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Iqaluit

City of Iqaluit

Municipal Design Guidelines

Version 1

October 2026

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Terms of Use

These Design Guidelines are provided as a minimum standard for the design of municipal infrastructure. The use of these guidelines does not relieve the Engineer of Record (EoR) of their professional responsibility to ensure that the project is designed in accordance with sound engineering practices, applicable laws, and safety regulations. The EoR maintains full responsibility for any sealed designs submitted to the Municipality.

Any deviation from these minimum standards must be submitted in writing as a Request for Variance and must be supported by a technical justification signed and sealed by the EoR.

Should any user have question as to the intent or accuracy of any guideline, specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures, the user is advised to seek clarification by contacting the City of Iqaluit.

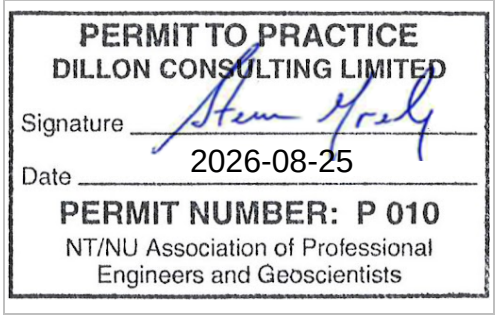
The City of Iqaluit provides these Design Guidelines "as is" and makes no warranties, express or implied, regarding their completeness or fitness for a particular purpose. The City of Iqaluit shall not be held liable for any damages, losses, or expenses arising from the interpretation or use of these guidelines.

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Professional Seals

The Design Guidelines contained within this document have been prepared by or under the direct supervision of the undersigned Engineering Professional, who is registered and in good standing with the Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists (NAPEG).

NAPEG Professional Seal	Responsible for Sections:
	**Section 1 – Typical Development Process** **Section 2 - Technical Submittals** **Section 3 - Water Distribution Design Guidelines** **Section 4 - Sanitary Sewer Design Guidelines** **Section 5 - Stormwater Management Guidelines** **Section 6 - Trucked Servicing Guidelines** **Section 7 - Roadway and Trail Design Guidelines**
	**Section 8 - Power, Illumination & Telecommunications Servicing Guidelines**

NAPEG Permit to Practice


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1.0 Typical Development Process

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Typical Development Process

Municipalities establish development processes to ensure that proposed developments are planned, designed, and constructed in a safe, orderly, sustainable, and coordinated manner that aligns with municipal policies, infrastructure capacity, regulatory requirements, and long-term community objectives. The development process allows municipalities to evaluate the technical feasibility and impacts of proposed projects; protect public safety, environmental quality, and municipal assets; coordinate infrastructure and utility servicing; ensure compliance with applicable standards and bylaws; and identify any required upgrades, conditions, or approvals prior to construction. The process also supports responsible growth, effective land use planning, and long-term operation and maintenance of municipal infrastructure.

This section describes the typical process followed by the City of Iqaluit and outlines the expectations for developers with respect to land development and subdivision projects.

A quick reference flow chart is appended to the end of this section.

1.1 Private Land Development

Under the Land Administration By-law No. 897 (Sections 65–67), the City of Iqaluit disposes of vacant land to private developers through a competitive Call for Proposals process. This approach ensures development aligns with the City's long-term planning objectives and supports sustainable, responsible growth.

The successful proponent is responsible for subdivision planning, road construction, home construction, and compliance with all applicable municipal, territorial, and regulatory requirements. Proposal evaluations emphasize sustainability, affordability, and Inuit housing outcomes.

1.2 Land Disposal Agreement

Developers awarded land must enter into a Land Disposal Agreement with the City. This agreement governs all aspects of development and ensures alignment with the Call For Proposals, municipal standards, and Council's vision.

At a minimum, the agreement shall:

- Specify procedures for parcel registration and lease transfer;
- Identify applicable off-site levies and payment timing;
- Identify lands to be dedicated to the City, if required;
- Establish required development standards;
- Define timelines for infrastructure development and lot disposition; and

- Outline consequences for non-compliance, including penalties, cancellation, or land reversion.

The City may impose off-site levies to recover capital costs associated with servicing the development and may require land dedication for public purposes. All levies, dedications, and standards shall be detailed in the Land Disposal Agreement.

1.3 Land Development Project Types

There are two classifications of land development projects within the City of Iqaluit; “Major Land Development” and “Minor Land Development”. There are different submittal and approval requirements depending on the classification of the development.

The City reserves the right to modify the land development classification for any development based on a review of infrastructure requirements.

1.3.1 Major Land Development

Developments are classified as major land developments when any of the following criteria are applicable:

- New water and / or sewer mains are required within the City’s right of way.
- Roadway improvements are required within the City right of way.
- The development will include five or more dwellings or more than one commercial / industrial building.

The City of Iqaluit encourages developers to request a pre-submittal review meeting for all complex developments prior to moving forward with any engineering plan / report submission package. A pre-development review meeting provides the opportunity for early discussion between the developer and the City to identify the City’s requirements for submission and provide an opportunity for the Developer to ask questions and clarify the City’s regulations/requirements prior to submissions.

1.3.2 Minor Land Development

To be classified as minor land development, the development must meet all of the following criteria:

- The development includes less than five dwellings or no more than one commercial / industrial building.
- Aside from new driveway construction, roadway improvements within the City’s right of way are not required.

- City water and sewer mains (suitable to tie into with new lateral services) are already installed adjacent and the development.

1.4 Technical Submittals

Technical drawing and specification submittals are required for the 25%, 66% and 99% design development process milestones.

Drawings, technical reports and specifications for land development projects shall be prepared in accordance with the City's Technical Submittal Requirements (Section 2).

The approved 99% drawings and supporting technical information form an integral part of the agreement between the Developer and the City for development projects.

The 25% submittal must include a Tentative Plan of Survey, prepared by a surveyor registered with the Association of Canada Lands Surveyors (ACLS). The Tentative Plan of Survey shall include existing and proposed lot lines and easement lines (with dimensions). The Tentative Plan of Survey must be approved by Council.

The requirements for drawing and technical report submissions vary depending on the development classification (major or minor).

Technical reports and supporting information shall be provided to the City with the 66% engineered plan submission and shall be further refined at the 99% stage, as required by the City.

The Developer's Design Engineer shall submit revised design drawings if significant design changes are made following the acceptance of plans by the City. Significant design changes include but are not limited to; revisions to drainage boundaries, pipe sizes, pipe or roadway grades, roadway cross-sections, or pavement structures, or the inclusion of retaining walls. All changes shall be identified on the accepted plans by crossing out the original information and adding the revised information (similar to the method used for preparing "As-constructed" Drawings). Changes shall be coloured red on all copies submitted to the City for approval. A new drawing may be submitted if significant changes are being made.

1.5 Formal Development Agreement

After City Council has approved the development plans, the Developer will enter into a formal Development Agreement with the City.

A development agreement between a developer and a municipality is a legally binding contract outlining how land will be developed. It covers land use, design standards, infrastructure responsibilities (roads, sewers, water, lighting), financial obligations (fees, securities, levies, cost-sharing), construction timelines and phasing, maintenance responsibilities, quality standards,

and dispute resolution, ensuring the project aligns with local planning policy while defining who pays for public amenities.

The City will issue a Development Permit after the Development Agreement has been executed by both parties.

The City will require infrastructure cost estimates from the Developer's Design Consultant to calculate the Developer's securities and off-site levies.

1.6 Public Consultations

The City requires Developers to undertake public consultations to solicit feedback on proposed public spaces and amenities, including playgrounds, parks, trails, and similar features.

The Developer is responsible for organizing public consultations, in coordination with the City.

Public consultations shall be in-person unless directed otherwise by the City. The Developer shall also be prepared to accept public feedback via email and postal mail.

1.7 Approvals

The Developer is responsible for seeking and procuring approvals from agencies or authorities that fall outside the jurisdiction of the City of Iqaluit.

Approvals that may be required include:

- Transport Canada (airports)
- Government of Nunavut Airports
- Fisheries and Oceans Canada
- Government of Nunavut Department of Environment and Wildlife
- Nunavut Water Board
- Nunavut Planning Commission
- Nunavut Impact Review Board
- Qulliq Energy Corporation
- Government of Nunavut Department of Health
- Government of Nunavut Heritage Resources

1.8 Requirement for Asphaltic Pavement

In general, Developers are not required to include asphaltic pavement within new developments.

Any existing asphalt that is disturbed during the course of development work must be reinstated to as good or better conditions than the existing asphaltic pavement. Please refer to

the City of Iqaluit construction specification for asphaltic pavement for materials and execution information.

Any asphalt that is disturbed shall be sawcut to a clean, straight edge prior to reinstatement of new asphalt.

1.9 Infrastructure Installation

The Developer is responsible for installing infrastructure in compliance with the City of Iqaluit Design Guidelines and Specifications.

The City of Iqaluit requires independent vaults for water distribution and sewer infrastructure. The design of water and sewer infrastructure in a common vault is no longer an acceptable practice.

The Developer must be able to demonstrate to the City that the infrastructure has been properly designed and installed. This will require that the Developer procure the services of an engineering consultant registered with NAPEG to design and oversee the construction of the infrastructure.

The Developer's procured contractor must be provided with the most current project drawings and specifications.

1.10 Legal Plan of Survey and Land Registration

The Developer shall procure the services of an ACLS surveyor to prepare the plan of subdivision and to assist with land registration with the Land Titles Office.

The Developer's ACLS surveyor shall register new lots with the Land Titles Office after the formal development agreement has been executed and before the substantial completion of infrastructure.

The lot corners for new lots shall be posted by the ACLS surveyor after the installation of infrastructure.

Surveys and deliverables shall conform to the National Standards for the Survey of Canada Lands (latest version), as published by Natural Resources Canada.

Subdivision plans shall be georeferenced to the City of Iqaluit standard mapping projection.

1.11 Developer's Maintenance Period

After the installation of infrastructure has been completed according to the approved plans and to the satisfaction of the City, and after issuance of a Substantial Completion Certificate by the City, the Developer's maintenance period will begin.

The length of the maintenance period is defined in the formal Development Agreement. During the Maintenance Period, the Developer is responsible for the maintenance of the new infrastructure. Work required during the Maintenance Period may include deficiency rectification, upkeep of infrastructure, snow clearing and road re-grading.

Maintenance period work is the responsibility of the Developer. All costs associated with Maintenance Period work are the responsibility of the Developer.

Quality Control documentation, as outlined on drawings and in the project specifications, must be provided to the City for all work prior to issuance of the Substantial Completion Certificate. This will include but is not limited to; earthworks compaction results, aggregate gradation testing, concrete testing, pipe fusion results, pressure test results, pipe fusion datalogger reports, and quality control test results for factory fabricated structures.

1.12 Final Acceptance & Release of Securities

Towards the end of the Maintenance Period, the Developer must demonstrate that the development infrastructure is fully operational, ready for it's intended use, clean, and in like-new condition. Once the Maintenance Period expires and all deficiencies are cleared to the satisfaction of the Engineer of Record and the City, the City will release the remaining security deposit and will take over ownership of the public infrastructure.

1.13 Development Requirements

All works and services required shall be constructed and installed at the expense of the Developer of the land and shall be constructed and installed to standards prescribed in the most recent City of Iqaluit Design Guideline and Specification publications.

The City of Iqaluit will not accept the works and services or any part of the work required to be completed by the Developer until:

1. The works have been certified by an engineering professional registered with the Northwest Territories and Nunavut Association of Engineers and Geoscientists (NAPEG) to have been completed and constructed in accordance with the City Guidelines and Specifications, and according to good engineering practices;
2. Quality control documentation has been received by the City.
3. The Developer has deposited with the City a detailed as-built survey of the installed infrastructure showing the vertical and horizontal position (using the vertical datum and mapping projection commonly used by the City) in CAD format;
4. The Developer has deposited with the City one set of reproducible drawings showing the works as actually constructed, certified as correct by a NAPEG Professional, in PDF format;

5. The City is satisfied that the certification covers all of the works required to be constructed and installed;
6. The Developer deposits with the City a bond / security in a form satisfactory to the City to expire not earlier than one year after all contractual requirements have been met; and
7. The Developer enters into an agreement with the City to maintain and repair the prescribed works and services to the satisfaction of the City for a period of one year or forfeit all or part of the amount secured by the said bond to the City.

1.14 Development Fees

Development fees as described in City By-law 955 shall be collected by the City of Iqaluit.

1.15 City Development Checklist

The following shall be referenced by City staff during the development process to ensure the appropriate documentation and approvals are in place for new developments:

1.15.1 Development Preparation

- Identification of Developable land (by City) and public consultations.
- Plan of Survey prepared for developable parcel (by City).
- Archaeological Impact Assessment (by City, if applicable).
- Environmental Site Assessment (by City, if applicable).
- Land rezoning application prepared (by City).
- Land rezoning completed (by City).
- Call for Land Development / Subdivision Proposals (by City).
- Review Developer proposals to ensure alignment with Community objectives.

1.15.2 Preliminary Planning and Engineering

- Land Disposal Agreement prepared (by City).
- Land Disposal Agreement prepared executed.
- 25% Plan Set received and reviewed. Provide comments back to Developer.
    - Planning staff review:
        - Review Developer proposal, check for consistency / alignment.
        - Review applicable by-laws
        - Check setbacks
        - Check whether easements or right of ways are required
        - Review community plan for alignment
        - Review density

- Review parking
- Review pedestrian facilities
- Review typical roadway cross section
- Review phases of work / staging

- Engineering staff review:
  - Review grading
  - Review water / sewer alignments and vault locations
  - Review pipe diameters
  - Review hydrant locations
  - Review location of isolation valves
  - Review lot servicing
  - Review ditches and culvert locations
  - Review impacts to adjacent properties
  - Review road improvements
  - Check whether guiderail is warranted
  - Ensure references to City Specifications are included
- Operations staff review:
  - Snow clearing
  - Snow storage
  - Garbage pick-up
  - Location of vaults
  - Flag potential maintenance issues
  - Review trucked water / sewer tank locations, driveways
  - Review temporary water servicing plan
  - Ensure residents / businesses have road and property access during all stages of work
- Review necessary approvals outside City jurisdiction and provide comments back to Developer.

1.15.3 Detailed Engineering Review & Agreements

- 66% Plan Set received and reviewed. Provide comments back to Developer.
  - Planning staff review
  - Engineering staff review
  - Operations staff review

- Determine which studies are required and provide comments back to Developer. Studies may include:
    - Geotechnical investigation
    - Traffic impact assessment
    - Wind & snow study
    - Stormwater management report
    - Sanitary sewer flow / capacity calculations
    - Water distribution servicing report (hydraulic modelling required)
    - Vehicle turning movement figures
    - Estimates
    - Bird hazard study (as required by airport authorities)
- Request and review approval letters / correspondence from approvals / authorities outside the jurisdiction of the City.
- Review studies and reports as prepared by Developer.
- 99% Plan Set received and reviewed. Provide comments back to Developer.
    - Planning staff review
    - Engineering staff review
    - Operations staff review
- Prepare Motion for Council.
- Prepare approval letter to Developer (intent to enter into a Development Agreement).
- Prepare Development Agreement.
- Calculate the Developer's securities amounts / fees.
- Execute Development Agreement (City / Developer).
- Collect security funds.
- Request Development Permit application.
- Review / execute Development Permit.

1.15.4 Infrastructure Construction

- Developer has suitable representation for engineering oversight (Developer's Consultant) and quality control (Developer's geotechnical / materials testing firm).
- Developer has provided appropriate notice to adjacent residents / businesses.
- Developer has coordinated regular progress meetings between Developer's consultant, City engineering department, operations staff, City fire chief.
- Visit site periodically to review site safety, traffic signage, detours, and to ensure there is appropriate on-site representation by the Developer's consultant.

- Review Developer's quality control documentation with engineering team to confirm compliance with City specifications.
- Document deficiencies that need to be rectified prior to Final Acceptance.
- Review Developer's application for Substantial Completion.
- Issue letter to Developer noting start of Developer's Maintenance Period.

1.15.5 Post-Construction

- Ensure new lots have been registered with the Land Titles Office.
- Review Developer's record drawing submission.
- Record drawings are certified by NAPEG professional.
- Ensure securities / bond is in place during Developer's maintenance period.
- Review deficiency issues that arise during the Developer's maintenance period.
- Process Building Permit applications.
- Sign off on Final Acceptance Certificate after maintenance period and after all deficiencies have been corrected.
- Return Developer's securities after Final Acceptance certificate has been issued.
- Notify Engineering and Operations staff when Final Acceptance certificate has been issued. City to maintain infrastructure from this point on.

CITY OF IQALUIT TYPICAL LAND DEVELOPMENT PROCESS

Iqaluit

1 **Developable Land (Land Disposal) Identification**
City of Iqaluit identifies land for potential development.

2 **Land Survey**
City prepares plan of survey for area of interest.

3a **Archaeological Impact Assessment** (by City)

3b **Environmental Site Assessment** (by City)

4 **Land Re-Zoning (if required)**
City Re-Zones land as required to facilitate development.

5 **City of Iqaluit Call for Proposals**
Land Administration By-law no. 897 outlines a structured process for the disposal of vacant land to private developers via a competitive call for proposals. The City will seek proposals from proponents wishing to enter into a Private Land Development Agreement with the City of Iqaluit.

6 **Developers Prepare Land Development Proposals**

7 **Land Disposal Agreement**
Successful Developer enters into a Land Disposal Agreement with the City of Iqaluit.

8 **25% Engineered Plans with Tentative Plan of Survey**

9 **Amenity Public Consultations**

10 **66% Engineered Plans & Reports**

11 **99% Engineered Plans & Estimates**

12 **City Council Deliberation**

13 **Formal Development Agreement**

14 **Development Permit**

15 **Infrastructure Construction Proceeds**

16 **Registration of New Lots with Land Titles Office**

17 **Developer's Maintenance Period**

18 **Final Acceptance:** City Takes Ownership of Infrastructure

19 **Release of Securities**

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2.0 Technical Submittal Requirements

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Engineered Plan and Specification Submittals

Technical reports and engineering drawings are required to provide the City of Iqaluit with sufficient information to evaluate the feasibility, adequacy, impacts, and compliance of proposed development and infrastructure works with applicable municipal standards, servicing requirements, and regulatory obligations. These submissions allow the City to assess servicing capacity, infrastructure performance, public safety, environmental considerations, constructability, and potential impacts on existing municipal systems and adjacent developments, and to identify any required upgrades or conditions of approval.

The City of Iqaluit classifies development projects as either Major Developments or Minor Developments. These classifications are used to determine the applicable technical submission requirements. Refer to Section 1.0 for definitions of each classification.

2.1 General Requirements

All technical submissions shall be of professional quality and prepared in accordance with accepted industry standards.

All plans being submitted to the City of Iqaluit shall include the following:

- Project name, location
- Owner/developer name and contact information
- Consulting engineer name
- Drawing title, number, scale, and date (including revision history)
- North arrow and key plan
- Lot numbers and/or civic address for subject property and adjacent properties.
- Existing and proposed building footprints.

Drawings shall be provided in AutoCAD and PDF formats.

All plans shall be in metric units.

Drawing size is to accommodate clarity and legibility of information. Typically, a standard A1 size (594mm x 841 mm) is required for all drawings.

The largest scale for plan view drawings shall be 1:1250. Plan / profile drawings shall be scaled to 1:500.

The minimum plotted text size is to be 2 mm and all line-types are to be presented consistently on all sheets within the drawing set.

At least one of the submittal plans shall include aerial photography showing the subject property and adjacent properties. Aerial photography shall haven been taken within the three

years prior to the preparation of the design drawings and shall be of a resolution that is high enough to easily decipher existing conditions.

