Farmington City Hall.

SWPPP: Shall mean the storm water pollution prevention plan.

ROW: Shall mean right of way (State, County, City, Etc.).

Site Inspection: Shall mean the observance of infrastructure construction to monitor compliance with the approved construction plans and City standards.

Warranty Period: Shall mean the period of time that the developer warrants improvements to be free from defect, commencing from the time of written acceptance of those improvements by the City Engineer.

Public Infrastructure Installation

Purpose

The purpose of this policy is to establish the City's policies and procedures for the construction of public streets and utilities in new developments.

It is the City's responsibility to provide and ensure the public health, safety, and welfare through the City's infrastructure including the sanitary sewer system, potable water system, storm water drainage system, transportation systems and related appurtenances. Once constructed, these facilities are owned, operated, maintained and ultimately reconstructed by the City, which requires substantial investment of taxpayer dollars. Because of these financial obligations it is important for the City to clarify the City's policy towards constructing new public improvements in developments.

Statement of Policy

This policy, as adopted by the City Council and placed into practice by the city of Farmington, establishes the basis for the design and construction of development in the City for the following reasons:

1. To ensure consistency and compatibility with the City's existing utility system.

2. To ensure consistency and compatibility with the City's Comprehensive Storm Sewer, Sanitary Sewer, Water Distribution, and Transportation Plans.

3. To ensure maximum control by the City of system components that will ultimately be owned and maintained by the City.

4. To ensure construction meets City standards.

5. To avoid potential insurance liability problems.

6. To ensure completion of a facility once construction is initiated.

7. To ensure record plans are properly prepared and filed.

8. To minimize the amount of staff time and consequent taxpayer dollars being spent in educating numerous privately-employed design personnel about City ordinances, standards and procedures.

Design, financing and construction of improvements hall be according to Procedure 1, described below. At the request of the Developer, recommendation of the Senior Project Management Team (City Administrator, Finance Director, and City Engineer), and approval of the City Council improvements can be designed, financed, and constructed according to

Procedures 2, 3, or 4. The City reserves the right to choose a Procedure at its sole discretion. In all cases, the Developer will be required to execute a Development Contract.

Procedure 1 - Developer designs, constructs, and finances the improvements; City inspects the improvements.

Under Procedure 1, the Developer designs, constructs, and finances the improvements; and the City reviews the construction plans for compliance with City standards and inspects the work upon completion. Construction plans must be approved by City staff before any work may begin. The Developer is responsible to insure compliance with the approved plans and City standards through inspection by the design engineer. The City reserves the right to inspect as necessary to monitor compliance with the approved construction plans and City standards. The Developer will reimburse the City for inspection per current policy.

The Developer will provide security for the improvements in the form of a letter of credit for the estimated costs of the improvements, plus 25 percent, plus the amount equal to 2 years principal and interest on the assessments as identified in the Development Contract. The letter of credit may be periodically reduced as work is completed and accepted. A 2 year warranty on the utilities and a 1 year warranty on the streets will be required from the Developer.

Procedure 2 – City designs and inspects the improvements; Developer constructs and finances the improvements.

Under Procedure 2, the City designs the improvements and inspects the construction work; and the Developer constructs the subdivision improvements. The City reserves the right to reject the Contractor selected by the Developer. The Developer will submit in writing his/her request for design and construction of public improvements and will be required to submit funding which will establish a "Construction Account" for the project. Initially, the Developer must submit funding for the Feasibility/Preliminary Report and the preparation of the Plans and Specifications per the City's Fee Schedule. If the project proceeds to construction, the Developer will need to create a "Construction Account" for: the bid amount plus a 15 percent contingency to pay the Contractor for construction, costs identified in the City's Fee Schedule, and any other costs including:

- Construction Engineering and Surveying
- Testing Services
- Attorney Fees
- Administration Fees

A 2 year warranty on the utilities and a 1 year warranty on the streets will be required from the Developer.

The City will have the sole authority and responsibility to pay the construction costs plus those described above from the "Construction Account", in the same manner as is done with Procedure 1. The Development Contract may describe other requirements, financial or otherwise, which the Developer is responsible for, above and beyond the "Construction Account".

Approval for Developer constructed utilities and streets for the first addition or phase of a final plat, does not automatically grant the developer the right to complete each phase on that basis. The evaluation of each phase will be based on the satisfactory completion of previous phases, and compliance with previous Development Contracts and Improvement Policies. Based on this evaluation, the City reserves the right to terminate the agreement after any addition/phase of the development.

Procedure 3 – City designs and constructs the improvements; Developer finances the improvements.

Under Procedure 3, the City designs, constructs, and inspects the improvements; publicly advertises and bids the work; and awards the contract to the low responsible bidder.

This procedure, however, allows the Developer to finance the construction. The Developer will submit in writing his/her request for design and construction of public improvements and will be required to submit funding which will establish a "Construction Account" for the project. Initially, the Developer must submit funding for the Feasibility/Preliminary Report and the preparation of the Plans and Specifications per the City's Fee Schedule. If the project proceeds to construction, the Developer will need to create a "Construction Account" for: the bid amount plus a 15 percent contingency to pay the Contractor for construction, costs identified in the City's Fee Schedule, and any other costs including:

- Construction Engineering and Surveying
- Testing Services
- Attorney Fees
- Administration Fees

A 2 year warranty on the utilities and a 1 year warranty on the streets will be required from the Contractor.

The City will have the sole authority and responsibility to pay the construction costs plus those described above from the "Construction Account", in the same manner as is done with Procedure 4. The Development Contract may describe other requirements, financial or otherwise, which the Developer is responsible for, above and beyond the "Construction Account".

Procedure 4 – City designs, constructs, and finances the improvements.

Under Procedure 4, the City designs, constructs, and inspects the improvements; bids the work; awards the contract to the lowest responsible bidder; and pays the Contractor following the acceptance of improvements through the State Statute, Chapter 429, Public Improvement Process.

The Developer will be required to sign a petition requesting public improvements. The Developer shall waive his/her rights to all hearings and request that the entire cost of all engineering, planning, legal or other required work be assessed against their developing property; including the feasibility/preliminary reports even if the project does not proceed past this point. The Developer/Land Owner will provide the design for the grading of the site and the City will design the public improvements. The Developer will be required to fund an escrow for the engineering costs before the City begins any engineering work.

If the Developer desires, he/she can pay directly for the Feasibility/Preliminary Report and for the preparation of plans and specifications instead of having the costs assessed against their developing property.

In the Development Contract, the Developer will be required to submit a security for the public improvements and appurtenances. The security amount will be determined by the City Council based upon the recommendation of the City Engineer. A 2 year warranty on the utilities and a 1 year warranty on the streets will be required from the Contractor.

General Engineering Requirements

As set forth in various sections of the City Ordinances, Developers of property within the city of Farmington are required to submit plans and specifications for review and approval by the City. These include grading plans, record plan grading plans, plats, street plans, utility plans, erosion and sediment control plans, landscaping plans, park improvement plans, signage plans, lighting plans, record plan construction plans and project specifications. These plans and specifications shall be prepared by a competent professional engineer that is licensed to practice in the State of Minnesota.

The professional services required of the Developer might include an Architect, Land Surveyor, Planner, and Engineer. The engineering services include not only preparation of plans and specifications but field staking and site inspection to assure the City of a quality product and that the completed project is in conformance with the approved plans and specifications.

There are four procedures for the design, construction, and financing of public infrastructure improvements in developments, as outlined in the previous section. If the Developer installs the required public improvements within the development under Procedure 1, the following procedures shall be followed:

1. After Preliminary Plat approval, the Developer shall submit the following for review and approval by the City:
    a. Street and Utility Plan
    b. Grading, Erosion, and Sediment Control Plan
    c. Dewatering Plan
    d. Landscaping Plan
    e. Park Improvement Plan
    f. Street Lighting Plan
    g. Signage Plan
    h. Plat
    i. Storm Sewer Design Calculations (Hydrology map and rational worksheet)
    j. Water Main Design Calculations
    k. Sanitary Sewer Design Calculations
    l. Specifications (Grading, Streets, and Utilities)
    m. Soils Report (With borings and street section recommendations)

n. Construction cost estimates for Development Contract preparation

2. All residential streets are to be designed to meet or exceed MnDOT standards for 30 mph vertical and horizontal curve data unless otherwise determined by the City. Collector streets are to be designed to meet or exceed the MnDOT standards for 40 mph.

3. All utility testing (sanitary sewer, water main, storm sewer, etc.), grading record plans, curb and gutter, bituminous base, the raising of structure iron, installation of sidewalks and paths, erosion control and signage shall be completed and approved prior to issuance of building permits. The City may waive some or all of these requirements when weather related circumstances prevent the completion of street projects before the end of the construction season. The Developer is responsible for maintaining streets in a condition that will assure the access of emergency vehicles at all times when such a waiver is granted. Concrete curb and gutter installation and bituminous paving after November 1 will require written authorization from the City Engineer.

4. The Developer shall submit an erosion and sediment control plan to the City for review and approval. No work is to begin until all erosion and sediment control measures are in place. Plans and permits must be kept up-to-date by the Owner or Contractor.

5. The Developer shall submit, for review and approval, the NPDES permit with SWPPP. Plans and permits must be kept up to date by the Owner or Contractor.

6. Developer will provide competent engineering services for staking and site inspection for the construction of improvements, unless other arrangements are made in advance with the City.

7. The Developer will provide the City with areas designated for future well sites, as specified within the latest well site map or Guiding Document listed on page 16.

8. Copies of project bids, change orders, written field instruction, test reports, etc. shall be forwarded to the City's Engineering Department in a timely manner.

9. The Developer shall furnish the City with a list of Contractors being considered for construction of the project. The City reserves the right to reject any Contractor.

10. Any changes or modification to the plans or specifications shall be submitted to the City and approved by the City Engineer in writing before they are made.

11. The City will provide construction site inspection of the work as it deems necessary. The cost of all site inspections and related items will be charged back to the Developer. The City must be notified a minimum of **48 hours** in advance of all work so a City representative can be present at the time tests are made. Failure to notify the City or to provide adequate notice will require the tests to be repeated at a later date.

12. Upon completion of all required work, the City Engineer or a designated City representative will make a final inspection of the completed work. Representatives of the Developer may accompany the City's representative during the final inspection. Before final payment is made to the Contractor by the Developer, the City Engineer shall be satisfied that all work is satisfactorily completed in accordance with the approved plans and specifications, including placement of the wear course. The Developer's Engineer shall submit a written statement to the City Engineer attesting that to the best of his/her knowledge the work has been completed in accordance with the approved plans and specifications. Upon acceptance of the work and submittal of an alternate security for the warranty period, the City Engineer shall release the project letter of credit.

13. The bituminous wear course shall not be laid until the completed utilities and bituminous base course have gone through a minimum of one (1) freeze-thaw cycle and record plans have been reviewed by the City. Additional time may be required at the discretion of the City Engineer.

14. The Developer warrants all improvements required to be constructed by it pursuant to the Development Contract against poor material and faulty workmanship. The warranty period for streets is 1 year. The warranty period for underground utilities is 2 years. The warranty period for the streets shall commence after the final wear course has been completed. It is the responsibility of the Developer to complete all street improvements. Failure of the Developer to complete all street improvements in a timely manner shall not in any way constitute cause for the warranty period to be modified from the stipulations set forth above. The warranty period on underground utilities shall commence following their final acceptance by the City. It is the responsibility of the Developer to complete required testing of the underground utilities. Failure of the Developer to complete the required testing of the utilities in a timely manner shall not in any way constitute cause for the warranty period to be modified. All trees shall be warranted to be alive, of good quality, and disease free for 12 months after the security for the trees is released. Any replacements shall be warranted for 12 months from the time of planting. The Developer shall post maintenance bonds or other surety acceptable to the City to secure the warranties. The City shall retain 10 percent of the security posted by the Developer until the bonds or other acceptable surety are furnished to the City or until the warranty period has been completed, whichever occurs first. The retainage may be used to pay for warranty work.

15. Upon completion of the base course, the Developer shall provide the City a full set of record plans for review. Such record plans shall be completed and submitted to the Engineering Department within 3 months of completion of the work. Once approved the Developer or its Surveyor/Engineer shall provide one complete full size set and PDF drawings to the City. See pages 52-55 for "Record Plan Requirements".

If the Developer requests and the City Council approves that the city of Farmington install the required public improvements within the development per Procedures 2, 3, or 4 as outlined in the "Statement of Policy" (See pages 8-12), the following procedures shall be followed:

1. The Developer shall submit a preliminary plat with sufficient information to enable City staff to review the proposed development and to determine that the development can be provided with utility service.

2. The City will provide a final design for the approved plat, and will prepare construction plans and specifications for the utility and street improvements. The City will administer the construction contract and provide construction staking and construction inspection in accordance with the provisions set forth with the designated option.

3. The Developer will be responsible for site grading and for rough grading the street ROW. The Developer will also be responsible for erosion and sediment control as outlined above.

4. The Developer will provide all on-site improvements required by the final approval of the subdivision, including such items as: landscaping, street lighting, street signs, special berming, storm water holding ponds, paths, walkways, etc.

All Procedures for design, construction, and financing must incorporate the requirements identified in the City's comprehensive plans in effect at the time of the infrastructure design and installation. The City currently has the following comprehensive plans relating to Public Improvements:

a. Comprehensive Plan

b. Comprehensive Sewer Plan

c. Water Supply and Distribution Plan

d. Local Surface Water Management Plan

A copy of the city of Farmington Engineering Guidelines, Standard Detail Plates and the comprehensive plans are on file for review at the City Hall or may be purchased in accordance with the current fee schedule.

Prior to beginning of construction, the Developer shall obtain all regulatory agency permits and approvals including but not necessarily limited to (as required) the following:

a. City of Farmington

b. Minnesota Pollution Control Agency

c. Army Corp of Engineers

d. Minnesota Department of Natural Resources

e. Minnesota Department of Health

f. Metropolitan Council (Environmental Services)

g. Minnesota Department of Transportation

h. Dakota County

Design Standards

This information has been prepared to assist Developers and their engineers in the planning and construction of public infrastructure in the city of Farmington. It is not intended to be, nor should it be used as a specification for any improvement, but rather a guideline to be used in the preparation of such documents.

Guiding Documents

The design and construction of infrastructure shall conform to the most recent editions of the following documents or as modified herein:

a. City General Specifications

b. City Standard Detail Plates

c. City Comprehensive Plans (See page 16)

d. City Code

e. MnDOT Standard Specification for Construction

f. MnDOT Road Design Manual

g. MnDOT Bikeway Facility Design Manual

h. MnDOT ADA Project Design Guide

i. Minnesota Storm Water Manual

j. Recommended Standards for Wastewater Facilities (Ten State's Standards)

k. Recommended Standards for Water Works (Ten State's Standards)

l. AWWA Standards

m. CEAM Standard Utilities Specifications

n. MPCA's General Permit to Discharge Storm Water Associated with Construction Activity under the NPDES/SDS Program

o. Minnesota Manual on Uniform Traffic Control Devices for Streets and Highways

These documents contain information that the design professional must incorporate in the design of public infrastructure within the City.

Sanitary Sewer

General

The design and construction of sanitary sewer and sewer services shall conform to the most recent editions of "Guiding Documents" (See page 15) or as modified herein.

