

# *Bylaw 2021-17*

## *General Municipal Servicing Standards*

**COPY**



The County of  
**ST. PAUL NO. 19**

Consolidated September 2022



**Consolidated with Bylaws:**

2022-15: Road Classification Amendments



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## 1 Administration

These standards provide direction and guidance to land developers, and County Council and Administration in the development of land, including the development process and ultimately servicing of new developments. This ensures proper and fair process for all applicants and allows the County to ensure quality development that supports its long-term vision in a sustainable way.

### 1.1 Definitions

Unless the context require otherwise:

"Act" means *Municipal Government Act*, *Land Titles Act*, and any other *Act* named herein and found in the Statutes of Alberta, as amended from time to time both before and after the date of this document.

"Applicant" means a person applying for the approval of a subdivision, pursuant to the provision of the *Municipal Government Act*, or a person applying for development other than subdivision, whether as the Applicant of the property proposed to be subdivided or developed or as agent for the Applicant or his contractor.

"Approval, Preliminary Layout" means written notification of a review of information presented to the Subdivision Authority previous to submission of a subdivision plan for final approval.

"Arterial Street" means a highway with the primary function of carrying all types of through traffic from one area to another and a secondary function of providing access to adjacent parcels of land.

"Boulevard" means that portion of a highway between the curb lines or the lateral boundary lines of a roadway and the adjoining property or between curbs on median strips or islands, but does not include curbs, sidewalks, ditches, or driveways.

"Building Permit" means such authorization as issued by the County to proceed with building construction on a particular lot.

"Collector Street" means a highway with equal priority functions of distributing traffic between arterials and lower classifications of roads such as other collectors and local roads and providing access to adjacent parcels of land.

"Community Sewer System" means a sanitary sewer, or a system of sewage disposal works which is owned, operated and maintained by the Municipality.

"Community Water System" means a waterworks system, which is owned, operated, and maintained by the Municipality.

"Construction Completion Certificate" means the certificate issued by the County certifying the completion of the municipal improvements, or a portion thereof once the municipal improvements have been constructed and installed by the Applicant/Applicant to the satisfaction of the Municipality without defects or deficiencies.

"Council" means persons duly elected to Council of the County.

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"County" means the County of St. Paul No. 19.

"County Designated Engineer" means either a County employed engineer or consulting engineer contracted by the County.

"Cul-de-sac" means a local street that is connected to the remainder of the road network at only one point and that terminates in a vehicle-turning area.

"Design Engineer" means the Professional Engineer engaged by the Applicant/Applicant to design and prepare drawings for construction of works in a subdivision or development, or his authorized representative.

"Developer" means such person or persons developing a subdivision or subdividing land, or an Applicant or Applicants of land, or their employee, agent or representative.

"Development" shall be interpreted as defined in the *Municipal Government Act*.

"Development Agreement" means documents outlining the general requirements and conditions of which the developer enters into agreement with the County prior to construction and installation of municipal services in the development.

"Development Officer" means person or persons appointed and acting on behalf of the County to regulate the orderly development of subdivisions and properties.

"Development Permit" means such authorization as issued by the County to the Developer to proceed with construction and installation of municipal services in the development.

"Drainage System" means a system of works designed and constructed to control the flow of storm water and/or ground water.

"Engineer" means Municipal Engineer, or an Engineer designated by the Municipality.

"External Local Improvements" means all of the Local Improvements, or the portions thereof to be constructed by the Developer outside of the Lands.

"Final Acceptance Certificate" means a written acceptance issued by the County for the municipal improvement, or a portion thereof, upon the completion of any repairs for defects or deficiencies, and the expiration of the Maintenance period.

"Frontage" means the length of a lot boundary which immediately adjoins a highway other than a lane or a walkway.

"Highway" includes a street, road, lane, walkway, bridge, viaduct, and any other way open to public use. The width of a highway is measured from lot line to lot line. A highway does not include private easements on private property.

"Industrial Street" means a local street that provides access to adjacent parcels districted for industrial use.



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"Internal Local Improvements" shall mean all of the Local Improvements, as described in Schedule "C" or the portions thereof to be constructed by the Developer within the Lands.

"Lane" means a roadway which provides utility access and access for municipal services and is generally located at the rear of the property.

"Local Street" means a roadway with the primary function of providing direct access to adjacent parcels of land and generally connects to other local roads and collector roads.

"Lot" means a quarter section; a part of a parcel where the boundaries of the part are separately described in a certificate of title other than by reference to a legal subdivision; or in part of a parcel where the boundaries of the part are described in a certificate of title by reference to a Plan of Subdivision.

"Lot Depth" means the average horizontal distance between the front and rear lot lines.

"Lot Line, Front" means the property line of a lot abutting a public roadway other than a lane. In the case of a corner lot, the front lot line is the shorter of the property lines abutting a public roadway.

"Lot Line, Rear" means either the property line of a lot which is furthest from and opposite the front lot line, or where there is no such property line, the point of intersection of any property lines other than a front lot line which is farthest from and opposite the front lot line.

"Lot Line, Side" means the property line of a lot other than front lot line or rear lot line.

"Lot Width" means the horizontal distance between side lot lines of the site measured at a distance from the front lot line equal to the minimum required front yard.

"Panhandle Parcel" means any parcel which is serviced and gains highway frontage through the use of a narrow strip of land which is an integral part of the parcel (hereinafter called the "Access Strip").

"Parcel" means the aggregate of the one or more areas of land described in a Certificate of Title or described in a Certificate of Title by reference to a plan filed or registered in a Land Titles Office.

"Pathway" means a path which follows routes independent of motor vehicle roadways, sidewalks, and bike lanes, intended for use by pedestrians and other non-motorized modes of travel.

"Potable Water" means water which is approved for drinking purposes by the Medical Officer of Health.

"Professional Engineer" means a person who is registered or duly licensed as such with the Association of Professional Engineers, Geologists, and Geophysicists of Alberta (APEGGA).

"Proven Supply" means that a supply of potable water is available and proven with respect to volume, delivery and continuity of supply from an on-site groundwater system, a source requiring a water license from Alberta Environment and Sustainable Resource Development or a community water system.

"Roadway" means the portion of the highway that is improved, designed, or ordinarily used for vehicular traffic.

"Rural Development" means development of low density, located in a rural setting.

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"Service Level" means the standard of municipal services required for development of subdivisions under the provisions of this document.

"Site" means any combination of lots or titled areas for which application is made for a Development Permit.

"Subdivision" means the division of land into two or more parcels by plan or apt descriptive words.

"Subdivision Authority" means any person duly authorized by the Municipal Council to act as Subdivision Authority Officer pursuant to the provisions of the *Municipal Government Act*.

"Substantial Completion Certificate" means the certificate issued by the County certifying the completion of the municipal improvements to 97% and that the improvements are ready to use and for the purpose intended.

"Top of Slope, Embankment or Escarpment" means the natural defined top edge of a slope, embankment, or escarpment; or, where a gradual steepening exists, the point at which the slope exceeds 30% grade.

"Urban Development" means development of high density, located in an urban setting.

"Watercourse" means any natural or man-made drainage course or source of water, whether usually containing water or not, and includes any lake, river, creek, spring, ravine, swamp, gulch, or source of groundwater, whether enclosed in a conduit or not.

## **2 Subdivision and Development Servicing General Requirements**

### **2.1 Purpose Statement**

These servicing standards and guidelines are the minimum development requirements ascertained by the municipality pursuant to the Municipal Government Act.

It is the Developer's responsibility to satisfy, in addition to these requirements, all regulations and conditions required by the Municipal Government Act and Federal and Provincial Government Authorities.

### **2.2 Compliance**

No person shall subdivide or develop land in the County except in compliance with the provisions of this document, the County's Municipal Development Plan or Land Use Bylaw.

### **2.3 Approval Process**

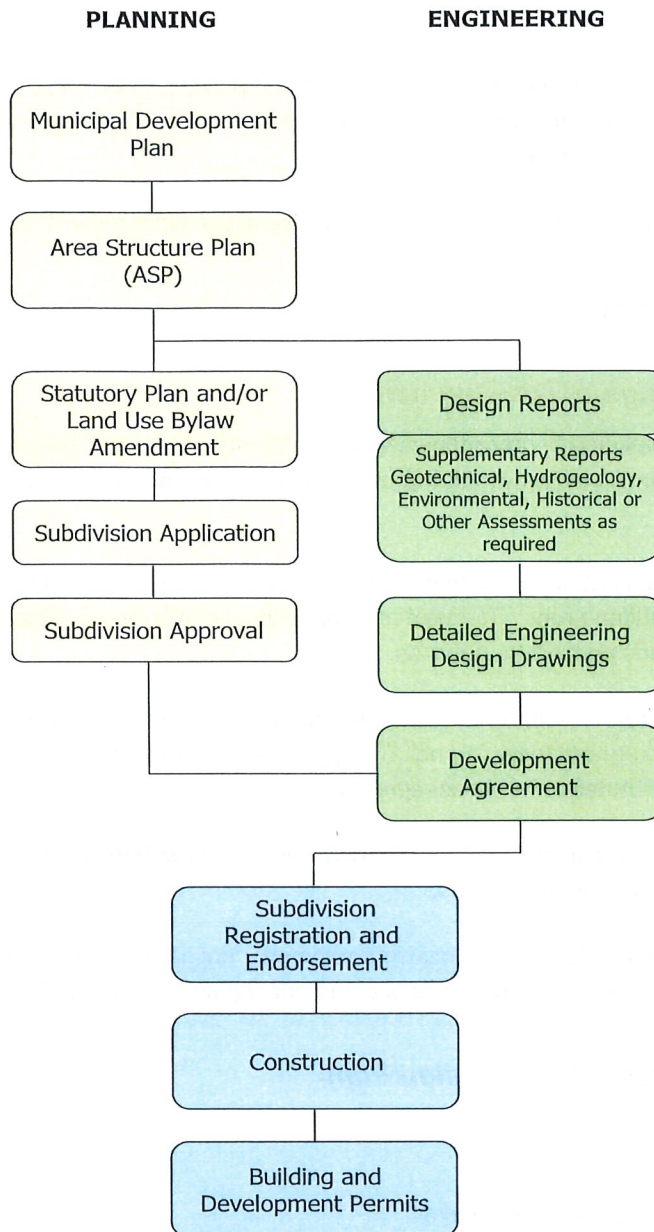
#### **2.3.1 Process Overview**

Development of new areas requires the planning and subdivision of land in accordance with procedures and requirements set out in the *Municipal Government Act*, and the Subdivision and Development Regulation pursuant to that Act.

Where required in the County's Municipal Development Plan and Land Use Bylaw, the following items may be submitted to and approved by the County of St. Paul:

1. Area Structure Plan
2. Land Use Bylaw Amendment
3. Preliminary Layout Review
4. Subdivision Plan
5. Development Brief, Detailed Design Drawings and Specifications
6. Development Agreement
7. Endorsement and Registration of Plan of Subdivision
8. Development Permit
9. Construction
10. Construction Completion Certificate (CCC)
11. Final Acceptance Certificate (FAC)





### **2.3.2 Area Structure Plan**

Where required, an Area Structure Plan shall outline a general vision and policy framework for the development, as well as more specific servicing and phasing information. All Area Structure Plans shall conform with the County's Municipal Development Plan.

Area Structure Plans shall be, in accordance with Section 633 of the *Municipal Government Act*.

### **2.3.3 Preliminary Layout Review**

#### **2.3.3.1 Requirements for Design of Development**

The proposed development shall be designed in accordance with the County's Municipal Development Plan, relevant Area Structure Plan, Land Use Bylaw, Municipal Servicing Report and Minimum Design Standards.

The proposed development shall be laid out and designed to meet the overall development of the County and possible future expansion into abutting areas. Tie-ins of proposed local improvements into existing developments shall not create overloads on existing services.

The inclusion of oversize services to provide sufficient capacity for future developments shall be carried out at the expense of the Applicant and as agreed to by Council. The potential recovery for oversized infrastructure may be included with an Endeavor to Assist agreement.

Subdivisions requiring curves on roadways shall reflect right-of-way boundaries with the same curves or sufficient size corner cut-offs to accommodate the curves.

Easements and/or right of way shall be provided for all local improvements not located on streets, lanes, or utility lots, including right of way for ditches or watercourses accommodating surface runoff.

### **2.3.4 Application for Subdivision (Subdivision Plan)**

#### **2.3.4.1 Subdivision Application**

The County of St. Paul Subdivision Guide can be viewed at:

[https://www.county.stpaul.ab.ca/wp-content/uploads/2020/09/Subdivision-Guide\\_2019.pdf](https://www.county.stpaul.ab.ca/wp-content/uploads/2020/09/Subdivision-Guide_2019.pdf)

#### **2.3.4.2 Infrastructure Servicing Report**

The County may ask the Applicant to submit an Infrastructure Servicing Report or sufficient detail to address water, sanitary, and drainage servicing and road networks in the proposed subdivision.

### **2.3.4.3 Geotechnical Report**

The Applicant shall submit a Geotechnical Engineering Report prepared by a qualified geotechnical engineer, of sufficient detail to establish the suitability of the proposed subdivision for the type of development proposed in the development brief.