All digital files shall be georeferenced to the City's standard mapping projection. The City's standard mapping projection is:

- UTM zone 19N (horizontal datum NAD83 CSRS, vertical datum CGVD2013)

The City will not accept drawings, specifications or reports that include statements intended to limit the professional liability of the design consultant for the work as submitted.

The City reserves the right to reject design drawings or specifications that lack sufficient detail, contain errors, or are inadequately organized or presented.

The Design Consultant shall clearly indicate the applicable reference specification document for all proposed infrastructure.

If a particular specification is not included in the City's published specifications, the Design Consultant shall provide a specification document to the City for approval. The Specification document shall include; the material, execution procedures, quality control requirements, performance criteria, submittal requirements, applicable codes and standards, and the testing and commissioning requirements.

2.2 25% Engineered Plans

The Design Consultant shall submit 25% engineered plans to the City for review.

25% drawings should have sufficient information to allow the City to understand the development concept, the general intent for utility servicing, and the general intent for vehicular and pedestrian movement.

The 25% engineered plans shall include:

- Tentative plan of subdivision (prepared by a surveyor registered with the Association of Canada Lands Surveyors).
- Concept plan, showing roads, land use, amenities, lots and building footprints.
- Removals plan.
- Existing conditions plan with existing ground contours.
- Existing water / sewer mains (with surveyed elevations)
- Typical sections for roads (if applicable).
- Roads / trails / parking plan showing arrows for drainage direction (with elevations and grades).
- Water and sewer mains / servicing concept (with elevations and grades).
- Culvert locations.

- Existing and proposed power poles.

Plan / profile drawings are not required for the 25% engineered plan submission.

The Design Consultant shall evaluate the downstream capacity of City owned sanitary mains at the 25% plan stage.

The Design Consultant shall evaluate the available flows and supply pressures for City owned water mains at the 25% plan stage.

2.3 66% Engineered Plans

The Design Consultant shall submit 66% engineered plans to the City for review.

66% plans shall have significantly more detail than the 25% plan set.

66% plans shall be stamped / sealed by an engineering professional registered with NAPEG.

2.3.1 Major Land Development & Capital Works Projects

The 66% engineered plans for major developments shall include:

- Existing conditions plan with existing ground contours.
- Removals plan.
- Roads / trails / amenities / parking plan(s).
- Grading and drainage plan (existing ground and finished ground elevations / grades).
- Typical section details for roads.
- Cross sections sheets.
- Overall water and sewer servicing plan.
- Temporary water servicing plan, if required by the City.
- Snow storage plan.
- Plan / profile sheets (1:500 scale max).
- Bedrock depth (profile sheets).
- Water and sewer vault details (new vaults and retrofit vaults).
- Power servicing / illumination plan.
- Traffic signage plan.
- Retaining wall details with cross-sections.
- Civil / structural detail sheets.
- Water / wastewater tank details (if applicable).
- Building elevation plan.

2.3.2 Minor Land Development

The 66% engineered plans for minor developments shall include:

- Existing conditions plan with existing ground contours.
- Grading and drainage plan (existing ground and finished ground elevations / grades).
- Snow storage locations.
- Typical section details for roads.
- Overall water and sewer servicing plan.
- Water and sewer vault details.
- Power servicing / illumination plan.
- Retaining wall details with cross-sections.
- Civil / structural detail sheets.
- Water / wastewater tank details (if applicable).
- Building elevation plan.

2.4 99% Engineered Plans

The Design Consultant shall revise the 66% engineered plan submittals and submit 99% engineered plans to the City for review and acceptance.

The Design Consultant shall include a letter detailing the changes made from the 66% submittal to the 99% submittal.

99% plans shall be stamped / sealed by an engineering professional registered with NAPEG.

2.4.1 Major Land Development & Capital Works Projects

The 99% engineered plans for major developments shall include the same plan types as submitted during the 66% submission.

Additional drawings and reports may be required at the discretion of the City.

2.4.2 Minor Land Development

The 99% engineered plans for minor developments shall include the same plan types as submitted during the 66% submission.

2.5 Specific Drawing Requirements

2.5.1 Servicing Plan Requirements

The Design Consultant's servicing drawing(s) shall include the following information. A combination of overall plans and plan / profile drawings can be used to illustrate these items.

- **Existing Infrastructure**
  - Existing water distribution system (mains, valves, hydrants) with field verified invert elevations and pipe sizes
  - Existing sanitary sewer system (mains, vaults, lift stations) with field verified invert elevations and pipe sizes
  - Existing pipe and vault materials
  - Direction of flow in existing systems
  - Adjacent infrastructure and tie-in locations
  - Known capacity constraints or deficiencies
- **Proposed Water System**
  - Watermain layout (location, size, and material)
  - Invert elevations and pipe slopes
  - Vaults (locations, spacing, and numbering)
  - Vault bollard locations
  - Air release valves
  - Fire hydrants (spacing and locations)
  - Service connections
  - Flow direction
  - Pipe cover depths and insulation/heat trace (if applicable)
  - Connection points to existing system
  - Phasing (if work is staged)
  - All proposed off-site improvements related to the subject development
  - Location of Fire Department Connection if buildings will be sprinklered
- **Proposed Water Vault Details**
  - Vault, piping and appurtenances must be drawn to scale.
  - Hatch and ladder location
  - Hydrant
  - Valves, valve access ports, valve key guide
  - Pipe support location
  - Bleeder locations where applicable
  - Drain locations
  - Steam port locations
  - Sump location
  - Pipe material
  - Vault diameter
  - Pipe diameter(s)
  - Vault invert elevations
  - Vault top elevation

  - Vault floor elevation
- **Proposed Sanitary Sewer System**
  - Sewer layout (location, size, material, and class)
  - Vaults (locations, spacing, and numbering)
  - Vault bollard locations
  - Invert elevations and pipe slopes
  - Service laterals
  - Direction of flow
  - Connection points to existing system
  - Lift stations (if required), including location and capacity
  - Forcemains (if applicable)
  - All proposed off-site improvements related to the subject development
- **Proposed Sanitary Sewer Vault Details**
  - Vault, piping and appurtenances must be drawn to scale.
  - Hatch and ladder location
  - Cleanouts and note type of cleanout
  - Pipe support locations
  - Bleeder locations where applicable
  - Sump location
  - Flush port locations
  - Pipe material
  - Vault diameter
  - Pipe diameter(s)
  - Vault invert elevations
  - Vault top elevation
  - Vault floor elevation
- **Stormwater**
  - Culverts with inverts, material, slope and length
  - Rip-rap and geotextile
  - Ditch details with elevations / grades
  - Swales with elevations / grades
- **Profiles and Details**
  - Longitudinal profiles for all water and sewer mains
  - Ground elevations and pipe inverts
  - Identification of utility crossings and clearances
  - Conflicts with other infrastructure
  - Standard and project-specific details
- **Construction and Materials**

- Pipe materials and bedding requirements
- Trench details and backfill specifications
- Minimum cover requirements
- Frost protection measures (if applicable)
- Quality control requirements
- As-built requirements

- **Notes and General Requirements**
  - Reference to City of Iqaluit standards and specifications
  - Construction sequencing considerations

2.5.2 Grading Plan Requirements

The Design Consultant's grading plan drawing(s) shall include the following information:

- **Existing Conditions**
  - Existing property boundaries and adjacent parcels
  - Existing and adjacent topography (contours and spot elevations)
  - Benchmarks and vertical datum reference (georeferenced to City mapping projection)
  - Existing roads, culverts, ditches, curbs, sidewalks, and driveways
  - Existing buildings and structures
  - Natural features (watercourses, wetlands, rock outcrops, tree lines)
- **Proposed Grading**
  - Proposed finished grades (contours and spot elevations)
  - Extent of surface treatment areas (gravel, asphalt, landscaping etc.)
  - Finished floor elevations (FFEs) and building entrances
  - Slopes and grade transitions (including direction of drainage)
  - Driveway and parking area grades
  - The direction of water runoff from buildings and impervious surfaces
  - Road elevations
  - Swales, ditches, and overland flow routes with elevations / grades
  - Retaining walls (location, top and bottom of wall elevations)
  - Limits of grading and disturbance
  - Fire department access route.
- **Drainage and Stormwater**
  - Drainage direction arrows
  - Overland flow routes and major/minor system considerations
  - Consideration for controlling erosion and flow (e.g. rock check dams, or geotextile and riprap in ditches)
  - Address how snow accumulation and melt will be managed to avoid flooding or pooling.

- **Lot Grading Details (for subdivisions)**
  - Typical lot grading patterns (rear-to-front, split drainage, etc.)
  - Side yard swales and minimum slopes
- **Access and Accessibility**
  - Barrier-free access routes and slopes (where applicable)
  - Driveway tie-ins to existing roads
  - Temporary construction access (if required)
- **Notes and Specifications**
  - General grading notes and design criteria
  - Minimum and maximum slope requirements
  - Reference to applicable City of Iqaluit specifications and bylaws
  - Construction tolerances
  - Quality control requirements.
- **Approvals and Coordination**
  - Adjacent property impact considerations
  - Required permits and approvals identified

2.6 Technical Report Submittals

Developers are typically required to provide technical reports during the design phase so the municipality can evaluate whether the proposed development can be safely, efficiently, and sustainably supported by existing and proposed municipal infrastructure and services.

2.6.1 25% Submittals for Major Land Development & Capital Works Projects

The following calculations / reports are required at the 25% engineered plan stage for Major land development & capital works projects:

- Water distribution servicing report (hydraulic modelling required).
- Sanitary sewer analysis report.

2.6.2 66% Submittals for Major Land Development & Capital Works Projects

The following calculations / reports are required at the 66% engineered plan stage for Major land development & capital works projects:

- Stormwater management report;
- Refined sanitary sewer flow / capacity calculations report;
- Refined water distribution servicing report (hydraulic modelling required);
- Traffic Impact Assessment (TIA) report;
- Geotechnical investigation report;

- Snow and Wind Study;
- Vehicle turning movement figures;
- Engineer's estimate for works within a City right of way;
- Bird hazard study (as required by airport authorities).

Additional reports (such as Archaeological Impact Assessment or Environmental Site Assessment) may be required at the discretion of the City.

Reports shall include supporting information, including but not limited to, calculations, standard references, and relevant correspondence.

2.6.3 66% Submittals for Minor Land Development

The following calculations / reports are required at the 25% engineered plan stage for minor land development projects:

- Vehicle turning movement figures.

Additional reports (for example; Geotechnical Investigation, Utility Servicing Report, Traffic Impact Assessment or Snow and Wind Study) may be required at the discretion of the City.

2.6.4 Geotechnical Report Requirements

If required, the Geotechnical Report shall:

- Confirm existing geotechnical conditions of the site;
- Confirm permafrost depth;
- Confirm the land can be used safety for the intended use without undue risk of hazards or damage,
- Identify all relevant restrictions, conditions, limitations to the proposed development, and to make recommendations for design, construction, and inspection of the development.

Recommendation requirements shall include (but not be limited to):

- Foundation design and construction;
- Frost protection and pipe insulation;
- Permafrost protection;
- Backfill requirements;
- Site grading and drainage;
- Pavement structure; and
- Deviations from the City's design guidelines / specifications.

The Engineering Services Department will identify additional requirements to be addressed in the Geotechnical Report, if applicable.

The Geotechnical Report is to be prepared by a qualified professional engineer registered to practice in Nunavut.

2.6.5 Water Distribution Servicing Report Requirements

A Water Distribution Servicing Report is typically intended to demonstrate that the proposed development can be adequately serviced by the municipal water system, both hydraulically and operationally, while meeting municipal design standards and fire protection requirements.

The City of Iqaluit has procured the services of consultants to maintain digital hydraulic models for water and sewer infrastructure. Developers are required to request copies of the digital models from the City.

If required, the Water Distribution Servicing Report shall include the following:

- Map showing area of interest, and existing water mains, sizes of existing mains;
- Map showing proposed servicing schematic;
- Description of new development;
- Proposed watermain alignments, sizes, and materials;
- Connection points to the existing municipal system;
- Description of software used;
- Population and demand assumptions;
- Minimum pressure during peak hour conditions;
- Map showing minimum residual pressure during fire flow;
- Maximum pressure limits;
- Maximum and minimum pipe velocities;
- Summary of findings;
- Confirmation of servicing feasibility;
- Required upgrades or conditions;
- Recommendations for detailed design;
- Maps showing peak pressure, fire flow and velocity at nodes;
- Digital water distribution modeling results pre-development (appendices);
- Digital water distribution modeling results post-development (appendices).

Hydraulic modelling completed as part of the Water Distribution Servicing Report shall account for projected future community growth and associated increases in water demand.

2.6.6 Sanitary Sewer Analysis Report Requirements

A Sanitary Sewer Servicing Report is typically required to demonstrate that the proposed development can be adequately serviced by the municipal sanitary sewer system without

causing adverse impacts to existing infrastructure, downstream capacity, or wastewater treatment facilities. The Sanitary Sewer Servicing Report shall include the following:

- Map showing area of interest, and existing sewer mains, sizes of existing mains;
- Map showing proposed servicing schematic;
- Description of new development;
- Proposed sewer main alignments, sizes, and materials;
- Connection points to the existing municipal system;
- Description of software used (spreadsheet is acceptable for gravity systems);
- Population and unit flow rate assumptions;
- Map showing maximum pipe capacity utilization;
- Map showing minimum and maximum flow velocities;
- Map showing maximum depth-to-diameter ratios;
- Pump station capacity and redundancy;
- Assessment of downstream trunk sewers and pumping stations;
- Identification of surcharge conditions, if any;
- Confirmation that wastewater treatment facilities have adequate capacity;
- Summary of findings;
- Confirmation of servicing feasibility;
- Required system upgrades;
- Recommended conditions for development approval;
- Recommendations for detailed design;
- Digital modeling or spreadsheet results for pre-development (appendices);
- Digital modeling or spreadsheet results for post-development (appendices).

2.6.7 Stormwater Management Report Requirements

Developers are required to submit stormwater management plans so the City of Iqaluit can evaluate how surface runoff generated by a proposed development will be collected, conveyed, controlled, and discharged without adversely impacting municipal infrastructure, adjacent properties, public safety, or the environment. Stormwater management reports allow the City to assess drainage patterns, system capacity, erosion and sediment control measures, flood risks, climate resiliency considerations, and the potential impacts of development on downstream drainage systems and receiving environments. The report must demonstrate compliance with municipal standards, regulatory requirements, and accepted engineering practices, and identify any infrastructure upgrades or mitigation measures required to support the proposed development.

At minimum, Stormwater Management Reports shall include:

- Summary of existing conditions;
- Contour map of post-development condition and overland routes;
- Runoff coefficients used;
- Post-development Rational Method runoff calculations, including time of concentration calculation;
- An assessment of downstream impacts;
- Map showing catchment areas;
- Hydraulic culvert flow calculations (with determination of inlet / outlet control);
- Manning's roughness coefficients;
- Spreadsheet for accumulative peak flow using Manning's equation;
- Maximum velocities and erosion control measures;
- Measures taken to mitigate the effects of climate change;
- Measures taken to mitigate erosion;
- Summary of findings;
- Confirmation of servicing feasibility;
- Required system upgrades;
- Recommended conditions for development approval;
- Recommendations for detailed design;
- SWMM model inputs and results, if applicable;
- SWMM model diagram, if applicable;
- SWMM hyetograph, if applicable.

2.7 Record Drawings

Upon installation of the Work, the Design Consultant shall complete (or oversee the completion of) an as-built survey to record the horizontal and vertical position of the installed Work and shall prepare detailed record drawings.

The City will not accept record drawings that include statements intended to limit the professional liability of the design consultant for the work.

All record drawings must be certified by an engineer registered with NAPEG.

The City reserves the right to reject record drawings that lack sufficient detail, contain errors, or are inadequately organized or presented.

The survey and record drawing submission shall be comprehensive. Refer to the City of Iqaluit Specification "Project Record Drawings" for detailed survey and submittal requirements.

The record survey (CAD format) and record drawings (PDF format) shall be provided to the City for review and acceptance.

Record drawings shall be prepared to the following standard:

- As-built information shall be presented in red ink.
- Record deviations in elevation, grade, diameter and length greater than 20 mm vertically and greater than 100 mm horizontally.
- Record deviations in sub-surface conditions and any remedial measures taken.
- A red line shall strike through the design text. Red text showing as-built information shall be positioned next to the design text.
- Horizontal positional deviations for water, sewer, roads, sidewalks, guiderails, buildings etc. shall be drawn using red lines in plan view.
- Vertical positional deviations for water, sewer, road grades, sidewalk grades etc. shall be drawn using red lines in profile view.
- Add at each Drawing Title Block Note: “AS-BUILT RECORD”.

2.7.1 Record Drawings for Major Land Development & Capital Works Projects

Record plans for major developments shall include:

- As-built removals plan.
- As-built roads / trails / parking plan.
- As-built grading and drainage plan (existing ground and finished ground elevations / grades).
- Typical section details for roads with deviations from design.
- As-built overall water and sewer servicing plan.
- As-built vault details.
- As-built plan / profile sheets (1:500 scale max).
- As-built power servicing / illumination plan.
- As-built traffic signage plan.
- As-built civil / structural detail sheets with deviations from design.

2.7.2 Record Drawings for Minor Land Development

Record plans for minor developments shall include:

- As-built roads / trails / parking plan.
- As-built grading and drainage plan (existing ground and finished ground elevations / grades).

- As-built servicing plan.
- As-built power servicing / illumination plan.
- As-built civil / structural detail sheets with deviations from design.

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Iqaluit

City of Iqaluit

Municipal Design Guidelines

3.0 Water Distribution

Version 1

October 2026

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3.1 Water Distribution System

3.1.1 Design Methodology

The water distribution system shall generally be designed to be in accordance with these guidelines and the latest version of the following publications:

- AWWA M11 Steel Pipe: A Guide for Design and Installation;
- AWWA M14 Backflow Prevention And Cross-Connection Control: Recommended Practices;
- AWWA M19 Emergency Planning For Water and Wastewater Utilities;
- AWWA M22 Sizing Water Service Lines and Meters;
- AWWA M28 Rehabilitation of Water Mains;
- AWWA M31 Distribution Systems for Fire Protection;
- AWWA M32 Computer Modeling of Water Distribution Systems;
- AWWA M50 Water Resources Planning;
- AWWA M51 Air Valves: Air-Release, Air/Vacuum and Combination;
- AWWA M55 PE Pipe - Design and Installation;
- CSA TS-006 Water Distribution and Wastewater Collection Systems in Northern Regions;
- Government of the Northwest Territories Good Engineering Practice for Northern Water and Sewer Systems.

The water distribution system shall consider the overall City distribution system, public safety, Iqaluit-specific flow distribution, unidirectional flow, future City growth, freeze protection, and minimum/maximum required system pressures and velocities.

3.2 Design Flow and Flow Requirements

3.2.1 General

The system shall be capable of delivering the maximum day demand plus fire flow or the peak hour flow, whichever is greater.

The Design Engineer shall review the available potable water supply in the vicinity of the proposed development and must demonstrate that the proposed development will not negatively impact the supply of potable water to adjacent areas and neighbourhoods. A 25-year growth factor shall be accounted for when designing the water distribution system unless the City explicitly requests otherwise.

3.2.2 Demands

The minimum per capita water demands for the City, except where historical data indicates otherwise, are as follows. Commercial and industrial areas shall be designed on the basis of equivalent population, or projected demand based on the building use, whichever is greater.