The Developer shall obtain all regulatory agency permits and approvals including, but not limited to, those listed on page 14 under "General Engineering Requirements" prior to beginning of construction.

The following are specific requirements related to the design of sanitary sewer and sewer services:

1. Manholes, frames and covers shall be Class 35 iron in accordance with ASTM Spec A-48. Both the surface of the frame and the cover shall have machine bearing surfaces with two concealed pick holes. The words "Sanitary Sewer" shall be stamped on the cover in two inch letters.

2. See City Standard Detail Plates for specific manhole casting models and numbers.

3. RCP shall conform to the requirements of the Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe, ASTM Designation C-76 of the class designated on the plans and in the specifications. Pipe joints shall meet the requirements of ASTM Specification C-361 and shall be the Bureau of Reclamation Type R-4.

4. PVC shall be used for gravity sewers 8 inch through 24 inch diameter and shall conform to ASTM Specification D-3034. Pipe shall be produced by a continuous extrusion process using Type 1, Grade 1 material as defined in ASTM Specification D-1784. SDR 35 pipe shall be used up to 16 feet in depth; SDR 26 shall be used in depths greater than 16 feet.

5. RCP or DIP may be used for gravity sanitary sewer. RCP pipe shall be of the proper strength class for the depths and soil conditions involved. DIP shall conform to the requirements of AWWA Standard C151 for the class of pipe indicated on the plans and the specifications. Class 52 pipe shall be used at a minimum. All DIP shall have mechanical or push-on type joints and shall have a standard thickness cement mortar lining in accordance with AWWA Standard C104.

6. Service connections shall be a minimum of 4 inch PVC, Schedule 40 sewer pipe installed in accordance with City Plate No. SER-01B.

7. Service riser pipe shall be a minimum of 4 inch PVC, Schedule 40 sewer pipe installed in accordance with City Plate No. SER-02, where the main is PVC. In areas where the main is DIP, the service wye and service riser shall also be DIP. Service risers are required when the mainline is greater than 14.5 feet in depth, or in areas of high water table. The service stub

must be constructed to an elevation at which the end of the stub is not submerged in groundwater.

8. Cleanouts shall be required at the property line for all sewer services in accordance with City Plate No.'s SER-01B and SER-03. Tracer wire shall be installed with all services, extending from the sewer main to the cleanout cap and from the cleanout cap to the point at which the service stub terminates beyond the easement line (See City Plate No. SER-01B). Anode rods shall be installed and connected to the tracer wire at the main and at the house foundation. Cleanouts are required to be placed at the lot line, or within 5 feet of the building face, within the easement, for services off of a sewer main that is not within a public street ROW.

9. Foundation for pipe sewer shall meet the requirements of MnDOT Specification 3149.2H, Course Filter Aggregate, except that hard, durable crushed carbonate quarry rock may be used. See City Plate No.'s BED-01 and BED-02.

10. Sanitary sewer manholes shall be in the center of the street. Manholes shall be at centerline/centerline at intersections.

11. Maintain a minimum of 10.5 feet depth on sanitary sewer unless approved by the City Engineer.

12. The maximum spacing between manholes for sewer mains is 400 feet unless approved by the City Engineer.

13. All manholes shall be located in public ROW unless approved by the City Engineer.

14. All manholes that are not within a paved area shall be marked by a heavy (3 lbs/ft) channel post with an aluminum alloy sign, (See City Plate No. GEN-01). Exceptions can be made, at the discretion of the City Engineer, for locations where the area is well maintained.

15. Show or define access routes for maintenance purposes to all manholes and lift stations that are outside of public right of way. Access routes shall have a 7 percent maximum grade, maximum 2 percent cross slope, minimum horizontal curve radius of 50 feet, a minimum width of 12 feet and be built to carry a 30 ton load. If necessary, access easements shall be dedicated at the time of final platting.

16. Manholes are required on the end of all sewer stubs if the line will be active.

17. A 0.1 foot drop is required through manholes if all pipe diameters are the same. If differing pipe sizes exist, the pipe crowns shall be at the same elevation.

18. 10 feet of horizontal separation between sanitary sewer and water main is required.

19. Any connections to existing manholes shall either be core drilled or cut out with a concrete saw. No jack hammering or breaking of the structure with a mall is permitted. All connections to an existing system will require a manhole for access.

20. Along deep trunk sanitary sewer (greater than 20 feet deep), the City may require the Developer to construct a parallel, shallower sanitary sewer that the services would connect to. The shallow sanitary sewer would eliminate the need for deep risers that connect to the trunk sanitary sewer.

21. No inside drops are allowed in manholes unless approved by the City Engineer. Drop manholes are required when pipe inverts are greater than 2 feet apart in elevation.

22. If the sanitary sewer will be installed within private property, the easement shall be a minimum of 20 feet and at least twice as wide as the depth of the sewer.

23. The trunk sanitary sewer system shall be designed to promote a laminar flow through the sewer system. Junction manholes should be designed to limit the hydraulic head increase by matching flow lines and by providing good angles of connection, typically greater than 90 degrees. Angles of connection less than 90 degrees are not allowed.

24. Any sanitary sewer manhole located within a designated or defined ponding and drainage easement shall be made of watertight materials and utilize a watertight casting.

25. Changing of pipe material is not allowed between manholes, with the exception of drop manholes. At drop manholes, 20 feet of DIP is required before the change of material.

26. A manhole is required at the property line/easement line in multi-family, commercial, residential, industrial, business park, public or waste management areas where service connection to the City system is made.

27. The City requires all sanitary lines to be televised with a closed circuit digital video system. A DVD, digital media, and a paper report must be submitted to the City for review and approval.

    a. The video shall record a distance, displayed in feet, on the screen at all times.

    b. The video shall be equipped with audio explaining the manhole the camera is in (physical location), which manhole the camera is going to (physical location) , the televising direction(upstream/downstream), locations of service wyes and any problem areas that are encountered.

    c. The camera shall stop and pan at each service wye.

    d. The paper report shall include the following:

        i. Company who performed the televising

ii. Location of the pipe segment

iii. Starting manhole

iv. Ending manhole

v. Length of pipe

vi. Date

vii. Direction

viii. Pipe type

ix. Video reference

x. Footage to services, problem areas, ending manhole, etc.

xi. Observations and comments

e. If the camera is unable to proceed or unable to clearly view the pipe for any reason during televising, please notify the Municipal Services Streets and Utilities Supervisor (651-280-6904) so the obstruction may be remedied prior to the televising crew leaving the site.

28. If construction requires dewatering, a plan must be submitted to the City for review and approval prior to construction.

Sewer Services

1. Sanitary service lines greater than 4 inch diameter shall be approved by the City Engineer based on the Minnesota State Plumbing Code.

2. Developers are responsible for constructing the services to 15 feet (See City Plate No. SER-01B) beyond the ROW line. This will allow the electric, telephone, gas and cable TV companies to install their lines outside of the ROW within the drainage and utility easement where conditions permit.

3. Sewer and water services constructed to lots that already have electric, telephone, gas and cable TV service shall be constructed only to the ROW line.

4. The end of all sanitary service stubs shall be plugged and marked with a 2 inch by 2 inch wooden marker or larger and a metal fence post (See City Plate No. SER-01B).

5. Cleanouts are required at the property line and at 100 foot intervals, including the riser, on sanitary sewer services and require a metal cap. All sanitary sewer cleanouts constructed in paved areas require the installation of a metal casting (See City Plate No. SER-03).

6. Sanitary services may be placed in the same trench as the water services provided that a 24 inch vertical clearance and a 36 inch horizontal clearance are maintained.

7. Sewer services shall be connected to a wye on the main. Service connections to manholes will not be allowed.

8. The minimum depth of the sanitary sewer service at the ROW or easement line shall be 10 feet unless otherwise approved by the City Engineer.

9. The sewer service shall be included in the air test requirements for the main lines.

10. Sanitary sewer services are not allowed to cross over the top of the water main.

11. Any services that have a depth at the main greater than 14.5 feet, or in areas of high water table, require a riser.

12. Service connections where depth of the main is greater than 18 feet shall be tee connections with concrete support. No service connections will be allowed on main at a depth over 28 feet.

Water Main

General

The design and construction of water main and water services shall conform to the most recent editions of "Guiding Documents" (See page 15) or as modified herein.

The Developer shall obtain all regulatory agency permits and approvals including, but not limited to, those listed on page 14 under "General Engineering Requirements" prior to beginning of construction.

The following are specific requirements related to the design of water main and water services.

1. Water main shall be DIP or PVC.

2. DIP shall be in accordance with AWWA C151 of the class shown on the plans. All pipes shall be furnished with standard thickness cement mortar lining conforming to AWWA C104. All pipes shall have push-on joints as specified in AWWA C111 and shall be electrically conductive. Water main shall be wrapped with an approved plastic film wrap in accordance with AWWA C105 if required by the City Engineer. Minimum class of pipe to 12 inch in diameter shall be Class 52. Class 51 will be used, at a minimum, for pipe over 12 inch unless unusual conditions such as extra depth, bedding conditions or corrosive soil conditions exist. In these instances, Class 52 pipe will be the minimum pipe class allowed.

3. PVC watermain shall be in accordance with AWWA C900 of the class shown on the plans. Fittings shall be the same pressure class as the pipe and conform to AWWA C907. PVC

pressure pipe and fittings shall have a pressure rating of one hundred sixty (160) psi or greater, unless otherwise noted in the plans. The PVC grade used shall be resistant to aggressive and corrosive soils and substances in accordance with requirements of ASTM D543. Dimensions and tolerances of the pipe and fittings shall conform to ductile iron pipe equivalent outside diameters.

4. Gate valve and box shall be resilient seat valves in accordance with City Plate No. WAT-02 and shall comply with AWWA Standard C515. Gate valves larger than 16 inch shall be equipped with gear reduction boxes. Gate valve boxes and caps shall be constructed of ductile iron (See City Plate No. WAT-02).

5. Hydrants shall be Waterous Pacer model WB-67-250 installed in accordance with City Plate No. WAT-01 and shall comply with AWWA Standard C502. Hydrants shall be equipped with two 2.5 inch hose connections, one 4.5 inch steamer connection, national standard operating nut, 5 inch valve opening, 6 inch mechanical joint pipe connection and 10 inch high traffic section. Nozzle caps shall be attached to hydrants with metal chains. All hardware shall be stainless steel. Hydrants shall have an 8 foot 0 inch bury with 7 foot 6 inch minimum cover. Hydrants shall have a brass plated upper washer and an epoxy coated lower washer. The hydrant base shall be epoxy coated and equipped to maintain conductivity. The cross arm shall be constructed of bronze. Hydrants shall have plugged weep holes unless otherwise authorized by the City Engineer. Hydrants shall have the caps painted black, and be equipped with a stainless steel tag marked “PUMP AFTER USE”. If the weep holes plugs are removed, the hydrants shall be all red, with the “PUMP AFTER USE” tags removed. If the hydrant is to be used for raw water purposes, the hydrant shall be painted blue.

6. Hydrant flags shall be a Hydra-Finder hydrant marker or equal, be 54 inch long and 3/8 inch diameter. Flags shall be a white fiberglass rod with four red reflective bands, without a bulb end. one flag shall be installed on the hydrant. Hydrants are to be stamped with their manufactured year and installed no more than 1 year later. Hydrants salvaged from a prior phase of the project must be reviewed and approved by the City Engineer prior to installation.

7. Fittings shall be mechanical joint ductile iron in accordance with AWWA C110. All fittings shall be designed for not less than 250 psi working pressure and shall have a standard thickness cement mortar lining conforming to AWWA C104. Rubber gaskets for mechanical joints shall conform to AWWA C111. All joints shall be installed with an electrical contact through every joint. The manufacturer of all water main fittings, including valve boxes, shall be approved by the City Engineer.

8. All fittings shall be fusion-bonded epoxy coated, conforming to ANSI/AWWA C550 and C116/A21.116 requirements. The thickness of the coating shall be 6-8 mils.

9. Corporation stop shall be installed per City Plate No. SER-01A or SER-01Ap. Minimum size shall be 1 inch.

10. Curb Stop shall be as listed on City Plate No. SER-01A or SER-01Ap. Minimum size shall be 1 inch.

11. Curb box and stationary rod shall be Mueller H-10388, or equal, Minneapolis pattern with 1.25 inch upper section, adjustable from 78 inch to 90 inch and shall have stationary rods. Adjustments shall be at mid-range at installation.

12. Water service line shall be copper or PE.

13. Copper pipe shall be seamless and of the size shown on the plans. Copper pipe shall conform to ASTM Specification B-88 Class "K", installed in accordance with City Plate No. SER-01A. Minimum service size shall be 1 inch from the main to the building. Maximum size of copper shall be 1.5 inch. All services larger than 1.5 inch shall be DIP.

14. PE pressure pipe shall be High Density Polyethylene Pipe SDR-9 Copper Tube Size (CTS) pipe conforming to AWWA C901 and ASTM 2737 and installed in accordance with City Plate No. SER-01Ap. Minimum service size shall be 1 inch. Compression fittings and insert stiffeners are required at all connections.

15. The water main alignment shall follow the sanitary sewer alignment where practical with a minimum of 10 feet of horizontal separation.

16. All pipes and services shall be designed for a minimum of 7.5 feet of cover to the top of pipe and maximum of 10 feet of cover. There shall be a minimum of 18 inch vertical clearance between all pipes and obstructions, with 2 inch insulation being used when crossing storm sewer lines at a distance less than 3 feet. See City Plate No.'s WAT-06 and GEN-16.

17. Minimum water main diameters shall be 8 inch for residential property unless otherwise approved by the City Engineer.

18. Minimum water main diameters shall be 8 inch for multi-family, commercial, industrial, business park, and public or waste management property.

19. Either copper straps or approved conductive gaskets with copper inserts shall be installed throughout the system to provide conductivity.

20. Connections to existing mains shall be coordinated with the City Engineer. The City requires a minimum 48 hour notice if residents are to be without water.

21. Hydrants should be placed 3.5 feet from back of curb and centered on side lot lines.

22. Operation of the water main system shall be performed by **City personnel only**. The City requires a minimum 48 hour notice before the activation or shut down of the water main system.

23. All connections to existing water mains shall be valved. Locate valves within the street surface where possible. Generally, two valves are required at a tee or 3-legged intersection, and three valves are required at a cross or 4-legged intersection. Valves should be placed in such a manner that a maximum of 20 lots are affected during a water shutoff. Maximum spacing of gate valves is 450 feet in residential areas and 300 feet in commercial areas. Additional valves may be required at the discretion of the City Engineer.

24. All utilities that cross the water main shall cross at a 90 degree angle if possible, with a minimum angle of 45 degrees for the crossing.

25. Dead-end lines shall be minimized by looping of all mains wherever practical. Where dead-end mains occur, a hydrant shall be installed at the end of the main for flushing purposes. All temporary and permanent dead-ends shall be secured with a gate valve and hydrant.

26. Reaction blocking and megalugs or AFC ALPHA ends shall be used at all gate valves, hydrants and fittings.

27. All gate valves that are not within a paved area shall be marked by a heavy (3 lbs/ft) channel post with an aluminum alloy sign, (See City Plate No. GEN-01). Exceptions can be made, at the discretion of the City Engineer, for locations where the area is well maintained.