In the event that the geotechnical investigation reveals areas of high water table and/or unstable soils conditions, the report will recommend special techniques to insure the stability of any of the proposed local improvements which may be affected by these unstable conditions.

### **2.3.4.4 Phase I Environmental Site Assessment**

The Applicant may be required to submit a Phase I Environmental Site Assessment prepared by a qualified environmental professional that meets or exceeds the CSA standards or better standard published by the Provincial Government of Alberta. The current reference document for the minimum requirements for a phase I environmental site assessment is CSA document "Z768-01 (R2012) – Phase I Environmental Site Assessment."

### **2.3.4.5 Traffic Impact Assessment**

Depending on the nature of the development, the surrounding neighbourhood and the adjacent transportation system, the County may require that the Developer submit a Traffic Impact Study completed by a qualified professional engineer(s).

The cost for the preparation and submission of the Traffic Impact Study will be entirely borne by the Developer.

### **2.3.4.6 Off-site Utilities Impact Analysis**

Depending on the nature of the development, the surrounding neighbourhood and the adjacent offsite utilities systems, the County may require that the Developer submit an Offsite Utilities Impact Analysis, completed by a qualified professional engineer(s). The Offsite Utilities Impact Analysis will discuss the impacts of the proposed development on the County's water, sanitary and storm sewer systems.

The cost for the preparation and submission of the Offsite Utilities Impact Analysis will be entirely borne by the Developer.

### **2.3.4.7 Excess or Extended Capacity**

Pursuant to Section 651(1) of the Municipal Government Act, the County may require that the Developer provide excess or extended services to provide access to or service land other than the land being subdivided or developed.

### **2.3.4.8 Cost of Excess or Extended Capacity**

The cost of providing excess capacity shall be derived by the following formula:



Cost of excess capacity = cost of installing system with excess capacity minus cost of installing system to service the proposed subdivision only or the minimum permitted for the size of line in the County minimum design standards, as amended, whichever is greater.

The determination of cost of excess capacity shall be based on estimates prepared by a professional engineer representing the Developer of the land being subdivided, agreed to by the County designated engineer and approved by the Subdivision Authority.

### **2.3.4.9 Payment of Cost of Excess or Extended Capacity**

Where the County requires the provision of excess capacity under Section 2.3.4.6, the cost of the excess capacity will be paid for by:

- a) the County, or
- b) the Developer of the land being subdivided, where the County considers that its costs to provide the excess capacity in whole or in part are excessive.

### **2.3.4.10 Cost Recovery by the County**

Where the County pays for the cost of providing excess capacity under Section 2.3.4.8 (a), it may recover the costs by:

- a) an off-site charge levied in accordance with the *Municipal Government Act*, or
- b) a rate tax or charge as provided for in Section 655 of the *Municipal Government Act*.

### **2.3.4.11 Endeavour to Assist for Excess Capacity**

The County may, as a condition of a Developer connecting to works and services where excess capacity has been provided under 2.3.4.8 (b), impose a charge and the charge shall be calculated as a proportion of the cost of providing excess capacity as determined under Section 2.3.4.8. The proportion of costs to be imposed on a Developer shall be derived on the basis of the capacity of the system to be utilized by the Developer in relation to the total excess capacity provided.

In calculating the charge to be imposed on the Developer who wishes to connect, there shall be included in the total cost of providing excess capacity, interest calculated annually at the current Bank of Canada prime rate plus 2% payable for the period commencing when the work or service providing the excess capacity was completed, up to the date that the connection is made.

### ***2.3.5 Approval of Subdivision Application***

If subdivision is conditionally approved, the development process will proceed as documented below. Entering into a Servicing Agreement may be a condition of subdivision.

If the application is refused, an appeal may be considered by the Applicant under Section 678 of the *Municipal Government Act*.

### ***2.3.6 Development Brief, Detailed Design Drawings and Specifications***

The applicant shall submit a development brief, including any and all background reports and design criteria, as part of the detailed design drawings package. The County will sign off on all final detailed design plans and specifications as part of the Development Agreement.

### ***2.3.7 Development Agreement***

Once the detailed design drawings package has been approved by the County, the applicant will be required to enter into a Development Agreement with the County. All re-development and off site levies, development conditions, and cost sharing shall be paid to the County in accordance with the conditions of the Development Agreement.

### ***2.3.8 Endorsement and Registration of Plan of Subdivision***

Following approval of the subdivision plan and signing of the Development Agreement by all parties, the Applicant/Applicant must submit a legal plan provided by a registered land surveyor in the Province of Alberta, as per section 657 of the *Municipal Government Act* to the County of St. Paul. The legal plan must be accompanied by documentation that all conditions of the subdivision have been met.

Following endorsement by the County of St. Paul, the subdivision plan must then be registered by the Applicant with Alberta Land Titles.

### ***2.3.9 Development Permit***

Refer to the County of St. Paul Land Use Bylaw for requirements regarding development and building permits related to physical structures and uses of the land. Development permit information can be viewed at: <https://www.county.stpaul.ab.ca/wp-content/uploads/2021/01/Development-Permit-Info-2021.pdf>

### ***2.3.10 Submission Requirements for Detailed Design Drawings***

These requirements pertain to the preparation of drawings for sanitary sewers, storm sewers, water, gas, underground power, telephone, cablevision, street lighting, roads, curbs and gutters, sidewalks, culverts, bridges, and other permanent structures.



Where no standard is defined in this section, the standard for the preparation of a drawing to portray a particular service, structure or other items, instructions and requirements may be obtained by discussion with the County designated engineer.

### **2.3.11 Construction**

#### **2.3.11.1 Legal Survey Requirements**

All legal survey control and elevations shall be tied into Alberta Survey Control Monuments. The Applicant shall be responsible to see that the survey control network is extended into the Development Area.

The Applicant shall employ a qualified Alberta Land Surveyor to install survey evidence (survey pins), prepare the necessary plans and acquire the necessary approvals as required by Alberta Transportation and the County to install the survey control network. Alberta Transportation shall be provided with survey measurements to first and second order necessary to calculate coordinate values and elevations for these monuments.

The Applicant shall be responsible to preserve all existing and new monuments and if necessary, replace such monuments as may be destroyed, damaged, or removed by the operation of the Applicant in carrying out the construction and installation of local improvements.

#### **2.3.11.2 General Requirements**

The Applicant's Engineer shall provide inspection of construction and provide sufficient tests to ensure that construction is in accordance with the Minimum Design Standards.

The franchise holder or their agent shall install franchise utilities with the Applicant providing coordination of their installation.

Any of the services to be installed by the Applicant shall be installed in such a manner as to least interfere with existing services. Any additional costs incurred by the County as a result of the installation of services by the Applicant shall be charged to the Applicant who will reimburse the County promptly for such additional expenditures incurred.

Approval shall be obtained from the County a minimum of 48 hours prior to closing developed streets or shutting off existing utility service when required for construction.

In the event that a road must be partially or fully closed for a crossing or connection, the Applicant shall provide all detours, signs, flagmen, barricades, in accordance with Roads and Transportation Association of Canada Standards.

Developed roads shall be returned to their original condition. Where it is necessary to excavate along or across an existing road or lane (for a water or sewer main, gas main, telephone cable, etc.), such excavations must be backfilled with compacted sand and/or gravel material and restored to pre-construction condition or better.

Approval shall be obtained from the County to use the County's water distribution system(s) during construction. Access to the existing system shall be through a temporary metered bypass service of ¾" (19 mm) maximum diameter. The first permanent valve from the existing water main to the new water main shall, in each case, be sealed closed and shall only be operated by the County. Prior to commissioning, the meter(s) and the bypass shall be removed.

In the sewer system, the first new manhole upstream from the existing system shall, in each case, be plugged to prevent flows from entering the existing system. These manholes shall be constructed such as to prevent foreign materials (i.e., soils, debris, etc.) from entering the County's existing system during construction, cleanup and testing procedures. Prior to commissioning, the manholes shall be completed to the same standard as others in the subdivision.

The Applicant shall protect and preserve existing vegetation, bodies of water and or existing slopes when these have been designated for protection by the County.

### **2.3.11.3      *Dust Control***

During construction of works and services the Developer shall be responsible for providing for and maintaining dust control measures at all times wherever:

- a) The operation of any equipment causes dust that becomes a nuisance to property landowners and residents in the area.
- b) Bare soil conditions are created in performing work.

Should the Developer not implement dust control procedures as required or directed by the County's Engineer, the County will undertake the dust control procedures and charge the Developer to recover all costs incurred including but not limited to engineering, administration costs, equipment costs, etc.

### **2.3.11.4      *Clean-up***

During construction of works and services the Applicant shall be responsible for ensuring that the construction area is maintained free of accumulation of excess waste material and debris.

The disposal of waste materials and rubbish by burning and burial on the site will not be permitted. The disposal of volatile wastes such as mineral spirits, oil, gasoline or paint thinner into stormwater and wastewater systems shall not be permitted.

During and after construction of works and services, the Applicant shall be responsible for ensuring that all access roads into the proposed development are maintained free of accumulation of excess water material and debris. The County reserves the right to carry out the maintenance of such access roads and charge the cost of such work to the Applicant if the Applicant fails to restore the road(s) to normal levels within one week of being notified in writing by the County.



**2.3.11.5 As-Built Information**

The Applicant shall provide "As Built Drawings" to the County. The as-built drawings shall show any changes made from the approved drawings and shall include the following information.

- a) Underground Utilities:
  - Location and size of all waterlines, fittings, valves, and hydrants.
  - Location, size, and grade of all sanitary and storm sewers including manhole and catch basin locations and inverts of all pipes into and out of manholes.
  - Location, size and elevation of all water and sewer service connections at the property line.
- b) Surface Improvements:
  - Location, widths, grades and key elevations of all roads, curb and gutter, sidewalks, ditches, culverts, and any additional major surface feature within the dedicated rights-of-way or easements.
- c) Franchise Utilities:
  - The Applicant shall insure that all franchise utilities forward as-built drawings in both printed and digital AutoCAD and .pdf formats, of any franchise utilities installed in the development.

**2.3.11.6 Substantial Completion**

Upon receipt of written notice from the Applicant's Engineer stating that the Work is substantially complete and ready for inspection (accompanied by a list of the known deficiencies), the County's Engineer shall make the required inspection within 10 days after receipt of the Applicant's Engineer's written required. A "Certificate of Substantial Completion" will be issued by the County when the works are 97% complete and the work is ready for use for the purpose intended.

Should the Work not be deemed as Substantially Complete by the County's Engineer, then a written notice will be given to the Applicant's Engineer stating the deficiency corrections required for Substantial Completion.

**2.3.11.7 Construction Completion**

Upon 100% completion of the works, the Applicant's Engineer must schedule a field inspection with the County's Engineer. Upon verification by the County's Engineer that 100% Construction Completion of all Works and Services have been achieved, the Developer must provide the County with:

- a) A confirmation of Professional Assurance
- b) Confirmation in writing from an Alberta Land Surveyor (A.L.S) that all survey pins have been installed on the Parcel.
- c) As-built drawings
- d) All copies of required manuals, videos, testing reports and results in a digital format

**2.3.11.8      *Operations and Maintenance Manuals***

Where the Applicant is required to construct and install works and services in accordance with the provisions of this Document, the Applicant shall be responsible to:

- a) Provide the County with 25% security in the form of a letter of credit for external an/or internal local improvements required at the time of Development Agreement execution. This amount shall be held by the County until such time Construction Completion Certificate (CCC) for the internal and/or external local improvements has been issued by the County.
- b) At issuance of CCC the security shall be calculated at 150% of the acceptable incomplete and/or deficient work as determined by the County. At issuance of the Construction Completion Certificate, a 5% security of all external and/or internal local improvements shall be provided to cover any deficiencies that may arise during warranty period until issuance of Final Acceptance Certificate.
- c) Pay the County the inspection fees as specified in the Development Agreement.

If the Development includes construction of a pumping facility(s), not less than two (2) weeks prior to application for a Construction Completion Certificate, the Applicant shall submit to the County's Engineer four (4) copies of operating and maintenance manuals containing information required by the specifications. All instructions in the manuals shall be in simple language to guide in the proper operation and maintenance of the installation.

Bind contents in a three-ring, hard covered, plastic jacketed binder. Organize contents into applicable sections of work, parallel to specifications breakdown. The name of the facility is to be embossed onto the binder cover.

In addition to information called for in the specifications, include the following:

- title sheet, labeled "Operation and Maintenance Instructions", and containing project name and date
- list of contents
- reviewed shop drawings of all equipment
- as-built drawings of all mechanical, electrical, control, and alarm installations
- full description of entire mechanical, electrical, control, and alarm system and operation
- names, addresses and telephone numbers of all major Subcontractors and Suppliers
- operating instructions for all equipment
- maintenance instructions for all equipment, including frequency of maintenance tasks
- equipment parts lists
- emergency operating procedures
- certified head/capacity curves for pumps

Each section shall be separated from the preceding section with a plasticized cardboard divider with a tab denoting contents of the section.