Table 3-1: Residential, Industrial, and Commercial Water Demands

	Residential	Industrial	Commercial
Average Daily Demand	400 L/person/day		
Population Equivalency	3.5 per residence	3.5 per residence	3.5 per residence
Maximum Daily Demand	2 x Average Demand	2 x Average Demand	2 x Average Demand
Peak Hourly Demand	4 × Average Demand	4 × Average Demand	4 × Average Demand
Minimum Residual Water Pressure During Peak Hour Flow	350 kPa (50 psi)		
Minimum Residual Water Pressure During Maximum Day + Fire Flow	140 kPa (20 psi)		
Minimum Residual Water Pressure Maximum Day Flow (for operation of residential fire sprinklers)	350 kPa (50 psi)		

If the population of a new development area is unknown, the greater of the following shall be used to calculate the demand:

- 50 persons per gross developable hectare; or
- 3 persons per residential dwelling.

3.2.3 Fire Flow

The minimum required fire flow for each proposed structure shall be calculated using the latest version of the “Water Supply for Public Fire Protection” document as published by the Fire Underwriters Survey.

3.2.4 Design Computations

The Hazen-Williams formula for flow in waterpipes shall be used:

$$Q = CD^{2.63}S^{0.54} \bullet (278.48)$$

Where: *Q = Rate of flow in L/s*
D = Internal pipe diameter in m
S = Slope of hydraulic grade line in m/m
C = Roughness coefficient is 140 for all mains

3.2.5 Hydraulic Network Analysis and Pipe Sizing

The City has procured the services of a consultant to maintain a digital network model using Bentley WaterGEMS software, which encompasses the water distribution system for the entire community. For all commercial and industrial developments as well as residential developments larger than five (5) units, the City requires the Developer's Design Engineer to analyze the development's watermain network using the City's digital model. The analysis shall determine the effect that the development's watermain network may have on the City's overall circulation flows, pressures, and velocities. A copy of the City's digital water distribution model is available upon request.

The following is required of the Developer's Design Engineer for hydraulic network analysis:

- All new mains shall be SDR9 (250 psi) polyethylene (PE 4710 resin) pipe;
- Network analysis shall be performed by utilizing the Hardy-Cross Method or a suitable alternative analysis technique acceptable to the City;
- Sizing of watermains shall be determined by hydraulic network analysis. Lines must be sized to accommodate the anticipated land use;
- The minimum size for a distribution main shall be 250mm outside diameter (based on PE SDR9 4710). The recirculation main shall be the same size as the distribution main in order to maintain unidirectional flow without creating capacity restraints or choke points. Main sizes may be increased as considered necessary by the City to accommodate future development, and in consideration of unidirectional flow;
- The maximum velocity under normal operating conditions shall not exceed 3.0 m/s;
- For freeze protection, the minimum velocity under normal operating conditions shall be 0.15 m/s;
- Ensure the minor pressure losses through valves and fittings are accounted for;
- Analysis shall be made to ensure that there is a minimum residual pressure of 350 kPa (50 psi) under Peak Hour Demand conditions;
- Separate analysis shall be made to ensure that there is a minimum residual pressure of 140 kPa (20 psi) under Maximum Day Demand plus Fire Flow Conditions;
- The City may require configuration and/or size alterations to the development's watermain networks based on the results of hydraulic modelling and conformance of the minimum criteria herein; and
- The Developer's Design Engineer shall submit a report, accompanying the design drawings, outlining the results of the network analysis. The digital model used for the evaluation shall also be provided to the City.

Refer to Section 2.0 for technical submittal requirements.

3.2.6 Watermain Circulation

The City of Iqaluit's water distribution network consists of seven separate zones, grouped into three broader categories. Two zones (*Road to Nowhere* and *Plateau*) operate under pumped pressure conditions and depend on booster stations. The other five zones (*Federal Zone*, *Happy Valley*, *Lower Iqaluit*, *Lower Base*, and *Uivvaq*) are gravity-fed from the reservoir. The main distribution point for all zones after the reservoir is Access Vault 306, which serves as the central division point.

- Southeast of AV 306, water branches off to the *Happy Valley* network and Booster Station No. 1, which maintains pressure for *Road to Nowhere*;
- South of AV 306 supplies the *Lower Iqaluit* Zone, including Astro Hill and the Lower Iqaluit Area, with a recirculation named Building 222; and
- West of AV 306 supplies Booster Station No. 2 (serving *Plateau*) and also feeds *Federal Zone*, *Lower Base*, and *Uivvaq*. For the flow recirculation, these three zones are supported by the Trigram recirculation station.

It is the responsibility of the Design Engineer to fully understand the City's water system. To reduce the risk of frozen watermains, the City's watermain system shall be unidirectional. "Dead end" watermains are not permitted. For remote developments, the City may require recirculation infrastructure to provide circulation if the City's overall system is adversely affected.

The Design Engineer must consider such factors as, but not limited to, the following:

- Periods of minimum demand;
- Heat loss from watermains, services and related appurtenances;
- Potential flow reversals during water demand fluctuations;
- Water temperature;
- Low water usage during the early stages of the development's construction; and
- The hydraulic network analysis.

Circulation pumps in access vaults, water bleeders, aqua-flows, or heat trace shall not be used to facilitate circulation (or freeze protection) in the development's watermain. Partially open valves or orifice plates shall not be used to create watermain circulation. All main valves shall be in a fully open or fully closed position.

During staged construction of the development, and subject to approval and conditions as set out by the City, the Developer's Design Engineer may be permitted to prescribe temporary circulation pumps or water bleeders provided the infrastructure is designed by an engineering professional registered with NAPEG.

3.3 Watermain Planning

3.3.1 Alignment

Watermains shall be located within the road right-of-way and outside the carriageway, or within a public utility right-of-way. Public Utility Lot (PUL) widths shall be at least 6.0m for a single utility and 8.0m for two utilities.

Watermains shall be spaced a minimum of 500mm horizontally (outside of insulation to outside of insulation) and 500mm apart (outside of insulation to outside of insulation) vertically from any sewer main. Consideration must also be given to allow for the future excavations of an adjacent sewer main. Watermains crossing above the sewer shall have sufficient clearance to allow for proper bedding and structural support of the pipes. When crosses between watermains and sewer mains are necessary, watermains shall cross above sewer mains. Under no circumstances shall a watermain cross under a sewer main without approval by the City Engineering Department.

Watermains shall be installed in straight run sections where possible. Bend fittings shall be provided inside vaults, as necessary. Bend fittings shall not be used outside the vault unless authorized by the City Engineering Department. In the event that bend fittings are required and the City has authorized their use, no more than two (2) long-sweep 22.5-degree bends may be used. Locations of bend fittings require review and approval by the City Engineering Department prior to installation.

3.3.2 Watermain Grades

Access vaults shall be provided at system low points to facilitate draining of watermains during maintenance.

Watermains shall be graded to prevent the formation of air pockets in the main. Air pockets may cause an “air lock” of the main creating a stop or restriction of the circulation flow; therefore, the following is required:

- For watermains that positively grade to a high point, the last full length of each pipe shall be installed at 0.0%. A minimum of three (3) water services shall be tapped along the flat section of main. The services shall be installed at the one or eleven o’clock position of the pipe (i.e. not vertical). The intent is to remove the air through the service pipes when the services are actively supplying water to an occupied building;
- During the development’s construction, the services mentioned above may be inactive until such time as the lot is developed. To temporarily clear air from the high point in the main, one or more of the services shall be extended to the surface at the property line where a bleed valve and circulation pump shall be installed. Approval and conditions, as set out by

the City, shall apply. It shall be the responsibility of the Developer's Design Engineer to remove this service when the lot is developed;

- Subject to City Engineering Department approval, air may be removed by grading the watermain to a high point located at a water service 100 mm dia. or greater. The water service must positively grade to the meter in an occupied building. This situation is not preferred, and a condition of acceptance is the size difference between the main and the service;
- Mains shall have a constant grade between access vaults; and
- If a high point in the watermain cannot be avoided, and the City finds that it is not practical to include services to remove air, the Developer's Design Engineer shall include a combination air valve inside an access vault. The Design Engineer shall utilize guidance from the AWWA publication "M-51 Air Valves: Air-Release, Air/Vacuum and Combination" to evaluate the warrant for, and the location of, the air valve.

3.4 Locate Marking

Buried water mains shall include 3M Electronic Marking System (EMS) tape and 3M locate marker balls to facilitate future locating of mains by City maintenance staff. 3M EMS tape shall be installed no deeper than 1.2m below grade. 3M marker balls shall be installed at all main stops, curb stops and direct buried appurtenances.

To reduce the risks associated with differential movement of the pipe, watermains shall be installed below the active layer. The minimum depth of cover shall be 3.0m from finished grade to top of outside insulation of the pipe. The depth of cover shall account for crossing under culverts and/or stormwater ditches.

3.5 Geotechnical

During the design phase, a geotechnical investigation shall be completed. The geotechnical investigation shall provide information on the approximate bedrock and active layer profile. Design drawings shall show the anticipated bedrock depth, as recorded during the geotechnical investigation.

3.5.1 Bedrock

For bedrock removal, mechanical methods shall be used, and blasting must be approved by the City Engineering Department, as well as all authorities having jurisdiction, prior to work commencement.

In situations where substantial bedrock is encountered, the Developer's Design Engineer may propose a shallow-bury configuration. The proposal must be accompanied by a technical and

financial justification and cannot be implemented without approval from the City Engineering Department.

3.5.2 Insulation for Soil Stabilization

Buried mains shall include rigid board insulation per the City Specifications. The inclusion of rigid board insulation does not replace the requirement for pre-insulated pipe.

Thermal modelling was undertaken to evaluate the effectiveness of rigid board insulation in minimizing vertical pipe movement by limiting thawing of the active layer beneath the pipe. The results of the modelling indicated that the inclusion of board insulation within 500mm of the finished grade is an effective means of minimizing pipe movement within the active layer.

3.6 Water Distribution Access Vaults

The water main system and sanitary sewer system shall be situated in separate and isolated access vaults to prevent cross-contamination between the sewer and potable water systems.

Water distribution vaults generally consist of the following:

- Dual-wall steel construction, with insulation between the inner and outer walls;
- A lockable hinged access hatch;
- Valve access ports vertically aligned with the valve;
- Steel plate top, designed to be 400mm above adjacent ground;
- An exterior safety ladder extension;
- An interior ladder;
- A top-side access conduit through the wall;
- Pipe supports at all pipe deflections, tees, crosses and hydrants;
- A sump;
- A frost plug;
- Stainless steel pipe and fittings;
- Drains at the underside of pipes;
- Thaw ports at each leg;
- Hydrant;
- Valves at each leg;
- Dynamic movement joints at each vault connection (installed at the exterior connection) to mitigate damage from differential movement / permafrost changes;
- A square plate at the bottom to resist uplift, and to aid in shipping;
- Bollards; and
- Vault ID signage.

Combined water and sewer access vaults may only be installed in special circumstances subject to approval by the City Engineering Department. Where combined access vaults are used, the watermain system and sanitary sewer system must be of a dual chamber configuration, separated by a welded steel partition, to ensure no cross-contamination can occur. Dual chamber access vaults are recommended to be rectangular to maximize available space for maintenance inside the access vault and reduce size requirements. For rectangular vaults, a structural engineer registered with NAPEG, shall design wall bracing to resist deflection.

Access vaults shall be provided at the end of each line, at junctions, at all changes in pipe size, direction (subject to approval by the City Engineering Department), and grade (subject to approval by the City Engineering Department), and at distances not exceeding 120m.

Access vaults shall not be designed to be within driving surfaces, or to be driven over.

Vaults should not be installed within 3m of driveways, should not be installed within the bottom of roadside ditches, should not be within 2m of power poles, and shall be positioned so they are accessible by maintenance staff vehicles.

Vaults shall be designed to allow space for maintenance staff to complete maintenance activities.

Vaults shall have minimum interior dimensions as shown in the table below.

Table 3-2: Water Access Vault Minimum Interior Diameter

Access Vault Type	Minimum Interior Diameter
Water – 1 through-pipe with maximum 22.5-degree bend	1524 mm
Water – 3 vault connections or 2 vault connections with hydrant	1830 mm
Water – 4 or more vault connections	2250 mm

Valves shall be oriented such that the operator wheel is horizontal (parallel with vault floor).

Access vaults shall be designed and constructed such that all internals are at least 400mm above the floor of the access vault.

Each pipe connection at the vault shall include restraint couplings that allow up to 8 degrees of movement in all directions at the connection. Refer to the City specifications and specification drawings for approved products and installation details.

Access vaults shall be designed to include blind flanges to allow for future connections. All proposed locations and orientations of blind flanges must be reviewed and approved by the City Engineering Department.

After installation, access vaults shall not be modified without approval from the City Engineering Department.

Some vaults within the City of Iqaluit include “bleeder connections”. Bleeder connections are small diameter water lines that allow a continuous flow from the water distribution system to the sanitary sewer system and are used to prevent freezing of utility lines. Bleeder connections are typically found at the furthest upstream (dead-end) sewer vault.

As part of the City’s goal to decrease total non-revenue water loss, the intent is to avoid the use of bleeders. However, if absolutely required, bleeders may be installed subject to approval from the City Engineering Department. Any and all bleeders shall be initiated inside the water access vaults and shall be terminated inside the sewer access vault. All bleeders shall include smart water meters installed inside the water access vault.

Grading around access vaults shall promote surface runoff drainage away from the access vault. The top of access vaults shall extend between 300-500mm above grade (top of surrounding slope).

Where a drainage ditch or swale is directly adjacent to a vault, the ditch / swale slope abutting the vault shall be protected using rip-rap over top of non-woven geotextile.

Vaults shall be protected using bollards. Bollards shall be included at maximum 1.2m spacing around the vault.

3.7 Valves

The location and spacing of valves should be such that when the system is in operation no more than two (2) hydrants will be put out of service by a water main shutdown, no more than four (4) valves are required to effect a shutdown, and no more than thirty (30) services are out of service due to a water main shutdown.

Valves should be no greater than 120m apart. All valves shall be installed in access vaults. Valves shall be the same size as the corresponding main. One valve shall be installed at each leg of a tee or cross inside a vault. Valves shall be located at both ends of a main passing through a utility lot or easement and shall be placed 500mm from the property line.

Service lines 100mm and larger shall have an isolation valve. The valve shall be located inside a vault to prevent the service stub and valve from freezing if the valve is shut off. All valve locations shall be reviewed and approved by the City Engineering Department and the Fire Department.

3.8 Hydrants

The maximum spacing between hydrants shall be 120m for residential areas. For school, industrial, or commercial areas hydrant spacing shall be such as to provide complete coverage to the building from a maximum distance of 90m. For sprinkled buildings, a hydrant shall be

located within 45m of the building Siamese connection. The noted distances must account for changes in both horizontal and vertical distances as well as navigating around any obstructions including but not limited to buildings.

All hydrants shall be connected to water mains inside access vaults. In general, hydrants shall be installed in all water distribution access vaults. In instances where access vaults are less than 45m apart, the City may forego this requirement.

Hydrants must be placed at locations where they are clearly visible and easily accessible by the fire department.

Access vault hatches shall be designed such that they do not interfere with hydrants when open. The hatch position when open must allow for the opening to remain fully open/accessible.

Hydrants and access vaults shall be located at the projection of the property lines where possible. For cul-de-sacs, locate the hydrant at the mouth of the cul-de-sac instead of the end (if coverage permits).

A plan showing all proposed hydrant locations, including spacing dimensions, shall be submitted for approval by the City Engineering Department and City Fire Department.

Following installation, all hydrants shall be tested in accordance with the City's standard construction specifications. All testing shall be reported through the use of the City's standard hydrant testing template provided with the standard construction specifications.

3.9 Service Connections

- Services shall be polyethylene;
- Separate water service connections shall be provided for each separate lot;
- Where a lot has more than one building, such as accessory dwelling units, separate water service connections shall be provided for each building;
- All service connections shall be equipped with smart water meters. Buildings that include multiple units shall have separate meters for each unit.
- Maintenance of services shall be the lot owner's responsibility inside the property line;
- The minimum size of a residential water service shall be a 25mm for the supply and 25mm for the return. The supply and the return pipes shall be placed inside a 100mm insulated carrier pipe. Non-residential service connections shall be sized according to anticipated demand;
- Carrier pipe for all water services shall be installed to the property line at the time of initial subdivision development;
- Water services complete with service saddles and associated connection kits shall be installed prior to or at the time of house construction;

- The minimum allowable distance between services shall be 1000mm;
- Water services equal to or greater than 100mm shall be connected and valved inside an access vault;
- Services shall be located such that they do not conflict with driveway locations;
- Multi-family, commercial and industrial service designs shall be submitted to the City for approval;
- All water services require a double check valve to prevent backflow to the potable water supply;
- Main stops shall be provided for the service supply and the service return and shall be installed at the main;
- Curb stops shall be provided for the service supply and the service return;
- Curb stops shall be installed within the City Right-Of-Way but shall not be installed within driving surfaces;
- If curb stop operating rods are to be buried, a steel plate shall be included over top of the curb stops for protection; and
- Services shall include 3M Electronic Marking System (EMS) tape and 3M locate marker balls to facilitate future locating of mains by City maintenance staff. 3M EMS tape shall be installed no deeper than 1.2m below grade. 3M marker balls shall be installed at the main connection and at bends.

A general guideline for service lateral sizing is shown in the table below. The Design Engineer shall determine the appropriate sizing.

Table 3-3: Typical Service Lateral Sizing

Building Type	Water Supply	Water Return	Sanitary Sewer	Carrier Pipe
Single family	25 mm	25 mm	100 mm	100 mm
2-plex	25 mm	25 mm	100 mm	100 mm
3-plex	25 mm	25 mm	100 mm	100 mm
4-plex	38 mm	25 mm	150 mm	150 mm
6-plex	38 mm	25 mm	150 mm	150 mm
8-plex	38 mm	25 mm	150 mm	150 mm
10-plex	38 mm	25 mm	150 mm	150 mm

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Iqaluit

City of Iqaluit

Municipal Design Guidelines

4.0 Sanitary Sewer System

Version 1

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Sanitary Sewer System

4.1 Design Methodology

The sanitary sewer system shall be designed as part of the overall City system. The sanitary system shall be of sufficient capacity to carry anticipated peak flows. The flow and factors listed below shall be used as minimum requirements in the design of the sanitary sewer systems.

The Design Engineer shall review the capacity of sewer mains downstream of the proposed development. Development will be allowed to proceed only if there is sufficient capacity in existing mains available to facilitate the new development. A 25-year growth factor shall be accounted for when designing the sanitary sewer system unless the City explicitly requests otherwise.

4.2 Flow Generation Rates

The minimum per capita sewer demands for the City, except where historical data indicates otherwise, are as follows. Commercial and industrial areas shall be designed on the basis of equivalent population, or the anticipated flow based on the building usage, whichever is greater.

Table 4-1: Residential, Industrial, and Commercial Sewer Demands

	Residential	Industrial	Commercial
Average Daily Demand	400 L/person/day		
Population Equivalency	3.5 per residence	30 per hectare	37 per hectare
Peak Sewage Flow	Average flow x peaking factor		
Peaking Factor	$1 + (14/(4+P^{0.5}))$ (Harmon's Formulas) where P = the contributing design population in thousands where P<1, a peaking factor of 4.5 shall be used. 3.0 (non-residential)		

If the population of a residential development area is unknown, a population density shall be calculated using the greater of;

- 50 persons per gross developable hectare or
- 3 persons per residential unit.

4.3 Inflow & Infiltration

Sewers in Iqaluit are constructed using fused polyethylene pipes. Vaults are installed so that their tops are above the adjacent ground level and vaults are constructed using welded steel. Further, grey-water connections are not commonplace. Considering these factors, an allowance for inflow and infiltration is generally not required. However, flow from bleeders should be accounted for as applicable.