28. Hydrants shall be placed at a height meeting City Standard Detail Plate requirements and at an elevation observing finished grades (See City Plate No. WAT-01).

29. Hydrants shall be located in single family residences such that a 225 foot radius for fire protection is provided.

30. Hydrants shall be located in multi-family, commercial, industrial, business park, public or waste management areas such that a 150 foot radius for fire protection is provided.

31. Furnish and install one (1) locator on each hydrant (See City Plate No. WAT-01).

32. Locate hydrants at intersections, if practical.

33. Gate valves are required on all hydrant leads.

34. Valves greater than 8 feet deep shall have extension rods placed within 7 to 8 feet of the finished surface.

35. Hydrants or water services are not allowed on the inactive side of gate valves for temporary stubs.

36. Air relief valves, when required, shall have a valve prior to, and after an air relief mechanism to allow replacement without shutting down the main.

37. If the water main is to be installed within private property, the easement shall be a minimum of 20 feet wide with the water main centered in the easement.

38. Water mains, laterals and/or services shall not be located within any defined or designated ponding easement.

39. All water main bolts are to be Core Blue or an approved equal.

40. If construction requires dewatering, a plan must be submitted to the City for review and approval prior to construction.

41. Tracer wire shall be placed with all PVC water mains. Tracer wire shall meet the Minnesota Rural Water Association specifications and standard details.

Water Services

1. Single family residences shall have a minimum 1 inch diameter Type K copper or PE water service.

2. Water service lines less than 1 inch in diameter shall be approved by the City Engineer based on the Minnesota State Plumbing Code.

3. Developers are responsible for constructing the services to 15 feet beyond the ROW line. This will allow the electric, telephone, gas and cable TV companies to install their lines outside of the ROW within the drainage and utility easement where conditions permit (See City Plate No. SER-01A).

4. Water services constructed to lots that already have electric, telephone, gas and cable TV service shall be constructed only to the ROW line.

5. The end of all water services shall be plugged and the curb stop marked with a 6 foot steel fence post placed vertically, and protruding 4 feet out of the ground (See City Plate No. SER-01A and SER-01Ap). Only one continuous piece will be allowed from main to curb box or valve unless service is over 100 feet long.

6. Water services may be placed in the same trench as the sewer services provided that a 24 inch vertical clearance and a 36 inch horizontal clearance are maintained.

7. All curb boxes constructed in bituminous or concrete areas require the installation of a Neenah casting #R-1914-B, Ford A-1, or approved equal.

8. A minimum of 7.5 feet of cover is required on all water services.

9. The water service shall be included in the pressure and leakage testing requirements for the main lines.

10. All water services 1.5 inch in diameter and smaller shall be Type K Copper or PE. For any services larger than 1.5 inch, the pipe material shall be ductile iron at a minimum size of 4 inch.

11. Service saddles may be required, as determined by the City Engineer.

12. Tracer wire shall be placed with all PE water services. Tracer wire shall meet the Minnesota Rural Water Association specifications and standard details.

Storm Sewer

General

Drainage facilities shall conform to the most recent editions of "Guiding Documents" (See page 15) or as modified herein.

The Developer shall obtain all regulatory agency permits and approvals including, but not limited to, those listed in item 0 of the "General Engineering Requirements" (See page 13) prior to beginning of construction.

1. Easements

    a. If a Developer's proposal involves directing some or all runoff off of the site, it shall be the responsibility of the applicant to obtain from adjacent property owners any necessary easements or other property interests concerning flowage of water. The City will assist in this process as appropriate.

    b. Outlots are required for all ponding areas to the basin's 100-year storm HWL elevation. Ponding outlots are required to be seeded with grasses approved by the City Engineer, to the outlot boundaries. Easements are required for all inletted and outletted basins, swales, ditches, and overflow routes to the basin's 100-year storm HWL elevation.

    c. If the storm sewer is to be installed less than 10 feet deep within private property, the easement shall be a minimum of 20 feet wide with the pipe centered in the easement. If the storm sewer is 10 feet deep or greater, then the easement shall be twice as wide as the depth.

2. Show or define access routes for maintenance purposes to all manholes, lift stations, inlets, and/or outlets at ponding areas that are outside of public ROW. Access routes shall have a 7 percent maximum grade, 2 percent cross slope, minimum horizontal curve radius of 50 feet, a minimum width of 12 feet, and a load capacity of 30 tons. If necessary access easements or outlots shall be dedicated at the time of final platting.

3. All newly constructed and reconstructed buildings will route drain leaders to pervious areas wherein the runoff can be allowed to infiltrate. The flow rate of water exiting the leaders shall be controlled so no erosion occurs in the pervious areas.

Pipe and Appurtenances

1. Manholes frames and covers shall be of the best grade of cast iron, free from all injurious defects and flaws and shall be Class 35 iron in accordance with ASTM Spec A-48. Each casting shall be sand blasted, but no further coating or finish is required. Both the surface of the frame and the cover shall have machine bearing surfaces with two concealed pick holes. The words "Storm Sewer" shall be stamped on the cover in 2 inch letters.

2. RCP shall conform to the requirements of the Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe, ASTM Designation C-76 of the class designated on the plans and in the specifications. Pipe joints shall meet the requirements of ASTM Specification C-361 and shall be the Bureau of Reclamation Type R-4.

3. PVC pipe, if allowed, shall be in accordance with ASTM specification D-3034. Pipe shall be produced by a continuous extrusion process using Type I, Grade 1 material as defined is ASTM Specification D-1784. Prior written approval from the City Engineer is required for the use of PVC. PVC storm sewer will generally be limited to areas of extremely low surface cover and outside of road right of way. Where PVC is allowed, core and seal manhole boots will be required.

4. CMP, if allowed, shall be in accordance with MnDOT Section 3226, Type I, 16 gauge material. Prior written approval from the City Engineer is required for use of CMP. CMP storm sewer will generally be limited to temporary culverts and driveway culverts, etc.

5. Foundation material for storm sewer shall be in accordance with City Plate No.'s BED-01 and BED-02.

6. Flared end sections shall be RCP with trash guards in accordance with City Plate No. STO-10.

7. Riprap and filter blanket shall be placed at all outlet flared end sections. The placement of the riprap shall be hand placed. The minimum class of riprap shall be MnDOT 3601.2A Class III. Design criteria justifying the size and amount of riprap are required (See City Plate No. STO-11).

8. In the case of discharge to channels, rip rap should be provided on all outlets to an adequate depth below the channel grade and to a height above the outfall or channel bottom. Rip rap should be placed over a suitably graded filter material and filter fabric to ensure that soil particles do not migrate through the rip rap and reduce its stability. Rip rap should be placed to a thickness at least 2.5 times the mean rock diameter so as to ensure that it will not be undermined or rendered ineffective by displacement. If rip rap is used as protection for overland drainage routes, grouting may be recommended.

9. Discharge velocity into a pond at the OE shall be 8 fps or less. Rip rap protection is required at all inlet pipes into ponds.

10. Where outlet velocities to ponds exceed 8 fps, the design should be based on the unique site conditions present. Submergence of the outlet or installation of a stilling basin or other energy dissipater approved by the City is required when excessive outlet velocities are experienced.

11. Junction manholes should be designed to limit the hydraulic head increase by matching hydraulic flow lines and by providing smooth transition angles. Intersection angles shall be a minimum of 90 degrees.

12. Where more than one pipe enters a structure, a catch basin/manhole shall be used.

13. Storm sewer pipe should match top of pipe to top of pipe unless grade constraints prevent this. In that case hydraulic calculations will be necessary to verify that excessive surcharging will not occur.

14. Storm water pipes shall be designed utilizing the rational method. Channel design shall be hydrograph method only. All methods are subject to the City Engineer's approval.

15. Lateral systems shall be designed for the 5-year rainfall using the rational method. State Aid roadway storm sewer shall be designed for the 10-year event.

16. The minimum full flow velocity within the storm sewer should be 3 feet per second (fps). The maximum velocity shall be 10 fps, except when entering a pond, where the maximum velocity shall be limited to 8 fps.

17. Trunk storm sewer should be designed at a minimum to carry 100-year pond discharge in addition to the 5-year design flow for directly tributary areas.

18. For storms greater than the 5-year event, and in the case of plugged inlets, transient street ponding will occur. For safety reasons, the maximum depth should not exceed 3 feet at the deepest point and the lowest opening at any adjacent building should be at least 1 foot above the low point EOF.

19. To promote efficient hydraulics within manholes, manhole benching shall be provided to half the diameter of the largest pipe entering or leaving the manhole.

20. Vaned grate catch basin castings shall be used on all streets. At low points alternate casting may be used with the approval of the City Engineer.

21. Overland drainage routes where velocities exceed 4 fps should be reviewed by the City Engineer and approved only when suitable stabilization measures are proposed.

22. Open channels and swales are recommended where flows and small grade differences prohibit the economical construction of an underground conduit. Open channels and swales can provide infiltration and filtration benefits not provided by pipe.

23. Maximum length for drainage swales shall be 400 feet.

24. Channel side slopes should be a maximum of 4:1 with gentler slopes being desirable.

25. Rock rip rap should be provided at all points of juncture between two open channels and where storm sewer pipes discharge into a channel.

26. Open channels should be designed to handle the expected velocity from a 10-year design storm without erosion. Rip rap or concrete liners may need to be provided.

27. Periodic cleaning of an open channel is required to ensure that the design capacity is maintained. Therefore, all channels should be designed to allow easy access for equipment.

28. The Developer should over-excavate the bottom of the water quality ponds to compensate for any erosion that could occur. The Developer will be responsible for verifying, at the end of the warranty period, that the ponds are providing the required volumes.

29. Provide for EOF routes to drain low points along streets or lot lines to ensure a freeboard of 1 foot from the lowest opening elevation, or 2 feet freeboard above the pond's calculated 100-year HWL elevation, whichever is less restrictive. Street ponding shall not exceed a maximum depth of 3 feet at its deepest point. Design criteria verifying the adequacy of the overland drainage route capacity is required.

30. Inlet and outlet pipes of storm water ponds should be extended to the pond normal water level whenever possible.

31. Outfalls with velocities greater than 4 fps into channels where the angle of the outfall to the channel flow direction is greater than 30 degrees require energy dissipation or stilling basins.

32. Outfalls with velocities of less than 4 fps that project flows downstream into a channel in a direction 30 degrees or less from the channel flow direction generally may not require energy dissipaters or stilling basins, but will require rip rap protection.

33. Manholes and inlets will generally be required every 400 feet on streets or in combinations of streets and swales. Additionally, inlets should be located such that 3 cfs is the maximum flow at the inlet for the 5-year flood design storm event, unless high capacity grates are provided.

34. Minimum pipe cover in paved areas shall be 2.5 feet. In unpaved areas, the minimum cover shall be 2 feet.

35. Storm sewer shall be designed to maintain a self-cleaning pipe velocity. The minimum full flow velocity shall be 3 fps. The maximum velocity shall be 10 fps, except when entering a pond, where the maximum velocity shall be limited to 8 fps.

36. Flared end sections shall not be used as inlets, unless prior written approval is granted by the City Engineer.

37. The minimum grade in all unpaved areas shall be 2 percent unless approved by City Engineer.

38. Refer to the Standard Detail Plates for the types of castings to be used on the storm sewer structures.

39. Manholes shall be placed in paved surfaces wherever possible.

40. A 0.1 foot drop is desired through manholes if the diameter of pipes is the same. If differing pipe sizes exist, try to match the pipe crowns.

41. All storm sewer inlets, outlets and manholes that are not within a paved area shall be marked by a heavy (3 lbs/ft) channel post with an aluminum alloy sign (See City Plate No. GEN-01). Exceptions can be made, at the discretion of the City Engineer, for locations where the area is well maintained.

42. The storm alignment shall follow the sanitary sewer alignment where practical with a minimum of 10 feet of horizontal separation. Storm sewer placed along the curb shall be along the curb opposite the water main to maintain 10 feet separation.

43. Catch basins shall be located on the tangent section of the curb at a point 5 feet from the return. Mid-radius catch basins will not be allowed. Catch basins shall be designed to collect drainage on the upstream side of the intersection.

44. Minimum pipe size shall be 12 inch diameter.

45. The maximum spacing between manholes shall be 400 feet for sewer lines less than 24 inch in diameter, and 500 feet for sewer lines 24 inch to 30 inch in diameter. Maximum spacing on large diameter sewer lines shall be approved by the City Engineer.

46. The last manhole in a paved area before entering a ponding area shall have a sumped bottom. The sump shall be a minimum of 3 feet in depth, unless otherwise approved by the City Engineer.

47. Any connections to existing manholes or catch basins shall be core drilled or the opening cut out with a concrete saw. No jack hammering or breaking the structure with a maul is permitted. All connections to an existing system will require a manhole for access.

48. Aprons or flared end sections shall be placed at all locations where the storm sewer outlets to a ponding area. All aprons or flared end sections shall be tied to the next 3 pipe sections. (See City Plate No. STO-10). All trash guard installations will be subject to approval by the City Engineer.

49. Outlet control structures from ponding areas are required as directed by the City Engineer.

50. The invert elevations of the pond inlet flared end sections shall be no lower than the OE of the pond.

51. No overland or channeled storm water may leave a development site in excess of the existing rate, unless the discharge is conveyed in the trunk system and is in accordance with the City's Local Surface Water Management Plan. The storm water in each phase of a development will need to be managed to this criteria and any interim storm water design for the development will need to meet this criteria.

52. If storm sewer installation requires dewatering, a plan must be submitted to the City for review and approval prior to construction. Dewatering or basin-draining activities must first be discharged to a temporary or permanent sedimentation basin on the project site unless infeasible. If the water cannot be discharged to a sedimentation basin prior to entering surface water, it must be treated with appropriate BMPs, such that the discharge does not adversely affect the receiving water or downstream properties.

Storm Water Basins

1. Storm water quality treatment ponds shall be designed and constructed to meet the MPCA's design criteria from the Minnesota Storm Water Manual.