### **2.3.11.9 Certificate of Final Acceptance**

Upon the expiration of all Maintenance Periods, receipt from the Applicant of Statutory Declaration and verification by the County designated engineer that all information, documents, agreements, covenants, and fees required from the Applicant and Applicant's Engineer pursuant to this Document have been provided to the County; the County will:

- a) Provide the Applicant with a Final Acceptance Certificate of all Works and Services; and
- b) Release the Applicant the balance of the Maintenance Bond.

## **2.4 Expense of Service to be borne solely by the Developer**

The following expenses are to be borne solely by the Developer:

- a) All reasonable and justifiable charges or accounts rendered to the County by Consulting Engineers that may be engaged by the County from the time subdivision application and plans are submitted until final acceptance of all municipal improvements.
- b) All reasonable and justifiable legal charges or accounts rendered to County by solicitors from the time of application for subdivision until final acceptance of all municipal improvements.
- c) Cost of additional work performed or of work repaired or redone by reason of orders and direction by the County's Engineer under the terms of the Development Agreement.
- d) Cost of providing the security and insurance required to be provided by the Developer under the terms of the Development Agreement.
- e) Cost of preparation of an easement or utility right-of-way document(s) to be provided by the Developer including cost of registration of the same.
- f) Cost of land title registrations of the Development Agreement.

## **2.5 Indemnity and Insurance**

The Developer shall indemnify and save harmless the County from any and all losses, costs, damages, actions, causes of action, suits, claims and demands, resulting from anything done or omitted to be done by the Developer in pursuance or purported pursuance of this Agreement.

The Developer must provide and maintain, at the Developer expense, at all times until the Certificate of Final Acceptance is issued, Comprehensive General Liability Insurance coverage, covering premises and operations liability, contingency liability with respect to the operations of contractors and sub-contractors, completed operations liability, contractual liability and automobile liability for owned, non-owned and hired units.



The limits of liability must be not less than \$5,000,000 for each occurrence for bodily injury, death, and damage to property. Each policy must provide that it cannot be cancelled, lapsed, or materially altered without a minimum thirty (30) days notice in writing to the County by registered mail, must name the County and its officials and employees as an additional insured, and must contain a cross-liability clause.

The insurance coverage required to be provided by the Developer may be embodied in a blanket insurance policy obtained by the Developer. The Developer must deliver a copy of each insurance policy to the County prior to the commencement of Construction of the Works and Services. If the Developer fails to obtain and maintain the said insurance or deliver the said policy or policies to the County, the County may but will not be obliged to obtain and maintain such insurance at the expense of the Developer.

## **2.6 Off-Site Services**

The Applicant/Applicant shall be required to contribute towards the cost of upgrading or upsizing of off-site roads and utilities.

### **3 General Design Considerations**

#### **3.1 Sustainability and Asset Management**

Development of appropriate design standards for municipal infrastructure involves consideration of principles of sustainability and asset management. These principles include the following:

- Enhancement of quality of life
- Environmental protection
- Financial economies
- Preventative maintenance
- Life-cycle costs

A balanced approach to design of municipal infrastructure requires careful consideration of all of the above principles.

#### **3.2 Independent Utilities**

Independent utilities are those not normally supplied by the County or regional authorities and are not included in these standards. They are:

- Electrical power
- Communications (telephone, internet, and cable)
- Gas

Design of municipal infrastructure must include consideration of the above utilities. Design of these utilities is normally carried out by the utility owner and coordinated by the Developer's Engineer and/or the County.

In new urban developments, all wiring is generally to be underground.

#### **3.3 Utility Rights-of-Way**

Utility right-of-way (ROW) locations shall be selected to avoid environmentally sensitive areas such as watercourses, wetlands, wildlife migration corridors and forested areas.

Where location of a municipal utility in a statutory ROW is approved by the County, the minimum ROW widths are as follows:

- Single service – ROW width to be equal to twice the depth from surface to the invert of the pipe (4.5-meter minimum width)
- Two services within the same trench – ROW width to be equal to twice the depth from surface to the crown of the deeper pipe (5.5-meter minimum width)
- More than two services adjacent to one another but in separate trenches. ROW width to be equal to twice the depth from surface to the invert of the deepest pipe plus the cumulative widths of the

pipe separations (6.0 meter minimum with).

Where the service is within a road allowance and the distance from the property line to the centre of the service is less than one half of the width indicated above for a single service, the difference shall be provided as ROW on the adjacent property.

In all cases, the width of ROW shall be sufficient to permit an open excavation with side slopes in accordance with the Workers Compensation Board (WCB) regulations, without impacting on or endangering adjacent structures.

Where required, sanitary trunks and interceptor sewers shall have ROW wide enough for future widening and/or twinning. The width of ROW shall be the required separation between pipe centre lines plus two (2) times the depth to the crown of the deeper sewer.

The designer shall provide cross sections indicating the minimum safe distances to adjacent building footings based on a safe angle of repose from the limits of the excavation.

Where a utility is located within a ROW and valves, valve chambers, manholes or other appurtenances which require maintenance are located within the ROW, road access from a public road shall be provided. The maintenance access must be sufficiently wide and structurally adequate to support maintenance vehicles for which the access is intended.

### **3.3.1 Right-of-Water Agreement**

Pursuant to Sections 648, 651 and 655 of the Municipal Government Act, where the provisions of this document require a Developer to grant a utility or drainage ROW to the County, the Developer shall be required to enter into a Development Agreement and shall pay all associated costs.

## **3.4 Utility Separation**

Requirements for separation of sanitary or storm sewers from water mains are as follows, unless otherwise indicated by the local public health authority.

### **3.4.1 Horizontal Separation**

At least 3.0-meter horizontal separation shall be maintained between a water main and either a sanitary sewer or storm sewer.

In special circumstances separation less than 3.0 meter may be permitted provided that:

- The sewer main and water main are installed in separate trenches and the water main invert is at least 0.5 meter above the crown of the sanitary sewer or storm sewer and the joints are wrapped with heat shrink wrap (or similar) or packed with compound and wrapped with petrolatum tape in accordance with the latest version of American Water Works Association (AWWA) Standards C217, and C214 or C209; or
- The Pipes are installed in the same trench with the water main located at one side on a bench of



undisturbed soil at least 0.5 meter above the crown of the sanitary sewer or the storm sewer and the joints of the water main are wrapped with heat shrink plastic or packed with compound and wrapped with petrolatum tape in accordance with the latest version of the AWWA Standards C217, and C214 or C209.

### **3.4.2 Vertical Separation**

Where a sanitary sewer or storm sewer crosses a water main, the sewer shall be below the water main with a minimum clearance of 0.5 meter and the joints of the water main, over a length extending 3.0 meter either side of the sewer main, shall be wrapped with heat shrink plastic or packed with compound and wrapped with petrolatum tape in accordance with the latest version of the AWWA Standards C217, and C214 or C209.

Where it is not possible to obtain the vertical separation indicated above, and subject to County's approval, the following details may be used:

- The water pipe joints shall be wrapped as indicated above; and
- The sewer shall be constructed of pressure pipe such as high-density polyethylene (HDPE) or polyvinyl chloride (PVC) with fused joints and pressure tested to assure it is watertight.

### **3.4.3 Sewers in Common Trench**

Storm and sanitary sewers may be installed in a common trench, provided that the design has taken into account the following:

- Interference with service connections
- Stability of the benched portion of the trench
- Conflict with manholes and appurtenances

The horizontal clearances between sewer pipes shall be no less than 1.0 meter and the horizontal clearance between manholes shall not be less than 0.3 meter.

## **3.5 Trenchless Technologies**

Installation or rehabilitation of pipelines by trenchless methods is frequently mandatory or desirable. Circumstances favouring trenchless installation include:

- Installation or rehabilitation in heavily built-up areas
- Stream crossings
- Railway crossings
- Highway crossings

Available technologies include the following:

- Slip- lining
- Cured-in-place pipe (CIPP)
- Pipe bursting
- Horizontal directional drilling (HDD)
- Micro-tunnelling
- Pipe jacking

## **4 Transportation**

### **4.1 General Principles and Objectives**

- For each new development, the appropriate roadway classification and design designation shall be determined during the planning stages in consultation with the County of St. Paul.
- The Developer/Contractor shall be responsible for quality control testing related to the roadway construction including but not necessarily limited to subgrade proof roll, sieve analysis, densities, mix design, core sampling and concrete testing. Quality control shall be performed by an independent party and certified by a professional engineer licensed to practice in the province of Alberta.
- Developers are to adhere to the established clear distance from Provincial Highway as per the Highway Geometric Design Guide – Alberta Transportation (most recent edition).
- Access along provincial highways will be granted through a collaborative process with the County of St. Paul and Alberta Transportation. Existing Access Management Study/Plans will be consulted at the time of the request.
- Developer will be required to submit a design criteria summary as part of their submission for review by the County.
- Grid Road refers to any Township Road or Range Road within County of St. Paul over which County of St. Paul is the Road Authority
- The County may consider an alternate design variation from the guidelines stated in Section 1A to accommodate the unique local conditions. The design exception will need to ensure public safety and risks are mitigated accordingly.
- All plans and proposed improvements must be approved by the County of St. Paul prior to the installation or construction of new works.

#### **4.1.1 Guidelines and Resources**

The most recent edition of the following manuals will be referenced during the design/study process:

- Geometric Design for Canadian Roads - Transportation Association of Canada (TAC)
- Manual of Uniform Traffic Control Devices for Canada - TAC (MUTCD)
- Highway Geometric Design Guide - Alberta Transportation (AT)
- Traffic Impact Assessment Guidelines - Alberta Transportation

### **4.2 Traffic Analysis/Traffic Assessments**

If a Traffic Impact Assessment is required, the Developer is responsible to provide a traffic assessment conducted by a qualified Transportation Engineer as required by the County. The traffic analysis will be completed using the latest Synchro for intersection analysis and SIDRA for roundabouts analysis.



The minimum requirements must meet the standards established in the **Alberta Transportation – Traffic Impact Assessment (TIA) Guidelines**.

The County accepts a minimum **Level of Service (LOS) 'D'** ( $v/c = 0.9$ ) for all movements and intersection controls at grid road intersections. Where the minimum LOS cannot be met, improvements to the intersection will be required to achieve the operational standards.

In additions to the minimum standards established in the AT – TIA Guidelines, the developer will be required to submit a TIA scope of work to the County for comment prior to the start of the study. The digital files from the Synchro and SIDRA analysis will be submitted to the County as part of the TIA submission package.

The cost for the preparation and submission of the Traffic Impact Study will be entirely borne by the Owner/Applicant.

### **4.3 Roads**

#### **4.3.1 Geometric Design**

Horizontal and vertical geometry will be designed to standards established in TAC.

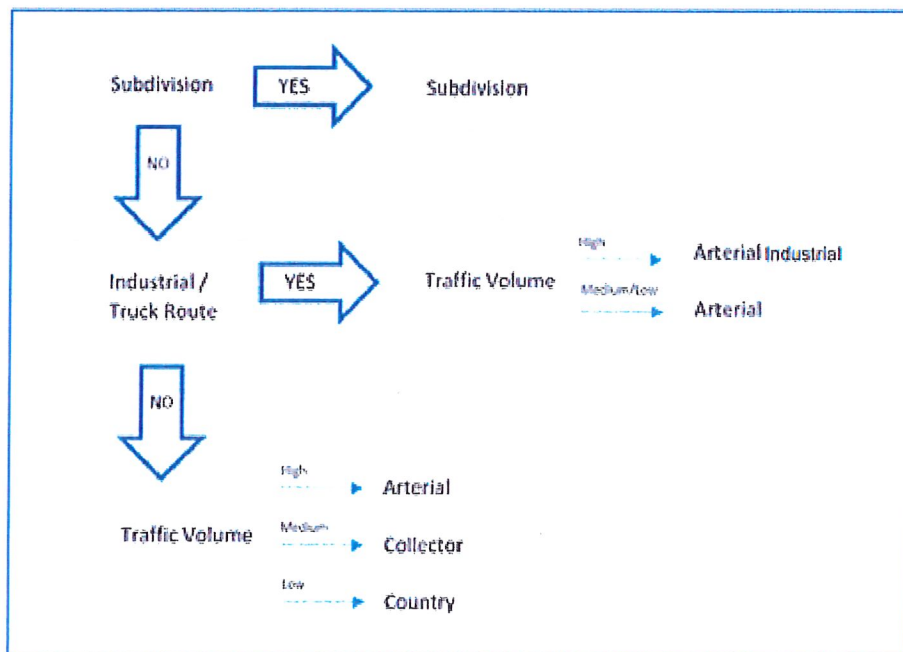
A design criteria sheet will be required for all proposed grid road construction or rehabilitation. The design criteria sheet will be completed and submitted to the County for approval and comment prior to commencing the design.

#### **4.3.2 Road Classification**

The results from the TIA and Functional Studies for the study area will be used to establish road hierarchy and classification. The road will be designed to accommodate the approximate number of vehicles per day (vpd) produced from the existing development. Future development or residential traffic may require the road be improved to a higher standard. The corridor improvements will be determined by the Developer during the TIA process and submitted to the County for comment.