4.4 Gravity Sewer Pipe Calculations and Sizing

The Design Engineer shall provide the City with pipe sizing calculations for new developments. Capacity calculations for sewers downstream of the development shall be included.

For gravity sewers, the following formulas shall be used for flow calculations:

Manning's formula: $Q = \frac{AR^{0.66}S^{0.5}}{n}$

Where:

Q = Design flow in m^3/s

A = Cross sectional area in m^2

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

S = Slope of hydraulic grade line in m/m

n = Roughness coefficient is 0.013 for all pipe

Sanitary mains in Iqaluit are to be constructed using SDR9 (250 psi) polyethylene (PE 4710 resin) pipe.

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

$$\text{Required full flow sewer capacity} = \frac{\text{estimated total design peak flow rate}}{0.86}$$

The following design parameters shall be used in determining the sanitary sewer pipe sizes:

- Sanitary sewers shall be designed for gravity flow unless approved otherwise by the City.
- Minimum pipe size for PE pipe - 250 mm outside diameter
- Minimum flow velocity - 0.76 m / sec (during average flow)
- Maximum flow velocity - 3.0 m / sec
- Minimum design slope: - 0.50% regardless of diameter

The minimum grade of the sanitary sewer from any high maintenance hole (or dead-end Maintenance hole) to the next downstream maintenance hole shall not be less than 2.0%.

The diameter of a sewer run shall not be reduced if the downstream run is at a higher slope than the upstream run.

Where practical, in areas at risk to thaw settlement caused by the degradation of ice rich permafrost, the sanitary sewer main grade shall be a minimum of 2.0%. The main size shall not be reduced to take advantage of the increased pipe capacity that is available at steeper grades. The intent is to extend the operational life of the main by allowing grade redundancy to be lost if settlement occurs.

4.5 Sewer Main Planning

Sewer mains shall be located within the road right-of-way and outside the carriageway. Public Utility Lot (PUL) widths shall be at least 6.0m for a single utility and 8.0 for two utilities.

The minimum separation distance from sewer mains to watermains shall be as indicated in the Water Distribution section of this Guideline document.

When crosses between watermains and sewer mains are necessary, sewer mains shall cross below water mains. Under no circumstances shall a sewer main cross over a watermain.

Sewer mains are to be extended 5.0m past the last house service, with the exception of cul-de-sacs. In cul-de-sacs, extend the main to the end of the cul-de-sac.

Sewer mains shall be installed in straight run sections where possible. Bend fittings shall be provided inside vaults, as necessary. Bend fittings shall not be used outside the vault unless authorized by the City of Iqaluit. In the event that bend fittings are required and the City has authorized their use, no more than two (2) long-sweep 22.5-degree bends may be used. Locations of bend fittings require review and approval by the City of Iqaluit prior to installation.

4.6 Geotechnical

To reduce the risks associated with differential movement of the pipe, sewer mains shall be installed below the active layer. The minimum depth of cover shall be 3.5m from finished grade to top of outside insulation of the pipe. The depth of cover shall account for crossing under culverts and/or stormwater ditches.

All buried mains shall include rigid board insulation per the City Specifications. The inclusion of rigid board insulation does not replace the requirement for pre-insulated pipe.

During the design phase, a geotechnical investigation shall be completed. The geotechnical investigation shall provide information on the approximate bedrock and active layer profile.

Design drawings shall show the anticipated bedrock depth, as recorded during the geotechnical investigation.

4.7 Bedrock

For bedrock removal, mechanical methods shall be used, and blasting must be approved by the City Engineering Department, as well as all authorities having jurisdiction, prior to work commencement.

In situations where substantial bedrock is encountered, the Developer's Design Engineer may propose a shallow-bury configuration. The proposal must be accompanied by a technical and financial justification and cannot be implemented without approval from the City Engineering Department

4.8 Locate Marking

Buried sewer mains shall include 3M Electronic Marking System (EMS) tape and 3M locate marker balls to facilitate future locating of mains by City maintenance staff. 3M EMS tape shall be installed no deeper than 1.2m below grade. 3M marker balls shall be installed at all main connections and bends.

4.9 Sanitary Sewer Access Vaults

The water main system and sanitary sewer system shall be situated in separate and isolated access vaults to prevent cross-contamination between the sewer and potable water systems.

Sanitary sewer vaults generally consist of the following:

- Dual-wall steel construction, with insulation between the inner and outer walls;
- A lockable hinged access hatch;
- Steel plate top, designed to be 400 mm above adjacent ground;
- An exterior safety ladder extension;
- An interior ladder;
- A top-side access conduit through the wall;
- Cleanouts for maintenance;
- Flush ports;
- Pipe supports at cleanouts;
- A sump;
- A frost plug;
- Stainless steel pipe and fittings;
- Dynamic movement joints at each vault connection (installed at the exterior connection) to mitigate damage from differential movement / permafrost changes;

- A square plate at the bottom to resist uplift, and to aid in shipping;
- Bollards; and
- Vault ID signage.

Combined water and sewer access vaults may only be installed in special circumstances subject to approval by the City Engineering Department. Where combined access vaults are used, the watermain system and sanitary sewer system must be of a dual chamber configuration, separated by a welded steel partition, to ensure no cross-contamination can occur. Dual chamber access vaults are recommended to be rectangular to maximize available space inside the access vault and reduce size requirements. For rectangular vaults, a structural engineer registered with NAPEG, shall design wall bracing to resist deflection.

The use of alternate materials for access vault fabrication must be reviewed and approved by the City Engineering Department prior to manufacturing.

Access vaults shall be provided at the end of each line, at junctions, at all changes in pipe size, direction (subject to approval by the City Engineering Department), and grade (subject to approval by the City Engineering Department), and at distances not exceeding 120m.

Vaults should not be installed within 3.0m of driveways, should not be installed within the bottom of roadside ditches, should not be within 2m of power poles, and shall be positioned so they are accessible by maintenance staff vehicles.

Access vaults shall not be designed to be within driving surfaces, or to be driven over.

Vaults shall be designed to allow for space to perform maintenance activities.

Vaults shall have minimum interior dimensions as shown in the table below.

Table 4-2: Sanitary Access Vault Minimum Interior Diameter

Access Vault Type	Minimum Interior Diameter
Sanitary – up to 3 vault connections	1524 mm
Sanitary – 4 or more vault connections	1830 mm
Dual chamber	2700 mm (rectangular)

Access vaults shall be designed and constructed such that all internals are at least 400 mm above the floor of the access vault.

Each pipe connection at the vault shall include restraint couplings that allow up to 8 degrees of movement in all directions at the connection. Refer to the City specifications and specification drawings for approved products and installation details.

Access vaults shall be designed to include blind flanges to allow for future connections. All proposed locations and orientations of blind flanges must be reviewed and approved by the City Engineering Department.

After installation, access vaults shall not be modified without approval from the City Engineering Department.

Some vaults within the City of Iqaluit include “bleeder connections”. Bleeder connections are small diameter water lines that allow a continuous flow from the water distribution system to the sanitary sewer system and are used to prevent freezing of utility lines. Bleeder connections are typically found at the furthest upstream (dead-end) sewer vault.

As part of the City’s goal to decrease total non-revenue water loss, the intent is to avoid the use of bleeders. However, if absolutely required, bleeders may be installed subject to approval from the City Engineering Department. Any and all bleeders shall be initiated inside the water access vaults and shall be terminated inside the sewer access vault. All bleeders shall include smart water meters within the water access vault.

The drop across the cleanout shall be 50 mm as a standard.

Pipe deflection shall not be greater than 90^0.

Grading around access vaults shall promote surface runoff drainage away from the access vault. The top of access vaults extend between 300-500 mm above grade (top of surrounding slope).

Where a drainage ditch or swale is directly adjacent to a vault, the ditch / swale slope abutting the vault shall be protected using rip-rap over top of non-woven geotextile.

Vaults shall be protected using bollards. Bollards shall be included at maximum 1.2 m spacing around the vault.

4.10 Service Connections

- Services shall be pre-insulated polyethylene;
- Separate sewer service connections shall be provided for each separate lot;
- Where a lot has more than one building, such as accessory dwelling units, separate sewer service connections shall be provided for each building;
- Maintenance of services shall be the lot own’s responsibility inside the property line;
- The minimum inside diameter of a residential gravity sanitary sewer service shall be 100 mm. The Design Engineer shall consider the wall thickness of polyethylene pipe with respect to the minimum diameter. For example, 100 mm DR11 pipe has an average inside diameter of 92mm, whereas 100 mm DR17 pipe has an average inside diameter of 100 mm. DR9 and DR11 pipes are not acceptable for 100 mm sanitary services as they have an average inside diameter of less than 100 mm;
- Non-residential service connections shall be sized according to anticipated user requirements;

- The sanitary services including sewer saddles shall be installed to the property line at the time of the initial subdivision development;
- The minimum grade for gravity sanitary sewer service line shall be 2.0% for 100 mm outside diameter lines and 1.0% for 150 mm outside diameter lines and larger;
- Where the depth of the sanitary main would make the lateral service slope greater than 5%, a long-radius sweep bend fitting shall be included at the main. In such cases, the service shall be installed at 10 and 2 o'clock;
- Services shall be located such that they do not conflict with driveway locations;
- Multi-family, commercial and industrial service designs shall be submitted to the City for approval;
- All sanitary services require a backflow preventer at the building, to prevent sewage from entering the home;
- The maximum length of a sanitary service without the inclusion of a sewer cleanout shall be 30.0m. Cleanouts shall be installed on public property unless authorized otherwise by the City.
- Bend fittings are not permitted on sewer services for horizontal realignment unless approved by the City. In some cases, the City may approve the use of long radius 'sweep' bend fittings. In no circumstance shall short radius bend fittings be permitted;
- For all buildings equipped with commercial kitchens, services shall be equipped with a grease trap that is owned, operated, and maintained by the building owner to prevent fats, oils, greases, and debris from entering into the City's sanitary sewer system; and
- Services shall include 3M Electronic Marking System (EMS) tape and 3M locate marker balls to facilitate future locating of mains by City maintenance staff. 3M EMS tape shall be installed no deeper than 1.2m below grade. 3M marker balls shall be installed at the main connection and at bends.

A general guideline for service lateral sizing is included in the Water Distribution section of the Guidelines.

4.11 Sanitary Sewer Pumping Systems

4.11.1 General

Wastewater pumping systems shall only be installed where site constraints restrict the gravity collection system from tying to an existing sanitary trunk line. The requirement must be justified in an initial subdivision design report taking the development plans for the surrounding area into account.

The design and construction of the pumping system must meet the requirements of other governmental authorities and regulations including Federal, Territorial, and Municipal. The Design Engineer is responsible for all submissions and applications required for approval.

4.11.2 Location and Configuration

The pumping station shall be located in such a manner as to minimize the impact to adjacent development in terms of visibility, odour, and noise. Pumping stations shall not be located in areas subject to flooding during a major rainfall event. Pumping stations shall always be accessible by road.

A wet well configuration with submersible pump or above ground suction head pump is preferred. A wet well/dry well configuration may be considered for larger facilities. A building will be required for all pumping stations. A collection access vault shall intercept flow from all incoming sewers before discharge to the pumping station. The station shall receive flow from one inlet only. Provision shall be made to shut off flow from the collection vault if required.

4.11.3 Pumping Station Design

Pumps shall be sized to accommodate the maximum expected flow as determined by accepted engineering practice and according to the City's municipal design guidelines.

For pumped sewers, the following formula shall be used:

Hazen-William's formula: $Q = CD^{2.63}S^{0.54} \times (278.48)$

Where:

Q = Rate of flow in L/s

D = Internal pipe diameter in m

S = Slope of hydraulic grade line in m/m

C = Friction coefficient is 140 for all pipe

Pumping stations shall be equipped with two or more pumps sized such that if one pump is out of service, the remaining pump(s) is/are capable of pumping the design capacity flow rate. Pumps shall be identical and interchangeable for a duplex pumping station. Pumps starts shall alternate between pumps.

Pumps shall be provided by a well-recognized manufacturer. The Design Engineer shall supply all pump details to the City. The City reserves the right to reject pumps if they are unfamiliar brands or if maintenance requirements are atypical.

Submersible pumps shall have a non-clog impeller design and flush valves. Pumps shall have their maximum efficiency within the normal operating range. Pumps shall be constant speed,

unless operational, maintenance, or economic advantages would result from the use of variable speed drives.

Pump motors shall operate on 3-phase power wherever possible.

Dead storage shall be minimized while meeting minimum depth requirements specified by the pump manufacturer.

Wet wells shall be sized based on accepted engineering practice. Storage shall be provided to minimize the frequency of pump starts but maximum retention time in the wet well should not exceed 30 minutes. The design shall meet pump manufacturer's specifications.

Wet wells shall be sized and equipped to accommodate operator access, maintenance, and safety requirements.

Sanitary sewer pumping stations shall be sized for a minimum of 25 years unless the City explicitly requests otherwise. Growth projections shall be determined during discussions between the Design Engineer and the City. The design basis is as follows:

Table 4-3: Sewage Lift Station Standards

Option	Flow (L/S)	Equiv. Pop.	Type of Sewage Lift Station
1	0-50	1,400 – 3,400	Lift Station to include an insulated wet well with two submersible pumps, 100% Standby pump capacity. Package lift station acceptable. Heated building to be provided over wet well. EI&C panels to be installed in adjacent heated structure. Fence to be provided around entire pump station and EI&C Panel.
2	50-100	3,400 – 6,900	Lift Station to include two (2) wet wells with two to three submersible pumps in total. 100% Standby pump capacity. (Number of pumps dependent on the hydraulics.) Backup generator and EI&C panels to be housed inside heated building. Building complete with appropriate lighting, heating, and ventilation. Fence to be provided around entire lift station wet well and building.

Option	Flow (L/S)	Equiv. Pop.	Type of Sewage Lift Station
3	100-200	6,900 +	Lift station to include two (2) wet wells and one (1) dry well with three dry pit pumps. 50% Standby pump capacity. Pumps to be placed in the dry well with building over top of the dry well and wet wells. The wet well and dry well buildings to be separated entirely with two separate access doors. Dry well to be accessible with stairs. Backup generator and EI&C panels to be housed inside building. Building complete with monorail, appropriate lighting, heating, and ventilation. Fence to be provided around entire pump station wet well and building

Piping shall be sized so as to give average velocities of between 0.76 and 1.5 m/s in suction piping and between 1.0 and 2.5 m/s in discharge piping. Future capacity increases shall be taken into account when sizing piping.

4.11.4 Valves and Piping

The minimum inside diameter for all pump suction and discharge piping shall be 100 mm.

Pipe sizing shall allow for minimum and maximum flow velocities of 0.76m/s to 3.5m/s respectively within the station.

The minimum pressure rating of piping within the station shall be determined based on calculated operating pressures but shall not be less than 900 kPa.

Pumps shall be connected in parallel to a common discharge header located within the station. Check valves and isolation valves shall be installed on the discharge line between each pump and the discharge header.

A forcemain isolation valve shall be installed on the main discharge pipe outside the wet well.

4.11.5 Water Supply

Water supply must be provided to the facility for washing/cleaning purposes.

The design shall ensure that the connection between the potable water supply and the wastewater pumping station does not cause contamination of the potable water supply. The design shall comply with the conditions stipulated in the Environment “Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems” for Water Supply and Wastewater Facilities.

Where a potable water supply is to be used for washing/cleaning purposes, a break tank, pressure pump and pressure tank shall be provided. In-line backflow preventers are not acceptable. The potable water shall be discharged to the break tank through an air gap at least 150 mm above the maximum flood line or the spill line of the tank.

4.11.6 Alarms and Emergency Backup

Stations shall be equipped with or provided with the feature for future connection of remote sensing and telemetry equipment enabling operators to monitor the alarms.

Power must be supplied from two independent sources. In the event of a power failure, secondary power must automatically engage through a diesel generator or direct-coupled motor.

Special consideration shall be made to control any possible overflow in a manner acceptable to the City and the Department of Environment.

A backup generator is to be provided at every lift station, designed and stamped by the Engineer of Record. Generator design considerations must include:

- Consideration of required electrical loading based on lift station panel schedule;
- Considerations of generator sizing to include equipment operations requirements such as lead/lag pumps from discussions with an operator;
- Spare generator load capacity consistent with the required amounts (typically 30%);
- An automatic transfer switch sized for the generator in use;
- A backup power generator can be within the dry side (no sewer gases) of a lift station building;
- When the generator is in a standalone enclosure, the building envelope must be a heated, weatherproof, sound attenuated to 55 dBA, skin-tight non-walk-in enclosure for the generator c/w receptacle and light; and
- Double-wall sub-base fuel tank to be sized for minimum 24 hours of fuel supply at 100% load.

4.11.7 Access and Maintenance

Permanent hoist equipment and access hatches of sufficient size and capacity shall be provided for removal of station equipment.

All access points shall have locking devices.

Ladders shall be non-skid and shall comply with Occupational Health and Safety requirements.

Stations shall have adequate interior and exterior lighting.

An Operating and Maintenance manual shall be provided for the facility. The manual shall include a complete parts list for all mechanical and electrical components including control diagrams, schematics and manufacturer's operation, maintenance, service, and repair specifications. Five (5) copies along with all commissioning and testing results shall be submitted to the City prior to issuance of the Substantial Certificate of Completion.

4.11.8 Heating and Ventilation

Forced mechanical ventilation is required for dry wells below ground level and for wet wells containing screens or mechanical equipment requiring maintenance or inspection.

Equipment shall be able to provide at least six air changes per hour. Provision shall be made for ventilation of the wells with portable equipment in case of system failure. Ventilation failure alarms are required.

There shall be no interconnection between wet well and dry well ventilation systems.

Multiple air inlets and outlets are recommended for dry wells over 5m deep. Air intakes and outlets shall be designed to function year-round and screen openings should be sized to avoid frost build-up or clogging.

Air shall be forced into the dry well at a point 150 mm above the pump floor and into the wet well at a point 150 mm above water level.

Automatic heating and dehumidification equipment shall be provided in all dry wells.

4.11.9 Building Requirements

All lift stations shall be provided with a building to house all electrical and control equipment and to provide a workspace for pump maintenance.

Buildings shall be of an adequate size to allow for the required access hatches, hoist equipment, ventilation and control equipment while allowing for an appropriate workspace for pump maintenance.

Access to the wet well shall not be from within the building.

Building layout and access shall be designed to facilitate the removal of any equipment that may require off-site maintenance.

Structural members shall be masonry, concrete or structural steel. Wood frame buildings are not permitted. Buildings shall comply with the National Building Code.

The design shall incorporate measures to reduce the noise and odour impact on the surrounding development.

Buildings shall be designed to blend architecturally with the surrounding development.

Windows shall not be permitted in lift station buildings.

4.11.10 Forcemains

System head curves shall be developed for each forcemain to be submitted to the City Engineering Department upon request.

Forcemains shall be SDR9 (250 psi) polyethylene (PE 4710 resin) pipe.

The minimum forcemain diameter shall be 100 mm (inside diameter).

The velocity shall be within 0.9 m/sec to 3.5 m/sec. The minimum velocity for pipes larger than 300 mm shall be 1.1 m/sec. Special design provisions in order to stabilize the line shall be incorporated when design velocities exceed 3.0 m/sec.

The forcemain design pressure shall allow for the normal static and dynamic operating pressures including water hammer effects.

Forcemains shall be installed in straight run sections where possible. Bend fittings shall not be used unless authorized by the City of Iqaluit. In the event that bend fittings are required and the City has authorized their use, no more than two (2) long-sweep 22.5-degree bends may be used. Locations of bend fittings require review and approval by the City of Iqaluit prior to installation.