2. Storm water detention facilities constructed in the city of Farmington shall be designed according to the most current technology as reflected in the design criteria from the Minnesota Storm Water Manual, and the city of Farmington Local Surface Water Management Plan, with the following design factors:

    a. A permanent pool volume of 1,800 cubic feet per acre of drainage to the storm water pond.

    b. A permanent pool length-to-width ratio of 3:1 or greater.

    c. A minimum 10 foot wide maintenance bench shall be provided around the entire perimeter with a slope no steeper than 10:1 and located from pond OE to 1 foot below pond OE.

    d. Maximum allowed pond slopes above the OE are 4:1. Below the safety bench slopes may be up to 3:1.

    e. Ponds constructed within the local groundwater ("groundwater ponds") should have their bench adjusted because of the fluctuating groundwater table. The grading design for such ponds shall be as follows:

        i. 4:1 slopes above the OE.

ii. 5:1 slopes from the pond OE to the bottom of the lowest expected groundwater fluctuation (typically 4-8 feet).

iii. 3:1 slopes from the bottom of the groundwater fluctuation level to the bottom of the pond.

f. All groundwater ponds must have pre-treatment ponds upstream with at least 1 foot of compacted silty-clayey topsoil liner to buffer the interaction between surface runoff and the groundwater.

g. All constructed ponds shall be provided a maintenance access from an adjacent roadway. The maintenance access shall be provided in the form of an easement no narrower than 20 feet. The maintenance access shall have a longitudinal slope no steeper than 6:1 and minimal cross slope. Maintenance access routes, due to their extra width, also serve well as EOF routes.

h. All constructed ponds and wetland mitigation areas shall have a maintenance access bench around sufficient perimeter to provide access to all inlets and outlets. The maintenance bench should be located within an outlot or permanent easement. The maintenance bench should extend from the OE to 1 foot above the OE and its cross slope should be no steeper than 10:1. The maintenance bench shall connect to the maintenance access.

i. Pond outlets must be designed to prevent short-circuiting and the discharge of floating debris. Basin outlets must have energy dissipation.

j. Elevation separations of buildings with respect to ponds, lakes, streams, and storm water features shall be designed as follows:

i. The lowest floor elevation of a structure that adjoins a pond must be a minimum of 2 feet above the calculated 100-year HWL or 1 foot above the EOF, whichever criteria leads to the higher elevation.

ii. The lowest floor elevation of a structure should also be at least 2 feet above the highest recorded groundwater elevation. The highest recorded groundwater elevation shall be based on existing on-site wells and/or piezometers monitored for a minimum of 6 months. The monitoring period shall include the spring months beginning in March.

iii. Drainage easements and outlots for ponds, lakes, wetlands, streams etc. shall encompass an area to the calculated 100-year HWL.

k. Maximum pond wet volume depth is 8 feet. Large groundwater ponds shall have a maximum depth determined by the City Engineer.

l. Mean depth for water quality ponds should be a minimum of 4 feet. If the pond is smaller than 3 acre-feet in volume, mean depths of 3 feet to 4 feet may be used. Mean depth is defined as the area at OE divided by the wet volume.

m. The pond outlets must be designed to not increase erosion or have undue influence on downstream geomorphology of a stream and such that the water quality volume is discharged at no more than 5.66 cfs per acre of surface area of the pond.

n. All ponds shall be graded to 1 foot below design bottom elevation. This "hold down" allows sediment storage until such time as site restoration is complete.

o. The top berm elevation of ponds shall be a minimum of 1 foot above the 100-year pond HWL.

p. Grading shall not block or raise EOFs from adjoining properties unless some provision has been made for the runoff that may be blocked behind such an embankment.

q. Pond design must be situated outside of surface waters and any buffer zone required under Appendix A, Part C.3 of the MPCA's General Permit to Discharge Storm Water Associated with Construction Activity under the NPDES/SDS Program and they must be designed to avoid draining water from wetlands unless the impact to the wetland is in compliance with the requirements of Appendix A, Part D. also of the MPCA's General Permit to Discharge Storm Water Associated with Construction Activity under the NPDES/SDS Program.

r. Seeding around ponds shall be a native mix, as approved by the City Engineer. Final stabilization must be obtained. Vegetation will be considered established when a uniform perennial vegetative cover (e.g., evenly distributed, without large bare areas) with a density of at least 70 percent of native vegetation, covers the entire disturbed site.

s. All ponds shall have a stabilized EOF.

t. A protective buffer strip of native grasses as approved by the City Engineer surrounding the pond will be required. The minimum width of the buffer is 15 feet, or as required by the City Engineer.

u. Pond design must provide live or temporary storage for water quality storage of ½ inch times the fraction of new impervious cover for the site.

v. All storm water detention facilities must have a berm or barrier to remove coarse-grained particles prior to discharge into a watercourse or storage basin.

w. City Natural Area signs per City Plate No. GEN-13 shall be installed 1.5 feet behind every other lot corner and at all angle points, or at a minimum spacing of 300 feet surrounding the pond.

3. Wetlands

    a. A protective buffer strip of native vegetation, as approved by the City Engineer, shall surround all wetlands. The minimum width of the buffer will be based on its management classification.

    b. Wetland buffer signs per City Plate No. GEN-13 shall be installed 1.5 feet behind every other lot corner and at all angle points, or at a minimum spacing of 300 feet surrounding the wetland.

    c. Wetlands must not be drained or filled, wholly or partially, unless replaced by restoring or creating wetland areas in accordance with the "Minnesota Wetland Conservation Act" and other wetland regulations.

    d. Utilization of existing wetlands for storm water management is subject to review by the appropriate regulatory agency in accordance with the "Minnesota Wetland Conservation Act" and other wetland regulations.

4. In the development of any subdivision or ponding area, the Developer is responsible for the removal of all significant vegetation (trees, stumps, brush, debris, etc.) from any and all areas which would be inundated by the designated controlled water elevation (OE) of any required ponding easement as well as the removal of all dead trees or vegetation, etc., to the HWL of the pond.

5. Calculations and drainage area maps showing 5-year design and 100-year flood boundaries shall be submitted with the plans and specifications verifying the adequacy of the number of catch basins, pipe capacities and pond sizes.

6. The lowest floor elevation of a structure in a development that adjoins a pond will be a minimum of 2 feet above the pond's 100-year storm HWL elevation, while the lowest opening elevation will be at least 1 foot above the pond's EOF elevation. In the case of a walkout, where the lowest floor is the lowest opening, the MORE restrictive (higher) elevation of the two would apply.

7. The Developer and/or their Engineer shall submit a record plan drawing upon the completion of construction of a designated ponding area. The record plans shall certify that the pond meets all design parameters as set forth in the approved site, utility and grading plans, and the city of Farmington's Local Surface Water Management Plan or as modified herein.

8. Erosion control shall at a minimum observe standards established in the following reports: the Minnesota MPCA's design criteria from the Minnesota Storm Water Manual, MPCA's General Permit to Discharge Storm Water Associated with Construction Activity under the NPDES/SDS Program and the city of Farmington Local Surface Water Management Plan or as modified herein.

Grading, Erosion, and Sediment Control

The grading plans and erosion control systems shall conform to the most recent editions of "Guiding Documents" (See page 15) or as modified herein.

The Developer shall obtain all regulatory agency permits and approvals including, but not limited to, those listed in item 0 of the "General Engineering Requirements" (See page 13) prior to beginning of construction.

City staff inspect and enforce erosion and sediment control practices on construction sites in the city of Farmington.

The following are specific requirements related to the development of grading/erosion control plans for the proposed subdivision and adjacent land within 200 feet unless noted otherwise:

1. Grading/erosion control plans shall be designed and signed by a Civil Engineer or a Land Surveyor registered in the State of Minnesota.

2. Show existing and proposed storm sewer.

3. Show proposed borrow pits and stockpile areas.

4. Show lot corner elevations and bench marks utilized.

5. Existing contours shall be at 1 foot or 2 foot intervals to a mean sea level datum (dashed lines). The contours shall extend beyond the proposed plat boundaries 150 feet or more to completely show the limits of a drainage basin(s) not fully contained within the proposed plat.

6. Proposed contours shall be at 1 foot or 2 foot intervals to a mean sea level datum (solid lines).

7. Graded slopes may be a maximum of 3:1 and minimum of 2 percent.

8. Retaining walls over 4 feet in height shall be designed by a Minnesota Registered Professional Structural Engineer. Walls on public properties require approval of the City Engineer.

9. Show ponds, wetlands, lakes, streams or marshes.

    a. Show city of Farmington's most recent Local Surface Water Management Plan OE and HWL for ponds.

    b. Show the OE and HWL for ponds and wetlands.

    c. Show OHWL and DNR pond number if applicable.

d. Storage volume proposed.

e. Drainage area boundaries.

f. Show and define areas that will be seeded and mulched, sodded (minimum of one (1) row behind the back of curb), or seeded with blanket. Common drainage swales must be seeded and blanketed at a minimum. Specify seed type on the construction plans.

g. Show Wetland Buffer, City Natural Area and Conservation Area sign locations.

10. Show existing and proposed building and driveway footprints. It is desirable to show the driveway location so that services can be designed outside the limits of the driveway. The front of house elevation must be a minimum of 1.5 feet above the top of curb, or maintain 2 percent grades to the curb, whichever is more restrictive.

11. Show house pads with house style and lowest floor elevations, garage elevation and walkout elevation. Include a legend for these items. Elevations must be in accordance with the requirements set forth in the City's Local Surface Water Management Plan.

12. Driveways shall be designed at a minimum grade of 2 percent and a maximum grade of 10 percent, unless otherwise approved by the City Engineer.

13. In cul-de-sacs the gutter grade shall not be less than 0.5 percent. A minimum 0.5 percent crown or minimum 2 percent cross slope grade, whichever is greater, is required for a cul-de-sac cross section.

14. Show proposed erosion control, including silt fence and heavy-duty silt fence locations. Heavy-duty silt fence is required around all ponding areas and wetlands. Silt fence is required in other areas as needed to keep any soil runoff within the property. Inlet protection is required on all catch basins (See City Plate No. ERO-12).

15. Show EOF routes from all low points and ponds and show high point elevations along EOF routes. Show directional flow arrows. Either sod or seed with fiber blanket shall be placed in these areas to protect from erosion.

16. Show removal of all trees and brush below the controlled water level that will be impacted from existing and newly created ponding areas. In the development of any subdivision or ponding area, the Developer is responsible for the removal of all significant vegetation (trees, stumps, brush, debris, etc.) from any and all areas which would be inundated by the designated controlled water elevation (OE) of any required ponding easement as well as the removal of all dead trees or vegetation, etc., to the HWL of the pond.

17. Show or define access routes for maintenance purposes to all inlets, outlets, manholes and lift stations at ponding areas.

18. Show limits of clearing and grading.

19. Show 5-year and 100-year design drainage boundaries. Show acreage of each drainage area/watershed.

20. Erosion control shall at a minimum observe standards established in the following reports: Protecting Water Quality in Urban Areas (Best Management Practices for Minnesota), National Urban Runoff Program (NURP) and the Local Surface Water Management Plan for the city of Farmington or as modified herein.

21. Label all lot and block numbers.

22. Label all street names.

23. Show centerline street elevations every 100 feet and at high points

24. Show street grades.

25. Show typical lot detail indicating where lot and house elevations are.

26. Show typical street section.

27. Show drainage arrows at high points and major grade changes.

28. Show existing and proposed easements and outlots.

29. Wetland boundaries must be accurately shown along with the name of the person or company who delineated the wetland boundaries and the date of delineation.

30. A grading record plan is required to be submitted and reviewed by the City prior to the issuance of building permits.

31. A minimum of one (1) roll of sod is required behind the back of curb in all locations. Where sidewalks and bike trails are located, one roll of sod is required on the outside of the walkway, and the entire boulevard between the walkway and curb will be sodded. A minimum of one (1) roll of sod will be placed on each side of trails located outside of road ROW's. Sod will also be placed in areas susceptible to erosion as identified by the City Engineer.

32. A minimum of 6 inch of topsoil must be applied to all disturbed areas of the development prior to seeding or sodding. Topsoil is defined as the top horizon of soil that existed on the site prior to grading of the development and is capable of adequately supporting grass. Soil that is predominantly sand, gravel, or clay will not be considered topsoil.

33. If dewatering is required for grading, a plan must be submitted to the City for review and approval prior to construction.

34. Erosion blanket shall conform to MnDOT 3885 category 4 for semi-permanent blankets. 8 inch staples shall be utilized for anchoring the blanket.

35. The developer shall establish turf, and shall control all erosion in park areas and outlots. The developer shall maintain turf and erosion control measures until the City accepts the project.

36. If the activity creates more than 1 acre of disturbed area, and the activity is taking place on a site where soils are currently disturbed (e.g., a tilled agricultural site that is being developed), areas that will not be graded as part of the development and areas that will not be stabilized according to the timeframes specified in the NPDES General Construction Permit Part IV.B. 2, shall be seeded with a temporary or permanent cover before commencing the proposed land disturbing activity.

Streets

Streets shall conform to the most recent editions of "Guiding Documents" (See page 15) or as modified herein.

The Developer shall obtain all regulatory agency permits and approvals including, but not limited to, those listed in item 0 of the "General Engineering Requirements" (See page 13) prior to beginning of construction.

The following are specific requirements related to the design of street construction:

Street construction materials shall be in conformance with the MnDOT Standard Specifications for Construction, 2018 Edition and all subsequent revisions, except as specifically altered or modified herein.

Traffic Safety

1. All residential streets shall be designed to meet or exceed MnDOT standards for 30 mph vertical and horizontal curve data unless otherwise approved by the City. All collector streets shall be designed to meet or exceed MnDOT standards for 40 mph design. Vertical curves shall be provided for all grade changes greater than 50 percent.

2. No street grade shall be less than 0.5 percent. The maximum allowable grade for a 30 mph design speed is 6 percent for flat topography and 7 percent for rolling topography. At intersections, the street grade shall not exceed 2 percent for the first 100 feet approaching the intersection unless otherwise approved by the City Engineer. The 100 feet approach is measured from the curb line of the intersected street.

3. The design of streets shall accommodate a minimum 7 foot clear zone behind the curb where trails or sidewalks are proposed and a minimum 10 foot clear zone in areas without trails or sidewalks to provide for adequate sight distances and snow storage. The clear zone

area will be the boulevard behind the curb (this area shall not contain any landscaping other than a ground cover) and the area shall have a minimum 2 percent slope.

4. Horizontal curves on residential streets with concrete curb and gutter shall be designed to ensure a horizontal sight distance of not less than 200 feet.

5. Streets shall intersect at right angles (90 degrees) unless otherwise approved by the City.

Access

1. Contiguous street segments with a total combined length of greater than 600 feet shall require at least 2 points of access. For phased development the second access point may have a temporary turnaround installed until the access is fully constructed.

2. Maximum length of a cul-de-sac street shall be 600 feet. See City Plate No.'s STR-08 and STR-09.

3. Access spacing for street intersections shall be in accordance with the "Farmington Access Spacing Guidelines" as defined in the City's Comprehensive Plan Barricades shall be placed on all dead end streets and shall conform to the Minnesota Manual on Uniform Traffic Control Devices and City Plate No. STR-24.

4. "Future Through Street" barricades per City Plate No. STR-24A shall be placed on all dead end streets that will be extended to future development, or as directed by the City Engineer.

5. Cul-de-sacs are required on all "dead-end" public streets. Temporary "dead-end" situations associated with phased development do not require concrete curb and gutter along the radius of the cul-de-sac, but must be paved for snow plowing purposes. Temporary "dead-end" situations associated with providing access to adjacent undeveloped property, requires concrete curb and gutter installation.

6. No residential driveway shall be permitted within 50 feet of the end of the radius of an intersection of any collector street or other residential street.

Pavement Items

Bituminous

1. Bituminous mixture shall conform to MnDOT 2360. The asphalt and bituminous mix designation shall be submitted to the City Engineer for review and approval at the preconstruction meeting. Bituminous pavement shall not be placed without prior mix designation approval. Recycled mixes will not be allowed.

2. Bituminous material shall conform to MnDOT 3151. The performance graded asphalt cement shall be PG58-34.

3. Bituminous Tack Material shall be in conformance with MnDOT Section 3151.2D1, for Emulsified Asphalt.

4. The minimum bituminous thickness for street sections shall be 4 inches. The base course shall be 2.5 inch thick after compaction. The wear course shall be minimum 1.5 inch thick after compaction and placed after the completed utility construction has gone through at least one (1) freeze-thaw cycle. Dependent upon the level of completion of home construction in the area, additional time may be required before the wear course may be placed at the discretion of the City Engineer.