To determine the proposed classification for a corridor, the developer must determine if roadway will be used to primarily service subdivision traffic. A Class 5 - Subdivision roadway will need to be constructed if subdivision traffic is the primary use. In all other cases, the first item to evaluate is whether the corridor will primarily service heavy vehicles (WB-20 or Higher). If the vehicle class is a WB-20 or higher, Class 1 or 2 - Arterial or Arterial Industrial roadway shall be constructed to service the larger vehicles. If larger vehicles are not the primary factors for the proposed roadway, the road class will be determined by the traffic volumes expected to use the corridor. The diagram below summarizes the road classification process.

Road Classification Diagram



[BR2]

The following section describes the road classification systems and details the different road elements. A summary can be found in Table 1.

**Class 1 - Arterial Industrial** – This category of roadway is to transport vehicles larger than a WB-20 with a **high traffic count**. The surface for this class of roadways will be constructed using a hot asphalt mix. This class of road can be a part of the Regional Transportation Network of Roads and will carry the majority of heavy industrial vehicles.

**Class 2 – Arterial** – This category of roadway will be constructed to transport vehicles larger than a WB-20 with the **medium or low traffic count**. The surface for this class will be constructed using a hot asphalt mix. This category also applies to **high traffic volume** roadways, even if the vehicles are smaller than WB-20.

If the road is not used by large vehicles (WB-20), the traffic volume will be the governing factor to determine the road class:

**Class 3 – Collector** – This type of road will have an approximate capacity of **medium traffic count**. This class of roadway will not be used when heavy vehicles are the primary vehicle of the corridor. The surface of the gravel road that is treated with dust suppressing agent (i.e.: oil). While the trigger for dust abated gravel roadways is traffic volume, access density will also contribute to the need of dust abatement. Corridors containing more than four intersections per 2.0 km, with medium or low traffic volume also require dust abatement.

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**Class 4 Country** – This class of roadway has a gravel surface with no treatment for dust suppression. The Class 4 corridor will not be used when heavy vehicles are the main class using the corridor. The type of road has a typical capacity for **low traffic volume**.

**Class 5** –Subdivision This category of roadways will be implemented for subdivision class corridors. This class of roadway will not be used to connect to the regional network. The developer will be required to forecast the vpd and where required, the cross section may require a design exception.

**Road Classes - Minimum Design Standards**

	<b>Class 1 Arterial Industrial</b>	<b>Class 2 Arterial</b>	<b>Class 3 Collector</b>	<b>Class 4 Country</b>	<b>Class 5 Subdivision</b>
<b>Surface Type</b>	Hot Asphaltic	Hot Asphaltic	Oil Gravel	Gravel	Hot Asphaltic
<b>Right of Way (m)</b>	30	20	20	20	30
<b>Foreslope</b>	04:01	04:01	03:01	03:01	05:01
<b>Backslope</b>	03:01	03:01	03:01	03:01	05:01
<b>Ditch Depth (m)</b>	1	1	1	1	0.75
<b>Ditch Width (m)</b>	3.5	2.5	2.5	2.5	1
<b>Subgrade (mm)</b>	150mm	150mm	150mm	150mm	200mm
<b>Granular Base (mm)</b>	200mm	150mm	100mm	100mm	100mm
<b>Asphalt (mm)</b>	100mm	50mm			80mm
<b>Clear Zones (m)</b>	9 to 10	6.75 to 8.25	6.75 to 8.25	6.75 to 8.25	
<b>Lane widths (m)</b>	3.7	3.7	3.5	3.5	3.3
<b>Shoulder (m)</b>	2.7	1.5	1.25	1.25	0.75

### 4.3.3 Access Management

Establishing the required access onto the development site or private parcel from a numbered highway shall be completed in accordance to Alberta Transportation guidelines.



Access from a County Road onto a development site or private parcel will be established in the traffic impact assessment and have final approvals from the County.

A design vehicle will be selected as part of the design criteria to ensure the intersection can accommodate the vehicle envelope for the design vehicle. Curb radius and pavement edges will be established based on the same design vehicle.

### **4.3.4 Road Structures**

Geotechnical Report for the proposed project shall be submitted to the County for review as part of the overall submission. The Geotechnical Report must include specific recommendations for pavement structure construction based on insitu conditions and projected traffic volume. The recommended structure will need to meet or exceed the minimum standards illustrated in Table 1 by a certified Geotechnical engineer.

Compaction limits will be established as per the Geotechnical report.

### **4.3.5 Sidewalk**

Where applicable, a concrete sidewalk will be constructed to a minimum width of 1.5m. Sidewalks shall be accessible to all persons as well as being safe, functional, and aesthetically pleasing.

Sidewalks installed for new subdivisions shall integrate with the existing walkway system on intersecting roadways.

Sidewalks on one side of the road will be reviewed on site specific basis.

The requirements for sidewalks in commercial and industrial areas shall be reviewed on a site-specific basis in conjunction with the proposed use and other required services.

Curb ramps shall be used at all curbed intersections.

Sidewalk/pedestrian connectivity will be a priority at all crosswalks and intersections to ensure a safe environment for all users.

### **4.3.6 Cul-de-sac / Dead-End Roads**

Dead-end roads in industrial subdivisions will be considered on a per case basis. The ultimate design will consider plans and documents for residential subdivisions; all dead-end roads shall be provided with a cul-de-sac or turnaround consistent with the requirements outlined in the Standard Drawings and the TAC Manual. The maximum length of dead-end roads that service residential lots shall be 200m.

Alternate emergency vehicle access is required for a cul-de-sac that exceeds 200m in length.

#### **4.3.7 Roadway Drainage**

It is the Developers responsibility to construct a drainage system that will meet the flow requirements outlined in Chapter 6 for both rural and urban cross sections.

Ditches for rural roadways shall have backslopes no steeper than 3:1 where applicable.

Ditch grades shall match the road grades wherever possible.

Ditch grades shall have a minimum grade of 0.5% wherever possible. Grades less than 0.5% shall be subject to review and approval by the Municipal Engineer.

Drainage channels shall be provided with ditch checks and/or other means of erosion control as necessary.

Ditches shall have a flat bottom; dimensions can be reference in Table1.

Culvert sizing is the responsibility of the Developer's Engineer. Culverts and ditches shall be designed according to the requirements outlined in Chapter 6. Ditches shall be allowed to back up during the design event to the height of the subgrade.

#### **4.3.8 Signage**

The Developer will be required to install signage adjacent to the roadway that will conform to the standards established in the MUTCD for Canada guidelines.

Guide and information signage shall be designed to the specification stated in the MUTCD.

Subdivision entry signage is not the responsibility of the County. All subdivision related signage (permanent, interim) is the responsibility of the developer or the homeowners' associations.

All signage must be mounted on individual signposts.

The proposed signage plan by the Developer will be reviewed and issued final approval by the County.

The County will be responsible for the installation of a subdivision key plan sign.

#### **4.3.9 Mailbox Turnouts**

Mailbox turnouts are required to be designed to allow the safest vehicle access onto the postal site. The start taper into the mailbox turnout must be a minimum of 50 meters from all intersections. All mailbox turnouts must meet the standards established by Canada Post Corporation and the County of St. Paul.

#### **4.3.10 Pavement Markings**

Pavement marking on grid roads and local roads markings will follow the guidelines stated in the MUTCD.

## **5 Stormwater**

### **5.1 General Principles and Objectives**

These guidelines are not intended to be a substitute for sound engineering knowledge and experience. Drainage designs shall be prepared under the direction of a design professional who has the appropriate experience and is registered with the Association of Professional Engineers and Geoscientists of Alberta.

### **5.2 Applicable regulations, guidelines, and resources**

These guidelines are intended to cover only minimum requirements. Drainage designs must conform to local government bylaws, regulations, guidelines and policies plus federal and provincial statutes and guidelines. These include but are not limited to the following:

- Supplementary Design Guidelines
- Subdivision and Development Control Bylaws
- Master Drainage Plan or Watershed Drainage Plan
- Municipal Government Act
- Fisheries Act
- Water Act
- Environmental Protection and Enhancement Act
- Navigable Waters Protection Act
- Wildlife Act
- Migratory Birds Convention Act
- Dyking Act
- Land Development Guidelines for the Protection of Aquatic Habitat (Canada)
- Stormwater Management Guidelines for the Province of Alberta
- National Guide to Sustainable Municipal Infrastructure (Canada)

### **5.3 Stormwater Management**

Stormwater management involves the planning and design necessary to mitigate the hydrological impacts of land development or land use changes. Adverse hydrological impacts include such things as increased peak storm water flows, erosion, sedimentation, flooding, reduced surface infiltration, reduced minimum groundwater levels and stream flows, water quality deterioration and degradation of aquatic and wildlife habitats. Mitigation measures include but are not limited to the following:

- appropriate sizing and routing of conveyance system
- major flow path routing
- detention storage
- sediment removal



- biofiltration
- landscaping
- source control
- erosion protection
- groundwater infiltration
- subsurface disposal
- outlet control
- lot grading

### 5.4 Dual Drainage Concept

Each drainage system consists of the following components:

#### 5.4.1 *Minor System*

The minor system consists of pipes, manholes, gutters, catch basins, driveway culverts, open channels, and watercourses outfall structure. The minor system shall convey runoff from snowmelt and rainfall events less than or equal to the minor storm design event without any surface ponding or excessive surface flow.

#### 5.4.2 *Major System*

The major system consists of surface flood paths, roadways, roadway culverts, watercourses and storm water management facilities designed to carry runoff from events up to and including the major storm design event.

### 5.5 Stormwater Management Plan

Unless otherwise indicated an Integrated Stormwater Management Plan is required for all developments larger than 3.0 ha, except those in rural or agricultural areas where lots are larger than 0.4 ha. The stormwater management plan shall include the following:

1. Tributary areas in the catchment with existing and potential land uses.
2. Details indicating how the local catchment area relates to the boundaries in the Master Drainage Plan or Watershed Drainage Plan if such plan has been developed by the County of St. Paul.
3. Contours at 0.5 m elevation intervals.
4. Existing watercourses and wetlands, including environmental classifications and/or fish presence information, if available.
5. Layouts of existing and proposed drainage systems.
6. Major flow paths.
7. Conceptual lot grading patterns.
8. Proposed source control and/or quality treatment facilities, if appropriate.

9. Locations, sizes and hydraulic grade line (HGL) elevations of proposed detention facilities, if appropriate.
10. Other proposed mitigation measures, if appropriate.
11. Proposed minimum building elevations (MBE) and 100-year HGL of major flow path.
12. Construction sedimentation control plan.
13. Pre and post development flows, with and without the mitigation measures.
14. Current and future upstream and downstream flows and system capabilities.

## **5.6 Stormwater Runoff Analysis**

### **5.6.1 Design Basis and Method**

Storm drainage design shall be carried out using one or both of the following methods as indicated below. Calculations are to be submitted with designs.

- Rational Method: applicable to preliminary design and to detailed design of minor drainage systems in urban areas where detention or other runoff controls are not required. Use of the Rational Method should be limited to areas less than 65 ha.
- Rainfall-Runoff Simulation Method (Computer Modeling): applicable to design of complex minor drainage systems and all storage calculations and major drainage systems. The computer program proposed for use is subject to approval by the County of St. Paul.

### **5.6.2 Rational Method**

The Rational Method for calculation of peak flows for use as indicated in the Runoff Analysis section is as follows:

$Q = CAI/360$     Where:     $Q$  = peak flow in cubic m<sup>3</sup>/s

$C$  = runoff coefficient

$I$  = intensity of rainfall in mm per hour

$A$  = area of catchment in hectares (h)

Factors for use in the Rational Formula are indicated below:

#### **5.6.2.1 Runoff Coefficients**

The following runoff coefficients are for use with the Rational Formula. These coefficients are for general application only. Design values are subject to verification by the designer and approval by the County designated engineer.

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Higher values may be applicable in consideration of rainfall during the winter when the ground is frozen. These values may reach 0.80 to 0.95.

Land Use	Percent Impervious	Runoff Coefficient	
		5/10 Year Storm	100 Year Storm
Suburban (Rural) Residential (Lots > 0.4 ha)	20	0.35	0.40
Low Density Residential	40	0.50	0.55
Medium Density Residential	65	0.60	0.65
High Density Residential	78	0.70	0.75
Commercial	90	0.80	0.85
Industrial	90	0.80	0.85
Institutional (eg. Schools)	80	0.75	0.80
Parks/Grasslands	20	0.20	0.30
Cultivated Fields	30	0.30	0.40
Woodlands/Agricultural	5	0.10	0.30

### 5.6.2.2 Design Inlet Time

#### Time of Concentration

The time of concentration is the time required for runoff to flow from the most remote part of the catchment area under consideration to the design node. The time of concentration can be calculated using the following formula (all times are measured in minutes):

$$T_c = T_i + T_t \quad \text{Where:} \quad T_c = \text{time of concentration}$$

$T_i$  = inlet or overland flow time

$T_t$  = travel time in sewers, ditches, channels, or watercourses



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### Inlet or Overland Flow Time (Ti)

Typical inlet times for urban areas should not exceed 10 minutes.