Air release valves shall be installed in access vaults at all relative high points. Forcemain grades should be designed in order to avoid the requirement for an air release valve wherever possible.

Blow-off valves shall be provided at all low points.

Vacuum relief valves shall be installed wherever necessary in lines designed to drain by gravity between pumping cycles.

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Iqaluit

City of Iqaluit

Municipal Design Guidelines

5.0 Stormwater Management

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5.1 Terms of Use

These guidelines are intended as a guide only. The Design Engineer is responsible to ensure that the stormwater management system is designed according to accepted engineering practice. These Guidelines shall not be considered as a substitute for a detailed material and construction specification prepared by the Design Engineer.

5.2 System Purpose and Planning

In Iqaluit, the stormwater management system generally consists of roadside ditches, culverts, and surface flow routes. Some concrete curb is also used within the community.

The system must provide a continuous overland flow route allowing the excess runoff to reach the designated ponding areas or water body. The system shall provide surface flow management in order to minimize erosion, flooding and property damage from a 1:100-year rainfall event.

As storm sewers are not used in Iqaluit, there is no distinction between a major and a minor system in the City. Although a piped minor system is not utilized, the Design Engineer shall demonstrate that the drainage system safely conveys both frequent and major storm events, while maintaining safe and controlled overland routes without flooding of buildings, or uncontrolled erosion.

Drainage conveyances should follow the natural starting point of flow on a surface (e.g., natural ground, roof, road, or parking lot) and sequentially follow the flow to a collection point (natural or constructed), such as a swale or ditch, and ultimately into a natural watercourse.

Drainage systems shall be designed to maintain natural drainage conveyance patterns wherever practicable.

The design of the drainage system must not be limited to the immediate development area. It must consider overland flows that may enter the area from adjacent land as well as down stream effects on adjacent development and receiving water bodies.

The stormwater management system shall be designed as a separate independent system. Effluent from sanitary sewers or any potentially contaminated drainage shall not be discharged into the stormwater management system.

5.2.1 Climate Change

The stormwater management system shall be designed to account for the anticipated impacts of climate change over the service life of the infrastructure. The Design Engineer shall incorporate appropriate climate-adjusted design inputs, such as updated Intensity-Duration-

Frequency (IDF) data (as included below), projected increases in precipitation intensity and volume, and changes in snowmelt patterns.

Designs shall demonstrate resilience to future climatic conditions by ensuring that system capacity, conveyance, and storage components adequately manage increased runoff volumes and peak flows without increasing flood risk, erosion potential, or adverse impacts to downstream properties and receiving water bodies. This may include the application of safety factors, use of climate change–adjusted IDF curves, or scenario-based modelling.

Supporting documentation shall be provided to the City outlining the assumptions, data sources, and methodologies used to account for climate change in the design.

5.3 Definitions

Ditch: An excavated open channel with a depth greater than 300mm.

Swale: A shallow open channel which is traversable by a small passenger vehicle, and with a depth equal to or less than 300mm.

5.4 Drainage Easements

Drainage infrastructure shall be installed within the City's Right-Of-Way. Should the Design Engineer identify that there is not sufficient space, the Design Engineer shall investigate alternate solutions such as realigning the road or proposing an easement into the adjacent lot(s). No further design or construction shall proceed until the City Engineering Department has approved an alternate solution.

Where drainage swales are located on private property, the property owner shall grant and register an easement in favour of the City to allow for access, maintenance, and protection. A minimum clearance of 200mm shall be provided between the edge of the swale and the property line.

5.5 Lot Grading

The goal of the lot grading shall be to ensure that water flows away from the building and does not impact adjacent properties. The lot-grading plan shall develop a proper balance between the road elevation, proposed building elevations, surrounding development, and existing topography.

Generally, the lots shall be designed to drain to adjacent laneways or public right of ways without crossing adjacent lots. An overall drainage plan is required for all lot developments and subdivisions. The City reserves the right to require that developments implement drainage plans in order to mitigate impacts on adjacent and nearby lots and City infrastructure.

Individual sites and lots shall be designed and graded such that:

- Lots drain from back to front where possible. Exceptions must be approved by the City Engineering Department;
- Areas adjacent to buildings shall have a minimum 2% grade for the first 3 meters draining away from the building;
- Lots lower than adjacent roadways should be avoided where possible;
- There is basic positive drainage until a lot is developed (the lots shall be rough graded to prevent ponding water); and
- Building finished grade should be above the hydraulic grade line for a 1:100-year storm event plus a minimum of 0.30 m freeboard.

The use of ditches and culverts is preferred for water conveyance at the frontage of lots. Swales may be used to convey runoff along the sideyards. The City, at its discretion, may permit the use of swales along the property frontage for multi-family developments where parking will be along the front of the building (roadside). The Design Engineer shall supply the City with swale flow / capacity calculations to show that swales will be effective in the control of runoff. The Design Engineer must demonstrate that the peak flow from a 1:100-year storm (climate change scenario) will be contained within the swale.

5.6 Hydrology

The Rational Method shall be used in estimating flows for the design of storm ditches and swales for areas less than 10 hectares. For areas larger than 10 hectares, acceptable computer modeling of the area must be submitted for review.

$$Q = \frac{CIA}{360}$$

Where: *Q = Design peak flow rate in cubic metres per second*

I = Intensity of rainfall in millimetres per hour

A = Contributing area in hectares

C = Runoff coefficient

Runoff analysis must consider more frequent storms that occur in 5-year, 10-year, 25-year and 50-year storm scenarios, as well as the impacts of major 100-year storm events.

The rainfall intensity shall incorporate allowances for the projected impacts of climate change.

Developers shall submit to the City a description of any adjustments made to the IDF data, along with an outline of the design measures implemented to address climate change considerations.

Minimum runoff coefficients shall be according to the following table:

Table 5-1: Minimum Runoff Coefficients by Land Use/Surface Characteristics

Land Use/Surface Characteristics	Runoff Coefficient, C
Open Space	0.15
Residential Lots	0.35
Multiple Family	0.70
Undeveloped Land	0.15
Commercial Land	0.70
Industrial Land	0.70
Pavement, Concrete, Buildings	0.95
Gravel Roadways	0.30

Due to the large variation in lot sizes for commercial and industrial areas, a weighted runoff coefficient for these types of developments can be calculated using the following formula:

$$Q = \frac{(0.9\ x\ impervious\ area)+(0.15\ x\ pervious\ area)}{total\ area}$$

The rainfall intensity for the rational formula is selected from the Intensity-Duration-Frequency (IDF) curve, with a duration chosen to coincide with the critical storm duration, which is the time of concentration (t_c). The time of concentration for runoff flow is the time required for runoff flow to become established and reach the design location from the furthest point within the contributing catchment area.

Determination of t_c requires estimation of two components, the inlet time and travel time. The inlet time is the time for flow from the extreme limits of the catchment to reach the point of inflow into the defined conveyance system. It is dependent upon the imperviousness and the size of the catchment. The travel time is the length of time required for flow to travel within the conveyance system from the point of inflow to the design location.

Rainfall IDF curves for the City of Iqaluit for selected frequency events (adjusted for Climate Change) are presented below (reproduced from the *Development of a Master Drainage Plan – Final Submission City of Iqaluit* report (*Nunami Stantec, 2019*)). Climate change impacts on the IDF equations were assessed using the IDF Climate Change Tool 3.0, developed by Dr. Slobodan Simonovic of the University of Western Ontario (Simonovic, Schardong, Sandink, & Srivastav, 2016). The IDF curves are based on data collected between 1950 and 2017.

All conveyances shall be designed using the climate change scenario IDF curves (ditches shall maintain 0.30m of freeboard in a 100-year storm event).

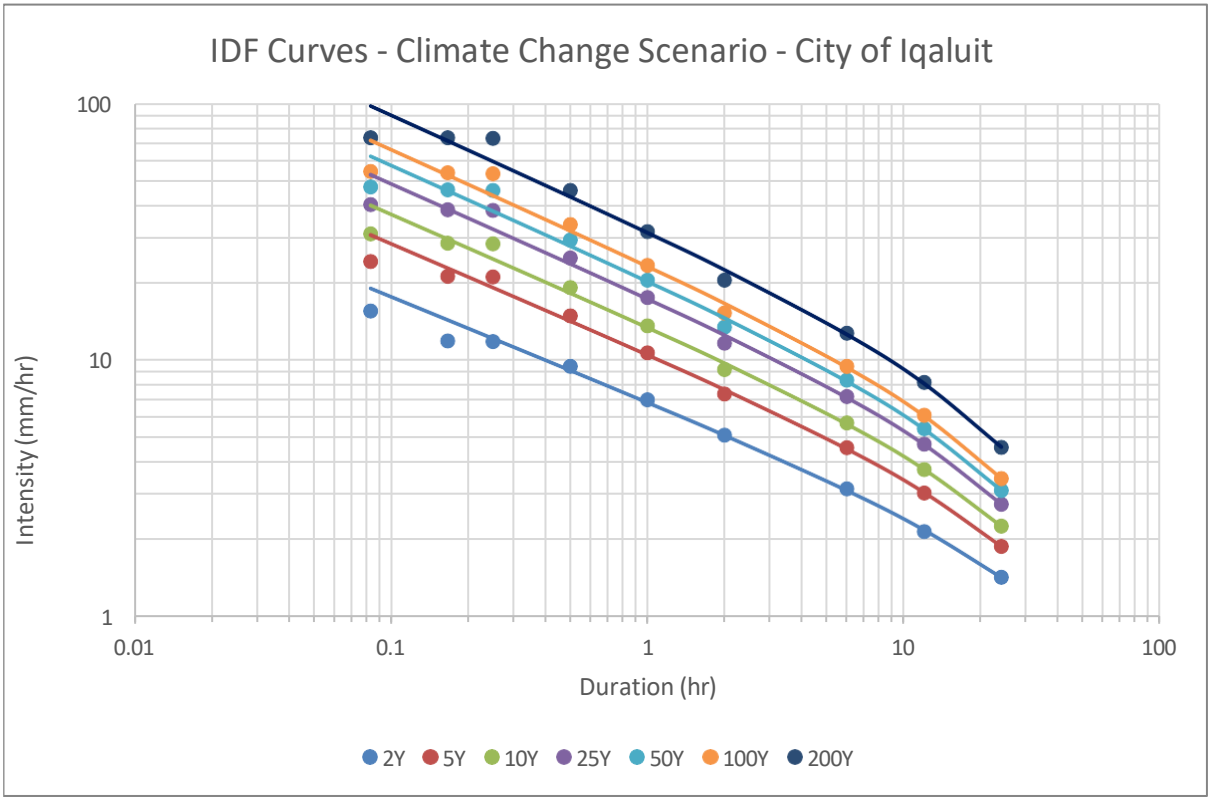


Table 5-2: IDF Parameters – Climate Change Scenario

Rainfall Rate (i) $a \times (b^t) \times (t^c)$	Return Frequency						
Parameter	**2-yr**	**5-yr**	**10-yr**	**25-yr**	**50-yr**	**100-yr**	**200-yr**
a	6.875	10.583	13.550	17.564	20.564	23.553	31.940
b	0.988	0.985	0.983	0.981	0.980	0.979	0.979
c	-0.409	-0.428	-0.436	-0.442	-0.446	-0.448	-0.450

Note: Where t = duration in hours

A design check should be done to calculate the peak daily snow melt rate to ensure that the runoff from snow piles during the melt period is accounted for in the design. A conversion of 100 mm of snow = 25 mm of runoff is typical for piled snow. A conversion of 100 mm of snow = 10 mm of runoff is typical for accumulated snowfall.

The following tables, reproduced from the *Development of a Master Drainage Plan – Final Submission City of Iqaluit* report illustrate typical snow accumulation and snow melt values for the City of Iqaluit:

Table 5-3: Return Period for Maximum Annual Snow-on-Ground Depths

Return Period	Snow-on-Ground Depth (cm)
2	42.1
5	55.7
10	64.6
25	76.0
50	84.4
100	92.8
200	101.1

Table 5-4: Return Period for Spring Snowmelt in Iqaluit

Return Period	Snowmelt (cm/day)
2	14.7
5	24.8
10	31.5
25	40.0
50	46.3
100	52.5
200	58.7

5.7 Conveyance Hydraulics

For the purposes of sizing conveyance systems, the peak flow shall be calculated using a minimum time of concentration of 10 minutes (0.1667 hours). The intensity may be reduced (using the IDF parameters below) if the Design Engineer can demonstrate that the calculated time of concentration is longer than 10 minutes.

Pipe sizing shall be determined by using Manning's Formula.

Culverts shall be sized using Manning's formula:

$$Q = \frac{AR^{0.667}S^{0.5}}{n}$$

Where: *Q = Design flow in cubic metres per second*

A = Cross sectional area in square metres

R = Hydraulic radius in metres

S = Slope of hydraulic grade line in metres per metre

n = Roughness coefficient

The Design Engineer shall complete calculations to determine whether the culvert's capacity is restricted by inlet control or outlet control.

The minimum freeboard as measured vertically from the high-water level for the design flow to the shoulder edge of the roadway upstream of a culvert shall be 0.30 metres in a 1:100-year storm event.

The manning's roughness coefficient (n) for culverts and ditches shall be:

HDPE culverts (smooth inner wall)	0.013
Corrugated steel culverts	0.025
Excavated earth ditches and swales	0.025

The minimum design slope for ditches shall be 0.80%. The minimum design slope for swales shall be 1.00%. The minimum flow velocity in ditches shall be 1.0 m/s. Where velocities in excess of 3.0 m/s are attained, special provisions shall be made by the Design Engineer to protect against displacement by erosion.

Design ditch depths shall be based on culvert depths (the culvert diameter plus cover over the culvert).

5.7.1 Water Course Culvert or Bridge

Where a culvert or bridge is required at a water course, the Design Engineer shall design calculate the peak flow in accordance with the steps and methods outlined in the "Bridge Conceptual Design Guidelines" as published by the Technical Standards Branch of Alberta Transportation.

5.8 Ditches and Swales

The City mandates the use of ditches for runoff conveyance. The use of swales shall be avoided unless approved by the City Engineering Department. Swales may be considered where the use of ditches and culverts would be considered a parking constraint (e.g. multifamily buildings with front parking). If swales are incorporated into the design, the Design Engineer shall submit supporting calculations to the City demonstrating that the swales have sufficient capacity to fully contain the design runoff.

Drainage swales crossing several properties shall not be permitted unless approved by the City Engineering Department.

Swales shall be designed to be traversable by a small car.

Roadway ditch side slopes (the slope closest to the road) shall be no steeper than 3H:1V as a safety measure for vehicular traffic and pedestrians. Roadway ditch back slopes (the slope furthest away from the road) shall be no steeper than 2H:1V. The desired minimum ditch bottom width is 1000mm. The absolute minimum ditch bottom width is 500mm. Widths less than 1000mm shall be approved by the City of Iqaluit.

In some situations, ditch depths may become relatively large, necessitating an exceedingly large space to accommodate the ditch. In order to maintain a standard ditch depth, gabion walls may be used to provide a narrower ditch. If gabion walls are used, the Design Engineer must demonstrate that the ditch capacity requirements are met and the gabion walls must be approved by the City Engineering Department prior to construction. Where gabion walls are included in the design, so too shall safety railings.

Drainage ditches and/or swales on municipal or private property shall be constructed prior to any development of subdivision lots. Complete ditch / swale construction shall be a prerequisite to the issuance of the Substantial Certificate of Completion.

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

5.9 Culverts

The minimum design slope for culverts shall be 0.80%. The minimum diameter of culverts shall be 600mm. Culverts shall have a minimum cover of no less than 0.5 times the culvert diameter or 300mm, whichever is greater.

The Design Engineer shall confirm that the specified culvert cover is appropriate for the selected pipe material and that the culvert has adequate structural capacity to withstand standard AASHTO HL-93 loading.

The City may, at its discretion, permit the use of 450 mm diameter culverts where the Design Engineer demonstrates that the existing ditch geometry does not allow for adequate pipe cover. In such cases, the Design Engineer shall also confirm, through appropriate analysis, that the reduced pipe diameter provides sufficient capacity to convey the design peak flow. The requirement for a minimum of 300mm of pipe cover shall remain regardless of pipe diameter.

Cover over culverts shall be graded both latitudinally and longitudinally to promote drainage towards the adjacent drainage infrastructure.

Culvert marker posts with reflective bands shall be bolted onto all culvert ends, both upstream and downstream. The bolt assembly shall be a flat washer and nut type with a flexible spring to allow flexibility should the marker be struck.

The maximum allowable single culvert length shall be 20m. Lengths greater than 20m introduce difficulties for City cleaning and thawing operations of culverts.

5.10 Outfalls

At the end of an outfall, energy dissipaters are often necessary to avoid downstream erosion and damage of creeks, ravines or riverbanks from high exit flow velocities. Outfall structures are required at locations where it is necessary to convert supercritical flow to subcritical, to dissipate flow energy and to establish suitably tranquil flow conditions downstream.

Appropriate erosion control measures are to be provided at and downstream of the outfall to prevent erosion in the downstream watercourse, regardless of whether the flow is subcritical or supercritical.

For all outfalls, it is required that a rigorous hydraulic analysis be completed, to ensure that the exit velocities will not damage natural watercourses. The final exit velocities, where the flow passes from an apron or erosion control medium to a natural channel, shall not exceed 1.0 m/s and may be further limited depending on site specific soil and flow conditions.

Rails or fences made of corrosion resistant material shall be installed along concrete headwalls and wingwalls to provide protection against persons falling.

Outfalls, which are often located in parks, ravines, or on riverbanks shall be made safe and shall be made to be as attractive as is reasonably possible. The appearance of these structures is important and cosmetic treatment or concealment is to be considered as part of the design. Concrete surface treatment is recommended to present a pleasing appearance.

5.11 Erosion and Sediment Protection

To prevent ditch erosion, all ditches shall be lined with non-woven geotextile. All ditches shall also be lined with a 0.20 m thick layer of 100 mm – 200 mm blast rock riprap. The geotextile and riprap layers shall be installed along the entire lengths of all ditches.

Sediment traps (geotextile elements) / silt fencing should be designed to reduce the velocity of flow and allow for the deposition of sediments before they can enter a fish bearing body of water. These are made from filter fabric that is buried at the bottom, stretched and supported by posts. Silt fences shall not be designed to withstand high heads.

Silt fences are appropriate for the majority of construction sites that are not more than moderately sloped. The design life for silt fence shall be six months or less, and shall be replaced beyond that duration. The maximum contributory sheet flow drainage area should not exceed 0.10 hectares per 30 metres of silt fence.

Silt fence might not be the most appropriate control measure for uneven terrain or when vegetative mat contains high density of roots that preclude keying in the fabric.

Sediment control shall be incorporated into designs to ensure proper functioning of the drainage components. Sediment control can be accomplished through the use of natural features such as ponds and wetlands or through constructed features such as siltation traps.

5.12 Stormwater Management Submittals

The Design Engineer shall prepare engineered plans and technical reports for the stormwater management system in accordance with Section 2.0.

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Iqaluit

City of Iqaluit

Municipal Design Guidelines

6.0 Trucked Servicing

Version 1

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Trucked Water and Sanitary Services

6.1 Water Services

All trucked water service systems shall comply with National Building Code of Canada, National Plumbing Code of Canada, CAN/CSA Standards, manufacturer specifications, and all Municipal By-Laws. In the event of a contradiction between the information in these standards and a Municipal By-Law, the By-Law shall govern.

Water holding tanks shall be installed at a location which is easily accessible for delivery trucks and operators. Operators shall not be required to enter confined spaces, use ladders, or climb over building structure components or infrastructure to access the tank. Driveways for buildings with trucked services shall be graded at less than 3% and graded away from the building.