5. The City requires the determination of an R-value to be used in calculating the total granular equivalency (G.E.) of a street's design requirements. The R-value is a measure of embankment soil resistance strength expressed on a scale of 1 to 100.

6. Street design shall meet standards contained in the MnDOT Road Design Manual. Residential streets shall be designed to a 7 ton minimum; collector streets to a 9 ton minimum.

Base

1. Aggregate base shall be Class 5, 100 percent crushed limestone or recycled crushed concrete meeting the requirements of MnDOT Section 3138.

2. Geotextile fabric shall be installed after completion and approval of subgrade if required by the City Engineer. Geotextile fabric shall be a non-woven fabric consisting of polymeric filament or yarns such as polypropylene, polyethylene, polyester, polyamide or polyvinylidene chloride that is formed into a stable network such that the filaments or yarns retain their relative position to each other. The geotextile shall be inert to commonly encountered chemicals, resistant to ultraviolet radiation, and conform to the properties in the following table:

Geotextile Property	***Test Method***	***Value***
Grab Tensile Strength, lbs., min. either principal direction	ASTM-D-1682 1" wide by 2" long clamps at 12 in/min. on a CRE type machine Method 16 using 8" x 4" specimens	180
Grab Tensile Elongation, percent, max.	ASTM-D-1682	60
Burst Strength psi, min	ASTM-D-751 (Diaphragm Method)	290
Trapezoid Shear Strength, lbs., min. (any direction)	ASTM-D-1117	50
Puncture Strength lbs., min.	ASTM-D-751 5/16" diameter hemispherical tip steel cylinder centered within ring clamp.	75
EOS (U.S. Sieve)	AASHTO M-288	70-100
Permeability cm/sec	Constant Head (50 mm)	0.20

3. Geotextile fabric shall be Phillips Supac 8-NP, Amoco Propex 4557, Hoechst Trevia 1127, or equal. All splices shall be overlapped a minimum of 24 inches or seamed (sewed, glued, welded) to produce equivalent fabric strength. Fabric shall not be left exposed to the sun for a period in excess of 3 days. Rips shall be patched with fabric lapped a minimum of 36 inches around the rip.

4. Subsurface drain pipe shall be PVC perforated pipe installed at road low point catch basins and shall be extended a minimum of 50 feet in each direction parallel to the gutter line. Pipe shall be rigid, thermoplastic PVC. Flexible pipe will not be allowed.

5. Soil boring information and street section recommendations shall be included in the project specification and submitted to the City for review prior to the start of construction.

6. Removal and replacement of unsuitable subgrade materials will be subject to the recommendations of the geotechnical engineer and the approval of the City.

Curb

1. Material for concrete curb and gutter shall be accordance with MnDOT Section 2531. Reinforcing rods are required when new curb and gutter crosses a service or utility (storm, sanitary or water main) trench, 10 foot transitions to and from catch basins and concrete valley gutters. A "W" or "S" stamp per City Plate No. STR-28 must be placed where curb and gutter crosses a water or sewer service respectively.

2. New residential subdivisions will require mountable curb and gutter as shown on the City Plate No. STR-01. B6-18 curb and gutter are required in all intersection radii and catch basin transitions.

3. A 20 foot minimum intersection radius shall be used on residential streets. A 30 foot minimum intersection radius shall be used for collector roads. Minimum grade around curb radii is 0.5 percent.

4. Concrete valley gutter shall not be used unless approved by the City Engineer.

Boulevard Items

1. Street lighting systems shall be installed at the developer's expense and as approved by the City Engineer. Streetlights must be placed at a 300 feet maximum spacing. A street lighting plan must be provided to the City for review prior to construction.

2. Street signs, stop signs or other traffic control signage shall be installed by the developer per the Minnesota Manual on Uniform Traffic Control Devices and the City's Standard Detail Plates.

3. Lot frontage trees shall be installed according to the following guidelines:

    a. Lot frontage trees are required in the front yards of lots in new developments. Boulevard trees in new developments shall only be installed on City approved boulevard tree routes. The only exception would be if an agreement is made with a homeowners' association or other such organization where the responsibility to maintain the trees is that of the named organization in perpetuity. Lot frontage trees in new developments

shall be installed on private property in the front yard at a minimum spacing of one (1) tree for every 40 feet of lot frontage or one (1) tree per lot if 40 feet is not feasible.

b. Boulevard trees in new developments shall be located on City approved boulevard tree routes and be installed at a minimum spacing of one (1) tree for every 40 feet of boulevard frontage or one (1) tree per boulevard frontage if 40 feet is not feasible.

c. Lot frontage trees in new developments shall be planted by the developer per the Development Contract on private property 8 feet from the front property line and shall be installed in a parallel line to the front lot line.

d. Boulevard trees in new developments shall be planted by the developer per the Development Contract on City approved boulevard tree routes in the center of the City boulevard width between the property line and curb or the sidewalk and curb. The distance trees may be planted from curbs, sidewalks, trails or pavement shall be no closer than 4 feet.

4. The construction of any retaining walls within the public ROW will need prior approval of the City Engineer. All retaining walls that need to be constructed in the public right-of way shall be designed and constructed in accordance with MnDOT Road Design Manual, Chapter 9, Section 4. All Retaining walls in the public ROW shall be designed for an equivalent live load surcharge of 2 feet. Soil borings and a geotechnical report will be required for each wall. All materials used shall be on the approved list of materials as maintained by the MnDOT Geotechnologies Unit. Dry-cast modular walls are not allowed. The retaining wall construction will require the submittal of details, plans, and specifications for review by City staff.

Trails and Sidewalks

Trails and sidewalks shall conform to the most recent editions of "Guiding Documents" (See page 15) or as modified herein.

The Developer shall obtain all regulatory agency permits and approvals including, but not limited to, those listed in item 0 of the "General Engineering Requirements" (See page 13) prior to beginning of construction.

The following are specific requirements related to the design of trails and sidewalk construction:

1. Concrete pedestrian curb ramps are required when sidewalks or pathways intersect with curbs. The ramp shall be constructed according to the latest applicable revision of City Plate No.'s STR-17, STR-18, and STR-19 and shall comply with current ADA Standards.

2. The design and construction of sidewalks and trail ways shall be in accordance with the City's Comprehensive Plan and City Standard Detail Plates.

3. The design and construction of sidewalks and shall conform to the City's Standard Detail Plates and City ordinances. Concrete walks shall be 5 feet wide. Trails along the boulevard in front of residential property shall be 8 feet wide. Trails constructed between residential or commercial lots shall be at least 10 feet wide. Trails constructed in the interior of parks, along ponds, wetlands, or greenways shall be at least 10 feet wide with preference given for greenway trails to be at least 12 feet wide.

4. Trails shall be constructed in accordance with the City's Comprehensive Plan Materials used for trail and sidewalk construction shall be in accordance with City Plate No. STR-21.

Storm Water Performance Measures

Volume Management

1. For development projects that create 1 acre or more of new impervious surface, volume control practices must be incorporated that hold the greater of the following volumes:

    a. The runoff volume for the 2-year 24 hour storm to pre-project conditions.

    b. A volume of 1 inch of runoff from the new impervious surface.

2. Volume control practices shall be separate from, but may discharge to, surface waters. Surface waters do not include man made drainage systems that convey storm water to a compliant permanent storm water management system.

3. Infiltration practices shall be utilized to the fullest extent practicable. Filtration or other volume control practices may be utilized if the depth of excavation to the bottom of the engineered soil layer of the practice exceeds 5 feet as measured from the proposed finish grade surrounding the proposed practice.

4. When using infiltration for volume control, the following infiltration rates shall be assumed:

    a. Type A soils: 0.30 inches per hour

    b. Type B soils: 0.15 inches per hour

    c. Type C soils: 0.07 inches per hour

5. Higher infiltration rates may be used if site specific infiltration or hydraulic conductivity measurements are completed by a licensed soil scientist or engineer.

6. Infiltration areas shall be designed to infiltrate water in 48 hours or less.

7. Infiltration areas shall not be constructed in karst or fractured bedrock areas, within 400 feet of a municipal or other community supply well or within 100 feet of a private well (unless located outside of the wellhead protection zone), for runoff from fueling and vehicle maintenance areas and industrial areas with exposed significant materials, on areas with less than 3 feet vertical separation from the bottom of the infiltration system and the seasonal high water table, or in Type C and D soils.

8. Pretreatment, in the form of ponds, forebays or filter strips, shall be provided for all infiltration areas.

9. For infiltration benches adjacent to ponds benches shall have slopes no steeper than 5:1 over the proposed infiltration zone. A slope of 10:1 is preferred.

10. For those projects where infiltration is prohibited (as per the MPCA's General Permit to Discharge Storm Water Associated with Construction Activity under the NPDES/SDS), the Permittee(s) shall consider other methods of volume reduction and the water quality volume (or remainder of the water quality volume if some volume reduction is achieved) must be treated by a wet sedimentation basin, filtration system, regional ponding or equivalent methods prior to the discharge of storm water to surface waters.

11. Where the proximity to bedrock precludes the installation of any of the permanent storm water management practices outlined in Part III.D. of the MPCA's General Permit to Discharge Storm Water Associated with Construction Activity under the NPDES/SDS, other treatment, such as grassed swales, filtration systems, smaller ponds, or grit chambers, is required prior to the discharge of storm water to surface waters.

12. For work on linear projects with lack of ROW where easements or other permission for property needed to install treatment systems capable of treating the entire water quality volume on site cannot be obtained, the water quality volume that can be treated prior to discharge to surface waters must be maximized. Treatment can be provided through other methods or combination of methods such as grassed swales, filtration systems, smaller ponds, or grit chambers, prior to discharge to surface waters. A reasonable attempt must be made to obtain right-of-way during the project planning process. Documentation of these attempts must be in the SWPPP per Part III.A.5.m., as per the MPCA's General Permit to Discharge Storm Water Associated with Construction Activity under the NPDES/SDS, in the section addressing infeasibility.

Rate Control

1. Post development runoff rates shall not exceed existing runoff rates for the 1-year, 2-year, 10-year, and 100-year 24 hour (MSE 3 MN distribution or Atlas 14 nested distribution) rainfall events.

2. Numerical flow standards must be adopted at intercommunity boundaries as identified in the Vermillion River Watershed Joint Powers Organization Hydrologic Model (Latest Version).

3. For the 2-year storm event, post development runoff rates shall not exceed pre-agricultural conditions (assumed CN=58). However, the recommended minimum outlet diameter is 6 inch due to plugging susceptibility and would supersede the rate control if necessary.

Water Quality

1. A more strict water quality standard is imposed if a site discharges to a Protect, Manage 1, and Manage 2 wetland. For new development projects, no net increase from pre-project conditions for phosphorus loading (on an annual average basis in lbs/year) is allowed and for redevelopment projects, a net reduction from pre-project conditions for phosphorous loading (on an annual average basis in lbs/year) is allowed.

2. Ponds with permanent wet pools are allowed in areas tributary to the trout stream portions of the Vermillion River and its tributaries where such areas do not first drain to a waterbody with 10 or more acres of open water, **if** the applicant demonstrates:

    a. No net increase in the temperature of trout stream receiving waters resulting from the 1-year and 2-year 24 hour precipitation events and has met the volume control requirements of these guidelines.

        i. The pond design must include an appropriate combination of measures such as shading, filtered bottom withdrawal, vegetated swale discharges or constructed wetland treatment cells that will limit temperature increases.

        ii. The pond should be designed to draw down in 24 hours or less.

Temperature Control

Permit applications involving the creation of 1 or more acres of new impervious surface in the trout stream portions of the Vermillion River and its tributaries where such areas do not first drain to a waterbody with 10 or more acres of open water;

1. Must include a narrative description of the temperature sensitive practices incorporated; and,

2. The City or the Vermillion River Watershed Joint Powers Organization (VRWJPO) may limit or deny waivers, or may require additional runoff temperature BMPs, if the City or the VRWJPO finds that the site design does not minimize the potential for runoff temperature increases.

Permanent storm water management system must be designed such that the discharge from the project will minimize any increase in the temperature of trout stream receiving waters

resulting from the 1-year and 2-year 24 hour precipitation events. Projects that discharge to trout streams must minimize the impact using one or more of the following measures, in order of preference:

1. Minimize new impervious surfaces.

2. Minimize the discharge from connected impervious surfaces by discharging to vegetated areas, or grass swales, and through the use of other non-structural controls.

3. Infiltration or other volume reduction practices to reduce runoff in excess of pre-project conditions up to the 2-year 24 hour event.

4. If ponding is used, the design must include an appropriate combination of measures such as shading, filtered bottom withdrawal, vegetated swale discharges or constructed wetland treatment cells that will limit temperature increases. The pond should be designed to draw down in 24 hours or less.

5. Other methods that will minimize any increase in the temperature of the trout stream.

Submittal Requirements

To verify compliance with the standards discussed above, the following calculations must be submitted to the City.

1. Hydrologic and hydraulic calculations for the 1-year, 2-year, 10-year, and 100-year 24 hour (Atlas 14 Type II distribution) rainfall events.

2. Calculations for the storm sewer design (5-year or 10-year as required) and catch basin spacing if required.

3. Drainage calculations to verify the sizing of pipe, ponds, and EOFs.

4. Calculations that indicate proposed pond wet volumes and flood storage volumes.

5. Calculations showing infiltration sizing and credits sought.

6. Other items as determined.

Park Improvements

Prior to final acceptance by the city of Farmington and release of securities, the land deeded to the City for parks shall satisfy the following conditions:

1. Areas dedicated as park must be uniquely outloted (separate from pond or wetland areas).

2. Grading in the park shall conform to the grading plan approved by the City Engineer.

3. A minimum of 6 inches of topsoil shall have been provided by the developer dependent on subsoil material as determined by the City Engineer and Parks and Recreation Director and finish grading shall be completed as specified in the grading plan.

4. Rocks that are 2 inches or greater in diameter shall have been removed from the land to be deeded to the City for a park prior to seeding. All other debris such as tree branches, sticks and trash should also be removed prior to seeding.

5. Prior to seeding or laying sod, a starter fertilizer with a ratio of 9-23-30 should be first applied at a rate of 200 pounds per acre to the area that will be seeded or where sod will be laid.

6. Initially a quick establishing crop grass such as oat should be seeded in order to prevent soil erosion. Drill seeding and not broadcast seeding shall occur with the crop grass and perennial grass. Grass seed shall be planted at 250 pounds per acre. The grass seed mixture shall consist of either one of the two following mixtures:

    a. 30 percent Monopoly Kentucky Bluegrass, 30 percent Classic Kentucky Bluegrass, 20 percent Omega II Perennial Ryegrass and 20 percent Pennant Perennial Ryegrass

    b. 25 percent Park Kentucky Bluegrass, 25 percent Ken Blue Kentucky Bluegrass, 25 percent Line Drive Perennial Ryegrass, 25 percent Pennant Perennial Ryegrass.