The inlet time for larger areas can be calculated using the “Airport Method” as follows:

$$T_i = \frac{3.26 (1.1 - C) L^{0.5}}{S^{0.33}}$$

Where:  $T_i$  = inlet time (minutes)

$C$  = runoff coefficient (see above)

$L$  = travel distance (m) – max length = 300 m

$S$  = slope of travel path (%)

### **5.6.2.3 Rainfall Design Events**

The design events for minor and major systems shall be 5 year and 100-year events respectively.

### **5.6.2.4 Rainfall Intensity Duration Frequency (IDF) Data**

The locations with available IDF data that are applicable for use in the County of St. Paul are the City of Cold Lake and the Town of Vegreville. Based on the location of the development in the County, the rainfall intensity for the Rational Method shall be determined using Cold Lake or Vegreville rainfall IDF curve, whichever is closer, with the duration equal to the Time of Concentration ( $T_c$ ) calculated as indicated in Section 5.3.2.2. Cold Lake and Vegreville IDF data are indicated in the following tables.

**Vegreville IDF Data: Based on AES data at Vegreville CDA, Vegreville, AB for period 1971 to 1990.**  
**Latitude: 5329 and Longitude: 11202 and Elevation 633 m – Intensity mm/hr**

Duration	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
1 hour	16.3	28.3	36.2	46.2	53.6	61.0
2 hours	10.4	16.9	21.2	26.6	30.6	34.6
6 hours	5.0	7.1	8.5	10.3	11.7	13.0
12 hours	2.9	4.0	4.7	5.7	6.4	7.1
24 hours	1.8	2.4	2.8	3.2	3.6	4.0

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Cold Lake Airport IDF Data: Based on AES data at Cold Lake Airport, Cold Lake, AB for period 1966 to 1990. Latitude: 5425 and Longitude: 11017 and Elevation 539 m - Intensity mm/hr

Duration	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
5 min	72.0	101.9	121.7	146.7	165.3	183.7
10 min	54.9	79.4	95.6	116.0	131.1	146.2
15 min	44.2	65.5	79.7	97.6	110.9	124.1
30 min	27.5	42.4	52.3	64.8	74.1	83.3
1 hour	16.4	25.0	30.8	38.0	43.4	48.7
2 hours	9.7	14.1	17.0	20.8	23.5	26.2
6 hours	4.4	5.8	6.7	7.9	8.8	9.7
12 hours	2.7	3.7	4.3	5.1	5.6	6.2
24 hours	1.6	2.2	2.7	3.2	3.5	3.9

### 5.6.2.5 Design Summary Sheet

Rational Method design calculations are to be tabulated and submitted.

For storm water systems servicing areas greater than 65 ha and all stormwater systems with storage facilities, computer modeling and simulation techniques will be used.

### 5.6.3 Simulation Method

#### 5.6.3.1 Model Selection

Selection of computer programs requires review of the historical application of each program in watersheds similar to those under consideration. County approval of computer program selection shall be obtained before design is commenced.

The OTHYMO or SWMM models are recommended to be used in the design of dual (major and minor) drainage systems; however other suitable programs may be used as approved by the County designated engineer.

### **5.6.3.2 Modeling Procedures**

Whenever possible, modeling results shall be calibrated using observed rainfall and flow data from the design watershed or a similar watershed. Sensitivity of the model predictions to variations of key parameters shall be tested and the findings used to develop realistic and conservative models.

### **5.6.3.3 Rainfall Design Events**

The design events for minor and major systems shall be 5 year and 100-year events respectively.

### **5.6.3.4 Storm Duration**

The IDF curve and rainfall distribution curves (as presented in section 5.3.2.4) should be used to develop rainfall hyetographs with different durations. Details of the selection and interpolation procedure are to be documented and submitted to the County of St. Paul for approval.

For small urban areas (up to 50 ha), a storm duration of 1.0 hour is suitable. For larger areas and urban areas with detention facilities, the design storm with durations of 2, 6, 12 and 24 hours should be considered for simulation. A different range of storm durations may be appropriate, subject to County approval. This will identify the critical storm event to be used in designing the system component. Note that the storm durations that generate the critical peak flow may be different from the durations that generate the critical storage volume. Systems with a number of interconnected ponds or with restricted outlet flow capacity may require analysis for sequential storm events or modeling with a continuous rainfall record.

Detailed designs shall include maximum hydraulic grade lines (HGLs) of the minor and major systems plotted on profiles of the minor system components and compared with minimum building elevations (MBE) to demonstrate flood protection.

### **5.6.3.5 Submission of Modeling Results**

Modeling results are to be submitted to the County in a report containing at least the following information:

- plans showing catchment and sub-catchment boundaries, slopes, soil conditions, land uses and flow control facilities.
- name and version of modeling program(s)
- parameters and simulation assumptions
- design storm details
- pre-development and post-development flow calculations



## **5.7 Site Drainage Design**

### **5.7.1 Lot Grading Design Requirements**

Grading is to comply with the Alberta Building Code and the following:

- grade lots to drain to a municipal minor or major drainage system, natural drainage path or roadway - use 2% minimum grade
- avoid drainage across adjacent lots – if cross-lot drainage is unavoidable, provide a swale to divert runoff away from the lower lots
- grade areas around buildings away from foundations
- where lots are lower than the adjacent roadways, direct road runoff away from buildings and driveways and into a municipal drainage system
- set building elevations above the hydraulic grade line (HGL) of the major drainage system – see Minimum Building Elevations (MBE) guidelines.

Lot grading shall adhere to the following criteria:

- (a) 10% for 2 meters away from buildings for soft surface/landscaping (i.e., clay, topsoil, or sod).
- (b) 5% for the first 2 m away for slab-on-grade buildings for soft surface/landscaping
- (c) 1.0% for hard surface or other impervious surface treatment (i.e., concrete or asphalt).

Reserves and public lands shall be graded to drain toward developed streets, lanes and/or the storm sewer drainage system.

Lots shall be pre-graded to design grade or 300 mm below design grade.

Plans submitted by the Design Engineer shall indicate the following information:

- existing contours and proposed corner grades showing drainage to roadway and not across adjacent property
- minimum ground elevation at the building
- invert of sanitary sewer service
- location of water, sanitary sewer and storm sewer connections
- direction of drainage showing lot grading away from buildings and on to public roadway only
- actual elevation of the top of the sidewalk at the corner of the property
- the proposed and existing grades for the public lands (reserves, buffers, and boulevards).

A common drawing (Lot Grading Plan) may be used to consolidate this information.

***5.7.2 Minimum Building Elevations***

The MBE applies to the elevation of the lowest floor slab in a building or the underside of the floor joists where the lowest floor is constructed over a crawl space. Crawl space is defined as the space between a floor and the underlying ground having a maximum height of 1.2 m to the underside of the joists and not used for the storage of goods or equipment damageable by floodwaters.

The MBE is to be at least 0.60 m above the storm sewer service connection invert and 0.30 m above the major drainage system hydraulic grade line (HGL).

For sites near a watercourse for which a floodplain elevation has been established, the MBE is 0.30 m above the 200-year period instantaneous flood elevation.

## **6 Sanitary Service**

### **6.1 General Principles and Objectives**

The sanitary sewer system shall be of sufficient capacity to convey sanitary flows from all future contributing areas. Sanitary sewers are intended to convey wastewater only. This includes standard domestic plumbing fixtures, floor drains, approved industrial and commercial wastes and unavoidable infiltration. Sanitary sewer systems are intended to exclude stormwater, roof drains, footing drains and groundwater.

The Developer and the Developer's Engineer are responsible to ensure that the infrastructure is designed and constructed to achieve manufacturer's design life expectations consistent with good design and construction practice. System proposals must identify treatment and disposal means in accordance with Alberta Environment and Sustainable Resources Development (AESRD) regulations and guidelines.

Sanitary sewer system designs including plan-profile drawings, specifications and a letter report shall be prepared by a qualified Professional Engineer and be submitted to the County and AESRD for review and approval prior to construction.

### **6.2 Level of Service Objective**

There are two types of sanitary servicing:

- A) Rural Low Pressure Sanitary Servicing (STEP)
- B) Gravity Sanitary Collection System

The following sections outline the methodology and design criteria that apply to the design of these sanitary sewer systems.

### **6.3 Rural Low Pressure Sanitary Servicing (STEP)**

#### **6.3.1 Design Flows**

A sewage generation rate of 300 L/person/day for a low pressure sewer system, with no infiltration rate shall be used, unless otherwise determined by the County designated engineer. Any sewage generation rate other than the above will be dependent upon the disposal system capacity.

In determining residential flows a minimum of 3.5 persons per household shall be used unless otherwise determined by the County designated engineer.

#### **6.3.2 Low Pressure Sewer Mains**

A report from the Developer's Engineer must be prepared to ensure that system sizing is calculated in consideration with the topography of the serviced lands and the population projections.



Recommended pump rate and head will need to be provided. This information will be included in any plumbing permit issued by the County and will ensure that all residents are aware of this requirement.

### **6.3.2.1 Depth of Cover and Clearance**

Mains shall be at a depth adequate to provide a minimum of 2.75m depth of cover from finished grade to top of pipe.

A minimum distance of 2.5m horizontal separation must be maintained between a sewer main and any water main.

A minimum distance of 3.0m horizontal separation must be maintained between a sewer main and any gas line.

Public Utility Lot (PUL) widths shall be a minimum of 4.0m for a single utility and 6.0m for one containing two utilities. A 1.0m easement is required on the lots on each side of a PUL.

### **6.3.2.2 System Configuration**

A separate service line with a curb stop, marked "sewer" at the property line is required for each lot.

Manual air/vacuum relief valves are required at all high points for removal of hydrogen sulfide gases from anaerobic decomposition of organics.

Marker posts shall be installed perpendicular to all valves, air release and flushing standpipe locations, adjacent to the property line. Warning signs and painted fence posts shall be installed at the edge of the road right-of-way where low pressure sewers cross roadways. Posts shall be GlasForms Inc., Fiberglass Composite Markers, Dual-Flex, Part number DF66-00 (66 inches long in White) with Orange reflective stickers applied to both sides or approved alternate.

- Posts shall include one composite post anchor and shall be installed 18 inches in depth, thereby leaving 4 ft visible above ground.

Tracer Wire of 14-gauge copper shall be installed simultaneously with the pipe on all mains and services. Splicing the tracer wire can be done by soldering, and mechanical connections, the following shall apply:

- Tracer wire shall not be connected to the steel pipe or transition couplings.
- Tracer wire shall be brought flush to the ground at every valve box riser, at every road crossing, at every facility location and at each end of every plastic pipe section. It shall be brought flush to the ground inside a rigid PVC conduit and looped inside a PVC junction box, within a type A valve box marked "Sewer". An electrical continuity test shall be performed prior to acceptance.

### **6.3.3 Fittings**

High Density Polyethylene (HDPE), DR 11 conforming to ASTM F714 and CAN B137.1, shop molded fittings shall be used.

All HDPE molded fittings shall meet the requirements of ASTM D2683 for socket-type fittings, ASTM D3261 for butt-type fittings, or ASTM F1055 electrofusion-type fittings.

### **6.3.4 Valves**

Gate valves for 75mm and larger shall be iron body, bronze mounted gate valves with a non-rising spindle, which open by turning in a counterclockwise direction.

All valves shall conform to AWWA C500 for bronze mounted solid wedge gate valves or AWWA C509 for resilient seated gate valves. Interior to be factory coated with epoxy coating conforming to AWWA C550. Exterior to be factory applied epoxy coated. Corrosion reduction shall be provided by installation of a zinc sacrificial anode. Valves shall be flanged for polyethylene pipe.

Brass inverted key-type curb stops shall be used for valves 50mm and smaller conforming to ASTM B62 compression type. Curb stops should have adjustable bituminous, or epoxy coated cast iron service base with stem to suit 3.0m depth of bury. Top of cast iron box shall be marked "SEWER". All curb stops shall incorporate 75mm long stainless-steel sleeves for connections to polyethylene pipe.

Valve ends shall be compatible with pipe joint type (Cast Iron Outside Diameter).

Cast iron valve boxes conforming to ASTM A48, Class 25 of the screw or sliding type shall be required on all valves. Coating inside and outside shall be an asphaltic coating or fusion bonded epoxy conforming to AWWA C213. Set screws to be galvanized. Top of box to be marked "SEWER".

Extension stem shall be 25mm square mild steel with 50mm operating nut and flange suitable for 3.0m bury. A rock disk nut is required on all valves.

Schedule 40 PVC valve boxes for the bottom boot of Norwood Foundry Type A sliding type valve boxes or approved equal are permitted in areas not exposed to vehicle loading.

### **6.3.5 Service Connections**

Each lot must have a separate service.

Curb stops marked "SEWER" shall be installed at the private property line, located within the 3.5m utility easement.

Sanitary sewer service pipe shall be 40mm, DR 11 polyethylene pipe, Series 110 Municipal tubing.

Main connections shall be made by means of fused in-line tees or saddles. All fittings and joints must be assembled by electro fusion or butt fusion for HDPE piping. Services to be in one piece, no mechanical connections are permitted between main connections and curb stop.

Curb Stops shall be non-draining type located adjacent to driveway locations.

Minimum depth of cover shall be 2.75m from finished grade over top of the service pipe.

### **6.3.6 Septic Tanks**

Use two-compartment tank or a single compartment tank with a pump vault, sized and constructed in accordance with Alberta plumbing codes.