The centreline of water hose connection point shall be installed 1.2 - 1.5m above the driveway. In order for the City to be able to pump water into the tank, the middle of the tank interior shall be no higher than the centerline of the water hose connection point. The Design Engineer shall consult with the City Engineering Department to ensure that the water fill connection type is compatible with City equipment. The fill point shall be equipped with a backflow preventer device in order to stop any backflow into City equipment.

All buried tanks shall be anchored to concrete pads or pinned to bedrock to prevent movement. Buried holding tanks are not permitted to be installed within the footprint of the building. Cylindrical tanks installed horizontally that require soil or granular material to provide structural stability may be located within the footprint of a building.

Existing buried holding tanks are permitted to be abandoned and left in place in the same location provided they are filled up with concrete or gravel in a manner that is deemed to be adequate to maintain ground stability and prevent cave in.

The water holding tank shall be a minimum of 5,000 litres in volume for new developments and must be able to provide the development with water for a minimum of two (2) days of normal operating use, or other size subject to approval by the City Engineering Department. The water holding tank shall be equipped with a water level sensor. A red light, positioned so that it is easily visible by the operator, shall be activated by the level sensor when the tank is full.

Trucked service building facility installations servicing more than four (4) bathrooms or having a capacity of more than 13,638 litres (3,000 imperial gallons) shall be certified by a Professional Engineer. Multiplexes on trucked services shall have a shared water holding tank.

No trucked service building facilities shall be enclosed, covered, and backfilled until the work has been inspected by the City Engineering Department. All installation, maintenance, repair,

and disconnection of trucked service building facilities shall be subject to the inspection of the City Engineering Department.

All buildings that are designated to have trucked water services must be designed and constructed with rough-ins to accommodate future connection to the piped water system.

All water holding tanks shall be constructed with materials that are compliant with NSF61.

All water holding tanks shall be provided with adequate freeze protection consisting of one of the following:

- Installation of tank within a heated portion of a building or within a heated accessory building, for which the main lines are required to be insulated and heat traced or insulated to a higher value to prevent freezing; or
- Installation of tank within an unheated space in a building or accessory building, tanks shall be double walled, insulated to minimum R15 value and heat traced in compliance with CSA C22.2 NO. 130:16, or insulated to a higher value to prevent freezing; or
- Installation of tank outside the footprint of the building, tanks shall be, double walled, insulated to minimum R15 value and heat traced, or insulated to a higher value to prevent freezing.

Structural support of the water holding tank shall be sufficient to support one and one-half times the weight of a full water tank.

6.2 Sanitary Services

All trucked sanitary service systems shall comply with National Building Code of Canada, National Plumbing Code of Canada, CAN/CSA Standards, manufacturer specifications, and all Municipal By-Laws. In the event of a contradiction between the information in these standards and a Municipal By-Law, the By-Law shall govern.

Sanitary holding tanks shall be installed at a location which is easily accessible for delivery trucks and operators. Operators shall not be required to enter confined spaces, use ladders, or climb over building structure components or infrastructure to access the tank. Driveways of buildings with trucked services shall be graded at less than 3% and graded away from the building.

The top of the sanitary holding tank cannot be higher than the top of the water tank if the tanks are within 2.0m of each other as measured horizontally. This is to prevent sewage from running over the water access port in the event of a failure of the sanitary holding tank. Additionally, sanitary holding tanks shall be equipped with backflow preventers as part of the tank construction in order to mitigate operational errors that result in accidental pressurization of the tank.

The centreline of sanitary pump-out hose connection point shall be installed 1.2 - 1.5m above the driveway. In order for the City to be able to pump out the tank, the middle of the tank interior shall be no lower than 3.0m below the driveway. The Design Engineer shall consult with the City Engineering Department to ensure that the sanitary pump-out connection type is compatible with City equipment. The sanitary tank shall be installed close enough to the pump-out point such that there is no more than 10m of piping between the pump-out point and the tank.

All buried tanks shall be anchored to concrete pads or pinned to bedrock to prevent movement. Buried holding tanks are not permitted to be installed within the footprint of the building. Cylindrical tanks installed horizontally that require soil or granular material to provide structural stability may be located within the footprint of a building.

Existing buried holding tanks are permitted to be abandoned and left in place in the same location provided they are filled up with concrete or gravel in a manner that is deemed to be adequate to maintain ground stability and prevent cave in.

The sanitary holding tank shall be a minimum twice the volume of the water holding tank for new development and must be able to provide the development with sanitary capacity for a minimum of two (2) days of normal operating use, or other size subject to approval by the City Engineering Department. The sanitary holding tank shall be equipped with a water level sensor. A red light, positioned so that it is easily visible by the operator, shall be activated by the level sensor when the tank is full.

Multiplexes on trucked services shall have a shared sanitary holding tank.

No trucked service building facilities shall be enclosed, covered, and backfilled until the work has been inspected by the City Engineering Department. All installation, maintenance, repair, and disconnection of trucked service building facilities shall be subject to the inspection of the City Engineering Department.

All buildings that are designated to have trucked sanitary services must be designed and constructed with rough-ins to accommodate future connection to the piped sanitary sewer system.

All sanitary holding tanks shall be provided with adequate freeze protection consisting of one of the following:

- Installation of tank within a heated portion of a building or within a heated accessory building, for which the main lines are required to be insulated and heat traced or insulated to a higher value to prevent freezing; or

- Installation of tank within an unheated space in a building or accessory building, tanks shall be double walled, insulated to minimum R15 value and heat traced in compliance with CSA C22.2 NO. 130:16, or insulated to a higher value to prevent freezing; or
- Installation of tank outside the footprint of the building, tanks shall be, double walled, insulated to minimum R15 value and heat traced, or insulated to a higher value to prevent freezing.

Structural support of the sanitary holding tank shall be sufficient to support one and one-half times the weight of a full sanitary holding tank.

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Iqaluit

City of Iqaluit

Municipal Design Guidelines

7.0 Roadway and Trail Design

Version 1

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Roadways, Walking Trails, and Snowmobile Trails

7.1 General

These guidelines provide general direction for the design of municipal roadways, walking trails, and snowmobile trails within the City of Iqaluit. They are intended to reflect sound engineering practice while recognizing the City's unique northern environment, terrain, and climatic constraints.

These guidelines apply to all areas where roadway, trail, or snowmobile infrastructure is specified or upgraded. The guidelines are intended to promote a safe, efficient, and climate-resilient transportation network that supports mobility and connectivity year-round for all users, including pedestrians, snowmobile operators, and vehicles.

These guidelines are not a substitute for detailed project-specific design documents and specifications. It is the responsibility of the Design Engineer to ensure all infrastructure is designed in accordance with accepted engineering principles, local site conditions, and regulatory requirements. The application of these guidelines must be supplemented by professional judgment and adapted to the realities of permafrost, snow accumulation, drainage challenges, and limited construction windows specific to Iqaluit.

For each new subdivision or development project, the appropriate roadway classification and functional designation must be determined during the planning phase in consultation with the City Engineering Department. Design Engineers are encouraged to engage with the City Engineering Department early in the process to confirm if a traffic impact study is required, particularly for projects that may affect street patterns, access points, turning lanes, or signalized intersections. Such studies must be conducted by qualified transportation professionals.

All design work must be aligned with the following City of Iqaluit bylaws and plans:

- Traffic By-Law
- Zoning By-Law
- Building By-Law
- General Plan By-Law
- Transportation Master Plan

7.2 Traffic Impact Assessments

All development and transportation projects within the City have an associated impact on the overall transportation system. As the City continues to grow these impacts must be evaluated to ensure that issues are addressed and remediation measures put in place

where necessary. In general, a Transportation Impact Assessment (TIA) may be required to fully evaluate a proposed Development when one of the following situations is present:

a) The Development generates 100 or more trips during either of the peak hours;
b) The Development proposes access onto a high volume, high speed, or congested roadway;
c) The Development proposes access at or in close proximity to an intersection or other access;
d) The Development proposes a new intersection or upgraded control of an existing intersection;
e) High turning movements are associated with the proposed usage;
f) High pedestrian activity is expected;
g) The Development proposes new crosswalks or is in close proximity to existing crosswalks;
h) The Development includes changes to existing street characteristics such as lane designations, left turn storage bays, or access restrictions; or
i) Other special transportation concerns are present based on the adjacent community, design details, or specific usage proposed.

Given the dynamic nature of development in the City, a TIA has a “shelf life” of not more than five (5) years. If major changes have occurred to either the area development or the transportation network within the study area that were not contemplated within the original TIA, then the City Engineer may require an update to the TIA regardless of when the original TIA was prepared.

7.3 Roadway Classifications and Functional Hierarchy

The roadway classification system for the City of Iqaluit is designed to reflect the scale and function of roads within the municipal transportation network, while accounting for northern Canadian construction and operational realities such as snow storage, permafrost sensitivity, and seasonal access constraints.

All roads shall be classified according to their intended function, land use context, and anticipated traffic volumes. These classifications guide appropriate cross-sectional design elements, structural capacity, and utility integration.

Roadway classification and design shall be coordinated with the City Engineering Department and shall comply with applicable City by-laws.

Roads in Iqaluit are generally classified into the following types:

- Arterial roads (Industrial or Neighbourhood)
- Collector roads (Downtown, Industrial, Main Street or Neighbourhood)
- Local roads (Downtown, Industrial, Main Street or Neighbourhood)

A figure showing the road classifications for existing roads (at the time of publication) is included in the City's General Plan (By-law 898).

7.4 Typical Cross-Sectional Design Elements

The design of cross-sections for roadways in Iqaluit must account for climatic extremes, permafrost conditions, limited right-of-way availability, and the need to safely accommodate multiple users, including vehicles, pedestrians, service vehicles, and snowmobiles.

The following components shall be considered when developing roadway cross-sections. Refer to the accompanying standard details for more information.

- Vehicle lanes
- Shoulders
- Sidewalks
- Drainage corridors
- Utility corridors

Existing roads and developed areas in Iqaluit may not have a wide enough ROW to accommodate the entirety of the elements and widths shown in the typical cross-sections. In these situations, the Design Engineer shall use their best judgement to propose, either opportunities for the City to reclaim ROW space, or acquire easements, or implement non-typical ROW configurations. Any non-typical option(s) considered must include detailed background and justification for modifications. Any non-typical configurations and widths require approval from the City Engineering Department prior to finalizing and implementing the design.

The following tables describe the function and minimum design standards for each roadway classification.

Table 7-1: Arterial Roadways

Arterials	Industrial	Neighbourhood
Function	Moves large volume of traffic to/from industrial areas; connects to other arterials	Serves higher volume traffic within neighbourhood areas; supports internal circulation
Minimum Pedestrian Facility	Wide gravel shoulders	Dedicated sidewalk; one side
Design Speed	40 km/h	40-50 km/h
Min. R.O.W. Width	25 m	25 m
Curb & Gutter	No	No
Min. Lane Width	4.75 m (includes shoulder width)	4.75 m (includes shoulder width)
Surfacing Material	Granular A (25 mm)	Granular A (25 mm)

Table 7-2: Collector Roadways

Collectors	Industrial	Main Street	Neighbourhood	Commercial District
Function	Collects industrial traffic from local roads and directs to arterials	Carries moderate traffic volumes and supports mixed-use corridors; high pedestrian volumes	Connects local residential streets to arterials; supports moderate traffic	Facilitates movement within core; moderate pedestrian volumes
Minimum Pedestrian Facility	Wide gravel shoulder; one side	Dedicated sidewalk; both sides	Dedicated sidewalk; one side	Dedicated sidewalk; both sides
Design Speed	40 km/h	30 km/h	30 km/h	30 km/h
Min. R.O.W. Width	22 m	22 m	22 m	22 m
Curb & Gutter	No	Yes	Consult City	Yes

Collectors	Industrial	Main Street	Neighbourhood	Commercial District
Min. Lane Width	4.75 m including Shoulder	4.0 m to Face of Curb	4.75 m including Shoulder 4.00 m to Face of Curb	4.0 m to Face of Curb
Surfacing Material	Granular A (25 mm)	Asphalt	Consult City	Asphalt

Table 7-3: Local Roadways

Local	Industrial	Main Street	Neighbourhood	Commercial District
Function	Carry low volume traffic from individual properties and connect to Arterial Roads via Collector Roads			
Minimum Pedestrian Facility	Wide gravel shoulder; one side	Dedicated sidewalk; both sides	Dedicated sidewalk; one side	Dedicated sidewalk; one side
Design Speed	40 km/h	30 km/h	30 km/h	30 km/h
Min. R.O.W. Width	19 m	19 m	19 m	19 m
Curb & Gutter	No	Yes	Consult City	Yes
Min. Lane Width	4.00 m 4.75m one Side for Pedestrians	3.75 m to Face of Curb	4.00 m including Shoulder 4.00 m to Face of Curb	4.00 m to Face of Curb
Surfacing Material	Granular A (25 mm)	Asphalt	Consult City	Asphalt

Deviations from the tables above may be permissible through discussions with the City Engineering Department.

Narrower lane widths may be approved by the City Engineering Department on a case-by-case basis should existing conditions and constraints, such as existing right of way

width, space for drainage conveyances and space for utilidor infrastructure, inhibit the provision of standard vehicle lane widths.

7.4.1 Pedestrian Facilities

Roadway designs shall accommodate safe, convenient, and accessible year-round pedestrian and non-motorized travel.

In Iqaluit, pedestrian facilities shall be defined as follows:

Sidewalk: A hard-surfaced walkway installed parallel to a roadway, within a road right of way.

Walking Trail: A multi-use pedestrian route which is outside of a road right of way. Walking trails may be surfaced using gravel, concrete or asphalt, depending on the location, volume of traffic and intended purpose.

Sidewalks may be constructed using either concrete or asphalt, subject to approval by the City during the preliminary design stage.

Sidewalks and associated curb ramps shall provide barrier-free access in accordance with applicable accessibility standards. The design and grading of accessibility ramps shall consider the operational requirements of snow clearing equipment and provide positive drainage to prevent ponding and ice accumulation.

Pedestrian crossings shall be clearly identified with signs and pavement markings in accordance with the latest edition of the Manual of Uniform Traffic Control Devices for Canada (MUTCDC).

7.4.1.1 Design Criteria

The City requires a consistent and effective sidewalk design to promote pedestrian travel.

All geometric design shall conform to the Transportation Association of Canada Geometric Design Guide for Canadian Roads (TAC) and the Integrated Accessibility Standards Regulation Guidelines Part 4.1 – Design of Public Spaces Standard.

Sidewalks constructed shall be strong, durable, and long-lasting. Sidewalks should be easily maintainable and able to withstand equipment required to remove heavy amounts of snow.

All sidewalks within the City of Iqaluit are to be located within the City's Right-of-Way. Any pedestrian facilities not located within the roadway right-of-way would be considered a walking trail, which may be subject to separate design standards.

Curbs are not typically required on industrial or gravel roads.

7.4.1.2 Sidewalk Design

Sidewalks shall be either 1.5m, 1.8m or 2.0m wide, depending on the roadway classification, space available within the right of way and the expected pedestrian volume. The City of Iqaluit is to be consulted about the most appropriate sidewalk width during the preliminary design stages of any project.

2.0m wide sidewalks are preferred as they provide a more pleasant walking experience, particularly in areas with high foot traffic and snow accumulation (e.g., the additional width can provide temporary storage for windrows of snow). Wider sidewalks also provide more space for pedestrians to walk comfortably with children, and for individuals who may require an assistive mobility device (e.g., walker, wheelchair, stroller, etc.).

The City may permit deviation from the minimum sidewalk width at their discretion.

The minimum sidewalk concrete thickness shall be 150mm and at entrances, the minimum sidewalk thickness may be increased to account for heavy vehicle traffic. Where asphalt is used, the minimum thickness shall be 75mm.

Reinforced curbs and sidewalks shall be provided at all commercial and industrial driveways, and at any driveway that will be used by water delivery trucks or wastewater collection trucks.

7.4.1.3 Horizontal Clearance to Obstacles

Horizontal clearance is the distance between the edge of sidewalk and an at-grade obstacle, such as: hydrants, utility poles, signage, above ground utilidor, etc. A minimum horizontal clearance is necessary to minimize damage to obstacles from snow maintenance operations.

The recommended minimum clearance is 1.5m and the absolute minimum clearance dimension is 0.60m. Clearances are to be reviewed with the City on a case-by-case basis.

7.4.1.4 Sidewalk Slopes

The cross slope of a sidewalk is perpendicular to the direction of travel, while the running slope runs parallel to the direction of travel.

The cross slope of a sidewalk should be between 2% - 4%, towards the street or ditching, to allow stormwater to drain.

The minimum running slope of a sidewalk is 0.80%. If a running slope is greater than 5%, the sidewalk may be treated as a ramp, with proper landings at intersections and handrails along the steep sections of sidewalk. This would be considered in areas with high pedestrian activity or areas where pedestrians require an assistive mobility device (e.g., walker, wheelchair, stroller, etc.).

The recommended sidewalks slopes are summarized in Table 7-4 below.

Table 7-4: Sidewalk Slopes

Parameter	Recommended Slope
Cross Slope	2% - 4%
Running Slope	1% - 5%*

* If running slopes are greater than 5%, the sidewalk may be treated as a ramp, with proper landings at intersections and handrails along the steep sections of sidewalk.

Additional sidewalk slope details are depicted on the specification drawings.

7.4.1.5 Sidewalk Gravel Structure

Subsurface utility locates are to be conducted prior to excavating to avoid damage to existing underground infrastructure and contractors must follow the rules stipulated by utility companies, if excavating in the vicinity of subsurface utilities.

Subsurface conditions, site preparation, dewatering, and excess soil management shall be supported by a Geotechnical and Hydrogeological report.

The structural base below a sidewalk reduces cracks, sinking and heaving effects on the walking surface. Proper aggregate sizing and compaction is critical for drainage through the void spaces within the structural base.

A Professional Geotechnical Engineer licensed with the Northwest Territories and Nunavut Association of Professional Engineers and Professional Geoscientists (NAPEG) is to be retained to provide site specific recommendations for the sidewalk structural base.

The minimum compacted structural base thickness shall be 200 mm using Granular A (25 mm) aggregate.

Where a sidewalk is directly adjacent to a roadway (i.e. no boulevard), the same pavement structure of the roadway shall be used under the sidewalk and shall extend beyond the sidewalk zone by 300 mm.

The native material is to be reviewed by a Professional Geotechnical Engineer licensed with NAPEG, for suitability prior to the placement of the structural base.

In moist areas with clay or silty native soils, a layer of geotextile fabric should be placed under the structural base layer to ensure drainage is maintained. This requirement is to be determined by a Professional Geotechnical Engineer licensed with NAPEG.

The structural base must be completely thawed and not be frozen, prior to any compaction or concrete pours.

7.4.1.6 Pedestrian Crossings

Crosswalks are locations where the pedestrians cross a travelled vehicular path. At these crossings, sidewalks must be depressed to enable pedestrians to cross, who may require an assistive mobility device (e.g., walker, wheelchair, stroller, etc.).

Tactile Walking Surface Indicators are to be placed at every crossing location to support / guide the visually impaired.

7.4.1.7 Sidewalk Ramps

At each pedestrian crossing, a concrete sidewalk ramp is required to provide a grade transition. Sidewalk ramps are to be implemented at mid-block crossings, intersection pedestrian crossings, and driveways.

7.4.1.8 Intersection Crossings

Perpendicular (or 'double' ramp) concrete sidewalk ramps should be provided whenever feasible, as they have multiple benefits, including:

- Reducing ambiguity for drivers for which direction the pedestrian will cross;
- Reducing encroachment by turning vehicles;
- Mitigating pedestrian crowding by separating sidewalk users by their direction of travel; and,
- Allowing wheelchair users to enter crosswalks directly rather than at an angle.