7. All grass seeded areas should be straw mulched after the seeding has been completed. The mulch should be disc anchored in order to minimize erosion and shall be placed at a rate of 2 tons per acre. Mulch is required in order to help retain moisture for the seed and encourage a higher rate of germination.

8. The City will not accept the park land until the grass has been seeded and has at least 2 inches of growth above grade in order for the City to see the germination rate. The City Engineer and Park and Recreation Director or their designees shall determine, and based on germination rate, whether or not the seeded area needs to be further over-seeded due to a low germination rate.

9. The developer shall be responsible for maintaining the park land by mowing, controlling weed growth, etc. until the above conditions have been met and the all work required has been accepted by the City.

Construction Plan Standards

In order to standardize construction and achieve uniformity, the guidelines listed below shall be followed.

General Requirements

1. All sheets shall be 22 inch by 34 inch in size. Upon approval of the plans, three (3) full size sets and three (3) half-size sets shall be submitted to the City.

2. A standard title sheet shall be prepared for each project plan set. Each plan sheet shall be clearly labeled with sheet number, City project number, City project name, identification of improvements, and other appropriate information. The title sheet shall include a signature block for the City Engineer that reads "Reviewed by City Engineer".

3. A location plan shall be prepared on the title sheet, at a legible scale, indicating the entire project. An index of the construction plan sheets involved with the work and their location within the project shall be shown on the title sheet.

4. All detail drawings shall be on a separate sheet or sheets, and referenced to the proper plan sheet. City Standard Detail Plates shall be utilized whenever feasible.

5. Scale - Horizontal Scale – 1 inch = 30 feet, Vertical Scale – 1 inch = 10 feet (For full size)

6. All parcels shall be properly labeled with lot and block numbers and plat name, or PIN (in unplatted areas).

7. All streets shall be clearly labeled. Reference street stationing on all sheets. The stationing shall align with the included profile information.

8. All match line breaks shall be clean with reference points clearly marked. All plan views which are broken by a match line shall be on the same or consecutive sheets if possible.

9. Existing utilities (sanitary sewer, water main, storm sewer, etc.) shall be shown, stationed and labeled as existing.

10. Locations of existing gas, electric, cable TV and telephone lines shall be shown.

11. ROW and pavement or curb and gutter alignment data shall be shown.

12. All plans shall have properly placed north arrows for each plan sheet. Whenever possible, the north arrows should point up or to the left of the sheet.

13. Benchmarks shall be placed on all plan and profile sheets. A minimum of 2 benchmarks shall be provided. Control for the project shall come from at least 2 official MnDOT or Dakota County benchmarks outside of the project boundaries. The elevations of the benchmarks on the plan sheets shall be set from the official State or County benchmarks. The official benchmarks shall be identified by number and location on the overall record plan sheet of the project.

Specific Requirements

1. The following utilities shall be located as indicated below, to the extent practical:

    a. Sanitary Sewer - on centerline of street.

    b. Water Main - 10 feet north and east of centerline.

    c. Storm Sewer - under the south and west curb line.

2. The profile shall be directly below the plan, on the same sheet, with the stationing aligned. Stationing shall be shown on the plan view as well as on the profile.

3. All sanitary and storm sewer manholes, flared end sections and hydrants shall be numbered in both plan and profile views.

4. All hydrants, gate valves and fittings shall be stationed on the bottom of the profile. All hydrants shall be installed to the proper height and location as referenced above under “Water Main” and as indicated in City Plate No. WAT-01.

5. All sanitary services shall be drawn on the plan to the constructed length and the size and type noted. The height of each riser shall be indicated on the plans and each riser and cleanout shall be drawn on the profile view to scale. Indicate if jacked and the size of the casing. Stationing of sanitary sewer wyes shall be indicated by an "S" in front of the stationing.

6. On combination sewer and water projects, services should be located in the same trench with the sanitary sewer service line placed a minimum of 3 feet downstream of the water service line. This should be noted on the plans and "S & W" placed before the stationing.

7. All water services shall be drawn to constructed length and length noted if other than 15 feet beyond the property line (ROW line). Indicate if jacked.

8. Storm sewer plans shall indicate boundary or limits of ponding easements, pond outline, OE, HWL, acre-feet of storage, discharge rate of flow, and outlet control device for each pond.

9. A minimum of 2 benchmarks must be included within the construction plans in accordance with item 13 of “General Requirements” (See page 49).

10. All top of hydrant nut elevations must be shown.

11. A storm sewer schedule must be included with the construction plans. Include the structure number, size of structure, and proposed casting number in the schedule. Include all skimmer structures, flared end sections and sumps in this schedule.

12. Utility crossings shall be shown in the plan and profile views.

13. Show flow direction arrows in the plan section of the plan and profile.

14. The approximate invert elevation at the end of all sanitary sewer service stubs (tails) shall be shown on the plans.

15. All water fittings should be labeled as to size and type such as bends, tees, plugs, etc.

16. The size and type of all sanitary sewer and water services shall be noted on the plans.

17. All sewer and water main shall be shown in the profile with the appropriate information such as size, length, material type and class, existing and proposed surface elevations, rim elevations, invert elevations with size and direction in brackets, etc. Storm sewer plans should be on a separate sheet from sanitary sewer and water.

18. Storm sewers shall be shown on the plan and profile on the sanitary sewer and water main sheets in a different line weight. The water main and sanitary sewer shall be shown on the plan and profile on the storm sewer sheets in different line weights.

19. If storm sewer bends are utilized, provide stationing for the beginning and end points of the bends. Provide the radius of the bend utilized.

20. The utility construction plans and street construction plans shall show the centerline stationing.

21. The street construction plans shall include the typical street sections utilized.

22. Each street plan sheet shall show ROW width, street width (face of curb to face of curb), and a typical radius dimension at intersections.

23. Proposed horizontal alignment data shall be shown on the street plan sheets. Include the data on the water main and sanitary sewer plan sheets.

24. Existing and proposed vertical alignment data shall be shown on the street plan sheets. Include the data on the water main and sanitary sewer plan sheets.

25. The street construction plans shall show directional arrows for drainage. High points shall be labeled as such.

26. Show ponds, wetlands, lakes, streams or marshes.

a. Show city of Farmington's most recent Local Surface Water Management Plan watershed number, OE, and HWL for ponds.

b. Show the OE and HWL for ponds and wetlands.

c. Show OHWL elevation and DNR pond number if applicable.

d. U.S. Fish and Wildlife classification if applicable.

e. Show proposed pond storage volume.

27. Construction sheets must also be submitted for landscaping, park improvements, street lighting and project signage.

28. The park improvement plan shall show all areas dedicated as park land and the limits of turf improvements as defined in the "Park Improvements" section of these guidelines (See page 46). All bike trails and sidewalks shall be shown on the park improvement plan.

Record Plan Requirements

Record plans are required for all public and private improvements.

After completion of public or private improvements, the Developer shall provide the City Engineer with one set of record drawing plans of the project for review purposes.

Upon final approval of the record drawing plans, the Developer shall provide the City Engineer with one full size set (22 inch by 34 inch) pdf copy of the approved record drawing plans of the project. All record plans shall be clearly legible drawings, accurately drawn to scale. Proper notes and statements as specified in the City's Engineering Guidelines shall be placed on the plans.

The Developer shall also provide the City with the approved record plan drawings on disk in the City approved format as follows:

Electronic Record plans

1. Required on compact disk.

2. All information must be in AutoCAD DWG and .pdf format.

3. Approved final plat sheets submitted in Dakota County coordinates.

4. Record plan construction plan sheets shall have either descriptive layer names, or a key describing the layer names.

5. The symbol identifying the location of structures including but not limited to: hydrants, gate valves, manholes, catch basins, skimmers or other pollution control devices, catch basin manholes, flared end sections, etc., shall each be unique blocks and each type of structure shall be contained on a unique layer within the drawing. The block files shall be included on the same disc with the electronic record plan submittal.

6. The OE and the HWL for all ponds shall each be drawn as closed polylines on unique layers named for the respective elevation. For example, the layer for a HWL polyline at an elevation of 902 would be named "902".

7. Overall development plan with all utilities (curb stops, clean outs, MHs, FESs, CBs, GVs, etc.) in Dakota County coordinates.

8. Show any Dakota County monuments that were used for the survey.

After completion of construction, all manholes, catch basins, hydrants and other elements of the project shall be re-measured as part of a record plan field survey. The plans shall be corrected and modified to show the correct distances, elevations, dimensions and any other change in the specific details of the plans. All changes and modifications on the record plan

shall be drawn to scale to accurately represent the work as constructed. Incorrect elevations, distances, etc. shall be crossed out from the original plan sheets and corrected as necessary to complete the record plan. Do not remove the proposed elevations from the plan sheets.

At a minimum, record plans shall include:

General

1. The prime Contractor's names should be noted on each page.
2. Record Plan stamp with date should be shown on each page.
3. All ties should be less than 100 feet, wherever practical. A minimum of two (2) ties shall be provided using the following priorities:
    a. Fire hydrants.
    b. Manholes.
    c. Catch basins.
    d. The building or structure being served, with address.
    e. Neighboring structures, with the address noted.
    f. Buildings or other permanent structures (bridges, telephone boxes, pedestals, transformers, etc.).
    g. Power poles, street lights, etc.

Grading Plan

1. Existing ground elevations at all lot corners.
2. Spot elevations at all house pads (hold down elevations).
3. Spot elevations every 50 feet in areas dedicated as parkland.
4. Spot elevations of pond bottom (50 feet maximum grid).
5. Drainage and utility easement and outlot spot elevations.
6. Pond water elevations and date taken.
7. Prior to close out, record plans of ponding areas must be done to verify depths after house construction is complete.

NOTE: The record grading plan does not replace the approved grading plan. This plan is merely a tool to observe the grading of the area prior to home construction. The approved grading plan will still be utilized for all home construction purposes.

Sanitary Sewer, Water Main

1. Record plan elevations (invert and rims), pipe lengths, and grades for all lines.
2. Note describing pipe type and size for each run and for services.
3. Wye stationing from TV reports.
4. Elevation of riser.
5. Cross out proposed elevations and write record plan above –DO NOT remove proposed elevations from plans.
6. All curb boxes and sanitary sewer service cleanouts shall be tied in accordance with the provisions of item 3 of the "General" section of "Record Plan Requirements" (See page 53).
7. All water main gate valves and fittings shall be tied in accordance with the provisions of item 3 of the "General" section of "Record Plan Requirements" (See page 53).
8. Record plan elevations of each hydrant at top nut.
9. Any deviations of fittings from those shown on the plan.
10. Note describing pipe type and size for mainline and for services.
11. Stationing of corporation stop on water main.

Storm Sewer

1. Record plan elevations (invert and rim), pipe lengths, and grades for all lines.
2. Note describing pipe type and size for each run.
3. Cross out proposed elevations and write record plan above –DO NOT remove proposed elevations from plans.
4. Storm sewer bends, if utilized, shall be tied at the beginning and end points in accordance with the provisions of item 3 of the "General" section of "Record Plan Requirements" (See page 53).
5. Record plans on all ponding areas are required. Plans shall indicate finished contours at 2 foot intervals, OE, HWL, and the acre-feet of storage for each ponding area along with the final storm sewer plans. Upon completion of pond construction, ponds shall be cross-

sectioned to confirm that they have been constructed to the proper volume and shape. Record plans shall be prepared for all ponding areas just prior to closing project out.

Streets

1. Top of curb elevation (100 foot spacing).

2. Show where fabric has been placed in the streets on the plan portion of the record plans.

3. Show any areas where subgrade correction was needed, type of correction, and the size of the corrected area. Include ties to nearby structures.

4. Show location of all drain tiles on the plans.

Construction Requirements

No construction shall commence on any project until the construction plans for the improvements are approved by the City Engineer.

Subdivision Monumentation

Minnesota State Statute requires subdivision monumentation of all plats within 1 year of recording with the County. The Developer shall establish all subdivision monumentation that is necessary to provide control for the installation of public infrastructure improvements.

Construction Staking Guidelines

Cut Sheets

1. Copies of cut sheets shall be provided to the City's project inspector and the Contractor prior to construction. **The City will order the Contractor to cease working whenever this requirement is not met.**

2. All cut sheets must identify bench marks used, bench mark elevations, actual hub elevations, proposed elevations, and cuts or fills for all entries.

Sanitary Sewer

1. Line and grade stakes shall be set every 25 feet for the first 100 feet out of the downstream manhole, and every 50 feet thereafter to the next manhole.

2. A line reference stake shall be set for each manhole.

3. Wye locations, stationed from the downstream manhole, shall be staked and the stationing shown on the cut sheets.

4. Line reference stakes shall be set for cleanout locations. Proposed elevations at the top of the cap shall be staked and shown on the cut sheets.

5. Proposed elevations of service inverts at the 45 degrees bend for the end riser shall be staked and shown on the cut sheets.

6. Proposed structure top elevation and upstream and downstream invert elevations shall be shown on the cut sheets (manhole castings shall be set 0.25 inch to 0.5 inch below finished street grade).

7. Cut sheets shall be provided to the City for all sanitary sewer construction.

Water Main

1. Line and grade stakes shall be set every 50 feet (top of water main shall be staked 7.5 feet below finished elevation).

2. Fitting locations shall be staked and the stationing shown on the cut sheets.

3. Line and grade stakes shall be set for all hydrants.

4. Proposed elevations at the tops of curb boxes shall be staked and shown on the cut sheets. Line reference stakes shall be set for curb box locations.

5. Cut sheets shall be provided to the City for all water main construction.

Storm Sewer

1. Line and grade stakes shall be set every 25 feet for the first 100 feet out of the downstream manhole, and every 50 feet thereafter to the next manhole or catch basin.

2. An offset hub and line reference stake to back of curb shall be set for all catch basins and catch basin manholes.

3. Catch basin top and invert elevations and manhole top elevation and upstream and downstream invert elevations shall be shown on the cut sheets.

4. Cut sheets shall be provided to the City for all storm sewer construction.

Streets

1. When centerline stakes are set for grading subgrade, cut sheets shall be provided.

2. Line and grade stakes shall be set every 25 feet and for all beginning, mid and end radius points of the curb at street intersections.

3. Cut sheets shall be provided to the City for all curb and gutter construction.

Inspection

It is the policy of the city of Farmington that any construction activity within the City be monitored or inspected by City staff or by a designated representative on behalf of the City. The developer is responsible to have a representative from his/her engineering firm on site at all times.

Testing Requirements

In order to assure quality materials and workmanship, the following tests shall be required:

Sanitary Sewer

1. Closed Circuit Television - Required on all sanitary sewer lines. A copy of the test results, logs, reports, and digital video media must be submitted to the City Engineer for review and approval. See item 27 on page 18 for specific requirements.

2. Lamping - Physical inspection of all lines and manholes is required in addition to TV inspection.

3. Infiltration - 100 gals/inch diameter/mile of pipe/24 hours. If infiltration is present, tests will be required from manhole to manhole.

4. Air Test - Low pressure air shall be introduced into the plugged test section until the internal air pressure reaches 4.0 psi greater than the average back pressure of any ground water pressure that may submerge the pipe. At least 2 minutes shall be allowed for the air temperature to stabilize before readings are taken and the timing started. During this time the Contractor shall check all plugs with soap solution to detect plug leakage. If any plugs are found to leak, air shall be bled off, the plugs shall be re-tightened, and the air shall be reintroduced into the line. The sewer section under test will be accepted as having passed the air leakage test if it does not lose air at a rate to cause the pressure to drop from 3.6 psi to 3.0 psi in less time than 1/2 minute per 1 inch in diameter of the pipe tested.