Extend tank access risers at least 150mm above finished ground surface, provide watertight manhole covers and divert surface runoff away from the manhole cover.

Tank must be large enough to provide:

- Minimum of 450mm for pump submergence,
- Full day of emergency storage capacity above the high-water alarm level, utilizing the septic tank freeboard capacity below ground and/or below building drain outlet invert,
- Minimum of 12-hour retention time below high-water alarm level for proper treatment of the sewage flow,
- Storage of sludge and scum accumulation,
- Typically, 3800L (1000 gal) minimum total tank storage for an average 3 bedroom dwelling, and
- Reference "Alberta Private Sewage System Standard of Practice 2009", Part 4 - Initial Treatment Components Primary.

Tank must be sealed watertight tank (fiberglass, or one-piece precast pump tank or special provisions for assuring watertight tank).

Anti-buoyancy provisions must be adequate.

All pipe and wire conduits into tank must be through hubs or fittings made during the construction of the tank and installed in a watertight and gastight fashion.

No drainage or any water other than sanitary wastewater shall be allowed to enter the tank.

The effluent shall enter the pump compartment or pump vault from the clear zone of the tank between the scum and sludge layers.

### **6.3.7 Pumps and Discharge Pipe**

Pumps should be:

- Submersible,
- Capable of 3-minute minimum pump run time at 1 L/s pumping rate, and
- Must be a CSA approved effluent pump capable of delivering 0.3 L/s at 70 m of total dynamic head or at a pressure established by the County. Pump must be readily removable from the ground surface.

Pump discharge pipe must be of DR 11 HDPE or stronger and include a check valve, disconnect union and gate valve within the pump tank.



The pump screens shall be no larger than 3mm in size and occupy a surface area of 1.44 square meters; or equivalent product approved by the County.

Pumps must be activated by either mechanical level controllers or Mercury level control switches.

When any pump is located at a higher elevation than the elevation of the terminal end, a siphon-break valve must be provided for that pump.

Provisions for ventilation should be provided.

### **6.3.8 System Materials**

The Developer shall supply and install only new materials. All such materials which are defective in manufacture, damaged in transit, or have been damaged after delivery shall be replaced by the Developer at his expense.

All standards referred to mean the latest edition of that Standard.

Where specific products are specified, it is intended that approved equals are also acceptable, as approved by County designated engineer. The County designated engineer's approval must be obtained before the equal product is used.

#### **6.3.8.1 High Density Polyethylene (HDPE) Pipe**

High Density Polyethylene pressure (HDPE) pipe shall be DR11 or DR13.5; PE 3408 iron pipe sized (IPS) and shall conform to CSA B137.1, ASTM F714 and ASTM D3350 Standards. Pipe sized from 13mm through 76mm shall conform to ANSI/AWWA C901-02 Standard. Pipe sized from 100mm through 1575mm shall conform to ANSI/AWWA C906-00 Standard.

Shop only molded pipe fittings shall be used. If unavailable, other alternatives must meet County approval first.

All joints are to be thermal heat fused. Mechanical service connections are not approved.

All components shall be made of corrosion resistant materials.

Pipe age shall not exceed two years at the time of installation.

### **6.3.9 System Installation**

The system installation standards are intended to address key points only and are not to be considered as a substitute for a detail construction specification to be prepared by the Developer's Engineer.

#### **6.3.9.1 Trenching, Bedding and Backfilling**

All trenching and backfilling shall be completed in strict conformance with Occupational Health and Safety and any other applicable regulations and directions of the County Safety Officer.

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It is the Developer's responsibility to ensure that his Consultants and Contractors are familiar with the "Safe Procedures for Pipeline and Utility Crossings" document produced by the Edmonton Area Pipeline and Utility Operators Committee. This document is in its entirety from the Alberta One Call. The following sections from the 1991 publication of the referenced are provided below.

- Section 1.4 Contractor Responsibilities
- Section 1.5 Pipeline Applicant Responsibilities

The Developer shall, as a minimum, include the most recent version of the appended sections in their Contract Documents for Construction.

If unsuitable soil conditions (i.e., organics, high moisture content, rock, etc.) are encountered, the method for dealing with these conditions shall be assessed by a qualified Professional Engineer commissioned by the Developer, and a letter report submitted to the County designated engineer.

For open trench construction Class "B" bedding as depicted on the Detail Drawing shall be used for all sewer mains in suitable soil conditions. If unsuitable pipe foundation conditions exist, the design for a special pipe foundation and bedding shall be prepared by a qualified Professional Engineer and submitted to the County designated engineer.

In all new subdivisions it shall be the Developer's responsibility to ensure that utility trenches are adequately compacted. In the road ditch or ditch slope the road right-of-way 95% on Standard Proctor Density shall be required. A 98% SPD compaction shall be required for roadway core and roadway backslope.

A two year warranty on trench settlement shall be required in all areas of work performed by trencher machine excavation.

If the above compaction standards cannot be achieved because of abnormal weather or wet ground conditions the County designated engineer may at his sole discretion establish a more appropriate standard for the individual case on receipt of an acceptable proposal from the Developer's Engineer.

### **6.3.9.2 Service Connections**

Backfilling shall be carried out with approved native material in 300 mm layers, compacted to a minimum of 98% Standard Proctor Density with the road right-of-way and 95% Standard Proctor Density in all other areas. The top 1 m shall be in 150 mm lifts compacted to 98% Standard Proctor Density.

### **6.3.10 Inspection and Testing**

Before acceptance of the work, the entire system shall be subjected to a hydrostatic pressure test in the presence of the County representative. The Developer shall provide all necessary labor, materials and equipment for the test including a suitable pump, measuring tank, pressure hoses, connections, plugs, caps, gauges and all other apparatus necessary for filling the main, pumping to the required test pressure and recording the pressure and expansion-leakage losses. The Developer shall provide evidence that the gauges used are accurate.

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High points must have automatic air/vacuum relief valves to vent air when filling and be closed when pressure is applied.

A hydrostatic test pressure of 1.5 times the rated pressure of the pipe at the lowest point in the system main shall be applied.

Test period shall be for 2-hour duration. Amount of make-up water (leakage) required to return the pipe to required test pressure shall not exceed the allowance given in the following table.

### Field Testing of Low Pressure Sewer Systems

Nominal Pipe Size (mm)	Allowance for Expansion (Leakage) (liters/100 mm of pipe) 2 Hour Test
50	1.6
75	1.9
100	3.1
150	7.5
200	12.5

Total time under test pressure must not exceed 8-hours. If test is not accepted due to leakage or equipment failure, test section must be permitted to “relax” for 8-hour period prior to the next testing sequence.

## 6.4 Gravity Sanitary Collection System

### 6.4.1 Design Flows

#### 6.4.1.1 Dry Weather Flow

Sanitary sewer system design shall be based on an average daily dry weather flow (ADWF) of 300 litres per day per capita (L/d/c).

Average dry weather flows (ADWF) shall be based on specific data related to the development or zoning.

#### 6.4.1.2 Wet Weather Flow – Peaking Factor

The peaking factor is the ratio of peak dry weather flow (PDWF) to the average dry weather flow (ADWF). Where possible, the peaking factor shall be based on locally recorded flow data from similar developments. In the absence of such data, the peaking factor shall be the larger of either 2.5 or the calculation using the design residential population and non-residential equivalent population to a maximum of 3.5, with the following formula:



$$PF = 1 + 14/(4 + P^{0.5}) \quad \text{Where} \quad PF = \text{Peaking Factor}$$

P = Population and Equivalent (in thousands)

#### **6.4.1.3 Infiltration**

Design flow shall include an infiltration allowance to cover groundwater infiltration and system inflows. Irrespective of the land use classification, the allowance shall be based on the gross tributary area and the following:

$$\text{Infiltration allowance} = 0.14 \text{ L/s/ha}$$

#### **6.4.1.4 Total Design Peak Flow**

The total design peak flow for gravity sanitary sewer is the sum of the peak dry weather flow plus all extraneous flows plus sanitary flows from all future contributing areas.

Sanitary manholes are to be located away from roadway sags and low areas where surface runoff might pond. When this is unavoidable or the possibility of inundation by major drainage flows exists, the sanitary design peak flow rate shall be increased by 0.4 L/s for each manhole. For new construction, all sanitary manholes in sag locations are to be waterproofed.

Foundation drains (weeping tiles) and roof leaders shall not be connected to the sanitary sewer system. Therefore, for new development areas, a specific allowance for flows from foundation drains and/or roof leaders to the sanitary sewer system is not required. However, the Developer is required to account for foundation drain flows and/or roof leader flows when computing sanitary design flow from previously developed areas where such connections may be present.

### **6.4.2 Sizing of Sanitary Sewers**

#### **6.4.2.1 Gravity Sewers**

All sanitary sewers shall be sized using the Manning's formula:

$$Q = \frac{AR^{0.667}S^{0.5}}{n} \quad \text{Where:}$$

Q = design flow in m<sup>3</sup>/s

A = cross sectional area in m<sup>2</sup>

R = hydraulic radius (area/wetted perimeter) in m

S = slope of hydraulic grade line in m/m

n = roughness coefficient

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Sanitary sewers are to be designed to carry the Total Design Peak flow at flow depth of 80% of the sewer diameter. This results in a flow rate approximately 86% of the sewer's full flow capacity. Therefore, the required flow capacity for sizing of the sewer shall be computed using the following relationship:

$$\text{Required Full Sewer Flow Capacity} = \frac{\text{Estimated Total Design Peak Flow Rate}}{0.86}$$

### 6.4.2.2 Sewage Force mains

All sanitary sewage force mains shall be sized using the Hazen-Williams formula. The industry's recommended friction coefficient for pipe materials shall be used in the formula.

### 6.4.2.3 Minimum Flow Velocities

Sanitary sewers shall be designed to provide the following minimum full flow velocities:

- gravity sewers at 0.60 m/s for pipes 375 mm or greater. For pipes 300 mm or smaller, the minimum full flow velocity is 0.65 m/s

### 6.4.2.4 Minimum pipe diameter

The minimum size for sanitary sewers in residential areas is as follows:

Collector Sewers	200 mm
Service Connections	100 mm
Sewage Force Mains	100 mm

The minimum size for sanitary sewers for commercial, industrial, and institutional areas is 250 mm.

### 6.4.2.5 Slope Requirements

Minimum grades of gravity sewers are as required to obtain the minimum velocity of 0.60 m/s except for the upstream section of a residential sewer serving a design population of 25 or less in which case the minimum grade is 0.6%, unless otherwise approved by the County of St. Paul. No sanitary sewer shall have a slope of less than 0.10%.

Minimum slopes permitted for various sewer sizes are as follows:

Sewer Size	Minimum Slope
200 mm	0.40%
250 mm	0.28%
300 mm	0.22%
375 mm	0.15%
450 mm	0.12%
525 mm	0.10%
600 mm	0.10%

#### **6.4.3 Depth Requirements**

Sewers shall be of sufficient depth to:

- permit gravity service connections to basements
- prevent freezing – provide insulation where minimum depth cannot be attained
- clear other underground utilities
- prevent damage from surface loading
- minimum depth of cover 2.7 m to top of pipe measured from finished design grade
- maximum depth of cover 4.5 m, except under special circumstances with approval in writing from the County designated engineer

#### **6.4.4 Pipe Material**

Pipe material shall be PVC pipe – ASTM D3034 SRD35 (maximum 600 mm diameter). Larger pipe diameters shall be submitted for approvals by the County of St. Paul.

Installation is to comply with manufacturers recommendations.

#### **6.4.5 Alignment and Location**

Except as indicated for curved sewers, horizontal and vertical alignments shall be straight lines between manholes for gravity sewers, and between defined deflection points for force mains. Elevations are to be recorded.

Forcemain line and grade requirements are as indicated for water mains. Air release valves are required at high points.



### 6.4.6 Curved Sewers

Horizontal and vertical curves may be formed using pipe joint deflections as follows:

- minimum radius = 60 m
- constant radius throughout curve
- joint deflection not to exceed 75% of maximum recommended by pipe manufacturer
- minimum design velocity = 0.9 m/s
- continuous curves between manholes

#### 6.4.6.1 Minimum Slopes for Curved Sewers

Minimum slopes permitted for various curved sewer sizes are as follows:

Sewer Size	Minimum Slope
200 mm	0.40%
250 mm	0.31%
300 mm	0.25%
375 mm	0.18%
450 mm	0.15%
525 mm	0.13%
600 mm	0.10%

### 6.4.7 Manholes

#### 6.4.7.1 Location/Spacing

Sanitary manholes are to be located away from roadway sags and low areas where surface runoff might pond. When this is unavoidable or the possibility of inundation by major drainage flows exists, the sanitary design peak flow rate shall be increased by 0.4 L/s for each manhole. For new construction, all sanitary manholes in sag locations are to be waterproofed.

Manholes are required at the following locations:

- every change of pipe size
- every change in grade, except as indicated in the Curved Sewers section
- every change in direction, except as indicated in the Curved Sewers section
- downstream end of curved sewers
- every pipe intersection except for 100 mm and 150 mm service connections and junctions with trunk sewers 900 mm diameter and larger

- upstream end of every sewer line
- every future pipe intersection
- 120 m maximum spacing.