7.4.2 Boulevard Design

Boulevards create a safety barrier between pedestrians and the vehicle travelled portion of the roadway, providing a sense of safety and security to pedestrians. Additionally, they help guide the visually impaired by providing a clear separation between the sidewalk and the road. Boulevards also provide space for surface drainage, snow storage, garbage collection, street furniture, lamp posts, hydrants, etc. A minimum effective boulevard width of 1.5 m should be provided where feasible.

Boulevards shall consist of granular or landscaped material to convey drainage and shall be a minimum of 350 mm thick to mitigate erosion.

The boulevard must be flush with the sidewalk and have a cross slope between 2% to 10% to allow stormwater to drain toward the street or ditching, and to mitigate ankle sprains / falls into ditching or active vehicle lanes.

The use of boulevards is recommended on all roadways, where feasible.

7.4.3 Crossfall and Crown

All roads must be either crowned with a 2% crossfall from centerline or uniformly sloped to a ditch or curb & gutter. Cross-sections shall reflect the long-term drainage strategy and accommodate settlement from permafrost degradation where applicable.

7.4.4 Curb Cuts for Drainage

Where curb and gutter is included in the roadway cross section, the Design Engineer shall include provisions for drainage along the curb and gutter. Curb cuts shall be provided at minimum 100m intervals, and at low points, to direct runoff to the adjacent road ditch or swale. At the downstream end of the curb and gutter, water shall be directed to a ditch using rip-rap along the slope.

The face of curb at curb cuts shall be curved towards the ditch or swale using a 0.50 m radius. The curb cut shall include an opening of 1.0 m as measured from the face of curb. The gutter shall continue through the curb cut. A 1.0 m wide concrete apron shall extend from the gutter to the bottom of the ditch or swale. Curb cuts shall be marked with a 1.2m reflectorized PVC marker post to mitigate snowplow damage.

7.4.5 Ditching

Ditches must be designed to accommodate snowmelt and spring runoff and must be integrated with the development's overall drainage plan.

The maximum slope from the edge of the road shoulder or back of curb to the bottom of an adjacent ditch shall be 3H:1V.

Refer to the Stormwater Management System guidelines for more information on ditching and stormwater management.

Where sidewalks are separated from the roadway by a drainage ditch, pedestrian ditch crossings are required at 50m intervals. Pedestrian ditch crossings typically include a culvert, and a hard-surfaced sidewalk. Crosswalk signage is required where applicable.

7.4.6 Utility Corridors

Dedicated space for utilities shall be provided within the ROW to accommodate buried and overhead utilities.

Where available ROW is constrained, joint trenching or consolidated utility alignments may be used, subject to approval from the City Engineering Department.

Streetlights should be installed at least 3m away from buried utilities, ideally on the opposite side of the road. Refer to the Power, Illumination and Telecommunications guidelines for more information.

7.4.7 Roadway Structure

A site-specific geotechnical investigation shall be completed to determine the appropriate layer thickness for Granular A, Granular B and asphaltic pavement. The geotechnical engineer of record shall consider the future vehicular loading and subgrade conditions as part of the analysis.

The minimum roadway structure permitted in the City of Iqaluit is:

- 200mm Granular A (25mm)
- 300mm Granular B (75mm)
- Geotextile at subgrade

Where asphalt is required, the minimum allowable finished asphalt thickness is 80mm.

7.4.8 Snow Storage

Adequate snow storage space is critical in Iqaluit. Snow storage may be accommodated within side slopes, drainage ditches, or designated snow easements. Roads shall not be designed with full-width curb and gutter unless snow management provisions are made.

Commercial, industrial and multifamily developers, in preparing their development plans, shall consider the placement of snow storage as part of the design process;

- Snow storage piles should be located along the downgradient edges of parking lots and positioned as far away from major pedestrian destinations as possible. If possible, the main snow pile should be placed at the lowest point of the parking lot.
- Parking lots should be graded such that meltwater runoff from snow storage piles is transported away from high traffic areas.

- Snow storage piles should be staged in areas which receive large amounts of solar radiation to promote more efficient melting.
- Snow storage piles should be located in areas which are easily accessible for plows and other mechanical snow and ice removal machinery. This may involve having multiple snow storage piles.

7.4.9 Guiderail

The warrant for roadside guiderail systems shall be determined using the Ontario Ministry of Transportation Roadside Design Manual (RDM).

Guiderail systems shall be designed in accordance with the RDM.

7.5 Roadway Longitudinal Design Criteria

This section outlines the geometric and operational design criteria applicable to new municipal roadways in Iqaluit. These criteria are intended to ensure safe, consistent, and climate-resilient infrastructure design. They incorporate best practices from national guidelines, with adaptations for local topography, climate, and community needs.

7.5.1 Trip Generation Rates

The trip generation rate for single-detached dwellings in Iqaluit shall be assumed as 9 one-way trips per household per day. For other land uses, trip generation rates must be justified by the Design Engineer using appropriate sources (e.g., ITE Trip Generation Manual) and approved by the City Engineering Department.

7.5.2 Design Speeds and Traffic Volumes

Design speed is the primary basis for horizontal and vertical alignment, sight distance, and intersection design. Typical design speeds and traffic volumes are:

Table 7-5: Design Speeds

Road Type	Design Speed (km/h)	Daily Traffic Volume (Vehicles/Day)
Arterial	50-60	> 8,000
Collector	50-60	1,000-8,000
Local	30-50	< 1,000
Industrial	30-50	Site-specific
Rural Access	50-60	Site-specific

The design speed should typically be 10km/h greater than the posted speed limit, in line with public expectations and safety margins. Road surface design and geometrics shall accommodate forecasted traffic volumes and types, including potential heavy vehicle use.

7.5.3 Corner Turning Radii

The minimum corner radii shall be as follows:

- Arterial roads: 15 m
- Local roads: 6-10 m
- Collector roads: 10-12 m
- Industrial/commercial areas: 15 m (to accommodate truck turning)

Corner radii are measured to the face of curb where concrete curbs are present. For rural cross sections, the corner radii are measured to the edge of the vehicular travel way (i.e. not to the shoulder edge).

Designs must consider the largest regularly expected vehicle type. Turning radii shall comply with the TAC Design Vehicle standards appropriate to the context.

The Design Engineer shall provide vehicle turning movement figures for new developments or road improvement projects.

7.5.4 Sight Distances

Sight distances must comply with the current TAC Geometric Design Guide for Canadian Roads, considering stopping, decision, and intersection sight distance. Snowbanks, parked vehicles, signage, and utilities must not obstruct visibility at intersections or crossings.

7.5.5 Minimum and Maximum Grades

Where feasible, longitudinal grades should align with the site's natural topography and be reviewed in conjunction with geotechnical recommendations for permafrost settlement control. The grading requirements are as follows:

Table 7-6: Minimum and Maximum Grades

Road Type	Minimum Grade	Maximum Grade
Arterial	0.80%	5.0%
Collector	0.80%	6.0%
Local	0.80%	7.0%

7.5.6 Horizontal and Vertical Alignment

Horizontal curves must conform to the design speed and classification of the roadway, using TAC minimum curve radii.

Vertical curves must provide adequate stopping sight distance and rider comfort. Crest curves must allow for headlight sight distance in winter conditions. Sag curves must provide visibility under snow-covered conditions.

Vertical curve geometrics (k, length of curve) shall be designed based on TAC criteria.

7.5.7 Superelevation

Superelevation is not required for local and collector roads. If used on arterial roadways, limit the cross slope to a maximum 6%, following TAC guidelines. Transition lengths and crossfall shifts must be designed to facilitate snow clearing and minimize ice buildup.

Approval from the City of Iqaluit is required prior to undertaking superelevation design.

7.5.8 Cul-de-sacs and Hammerhead Turnarounds

The maximum length: 120 m from the intersecting street centerline to the bulb.
The minimum turnaround radius to face of curb/shoulder shall be as follows:

- Residential: 14.0 m.
- Industrial: 15.0 m or larger to accommodate truck turning.

Cul-de-sacs longer than 120 m require a 6.0 m wide Public Utility Lot (PUL) for emergency access and utilities. Hammerhead turnarounds may be approved on constrained sites, provided fire and emergency vehicle turning requirements are met.

7.5.9 Driveways and Private Approaches

Driveway grades shall not exceed 8% and must match adjacent roadway structure up to property line.
Driveways for buildings with trucked services shall be graded at less than 3% and graded away from the building as described in Trucked Water and Sanitary Services guidelines.
The minimum and maximum driveway widths shall be as follows:

- Residential: 7.5 m Min, 9.0 m Max.
- Commercial or Industrial: 10.0 m Min, 12.0m Max.
- Where driveway widths do not conform to these requirements, the Design Engineer shall discuss the variance with the City of Iqaluit during the design stage.

Refer to the Water Distribution System guidelines and the Sanitary Sewer System guidelines for minimum clearances from access vaults and coordination with piped services locations and alignments.
Refer to the Power and Street Lighting guidelines for minimum clearances from electrical utilities.

7.5.10 Intersections and Spacing

Intersections shall be aligned at 90°. If 90° cannot be achieved, the Design Engineer shall justify the proposed angle for approval from the City Engineering Department at the early stages of the design.

The minimum spacing between intersections: 60 m (centerline to centerline).

Intersection sight distances shall follow TAC standards for stopping and turning movements.

7.5.11 Fire Protection Routes

Commercial, industrial and multifamily developments must include a dedicated access route for fire protection. A portion of a roadway or yard provided as a required access route for fire department use shall;

a) have a clear width not less than 6 m, unless it can be shown that lesser widths are satisfactory,
b) have a centreline radius not less than 12 m,
c) have an overhead clearance not less than 5 m,
d) have a change of gradient not more than 1 in 12.5 over a minimum distance of 15 m,
e) be designed to support the expected loads imposed by firefighting equipment to permit accessibility under all climatic conditions,
f) have turnaround facilities for any dead-end portion of the access route more than 90 m long, and
g) be connected with a public thoroughfare.

Fire protection routes must be approved by the City of Iqaluit Fire Chief.

7.6 Geotechnical Considerations

During the design phase, a geotechnical investigation shall be completed. Boreholes shall be excavated at minimum 50.0 m intervals. The geotechnical investigation shall provide information on the approximate bedrock profile. Design drawings shall show the anticipated bedrock depth, as recorded during the geotechnical investigation.

For bedrock removal, mechanical methods shall be used, and blasting must be approved by the City Engineering Department, as well as all authorities having jurisdiction, prior to work commencement.

7.7 Quality Assurance

Quality control testing shall include but not be limited to 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 Territory of Nunavut.

Refer to the City's standard construction specifications for further information about the City's expectations for quality assurance.

7.8 Roadway Signage and Wayfinding

Signage is critical to safe and effective navigation for all users and must be designed for visibility and durability in northern environments characterized by snow accumulation, limited daylight hours, and high winds.

Signage and wayfinding are essential components of Iqaluit's transportation network, providing guidance, hazard warnings, and navigational support. In northern Canadian conditions where snow cover, reduced visibility, and seasonal darkness are common, signage must be highly visible, durable, and reliable.

All signage shall be legible, weather-resistant, and constructed with reflective materials suitable for cold climates. Signs must be mounted at consistent heights above the average snow surface and set back appropriately to remain visible despite drifting snow or roadside obstructions.

Signage must be bilingual (English and Inuktitut syllabics) where applicable, with particular attention at major intersections, trailheads, public destinations, and community access points. This ensures accessibility, cultural relevance, and user confidence for all residents and visitors.

Regulatory, warning, and informational signs should adhere to recognized standards (e.g., MUTCDC, IASA guidelines) and be scaled for the appropriate user group, whether motorist, pedestrian, or snowmobiler. Signage design must prioritize clarity, consistency, and simplicity, avoiding clutter and ensuring placement allows users time to interpret and react.

Roadway signage shall comply with TAC Manual of Uniform Traffic Control Devices for Canada (MUTCDC) standards. The following shall be considered with respect to the placement of signage:

- Signs shall be mounted at a height of 2.1 m (min) from ground to bottom edge in urban areas.
- Minimum lateral clearance of 0.6 m from edge of road or curb.
- Setback increased in areas with known snow drift accumulation.

7.9 Walking Trails

Walking trails are intended to support year-round pedestrian mobility, community connectivity, and active transportation. Trails must be designed with consideration for snow accumulation, freeze-thaw cycles, drainage, and low-maintenance requirements in northern region conditions.

7.9.1 Trail Types

Walking trails in Iqaluit may include:

- Community Trails: Multi-use corridors connecting neighbourhoods, parks, and public destinations.
- Recreational Loops: Scenic or perimeter trails for walking, jogging, and wellness activities.
- School Connectors: Trails facilitating safe pedestrian access to schools and educational facilities.
- Utility or Service Trails: May also serve as access routes for infrastructure maintenance.

The classification for new trails shall be determined through discussions with the City of Iqaluit and through public consultations.

7.9.2 Trail Alignments and Cross Sections

Trails should follow natural terrain where possible and avoid steep grades, sensitive areas, or drainage swales and must be integrated into subdivision design and aligned to connect key destinations, including community facilities & parks.

Typical cross-sectional elements include:

- Trail width: 1.8 - 3.0 m (minimum width of 3.0 m for shared-use or high-volume routes).
- Clear zone: 1.0 m horizontal clearance on both sides.
- Vertical clearance: Minimum 2.5 m.

7.9.3 Walking Trail Surfacing Options

The following surface types may be used based on site context and expected usage:

- Granular surface (preferred for low-volume trails). The structure shall be: 100mm of compacted Granular A (25mm), 200mm of Granular B, and geotextile.
- Asphalt: Preferred for urban and high-traffic routes, particularly near schools and downtown areas. The minimum finished thickness for asphaltic pavement shall be 80mm. The base shall have a minimum of; 100mm compacted Granular A, 200mm of Granular B, placed over geotextile.
- Boardwalk: May be used over environmentally sensitive terrain or poorly drained areas.
- Winter groomed surface: Seasonal trail grooming may apply to certain routes using snowmobile-mounted equipment.

All trail surface types must be reviewed and approved by the City Engineering Department and shall prioritize durability and low maintenance in a freeze-thaw climate.

A geotechnical report is required to confirm the layer thicknesses for the trail structure.

7.9.4 Accessibility and Safety

Trails must maintain a maximum grade of 5% unless resting platforms are provided.

Trails must include curb ramps or transitions at all road crossings and the sightlines at intersections or crossings must be maintained year-round and must not be obstructed by snowbanks or vegetation.

7.9.5 Drainage and Grading

Trail grading must accommodate a minimum 0.80% longitudinal slope to ensure positive drainage. Cross slopes shall not exceed 2%.

Culverts or footbridges must be provided where trails cross ditches, swales, or drainage channels. Refer to the City's stormwater management guidelines for further information.

7.9.6 Trail Right-of-Way and Setbacks

Where not co-located with roadways, dedicated trail ROWs shall be a minimum of 6.0 m wide. Trails should be centred within the ROW where feasible, but may be offset to avoid conflicts with utilities, structures, or vegetation. Setbacks from property lines must allow adequate space for snow clearing and year-round use.

7.10 Snowmobile Trails

This section outlines the minimum design requirements for snowmobile trails within the City of Iqaluit. Snowmobile trails are vital transportation and recreation corridors. Design considerations must reflect northern climactic conditions, safety, seasonal maintenance, and shared-use potential.

7.10.1 Snowmobile Trail Function and Alignment

Snowmobile trails may serve the following functions:

- Community access between neighbourhoods, amenities, and natural areas.
- Connector routes linking Iqaluit to sea ice access points, tundra routes, or cabin areas.
- Multi-use corridors shared with service vehicles, walking trails, or groomed winter routes.

Trails should be located to:

- Avoid steep slopes, frequent driveways, blind hills, and utility corridors where possible.
- Be aligned to reduce wind exposure and avoid snow drifting, with frequent community input.
- Provide clear entry/exit points at road crossings and residential areas.
- Use drainage swales or parallel berms to minimize surface water accumulation during thaw periods.

7.10.2 Snowmobile Trail Width and Right-of-Way

The minimum trail width: 4.0 m clear trail surface; 1.0 m clear zone on each side (3.0m clear zone preferred).

A minimum of 2.75m of vertical clearance shall be provided.

A minimum 6.0 m right of way is required for new trails to allow space for snow storage and maintenance access.

7.10.3 Snowmobile Trail Surfacing and Construction

Snowmobile trails in Iqaluit are typically constructed over natural ground and used primarily during the winter season when the surface is snow-covered and frozen. However, the underlying trail base must still be carefully prepared to support safe, consistent trail conditions throughout the operating season.

Prior to snowfall, the trail corridor must be cleared of rocks and other obstructions that may become hidden beneath the snow but still pose a hazard to users. Ground irregularities, such as ruts, hummocks, or soft spots, should be leveled where feasible to provide a smooth base and allow uniform snow coverage.

In wet, low-lying, or thaw-sensitive areas, additional preparation is required. These sections may require installation of geotextile fabric and a layer of compacted granular fill (typically 150 mm minimum) to provide structural support and minimize rutting, frost heave, or waterlogging during freeze-thaw cycles. Cross-sloped surfaces (2 - 4% cross slope) are recommended to facilitate meltwater runoff and reduce surface ice formation.

Where trails pass over buried utilities or drainage features, care must be taken to avoid damage from grooming or maintenance equipment. In these locations, surface marking or signage may be used to identify sensitive zones and alert operators.

In high-use corridors or routes shared with service vehicles, pedestrian traffic, or other winter trail users, enhanced construction practices such as trail widening, base reinforcement, or defined snow grooming zones may be considered to improve durability and safety. Trail construction should be completed before sustained snowfall to allow for compacted snow accumulation, which forms the functional riding surface.

7.10.4 Snowmobile Roadway Crossings

Snowmobile trail crossings of roadways are critical points that require enhanced design for safety, visibility, and conflict avoidance. Roadway crossings must be carefully located, well-marked, and constructed in a manner that protects both snowmobile operators and vehicular and pedestrian traffic.

Crossings shall be located at 90-degree angles to the roadway to minimize crossing distance and maximize visibility and avoid locations near blind curves, hillcrests, driveways, or intersections with limited sightlines. Where feasible, align trail approaches to be as level and straight as possible for at least 30m before the crossing and place

them where snow accumulation from plowing is least likely to obstruct sightlines or trail continuity.

7.10.4.1 Design and Construction

Approach ramps must be stable and graded to allow smooth transition from trail to road surface and a clear zone of at least 1.0m should be maintained on both sides of the trail to allow for snowmobile maneuvering. Trail approaches must be free of ice ruts, deep snowbanks, or obstructions that could limit control or visibility.

7.10.4.2 Visibility and Sight Distance

The minimum required sight distance shall be 30 m in both directions, with greater distances preferred on arterial or higher-speed roads. Trail designers must consider nighttime visibility, snow glare, and fogging conditions common in northern regions and use snow fencing or natural screening to prevent drift accumulation that reduces sight distance at crossings.

7.10.4.3 Crossing Signage and Delineation

Roadway approaches must be signed with advance warning signage such as:

- STOP or YIELD signs for snowmobile traffic
- “Snowmobile Crossing” signs for vehicular traffic in both directions
- Signs should be reflective and weather-resistant, mounted at 1.5 m above average snow surface and placed at minimum 60 m in advance of the crossing point on both approaches.
- Trail crossings near schools, playgrounds, or pedestrian crossings require extra signage, and may require reduced speed limits or additional awareness signage.