5. Mandrel - Maximum 5.0 percent deflection for all PVC pipe, 30 days after installation. The mandrel must be hand pulled. Areas where the mandrel test failed must be excavated and repaired; the vibratory method of repair will not be acceptable.

6. Mechanical compaction tests required on all trench backfill and report copies must be submitted to the City.

7. Tracer wire conductivity/cleanout inspection – every sewer service cleanout shall be inspected to ensure it is clear of debris, that the proper cap is utilized, is traceable (with metal locator), and is functioning, and that the tracer wires have conductivity to the main and to the service termination in the lot.

Water Main

1. Conductivity - 350 amps for 4 minutes, 400 amps for 1 minute at 30 volts, without wide voltage fluctuation. The conductivity test is required to be completed prior to the pressure test.

2. Pressure - 150 psi for 2 hours with no more than 2 psi allowable drop. Liquid-filled gauge to be used, and will have 1 psi increments. This test must be performed after the conductivity test has passed. After the entire system has passed, each valve will be tested for a minimum of 20 minutes with no more than 1 psi allowable drop.

3. Disinfection - Before being placed in service, the completed water main installation shall be disinfected and flushed. No sooner than 24 hours after the final flushing has been completed, the water shall be tested for bacteriologic quality to determine if it meets the standards prescribed by the Minnesota Department of Health. Disinfection materials and procedures, and the collection and testing of water samples shall be in accordance with the provisions of AWWA C651 and shall meet the requirements of the Minnesota Department of Health. The City will perform the flushing operation and sample collection, and will submit the sample to a qualified testing agency. Coliform bacteria shall not be present in the water sample at any level. The test results will be discussed with the developer after the City receives them. After receiving a passing test the City will open the valves to connect the new pipe to the public system.

4. Compaction tests are required on all trench backfill. The Developer shall provide copies of the test results to the City for permanent records.

Storm Sewer

1. Pipe Class - Pipe class shall be stamped on all pipes. Certification documentation may be required at the discretion of the City Engineer.

2. Mechanical compaction tests are required on all trench backfill and report copies shall be submitted to the City Engineer.

3. Lamping - Physical inspection of all lines and manholes is required.

Streets

1. Soil Borings - Logs and recommendations for subgrade correction and section design shall be submitted to the City Engineer. Soil boring reports must be included within the specifications.

2. Geotextile Fabric - Certification documentation shall be submitted to the City Engineer.

3. Compaction Tests - In accordance with MnDOT Section 2105.3F1, "Specified Density Method".

4. Subgrade Test Rolling - Prior to placement of aggregate base, the subgrade shall be test rolled substantially in accordance with MnDOT Section 2111. The City Engineer or authorized representative may allow some modification in the procedures outlined in Section 2111 to accommodate on-site equipment.

5. Tolerances - Physical inspection of subgrade and aggregate base by City staff. Tolerance limits include $\pm$0.10 feet on subgrade and $\pm$0.05 feet on aggregate base.

6. Aggregate Base Analysis (Gradation) - The test results shall be supplied to the City Engineer.

7. Bituminous Mixture Analysis (Gradation, bituminous extraction, density) - Asphalt content shall be determined by the design mix formula method, which shall be submitted to and approved by the City Engineer prior to the work being performed.

8. Bituminous density testing by coring shall be performed in accordance with MnDOT 2360. Coring worksheets and test results shall be submitted to the City Engineer.

9. Concrete Analysis (Slump, air, and compressive strength) - The mix design must be submitted to the City Engineer prior to the work being performed.

10. Testing of trail and sidewalk construction materials shall be the same as for street construction.

Construction Requirements

Sanitary Sewer

1. Trench widths must, in all cases, be held to a maximum width of 2 feet greater than the outside diameter of the pipe measured at the top of the pipe, unless the pipe is designed for unlimited trench width conditions. Bedding of pipe shall be Class "C" or greater.

2. When the bottom of the trench is soft or where in the opinion of the City Engineer unsatisfactory foundation conditions exist, the Contractor shall excavate to a depth to ensure proper foundation. The excavation shall then be brought up to grade with thoroughly compacted granular materials.

3. Backfill at the "pipe zone" shall be accomplished with select material hand placed and tamped carefully around and over the pipe to a depth of 1 foot above the top of the pipe. Each successive layer of backfill material shall be thoroughly compacted using suitable mechanical compaction equipment. The type of compactor is dependent on the type of backfill material used. The backfill material shall be compacted to 95 percent of the standard moisture density relationship of soils (ASTM D-698) except for the upper 3 feet of the trench if the sewer lies within an existing or future street ROW, alley, parking lot, etc. The upper 3 feet shall be compacted to 100 percent density.

4. Sewer services shall be extended from the main to a location 15 feet beyond the property line. Sewer services may not be placed directly into manholes. Cleanouts must be installed on all services at the property line or within 5 feet of the building face, within the easement, for services off of a sewer main that is not within a public street ROW. Service risers are required, when necessary, after the cleanout to bring the service line termination to the same elevation as the water service (7.5 feet to 8 feet) or beyond ground water elevation.

5. No inside drops are allowed unless approved by the City Engineer.

6. Copies of any shop drawings shall be provided to the City Engineer.

Water Main

1. Shall be placed with a minimum of 7.5 feet of cover over the top of the pipe.

2. Backfilling at the "pipe zone" shall be selected backfill material and shall be deposited in the trench by hand and mechanically tamped in 6 inch layers to an elevation of 1 foot above the top of the water main to provide Class "B" bedding of the pipe.

3. Pipe foundation, backfilling and compaction shall be as outlined under “Sanitary Sewer” items 2 and 3 (See page 61).

4. Water services shall be extended from the main to a location 15 feet beyond the property line. 1 inch services shall be the smallest allowable pipe diameter.

5. Gate valves shall be required on all hydrants. Hydrants, valves and leads shall be restrained with megalugs or AFC ALPHA ends (See City Plate No. WAT-01).

6. Concrete thrust blocking shall be installed in accordance with City Plate No. WAT-05.

7. Megalugs and concrete thrust blocking shall be utilized on all fittings.

8. All hydrants and gate valves are to be set at required height (See City Plate No. WAT-01) after curb and gutter, lawns, boulevards, etc. are completed.

9. Copies of any shop drawings shall be provided to the City.

Storm Sewer

1. Storm sewer pipe shall be installed in accordance with MnDOT Section 2501, except as modified or altered herein.

2. Pipe foundation, backfilling and compaction shall be as outlined under "Sanitary Sewer" items 2 and 3 (See page 61).

3. Catch basin leads or storm sewers which cross the street in areas where soils are highly frost susceptible shall be backfilled in accordance with the guidelines outlined in the MnDOT Road Design Manual, Section 8-6.01.09. A perforated drain pipe shall be placed on the bottom of the aggregate bedding, which shall drain into a catch basin structure. A detail for this construction shall be included on the plans. In lieu of the MnDOT method, the City may consider an alternative design. Any alternative design shall be reviewed and approved by the City Engineer.

4. Manholes and catch basins shall be constructed in accordance with City Plate No.'s STO-1 through STO-9.

5. Copies of any shop drawings shall be provided to the City Engineer.

6. Maximum lateral adjusting ring offset is 3 inches.

7. All inlets to the storm sewer system shall be fitted with appropriate erosion control during construction or as directed by the City Engineer.

Streets

1. Street construction shall be in accordance with the following MnDOT specifications:

    a. Common excavation and embankment - MnDOT Section 2105. Roadway embankments shall be compacted by the "Specified Density Method" as outlined in Paragraph 2105.3.F1.

    b. Aggregate Base - MnDOT Section 2211. Aggregate base shall be compacted by the "Specified Density Method" as outlined in Paragraph 2211.3D2a.

    c. Plant-mixed Bituminous Base - MnDOT Section 2360.

    d. Plant-mixed Bituminous Wear - MnDOT Section 2360. Steel wheel and rubber tired rollers required for finish. Place at least 1 year after base course has been placed.

    e. Cold Weather Paving – Paving after November 1st will require written authorization from the City Engineer.

    f. Tack Coat - Installed in accordance with MnDOT Section 2357.

    g. Concrete Curb and Gutter - MnDOT Section 2531. Curb section shall be as indicated on Plans in accordance with City Plate No. STR-01. Two (2) No. 4 reinforcing rods, 20 feet long, shall be placed in the lower portion of the curb crossing all sewer and water service trenches, fire hydrant leads, storm sewer trenches and other excavations or trenches. Two (2) No. 4 reinforcing rods 10 feet long shall also be placed on each side of all catch basins located within the curb and gutter. Joints shall be installed as outlined in Paragraph 2531.3E. Maximum spacing of expansion joints shall be 60 feet for hand formed curb; 200 feet for slip formed curb. Concrete curing and protection shall be in accordance with Paragraph 2531.3G.

2. Intersection Radius – The minimum curb radius at intersecting streets shall be 20 feet to face of curb for residential street intersections, and 30 feet to face of curb for collector street intersections. Where surmountable curb and gutter is used, the radius portion shall be changed to B-618 curb and gutter with a 10 foot transition extending from each end of the radius portion. (See City Plate No. STR-02).

3. Streets shall be constructed to at least the minimum standards shown on the typical sections detailed on City Plate No.'s STR-05, STR-05A, STR-05B, STR-06, STR-06A, STR-06B and STR-07. Subgrade conditions, traffic volumes or other circumstances may require a larger section.

4. The Developer or his Engineer shall have a soils analysis prepared for the streets within the project area. Soils reports shall identify all peat, muck, organic, black dirt and other unsuitable material to be removed from beneath the subgrade. The soils report shall also identify and make recommendations on the subgrade design; the subgrade stability (R

value); the amount of subgrade correction to be anticipated; the location and estimated amount of subsurface drain tile; the pavement design section and other factors that may affect the life and utilization of the street, based on a 20 year anticipated design life.

5. Prior to placement of geotextile fabric (if required) and base course, the Contractor shall test roll the street subgrade. The Contractor shall provide a loaded tandem axle truck with a minimum gross weight of 25 tons and a weight ticket for the test roll vehicle if required by the City Engineer. The test rolling shall be done under the direction of the City Engineer. The City may require test rolling of the aggregate base, once the base section has been constructed.

6. After acceptance of test rolling and completion of the tolerance of subgrade, a geotextile subgrade stabilization fabric shall be installed (if required) in accordance with manufacturer's recommendations.

7. Subsurface drain pipe shall be installed at the low point of all streets, connecting to low point catch basins at locations recommended in the soils analysis and at other places that may be required to intercept subsurface moisture.

8. It is desirable for the Developer to complete the street subgrade, aggregate base, curb and gutter and bituminous base course within the same construction season as the utility installation. The bituminous wear course shall be completed in the following year, after a minimum of one (1) freeze-thaw cycle after utility construction is complete. Installation of final wear course in the same season as utility construction is prohibited.

9. If the Developer is allowed to install curb and gutter and the first layer of bituminous in the same season as the utilities, all castings within the roadway shall be adjusted to a point ????? inch below the level of the bituminous base surface and readjusted later prior to placement of the final wear course. Ramping of castings will not be permitted.

10. Prior to placing the bituminous wear course, the Developer shall repair, replace and/or correct any and all settlements, cracks, breakups, markings, scars, or other damage or abuse. Damaged curb and gutter will be marked out for removal and replacement by City staff.

11. The City will plow snow on Developer's streets only if at least one course of bituminous surfacing is in place and all castings within the roadway are adjusted to proper elevation and crown. The City's Streets and Utilities Supervisor will inspect the development's streets to determine if additional improvements must be completed to allow for safe plowing operations.

12. Before any excess excavation material is deposited on private property, the Contractor must get permission in writing from the property owner. Special care should be taken when stockpiling or disposing surplus material in areas that may involve future buildings or foundations.

Trails and Sidewalks

1. Trails and sidewalks shall be constructed in accordance with the MnDOT Bikeway Facility Design Manual and the City's Comprehensive Plan (Chapter 8 "Parks and Recreation").

2. Avoid long steep grades; 6.0 percent maximum slope preferred, 8.0 percent maximum where unavoidable by existing terrain. Use flatter grades or slopes at intersections with streets or other trail ways; 2.0 percent maximum to allow adequate time to stop.

3. Provide positive surface water drainage away from the trail with shallow drainage swales or ditches, culverts and/or storm sewer as required. For drainage purposes, the minimum slope is 0.5 percent. Use 0.02 feet per foot minimum cross-slope or crown and 0.04 feet per foot maximum cross-slope.

4. Shape and compact subgrade to 100 percent standard proctor density. Excavate and remove all topsoil, black dirt, peat, muck or silt soils from beneath pathway as directed by engineer; backfill with select grading material. Subgrade of trail way shall be a minimum of 2 feet above water table.

5. Avoid sharp or sudden changes in horizontal and vertical alignment. Provide adequate site distance for bicycles at intersections and on vertical changes in alignment. Provide clearance for vertical obstructions (trees, power poles, signs, etc.)

6. Bicycle trails are to be marked and signed in accordance with the Minnesota Manual on Uniform Traffic Control Devices, latest edition.

7. Minimum standards shall be increased as necessary where required by poor subgrade soil, traffic volumes, hazardous conditions, or other special circumstances. Extra width and/or flatter curves may be required on long downhill slopes for additional reaction space.

8. Parklands shall be improved per the "Park Improvements" section of these guidelines (See page 46) and maintained by developer until final acceptance of the project is completed.

Final Project Completion/Acknowledgment

Acceptance of Utilities

Once the utility construction and all related work order items are complete and upon request from the Developer, the City will accept the utilities. The Developer's request must be accompanied by final pay estimates and lien waivers for related work. See the development agreement for specific approval requirements. Once the utilities are accepted, the warranty period for the utilities will begin.

Acceptance of Streets

Once the street construction and all related work order items are complete and upon request from the Developer, the City will accept the streets. The Developer's request must be accompanied by final pay estimates and lien waivers for related work. See the development agreement for specific approval requirements. Once the project is accepted, the warranty period for the streets will begin.

Building Permits and Certificates of Occupancy

Issuance of Building Permits

1. The Building Official will not issue building permits for structures or buildings in new subdivisions until the following items have been successfully completed.

    a. Sanitary sewer, storm sewer and water mains have been installed and all tests have passed.

    b. Small utilities including electric, gas and telephone services are installed and service is available.

    c. Final site and boulevard grading including seeding and erosion control are completed and certified as complete by the Developer's Engineer.

    d. All street curb and gutter and the first lift of bituminous (with iron raised and adjusted) is placed adjacent to the property. The City Engineer is authorized to waive this requirement when weather related circumstances prevent completion of street projects before the end of the construction season. The Developer is responsible for maintaining said streets in a condition that will assure the access of emergency vehicles at all times when such a waiver is granted.

    e. All street signs must be installed.

    f. Bike trails and sidewalks are installed.

    g. Record grading plan submitted and reviewed by the City Engineer.