### 6.4.7.2 Elevation Considerations

The obvert elevation of a sanitary sewer entering a manhole shall not be lower than the obvert elevation of the outlet sewer.

Pipe inverts shall have a minimum drop across manholes of:

Straight run	5 mm drop
Deflections up to 45°	20 mm drop
Deflections 45° to 90°	30 mm drop

Drop manhole and ramp structures shall be avoided where possible by steep-ending inlet sewers. Where necessary, provide drop structures as follows:

Invert Elevation Difference	Structure
Up to 0.25 m	Inside Ramp
0.25 to 0.90 m	Outside Ramp <sup>1</sup>
Greater than 0.90 m	Outside Drop <sup>12</sup>

<sup>1</sup> For tie-ins to existing manholes

<sup>2</sup> Inside drop may be used if specifically approved by the County of St. Paul.

Forcemain discharges shall be directed into the receiving manhole outflow pipe. Manhole benching shall be extended a minimum 200 mm above the force main crown. If a manhole drop cannot be avoided, an inside drop pipe is required.

Where possible, the maximum drop allowed across a manhole is 0.5 m.

### 6.4.7.3 Size and Material

Manholes shall be precast concrete with a minimum 1200 mm inside diameter in the main portion of the structure and shall conform to the latest version of ASTM C478. All concrete shall be sulfate resistant.

Oversized manholes are permitted to accommodate large diameter pipes and shall be sized according to manufactures requirements to accommodate the infrastructure.

Frames and covers shall be of cast iron and capable of withstanding H - 20 loading. The words "Sanitary Sewer" shall be permanently embossed on the cover.

All joints shall be designed and constructed to be watertight using a bitumastic watertight sealant.

PVC mains shall be connected to manholes using either a manhole adaptor or an approved pre-benched manhole base.

Benching in manholes shall provide a smooth flow channel between sanitary sewer pipes.

The maximum change in the direction of flow in any sanitary sewer manhole shall be 90°.

### **6.4.8 Service Connections**

Every legal lot and each unit of a residential duplex shall be provided with a separate service connection.

Unless otherwise approved by the County, connections are to serve all plumbing by gravity. Drawings shall provide service invert at property line and minimum service elevation at building setback location.

#### **6.4.8.1 Service Size**

Pipe size is to accommodate peak design flow. The minimum size of sanitary sewer service connection to a single family dwelling shall be 100mm diameter. The minimum sanitary service to industrial, institutional, and multi-family lots shall be 200mm.

#### **6.4.8.2 Location and Depth**

Connections to large lots are to be located at the lower portion of each lot. For residential developments, locate connections in accordance with standard detailed drawings.

Depth requirements are as indicated for sewer mains.

#### **6.4.8.3 Grade**

Minimum grade from property line to sewer main is:

100 mm diameter pipe	1.50 %
150 mm diameter pipe	1.00 %
Larger Sizes	Grade based on minimum velocity of 0.75 m/s



### 6.4.8.4 Details

Use standard wye fittings for connections to new mains. For connections to existing mains, use wye saddles or, if approved, insertable tees. The service connection centerline must not be below the sewer main centerline.

Double stainless steel strapped PVC saddles shall be used on all sewer service connections at the main.

Service connections may be permitted into manholes if:

- the connection is not oriented against the flow in the main
- manhole hydraulic requirements are met.

Inspection chambers are required on residential connections unless the service is less than 2.5 m long and connects to a manhole.

Control inspection manholes are required on all industrial and commercial connections or on a service connection larger than 150 mm diameter.

Connections exceeding 30 m in length shall be treated as mains.

All 100 mm, sanitary sewer service pipes shall be polyvinyl chloride (PVC) with a minimum SDR of 28, other sizes to be PVC, SDR 35.

All sanitary sewer service lines must have a 200 mm vertical inspection chamber complete with cast iron security cover at final lot grade located within 300 mm of the property line on the public side. When a gas easement occurs adjacent to the property line the service shall be stubbed 300mm beyond easement limits.

### 6.4.8.5 Fittings, Valves, Appurtenances

- surge protection
- Air release
- Blow-off valves
- Vacuum relief

## 6.4.9 Testing of Sewers

### 6.4.9.1 Water Leakage Test

In areas where the ground water level is at or above the sewer pipe invert, each section of sewer mains and service connections shall be tested for water tightness by an infiltration test. In all other situations, an exfiltration test may be required after review of the camera inspection report.

Maximum allowable leakage for an exfiltration test of a sewer pipe while subjected to a minimum 0.6 m hydrostatic head of water is 40 l/d/mm of diameter/km of PVC Pipe.

Tests shall be undertaken on each section of sewer main, and the results recorded.

### 6.4.9.2 Camera

All sections of sewer shall be inspected with closed circuit television camera equipment at CCC and FAC. An inspection report, photos and DVD shall be submitted to the County for their records.

## 6.5 Communal Wastewater Treatment Plant

In the event that offsite wastewater services are not available for the Applicant, a communal wastewater treatment plant can be proposed. In general, the requirements for the design, construction and operation of a wastewater plant in Alberta shall meet Parts 3 and 4 of the *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems* (AESRD, 2013a, 2013b).

### 6.5.1 General Requirements

The general requirements for the construction and operation of a wastewater treatment plant in the County requires:

- An approved Building Permit from the County.
- An approval to operate a mechanical wastewater treatment system from Alberta Environment and Sustainable Resources Development (AESRD);
- An agreement with the County or a third-party utility for the operations of the wastewater treatment plant;
- An approved discharge location:
  - Agricultural/golf course irrigation,
  - Outfall to a surface water body,
  - Soil based disposal (i.e. sand mounds, drip dispersal and treatment fields),
  - Other options as approved by the County.
- An approved feasibility study for onsite wastewater treatment detailing:
  - Business plan for cost recovery,
  - Technologies assessed,
  - Applicability and history of the proposed technology in Alberta's climate,
  - Capital, operations and maintenance, and life cycle costs

If the treated wastewater discharge is greater than 100 m<sup>3</sup>/day and is to be disposed to a surface water body, approval must be obtained through Environment Canada under the Wastewater Systems Effluent Regulations.

### **6.5.2 Specific Regulatory Requirements**

The primary approvals are obtained from AESRD and Environment Canada for the construction and operations of a wastewater treatment plant. There are some additional approvals and information that must be obtained for certain disposal options. There are specific additional requirements for:

- Outfalls into surface water bodies,
- Agricultural/golf course irrigation, and
- Soil based disposal.

#### **6.5.2.1 Outfalls**

For outfalls, there are three additional Acts that the Applicant requires authorizations:

- Navigable Waters Protection Act (Transport Canada),
- Fisheries Act (Fisheries and Oceans Canada), and
- Water Act (AESRD).

The above agencies shall be contacted, and information submitted as per their request.

#### **6.5.2.2 Agricultural and Irrigation**

Irrigation systems are an approved form of alternative disposal of treated wastewater. The guidelines for irrigating land are provided by AESRD and entitled Guidelines for Municipal Wastewater Irrigation (2000).

In addition to the guidance document above, the Applicant shall complete a soil classification study of the proposed area to irrigate. The study shall be completed by a qualified Professional Agrologist and completed based on the Standards for the Classification of Land for Irrigation in the Province of Alberta (2000). The outcomes of the study shall be reported to AESRD, and Alberta Agriculture and Rural Development.

#### **6.5.2.3 Soil Based Disposal**

Although AESRD has no specific guidance on soil-based disposal technologies, reference to the design of such systems should be made to the Alberta Private Sewage Systems Standard of Practice 2009 (SOP).

In addition to the guidance provided in the SOP:

- A soil-based disposal option must be designed and sealed by a Professional Engineer;



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- A soil investigation, as described in the SOP, must be completed by a Professional Agrologist.

## 7 Water Service

### 7.1 General Principles and Objectives

The Applicant and the Applicant's Engineer are responsible to ensure that the infrastructure is designed and constructed to achieve manufacturer's design life expectations consistent with good design and construction practice. Water distribution system designs including plan-profile drawings, specifications and a letter report shall be prepared by a qualified Professional Engineer and be submitted to the County and Alberta Environment and Sustainable Resources Development (AESRD) for review and approval prior to construction.

### 7.2 Level of Service Objectives

Definition of level of service standards in Policy 1.1

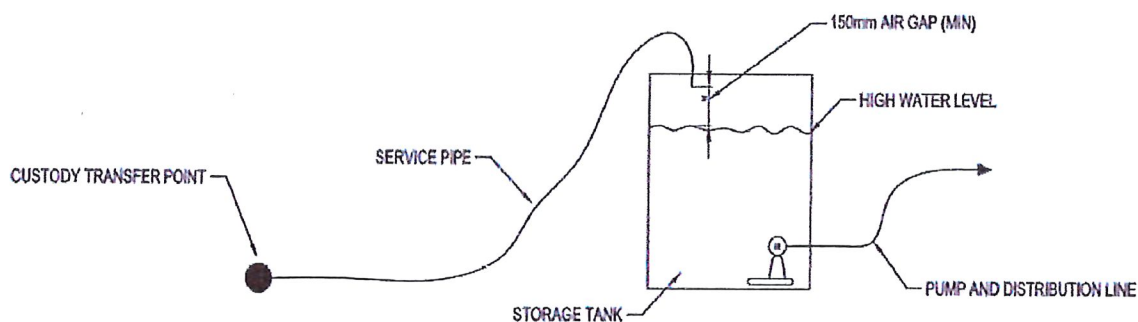
### 7.3 Direct Connection to Regional Water System

Service connections to the regional water line shall provide water metering, backflow and air gap as outlined in the schematic below.

Service connection designs shall be submitted to the County and the applicable Regional Water Commission for review and approval prior to construction.

#### 7.3.1 Typical Arrangement

From curb stop (i.e. custody transfer point) at the property line, individual consumers (or Developer) will be responsible for the design, supply and installation of the service connection components shown schematically in Figure 7.1 in accordance with the County of St. Paul Standards and Policies of the applicable Regional Water Commission.



#### 7.3.2 Service Connection

Service connection designs shall be submitted to the County and the applicable Regional Water Commission for review and approval prior to construction.

Service pipe shall be of Type K hard temper copper pipe, AWWA C800.

### **7.3.3 Metering**

Meter vaults/chamber shall be Plainsman Model 18 Meter Lift Assembly as manufactured by Plainsman Mfg. Inc or other meter vault/chamber approved by the County. Meter vaults shall include one SENSUS IPERL water meter (5/8 x1/2 IPERL M3 8WWHL25' w/ TRPL) for each service connection, each vault shall include one sensus pit meter transceiver unit (520M TC SP Hourly/LKD).

Height of meter vaults to be standard 3050 mm (120 in). Meter vaults shall be located in the County's Right-of-Way.

Single meter vaults shall include Y-strainer and tee in addition to standard fittings.

Dual meter vaults shall include a pressure reducing valve (PRV) in addition to standard fittings.

Meter vaults shall be supplied as a packaged system. Shop drawings shall be submitted for the complete package system. Bedding, Backfill and Compaction Specifications shall be the same as those for the transmission main.

## **7.4 Water Distribution System**

### **7.4.1 System Design**

The water distribution system shall be designed in accordance with these recommended minimum standards and under the direction of a design professional who has the appropriate experience and is registered with the Association of Professional Engineers and Geoscientists of Alberta.

With the exception of fire hydrants, blow-offs and blowdowns within public rights-of-way, provision shall be made for metering of all water connections. The design flow for the system shall be determined based on the Level of Service requirements for the proposed development.

Use the following per capita demands:

average annual daily demand (ADD) 300 litres per capita per day (L/c/d)

maximum day demand (MDD) 540 litres per capita per day

peak hour demand (PHD) 810 litres per capita per day

Residential, commercial, industrial, and institutional demands shall be determined using specific data related to the development or zoning.

For maximum day (MDD) and peak hour (PHD) use the following ratios indicated for per capita demands.



$$\text{MDD} = 1.8 \text{ ADD}$$

$$\text{PHD} = 1.5 \text{ MDD}$$

#### 7.4.1.1 Design Flows

Unless otherwise indicated by the County of St. Paul system design flows shall be based on the ultimate population and fully developed non-residential land as anticipated in the Municipal Development Plan (MDP).

Total design flows ( $Q_{\text{design}}$ ) are to be the greater of the following:

$$Q_{\text{design}} = D + F \quad \text{Maximum Day Demand for the population or equivalent population plus the Fire Flow, or}$$

$$Q_{\text{design}} = H \quad \text{Peak Hour Demand for the population or equivalent population}$$

#### 7.4.1.2 Fire flow Requirements

Fire Flows shall be determined in accordance with the requirements of the current edition of "Water Supply for Public Fire Protection – A Guide to Recommended Practice", published by Fire Underwriters Survey.

#### 7.4.1.3 Pressure Requirements

Pressure requirements in the system are as follows:

Maximum allowable pressure	850 kPa
Minimum pressure at Peak Hour Demand (PHD)	300 kPa
Minimum pressure in system during design Fire Flow and Maximum Day Demand (MDD+F)	140 kPa

Where the maximum pressure exceeds 515 kPa, service connections must be individually protected by pressure reducing valves located in the properties being served.