2. The issuance of individual building permits for residential property shall be based on the subdivision grading plan approved by the City as part of the development site plan process. Changes to the actual grading of the lot or structure type noted on said plan shall be subject to a separate review and approval process by the City. To initiate this review process, a revised grading plan clearly indicating proposed changes to the approved grading plan shall be submitted for review and approval before the building permit is issued. Further, the developer shall be required to acknowledge the revised plan as a modification to the original overall site grading plan. It is Farmington's intent to assure the revised plan fits the lot, is consistent with area development and does not negatively impact adjacent property or structures.

3. Commercial, residential and industrial building permit applications shall be accompanied with a Certified Survey of the lot, locating all existing and proposed buildings, outlining all setbacks, setting the first floor elevation and indicating the utility connection points.

Issuance of Certificates of Occupancy

1. No structure or building shall be occupied without first obtaining a Certificate of Occupancy from the Building Official.

2. Certificates of Occupancy shall not be issued until permanent sanitary sewer, water, gas, and electric services are connected to the building and in operating condition, and they have been inspected and approved.

3. Certificates of Occupancy shall not be issued until there is suitable street access to the parcel being occupied. Such suitable street access shall consist of a completed subgrade, aggregate base and the base course of bituminous.

Miscellaneous

1. Prior to starting construction, a representative of the Developer, a representative of the Consulting Engineer and a representative of the Contractor shall hold a preconstruction meeting with the City Engineer and other interested parties to discuss the method and means of supplying public and private utility services, a work schedule as to the construction phases, and a general review of the specifications and City requirements. Within 10 days of the pre-construction conference, the Developer shall submit to the City Engineering Division a written schedule of proposed construction activity, including estimates of time to complete each phase.

2. The Developer's Contractor shall make arrangements for receiving water from public or private sources and shall secure the necessary permits and pay the regular charges. Disposal of any waste water or any test water into the City sanitary sewer system is prohibited unless written approval is obtained from the City. The City Engineer shall be notified a minimum of 48 hours prior to commencing any work. Contractors shall be subject to being shut down if proper notification is not given to the City. Contractors shall not operate existing gate valves or hydrants, except under extreme emergency conditions.

3. Proper notification of improvements shall be given by the Developer or his/her Engineer to the proper governmental agencies, watershed districts, area residents, etc., that could be affected by said construction. All necessary permits shall be obtained prior to commencing any work. All special requirements of the governmental agencies having jurisdiction over the work shall be complied with.

4. The Developer's Contractor shall furnish, erect and maintain signs and barricades as provided in MnDOT Section 1710, "Traffic Control Devices" to protect the public. The City Engineer shall be notified a minimum of 48 hours prior to the proposed partial blockage or closure of any street, alley or public ROW. No street or public ROW shall be closed without the proper approval of the City Engineer.

5. It is the responsibility of the Developer's Contractor to protect and leave undisturbed markers or monuments set for the subdivision of land. In the event that any are destroyed, they shall be replaced at the Developer's and/or Contractor's cost.

6. The Developer shall immediately repair or replace, without additional compensation, any defective workmanship or material during the construction period, or within 1 year after the date of final acceptance of the work, regardless of prior inspections and approvals.

7. City streets utilized for access or egress to and from the project site shall be kept free of dirt and other debris resulting from construction activity, including material delivery. Any damage to access or egress streets shall be repaired or corrected by the Developer at his/her expense. Adequate control of dust shall be maintained by the Developer's Contractor.

8. Access routes shall avoid local streets in developed neighborhoods whenever possible. Access routes for construction are subject to final approval by the City Engineer.

9. The City will require the Contractor to submit a list of materials and respective suppliers as well as all tests of materials to the City Engineer. Where material or labor supplied by the Contractor or Developer shall be rejected by the City as defective or unsuitable, then such rejected material shall be removed, disposed of off the project site, and replaced with approved material. The work shall be completed to the specifications and approval of the City Engineer.

10. The Contractor shall supply the City with a list of all subcontractors and material suppliers.

11. Barricades shall be placed at the end of all dead-end streets.

12. All trees, stumps, brush, etc., shall be cleared within 2 feet of the edges of sidewalks and trails. The only exception will be for hardwood specimen trees or other exceptional items of high significant value, as determined by the City Engineer.

13. The standard 10 foot utility and drainage easement adjacent to the street ROW shall be cleared and grubbed for the placement of utilities. The only exception will be for hardwood specimen trees or other exceptional items of high significant value, as determined by the City Engineer.

SMALL WIRELESS FACILITY DESIGN AND REVIEW GUIDELINE POLICY

1. PURPOSE AND COMPLIANCE

In implementing Chapter 11 of Title 8 of the Farmington City Code, the City Council of the City of Farmington (the "City") finds that in order to protect the public health, safety and welfare of its citizens and to reasonably manage and protect the public rights-of-way (the "ROW") and its uses in the City, it is in the best interest of the City and its residents and businesses to establish Small Wireless Facility Design and Review Guidelines (the "Guidelines") to provide the aesthetic requirements and other specifications and reasonable conditions that small wireless facilities installed within the public ROW must meet prior to installation and following installation within the City. Although small wireless facilities installed outside of the ROW are not bound by these Guidelines, they may be used to inform their installations.

The objective of these Guidelines is to strike a balance between preserving and protecting the character of the City through careful design, siting, and camouflaging techniques to blend these facilities into their surrounding environment and provide other reasonable conditions upon such placement and use of the ROW, while enhancing the ability of small wireless facilities carriers to deploy small wireless facilities in the City effectively and efficiently so that residents, businesses, and visitors benefit from ubiquitous and robust wireless service availability.

These Guidelines apply to requests to locate small wireless facilities in the ROW and ongoing use of the ROW for such purposes. These Guidelines are established pursuant to Chapter 11 of the Farmington City Code and applicable law. These Guidelines are administered through the permitting process contained therein as conducted by the City Engineering Department.

Placement or modification of a small wireless facilities and/or wireless support structures shall comply with these Guidelines at the time the permit for installation or modification is approved and as amended from time to time. Wireless service providers and permittees are required to comply with Chapter 11 of Title 8 of the Farmington City Code.

2. AESTETIC REQUIREMENTS

A. PHOTO SIMULATIONS

For all applications to locate small wireless facilities in the ROW, photo simulations from at least three reasonable line-of-site locations near the proposed project site. The photo simulations must be taken from the viewpoints of the greatest pedestrian or vehicular traffic. Angle of photo simulation separation must be at least 90 degrees or greater and provide a full profile depiction. Photo simulations must be included in the application packet.

B. SMALL WIRELESS FACILITY ANTENNAS

1. Each small wireless facility antenna ("antenna") shall be located entirely within a shroud or canister type enclosure.
2. The diameter of the antenna or antenna enclosure should not exceed the diameter of the top of the wireless support structure pole, and to the maximum extent practical, should appear as a seamless vertical extension of the pole. In no case shall the maximum diameter of the shroud be wider than one and one half times the diameter of the top of the pole. Where maximum shroud diameter exceeds diameter of the top of the pole, the shroud shall be tapered to meet the top of the pole. The enclosure shall not exceed six cubic feet in volume.
3. All antenna shall be mounted to the top of the wireless support structure pole, aligned with the centerline of the wireless support structure.
4. Tree "topping" or the improper pruning of trees is prohibited. Any proposed pruning or removal of trees, shrubs or other landscaping already existing in the ROW must be noted in the application and must be approved by the City.

C. CABLES AND WIRES

All cables, wires and connectors related to the small wireless facility must be fully concealed on the wireless support structure and shall match the color of the wireless support structure. There shall be no external cables and wires related to the small wireless facility hanging off or otherwise exposed on the wireless support structure.

D. COLORS

All colors shall match the background of any wireless support structure that the facilities are located upon. In the case of existing wood poles, finishes of conduit shall be zinc, aluminum or stainless steel, or colored to match those metal finishes. Equipment cabinets shall be finished to match the color of facilities in the surrounding neighborhood or district, as determined by the City.

E. EQUIPMENT ENCLOSURES/CONCEALMENT

1. Equipment enclosures, including electric meters, shall be as small as possible. Ground mounted equipment shall incorporate concealment elements into the proposed design matching color and materials of the wireless support structure unless other materials or colors are approved by the City. Concealment may include, but shall not be limited to, landscaping, strategic placement in less obtrusive locations and placement within existing or replacement street furniture.
2. Radio equipment shall be fully enclosed within an equipment cabinet or concealed within the antenna shroud enclosure matching color and materials of the wireless support structure unless other materials or colors are approved by the City.
3. Landscape screening should be provided and maintained around exterior equipment enclosures unless otherwise approved by the City. The planting

quantity and size should be such that 100% screening is achieved within two years of installation.

F. SIGNAGE/LOGOS/LIGHTS/DECALS/COOLING FANS

1. Signage: The small wireless facility operator/permittee shall post its name, location identifying information, and emergency telephone number in an area on the cabinet of the small cell facility that is visible to the public. Signage required under this section shall not exceed 4 inches x 6 inches, unless otherwise required by law (e.g. RF ground notification signs) or the City. If no cabinet exists, the signage shall be placed at the base of the pole.

2. Lights: New small wireless facilities and wireless support structures shall not be illuminated, except in accord with state or federal regulations, or unless illumination is integral to the camouflaging strategy such as design intended to look like a street light pole.

3. Logos/Decals: The small wireless facility operator/permittee shall remove or paint over unnecessary equipment manufacturer decals. The color shall match or shall be as approved by the City. Small wireless facilities and wireless support structures shall not include advertisements and may only display information required by a federal, state or local agency. The small wireless facility operator/permittee shall utilize the smallest and lowest visibility radio-frequency (RF) warning sticker required by government or electric utility regulations. Placement of the RF sticker shall be as close to the antenna as possible.

4. Cooling Fans: In residential areas, the small wireless facility operator/permittee shall use a passive cooling system. In the event that a fan is needed, the small wireless facility operator/permittee shall use a cooling fan with a low noise profile.

EXAMPLE ACCEPTABLE VS UNACCEPTABLE SMALL CELL INSTALLATION ON LIGHT POLES

Unacceptable

Acceptable

3. LOCATION REQUIREMENTS

A. MOST PREFERABLE LOCATIONS

The following are the most preferred areas for new small wireless facilities in the order of preference (1 being most preferable):

1. Industrial Districts if not adjacent to a park or residential district.
2. Highway Rights of Way areas if not adjacent to a park or residential district.
3. Retail and Commercial Districts if not adjacent to a park or residential district.

B. COLLOCATION PREFERENCE

It is the City's strong preference that whenever an applicant proposes to place a new small wireless facility that the applicant collocate the same on existing wireless support structures.

C. LEAST PREFERABLE LOCATIONS

The following are the least preferred areas for new small wireless facilities in the order of preference (2 being least preferable).

1. Residential Districts
2. Parks

D. CONSIDERATION OF ALTERNATE LOCATIONS

The City reserves the right to propose an alternate location for a small wireless facility and/or wireless support structure to the one proposed in the application within one hundred feet of the proposed location or within a distance that is equivalent to the width of the ROW in or on which the small wireless facility and/or wireless support

structure is proposed, whichever is greater, which the operator shall use if it has the right to use the alternate location on reasonable terms and conditions and the alternate location does not impose technical limits or additional costs.

E. GUIDELINES ON PLACEMENT

The City desires to promote cleanly organized and streamlined facilities using the smallest and least intrusive means available to provide wireless services to the community.

Generally, a small wireless facility and/or wireless support structure shall match and be consistent with the materials and finish of the wireless support structure, adjacent City poles, and of the surrounding area adjacent to their location. In the absence of adjacent City poles, the wireless support structure shall match the materials and finish of the adjacent utility poles.

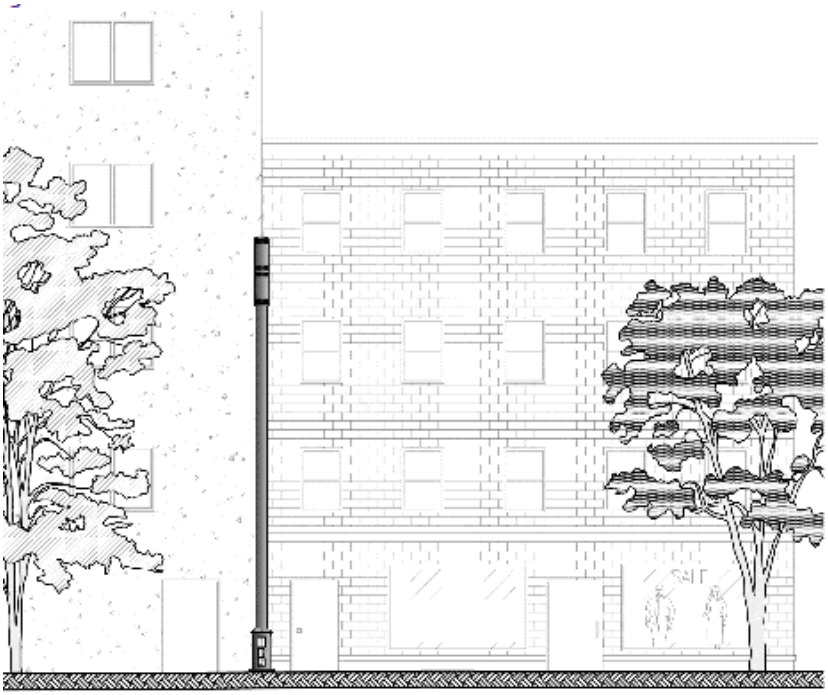
All proposed small wireless facilities located within residential districts and historic districts shall apply for a special land use permit (see Appendix A for map). In addition, small wireless facilities are strongly discouraged from locating within the historic downtown district and more specifically Division Street, Bridge Square, and Water Street (See appendix B for map).

The following additional guidelines on placement shall apply:

1. Small wireless facilities and wireless support structures shall be located no closer than 250 feet away, radially, from another small wireless facility and wireless support structure.
2. A combination wireless support structure and streetlight pole should only be located where an existing pole (usually Xcel Energy) can be removed and replaced, or at a new location where it has been identified that a streetlight is necessary.
3. In a manner that does not impede, obstruct, or hinder usual public pedestrian or vehicular travel or public safety on a ROW.
4. In a manner that does not obstruct the legal use of a ROW by a utility provider
5. In a manner that does not violate or conflict with the City's ROW Code, Chapter 11 or these Guidelines.
6. In a manner that does not violate the federal Americans with Disabilities Act.
7. In a manner that does not negatively impact the structural integrity of the associated wireless support structure.
8. In alignment with existing trees, utility poles, and streetlights.
9. Equal distance between trees when possible, with a minimum of 15 feet separation such that no proposed disturbance shall occur within the critical root zone of any tree.
10. With appropriate clearance from existing utilities.
11. So as not to be located along the frontage of a Historic building, deemed historic on a federal, state, or local level.
12. Not within sight triangles at street intersections.

Example of Acceptable Location Between Residential Homes

Example of Acceptable Location Between Commercial Buildings



4. LIMITATIONS
   While the City fully intends to have small cell facilities meet these guidelines established in this policy, there may be times when not every specific guideline may be met. In these cases, City Staff will use these guidelines in approval of small cell wireless permit applications.

5. EFFECTIVE DATE OF POLICY
   This Policy will be effective as of April 1, 2019.