#### 7.4.1.4 Hydraulic Network Analysis

Where the size of the area to be developed warrants, or if required by the County, a hydraulic network analysis shall be carried out and all relevant information shall be submitted with the design documents.

#### **7.4.1.5 Velocity Requirements**

Velocities at maximum flows shall not exceed 3.0 metres per second.

#### **7.4.1.6 Alignment and Location**

##### **7.4.1.6.1 Depth Requirements**

Water mains and services must be of sufficient depth to clear other underground utilities and prevent freezing. Soil type and groundwater levels shall be considered. Minimum depth of cover to be 3.0 m from finished design grade to the top of pipe.

Insulation is required for frost and mechanical protection in cases where minimum depths cannot be attained or to the satisfaction of the County designated engineer.

##### **7.4.1.6.2 Dead Ends**

Water mains must be looped wherever possible. Where dead ends are unavoidable, and approved by the County of St. Paul, blow-offs, blowdowns or fire hydrants shall be provided. Blow-off and blow-down sizes are:

- 50 mm diameter for 150 mm diameter water mains
- 100 mm diameter for 200 mm diameter and larger water mains

Where practical, and approved by the County, hydrants may serve a secondary role as a blow-off.

##### **7.4.1.6.3 Alignment/Separation between Utilities**

On straight roads, water mains shall have straight alignments with uniform offsets between intersections. Curved alignments, parallel to property lines, may be used. Design joint deflections shall be limited to half the maximum deflection specified by the pipe manufacturer. Locations of short lengths, or field cut pipes, must be recorded during construction.

Mains shall be located such that each property served has at least one side facing the water main.

Where a water main crosses private land, right-of-way requirements are as indicated in Section 3.0 General Design Considerations.

Clearance from sewers is as indicated in Section 3.0 General Design Considerations.

#### **7.4.1.7 Pipe Material**

#### **7.4.2 Hydrants**

All areas shall have hydrants installed in locations and at spacing convenient for Fire Department use along streets and in other areas including private developments, where fire apparatus may go. Fire hydrants will

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be located on the right-hand side of the street when entering dead ends or cul-de-sacs. General distribution of hydrants shall include spacing between hydrants measured in any direction along street frontage of:

- 140 m for residential protection,
  - 120 m for commercial, institutional, and industrial,
- or as specified by Fire Underwriters Survey "Water Supply for Public Fire Protection", whichever is less.

Hydrants shall be located to conform with the sidewalk and/or the curb and gutter and driveway design as follows:

- |                       |  |
|-----------------------|--|
| Residential           | <ul style="list-style-type: none"><li>▪ 0.3 m clear back of monolithic sidewalk curb and gutter</li><li>▪ 1.0 m from face of curb where there is no sidewalk</li><li>▪ 1.0 m from face of curb if separate sidewalk curb and gutter.</li></ul> |
| Commercial/Industrial | <ul style="list-style-type: none"><li>▪ 1.0 m from face of curb</li><li>▪ 1.0 m off property line if there is no curb.</li></ul>   |

Hydrants shall be located on the projection of lot lines or at the beginning or end of curb returns with adjustments made so as not to conflict with catch basins.

In areas with "rural" roadway cross-sections, hydrants shall be located on special "pads" extending perpendicular to roadway centre lines and a minimum of 3.0 m from the edge of the proposed road surface and be accessible from the roadway. The elevation of the "pads" shall be no more than 0.3 m below the crown of the road at that point.

Hydrants shall conform to AWWA Specification C502 and shall be Canada Valve complete with:

- two (2) 65 mm threaded connections to Alberta Mutual Aid Thread specifications
- one (1) 100 mm internal lug quick connect connection to CAN4-5543-M84 specifications, oriented to the street
- operating nut, #1 – 1 ¼ inch 5-sided pentagon
- all bolts and nuts shall be stainless steel
- 300 mm extension on top with breakaway flange
- all hydrant bodies shall be painted chrome yellow in colour; private hydrants may be red

Hydrants that are susceptible to vehicle damage shall be protected with bollards or similar devices as required by the County's Director of Public Works.



### **7.4.3 Fittings and Valves**

#### **7.4.3.1 Location**

In general, valves shall be located as follows:

- in intersections either in a cluster at the pipe intersection or at projected property lines to avoid conflicts with curbs and sidewalks:
  - 4 valves at “X” intersection
  - 3 valves at “T” intersection
- not more than 200 m apart
- not more than two (2) hydrants isolated
- not more than 20 service connections isolated in new developments or to the satisfaction of the County designated engineer

Gate valves are required on mains smaller than 450 mm diameter, for larger lines, butterfly valves shall be used.

#### **7.4.3.2 Valve Types**

- blow off valves
- gate/isolation valves
- chambers/manholes for valves or meters

Combination air valves shall be installed at the summits of all mains of 200 mm diameter and larger, except as follows:

- where the difference in elevation between the summit and valley is less than 600 mm
- where it can be shown that air pockets will be carried by typical flows
- where active service connections are suitably located to dissipate entrapped air.

Air valves must be vented to an appropriate above-grade location to eliminate any potential for cross connection in a flooded or contaminated chamber.

Where practical, and approved by the County of St, Paul, a hydrant may serve a secondary role as a blow-off.

Typical air valve sizes, subject to design analysis, are as follows:

Water Main Size	Valve Size
250 mm to 300 mm	25 mm
350 mm to 600 mm	50 mm
larger than 600 mm	special design

Chambers or manholes containing valves, blow-offs, meters, or other appurtenances shall allow adequate room for maintenance, including headroom and side room. Access openings must be suitable for removing valves and equipment. The chamber is to be provided with a drain to a storm sewer or ditch, complete with backflow prevention, to prevent flooding of the chamber. Rock pits may be considered subject to suitable soil and ground water conditions. A pumping system may be required for drainage.

Adequate venting shall be provided. The County may require provision of forced ventilation, lighting, heating and dehumidification. Access and ventilation details must comply with WCB regulations.

Insulation to prevent freezing shall be provided where necessary.

#### **7.4.3.3 Material**

#### **7.4.4 Thrust Restraints**

Concrete thrust blocking and/or adequate joint restraining devices complete with corrosion protection must be provided at bends, tees, wyes, reducers, plugs, caps, valves, hydrants, and blow-offs.

The restraint system must take into account potential future excavations in the vicinity of the water main. Design calculations must be based on fitting type, water pressure and soil conditions as per the charts shown in the design drawings section.

#### **7.4.5 Service Connections**

Minimum size 25 mm diameter for domestic requirements, 30 mm maximum length from main to the house. Minimum size 150 mm diameter to convey fire flow requirements. No pipe sizes between 50 mm diameter and 100 mm diameter will be allowed.

Corporation stop to be provided at the mains. Service saddles are to be used at all main connections as per manufacturer's recommendations.

Service pipe may be of type K copper AWWA C800 or other approved materials discussed in this section. All sizes 25mm diameter and under, the pipe shall be conformed to AWWA C903-02, Q-Line pipe to ASTM F1282 complete with the appropriate Cambridge Brass or Mueller Brass Water Service Fittings.

Should the IPEX Q-Line product be chosen it is with the condition that the contractor arrange with IPEX to conduct on-site training and on-going technical field support for the contractor's staff in the proper installation procedures.

The County reserves the right to withdraw this approval at any time should the product:

- no longer meet the current requirements
- receive numerous documented complaints from contractors or staff, or
- be found to be below the standard of similar products that are readily available.

For pipe sizes up to 50mm, pipe shall be conformed to CAN3-B137.1 Polyethylene municipal tubing, PE 3406 Series 160.

Tracer wire (#14-1C AWG FT1 solid white with polyethylene insulation) shall be fastened to the Main Stop and continuously wrapped around the service pipe to the curb cock and on up to terminate at the top of the service box.

For service size 100 mm diameter or greater use PVC water main.

All service lines shall be installed to provide a minimum depth of 3.0 m of cover (including "horizontal goose neck" or bend off the main).

Service saddles shall be all bronze or stainless steel and double strapped.

For industrial requirements, service connections shall not be installed until the servicing requirements are known and a permit, approving the installation, is issued by the County designated engineer.

Each service shall have a shut-off with Type 304 stainless steel extension rods located within 300 mm of the property line on the public side. When a gas easement occurs adjacent to the property line the service shall be stubbed 300mm beyond easement limits. Each connection of 100 mm diameter or larger require an approved backflow prevention device at the property side of the shut-off.

All service connections shall have provisions for metering.

### **7.4.6 Corrosion Protection**

A geotechnical corrosion analysis on the alignment of any proposed water main shall be conducted to determine the corrosiveness of the native soils. All hydrants and hydrant fittings, service connections, valves, fitting and metallic appurtenances shall have corrosion protection.

### **7.4.7 Inspection and Testing**

#### **7.4.7.1 Cleaning and Preliminary Flushing**

Before flushing and testing, ensure waterworks system is completely finished except tie-ins to existing watermains and services and make arrangements with County designated engineer for scheduling of testing and disinfection of mains.



Isolation of existing water system where required will be performed by Municipality. Do not operate any valves without County designated engineer's authorization.

Remove foreign material from pipe and related appurtenances by flushing with water. Main is to be flushed at water velocities as high as can be obtained from available water sources. Minimum velocity is to be 1.0 m/s and in accordance with AWWA C651.

Flushing water is to be discharged to storm sewer, water courses or ditches that have sufficient capacity to carry flow. Flushing to continue at least until flow from most distant point has reached discharge point and until water discharged is clean and clear.

### **7.4.7.2 Testing Procedure**

Before acceptance of the work, the entire constructed system shall be subjected to a hydrostatic pressure test in the presence of the County representative.

Upon completion of construction of any section, which shall be defined as that pipeline and appurtenances located between any two adjacent line valves, prepare section for testing.

Where any section of system is provided with concrete thrust blocks, do not conduct tests until at least 5 days after placing concrete or 2 days if high early strength concrete is used.

Before pipe is filled with water, pipe bedding, concreting of all valves and fittings and backfilling to be completed as required in these standards. Fill each section of pipe and allow to remain full of water for a period of a minimum of 24 hours, prior to commencement of any pressure tests. Subject pipeline to a test of 1.5 x working pressure applied at highest elevation in each section, with a minimum of 1380 kPa applied at the lowest point of test section.

Ensure that test pressure does not exceed pipe or thrust restraint design pressures. Maximum allowable leakage rate at test pressure to not exceed 1.25 litres per millimetre diameter of pipe per kilometre per 24-hour period. Minimum duration of test to be 2 hours. Maximum test pressures should not exceed those specified in CSA B137.3 – Table 9.

Perform pressure and leakage testing of ductile iron piping to AWWA C600 and AWWA M41.

Perform pressure and leakage testing of polyvinyl chloride (PVC) piping to AWWA M23 and AWWA C605.

Perform testing of welded steel piping to AWWA C206; no leakage allowed.

Should any test disclose excessive leakage, repair or replace defect and retest section until specified testing requirements are achieved.

### **7.4.7.3 Disinfection**

After Applicant's Engineer has certified that pipes and appurtenances have passed all specified tests, flush and disinfect pipes and appurtenances. Disinfect, flush, and bacteriological test in accordance with AWWA C651 continuous feed method and the following.

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Disinfection and Flushing procedures shall be witnessed by the Applicant's Engineer and the County's representative. Notify the County's representative at least 48 hours before the proposed date when disinfection will commence.

Do not use granular hypochlorite for disinfection of PVC pipe with solvent welded joints, due to explosive reaction potential.

Retain water containing not less than 25 mg/L free chlorine in water system for a period of at least 24 hours, in accordance with AWWA C651, Continuous Feed Method.

After completion of chlorination, flush chlorinated water from system, hydrants, and services until chlorine concentration in remaining water is less than 0.3 mg/L chlorine residual. Water with a chlorine concentration greater than 1 mg/L shall not be discharged to a recognized water course without the approval of Alberta Environment and Sustainable Resources Development.

After final flushing and before the new water main is connected to the distribution system, two consecutive sets of water samples taken at least 24 hours apart, shall be collected from the new main. Samples shall be taken at a minimum interval of 370m, plus one set from the end of the line and at least one set from each branch. Samples shall be tested at the Contractor's expense for total and fecal coliforms and background bacteria by a laboratory approved by the Engineer. Sampling and analysis shall be done in accordance with *Standard Methods for the Examination of Water and Wastewater*. The presence of total or fecal coliform bacteria and/or background bacteria greater than 200 CFU per 100 ml shall constitute a failed test.

Following successful bacteriological testing, the results of the bacteriological tests shall be delivered or faxed to the County's Engineer. Once satisfactory water quality and bacteriological test results have been confirmed, the County will notify the Contractor to proceed. Contractor shall remove test and bleed out apparatus and shall backfill and complete any work required to commission the waterworks systems. Final connections to existing mains and services shall be swab disinfected with 1% - 5% chlorine in accordance with AWWA C651, Section 4.6. Disinfection and final connections shall be witnessed by the Applicant's Engineer and a representative of the County.

## **APPENDIX A**

### **Typical Road Cross Sections for Different Classes**