7.10.5 Snowmobile Trail General Signage and Markings

Effective signage and trail markings are critical for snowmobile user safety, navigation, and confidence—particularly under Iqaluit’s winter conditions where snow accumulation, low visibility, and limited daylight are common. Signage must be clear, consistent, and visible under a wide range of environmental conditions, including blowing snow and whiteout scenarios. It should also help manage multi-use trail interactions and convey regulatory, cautionary, and directional information clearly.

All signage used on snowmobile trails within the City of Iqaluit shall be constructed from durable, weather-resistant materials and incorporate reflective surfaces for nighttime and low-light visibility. In areas where trails cross City roads, interact with pedestrian

pathways, or pass through residential zones, signage must be reinforced with additional warning and speed moderation messaging.

7.10.5.1 Sign Types

Snowmobile trail signage shall align with the International Association of Snowmobile Administrators (IASA) Guidelines for Snowmobile Trail Signing and Placement, which provide nationally recognized standards for safe and effective snowmobile navigation. These guidelines classify signs into four primary categories: regulatory, cautionary, directional/informational, and hazard markers.

Regulatory signs include STOP, YIELD, Speed Limit, and No Entry indicators. These communicate rules that must be followed and typically conform to those used on municipal roadways. Cautionary signs, such as Curve Ahead, Narrow Trail, or Bridge Crossing, should be used to alert snowmobile operators to upcoming hazards or changes in trail conditions. These signs are usually diamond-shaped with a yellow background and black lettering or symbols.

Directional and informational signs support trail navigation and orientation by identifying trail names, key destinations, and distances. These signs may also include emergency contact or access point information and are generally rectangular or arrow-shaped with blue or green backgrounds and white text. Hazard markers are used to indicate fixed or seasonal obstacles within or adjacent to the trail, such as culverts, drop-offs, utility poles, or fencing. These may include reflective chevrons, hazard stripes, or flagged indicators depending on the nature of the obstacle.

Where trails intersect with other users or public infrastructure, additional signage and markings may be used to reinforce safety messaging.

Speed limits, trail access regulations, and enforcement mechanisms should align with municipal bylaws. Clear communication, paired with consistent signage and routine monitoring, will foster a safer and more respectful trail environment for all users.

7.10.5.2 Placement and Visibility

Proper sign placement is essential to ensure adequate reaction time and user understanding. Advance warning signs should be placed no less than 60 metres before the relevant feature or intersection. In open terrain, directional or reassurance markers should be located every 400 to 600 metres and at all trail junctions. Signs must be installed perpendicular to the direction of travel and slightly tilted downward (5 to 10 degrees) to reduce glare off the snow surface.

7.10.6 Multi-Use Trail Signage Considerations

On multi-use trails, additional signage may be required to manage shared access. These include “Share the Trail,” “Yield to Pedestrians,” or “Mixed Use” warnings, along with posted speed limits where interaction with other users is expected. These messages are important in residential areas, trailheads, and locations near schools or public facilities.

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Iqaluit

City of Iqaluit

Municipal Design Guidelines

8.0 Power, Illumination, & Telecommunications Servicing

Version 1

October 18, 2026

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Power, Illumination & Telecommunications Servicing

8.1 Power Servicing

8.1.1 Qulliq Energy Corporation

The Design Engineer shall coordinate with Qulliq Energy Corporation (QEC) for the provision of the power servicing design.

The location of utility poles and other power infrastructure shall be reviewed and approved by QEC and the City of Iqaluit.

The design of overhead power (including vertical clearances) shall be in accordance with QEC standards and CSA C22.3 No. 1, Overhead Systems.

8.2 Telecommunications

8.2.1 NorthwesTel

The Design Engineer shall coordinate with NorthwesTel for the provision of the telecommunications servicing design.

Telecommunications infrastructure is generally installed on QEC utility poles.

The design of overhead telecommunications (including vertical clearances) shall be in accordance with QEC standards and CSA C22.3, Overhead Systems.

8.3 Street & Trail Lighting

8.3.1 Standard and Guidelines

These guidelines are intended as a guide only. The Design Engineer is responsible to ensure that the street lighting system is designed and constructed according to accepted engineering practice.

These Guidelines shall not be considered as a substitute for a detailed material and construction specification prepared by the Design Engineer.

The street lighting / trail lighting design shall be in accordance with the “Guide for the Design of Roadway Lighting” published by the Transportation Association of Canada (TAC) as well as applicable standards published by the Illuminating Engineering Society of North America (IESNA).

All roadway lighting systems shall be installed in strict compliance with the Nunavut Electrical Protection Act, the Canadian Electrical Code (CEC), Canadian Standards Association (CSA) and Underwriters Laboratories of Canada (ULC)" or "cUL listing standards and standard requirements of the Government of Nunavut Chief Electrical Inspector (Authority Having Jurisdiction).

All designs shall be coordinated with Qulliq Energy Corporation (QEC), NorthwesTel and all relevant stakeholders to ensure designs meet the applicable standards of the stakeholders.

8.3.2 Engineering Drawings and Approval

The Design Engineer is responsible for the preparation and submission of design drawings and specifications. Drawings and specifications shall be prepared by a qualified professional engineer registered with NAPEG.

The design drawings shall illustrate the layout, underground ducts and wiring details, pole spacing, types and heights and luminaire wattage and bracket information. The street lighting plan shall include all surface features and utilities.

The layout, products, and materials are subject to approval by the City and QEC. The Design Engineer shall ensure drawings comply with all requirements necessary to obtain electrical permits from the Territorial Electrical Safety Inspector.

8.3.3 Design and Operations

The Design Engineer shall be responsible to coordinate with the local electrical authority for the design, supply and installation of the service for the street lighting system.

Energizing the street lighting system shall be contingent upon obtaining final electrical inspection sign-off from the Territorial Electrical Safety Inspector (Chief Electrical Inspector) and coordinated between the City and QEC. The City and local electrical authority shall coordinate the type of service (flat rate or metered) based on the specific project requirements. The Design Engineer shall work with the City to complete the QEC Lighting Service Application Form, which is available at www.qec.nu.ca.

8.3.4 Safety

The lighting design shall ensure the proper illumination of conflict areas such as intersections and crosswalks. The design shall be prepared with public safety in mind.

8.3.5 Power Supply and Distribution

The nominal supply shall be 120/240V unless approved otherwise by the City or QEC. Services should be underground dip or service box type, where feasible. The power supply point to the roadway lighting system shall be determined in consultation with the QEC. QEC may require installation of a meter, when necessary.

All street lighting systems shall be protected by an overcurrent device, in the form of a fuse or circuit breaker. Lighting circuit load shall not exceed 80% of feeder breaker rating.

Suitable conductors shall be selected and sized as follows:

- Voltage drop in LED supply lines shall be limited to a Maximum of 5%.
- Conductors shall be de-rated where required per CEC standards.
- Conductor shall be sized up if future load is anticipated.
- Bonding wire shall be based on the ampacity of the largest conductor.

The Design Engineer shall reference QEC LED Street Lighting Standards (www.qec.nu.ca) and the Supplemental Ontario Provincial Standard Drawings.

8.3.6 Energy Usage

The street lighting design should be optimized to allow for the least possible energy consumption while still maintaining acceptable safety standards. The City of Iqaluit encourages the use of the highest efficiency lamps available at the time of installation.

8.3.7 Design Requirements

LED street lighting design shall be carried out by P. Eng. licensed by NAPEG, and the design shall meet IESNA and TAC standards following CEC and CSA/CUL standards, as applicable.

The minimum illumination levels shall be as per IESNA RP-8 (latest edition) for roadways and parking lots. Refer to Tables 8-1, 8-2, 8-3, 8-4 and 8-5 below:

Table 8-1: Illumination Requirements for Roadways

Roadway Type	Pedestrian Activity Classification	Average Illuminance (lux)	Average Luminance (cd/m²)	Maximum Recommended Uniformity Ratio (Avg/Min)	Maximum Recommended Uniformity Ratio (Max/Min)	Maximum Recommended Veiling Luminance Ratio (Max/Avg)
Local Road	Low	≥ 4.5	≥ 0.3	≤ 6:1	≤ 10:1	≤ 0.4:1
	Medium	≥ 7.5	≥ 0.5	≤ 6:1	≤ 10:1	≤ 0.4:1
	High	≥ 9.0	≥ 0.6	≤ 6:1	≤ 10:1	≤ 0.4:1
Per RP-8-25 Table 11-1. Design Criteria for Streets, Bicycle Lanes, and Shared Streets						

Table 8-2: Illumination Requirements for Partial Intersection Lighting

Intersection Classification	Average Illuminance (lux)	Maximum Recommended Uniformity Ratio (Avg/Min)
Local/Local	≥ 4.0	≤ 6:1
Per RP-8-25 Table 12-2. Pavement Design Criteria for Partial (Isolated) Intersection Lighting		

Table 8-3: Illumination Requirements for Full Intersection Lighting

Intersection Classification	Pedestrian Activity Classification	Average Illuminance (lux)	Maximum Recommended Uniformity Ratio (Avg/Min)
Local/Local	Low	≥ 8.0	≤ 6:1
	Medium	≥ 14.0	≤ 6:1
	High	≥ 18.0	≤ 6:1
Per RP-8-25 Table 12-1. Pavement Illuminance Criteria for Full Intersection Lighting			

Table 8-4: Pedestrian Activity Classifications

Classification	Number of Pedestrians during the highest nightly average one-hour volume period	Location Examples
Low	≤ 10	Residential
Medium	11 - 99	Schools, Recreational
High	> 100	Restaurants, Shopping, Theaters

Table 8-5: Illumination Requirements for Parking Lots

Area	Maintained Average Horizontal Illuminance** (lux)	Average Horizontal Illuminance* (lux)	Maximum Recommended Horizontal Uniformity Ratio** (Avg/Min)	Maximum Recommended Horizontal Uniformity Ratio* (Max/Avg)	Average Vertical Illuminance Measured 1.5 m above grade* (lux)	Maximum Recommended Vertical Uniformity Ratio* (Max/Avg)
All Parking Lots	10 - 25	≥ 2	≤ 5:1	≤ 4:1	≥ 1	≤ 20:1
*Per RP-8-25 Table 17-1: Design Criteria for Parking Lots (basic requirements, not for areas where security is an issue). ** Per TAC Table 16-4: Recommended Illuminance Levels and Uniformities for Parking Lots.						

Street lighting should not be used to illuminate adjacent surfaces such as residential lawns and walkways. Every effort shall be made to minimize light trespass onto private property and non-public right-of way. All new or replacement lighting designs shall ensure that light levels at the property line/right-of-way do not increase by more than 1 lux.

Lighting calculations shall be conducted with approved Lighting Software (eg. AGi32 or AutoLUX) and shall be as follows:

- The luminance method shall be used for roadway and interchange lighting calculations for straight road sections.
- The illuminance method shall be used for intersections and cul-de-sacs (dead end) lighting calculations.
- Curved sections with less than or equal to 600m radius shall be evaluated as an intersection and greater than 600m as straight sections.
- ±5% tolerance on the software recommended values may be used if light levels cannot be met.

The Design Engineer shall reference the QEC LED Street Lighting Standards, and the Ontario Provincial Standard Drawings.

8.3.8 Pole Location

In some cases, the road and lot configuration will dictate the pole layout. When possible, poles should be located at the projection of lot lines and shall not conflict with other utilities or approaches. Existing utility poles shall be used for new or replacement lights when possible.

Spacing shall be selected by the Design Engineer and the City, in coordination with QEC, based on the optimum spacing/height/light distribution combination to best meet the minimum standards for illumination.

Poles should be located on the opposite side of the road from water and sewer utilities.

Pole offsets shall be as outlined in the TAC guidelines for clear zone requirements. Where roadways are designated for widening within five years of pole installation, the pole setback shall allow for said widening. The Design Engineer shall consider future water/sewer work when placing electrical equipment within parking lots or road right of ways to mitigate future conflicts, where possible.

Additional details are in the QEC LED Street Lighting Standards and the Ontario Provincial Standard Drawings.

8.3.9 Pole Types

Pole types shall be consistent with adjacent developments. Poles can be wood or metal and shall be confirmed with the City/QEC during detailed design. Existing utility poles can be utilized for new or replacement lights to mitigate pole pollution.

All poles within a new development shall be of the same type and height for continuity. All poles shall be resistant to all climatic and environmental conditions encountered within The City.

8.3.10 Luminaire Types

All new luminaires and replacement luminaires shall be LED and shall be as follows:

- Luminaire shall be white in colour, neutral and warm white type only, with colour temperature no less than 3000K and no more than 4000K.
- Colour Rendering Index (CRI) shall be no less than 70 and no more than 80.
- Lighting distribution type II and III. Approval from the City shall be obtained to utilize other Lighting Distributions should it improve in the design efficiency.
- Luminaire shall be the high efficacy (higher lumens/watt) available to reduce power wastage.
- Luminaire shall be dimmable to maximize savings and reduce light pollution.
- Luminaire shall be complete with photocell and shorting cap.
- Luminaire street lighting shall use full-cutoff or fully shielded with BUG rating of zero uplight (U0) to reduce glare and light spill.
- Luminaires shall have a minimum 100,000-hour life expectancy per IESNA TM-21. The luminaire must maintain at least 85%-90% of its initial light output after 60,000 hours of operation and must maintain at least 70% of its initial light output after 100,000 hours of operation.
- Luminaire shall be tested and approved to IESNA LM-80 for measuring lumens maintenance of LED lighting sources at 20 °C by the manufacturer.
- Luminaires shall have multiple LED bars, preferably driven by multiple chips to provide redundancy against complete failure.

Previously approved luminaire manufacturers utilized by QEC include:

- Cree Lighting
- General Electric Lighting
- Liveable Cities (previously LED Roadway Lighting)
- SolarMax LED Lighting

Other manufacturers may be approved at the discretion of QEC.

The Designer shall ensure all proposed luminaires meet City and QEC Standards.

Additional details on specific requirements for LED Luminaires are provided in the QEC LED Street Lighting Standards and the QEC LED Procurement Specifications and Checklist.

8.3.11 Aesthetic

Street lighting design shall be compatible with the type of development and proposed buildings. Considerations shall be given to match existing/adjacent equipment for aesthetics and uniformity.

The use of decorative poles shall be subject to approval by the City. Proposed decorative poles and luminaries should share common optical systems and components as other decorative items found in existing developments within the City.

8.3.12 Foundations

Foundations shall be designed based on the specific soil conditions on site. The foundations shall be designed to withstand all loading, particularly wind loading for speeds up to 160 km/h.

8.3.13 Street Lighting Cabinets and Equipment

All electrical equipment, service cabinets, and custom assemblies shall bear certification marks accredited by the Standards Council of Canada (SCC) and accepted by the Chief Electrical Inspector prior to installation

All equipment shall be capable of operating at ambient temperature range of -40 °C (-50 °C desirable) to +40 °C to meet adequate arctic grade temperature ratings. The use of a controlled heater can be used for panel boards and circuit breakers to ensure proper function and safety of equipment at low temperatures.

Additional details are provided in the QEC LED Street Lighting Standards, the QEC Distribution Standards and the Ontario Provincial Standard Drawings.

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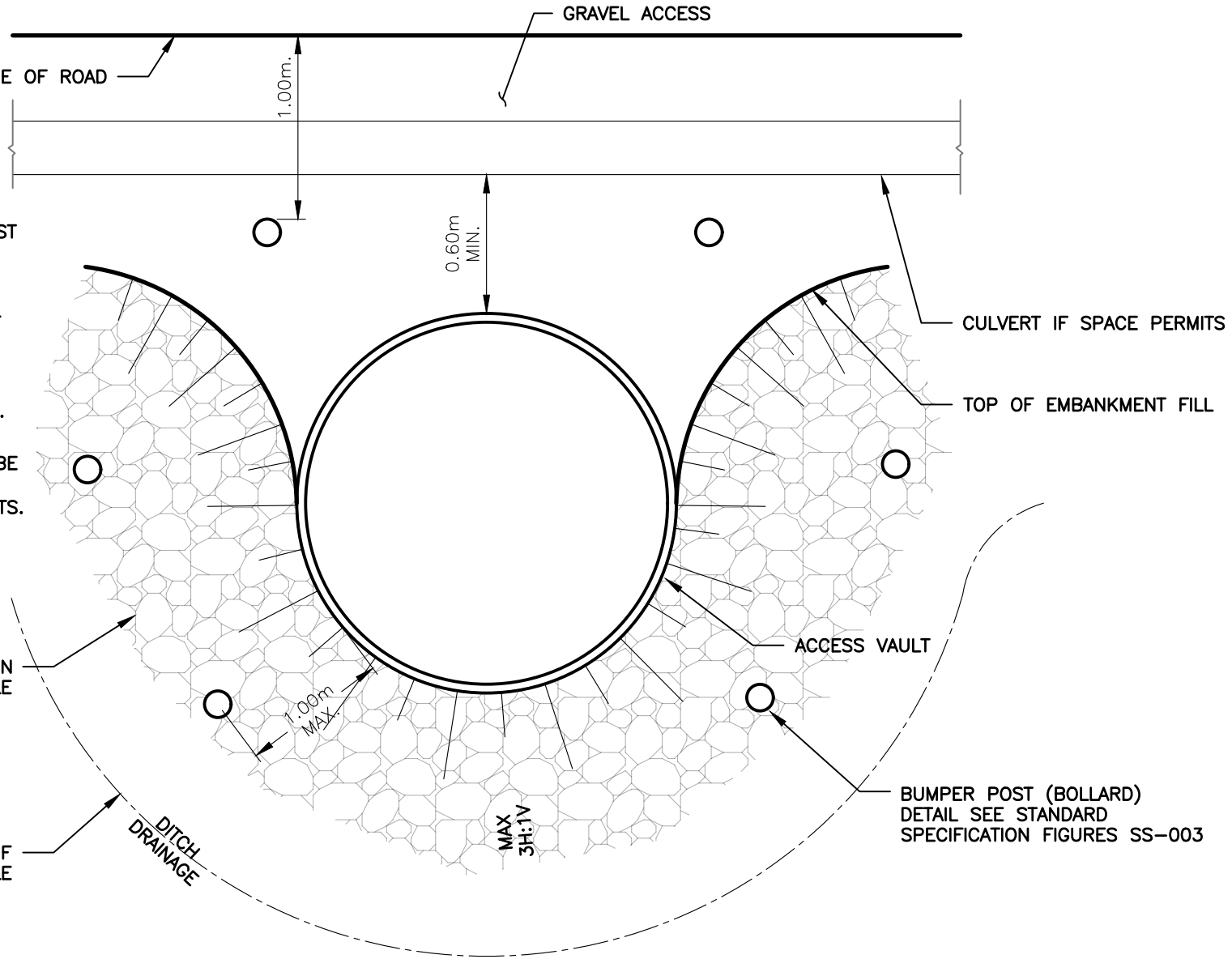
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City of Iqaluit

Municipal Design Guidelines

Figures

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DG 3.01	Access Vault Bumper Post Location & Drainage Requirements
DG 6.01	Trucked Service Driveway Layout Detail
DG 6.02	Trucked Service Driveway Section Detail
DG 7.01	Example Of Arterial Neighbourhood or Industrial Cross Section Geometry
DG 7.02	Example Of Collector Commercial Cross Section Geometry Configuration
DG 7.03	Example Of Collector Industrial Cross Section Geometry Configuration
DG 7.04	Example Of Collector Neighbourhood Cross Section Geometry Configuration
DG 7.05	Example Of Local Neighbourhood Cross Section Geometry Configuration
DG 7.06	Example Of Local Industrial Cross Section Geometry Configuration
DG 7.07	Example Of Local Commercial Cross Section Geometry Configuration
DG 7.08	Pedestrian Access (Ditch Crossing)
DG 7.09	Roadway Curb Cut For Drainage
DG 7.10	Cul-De-Sac
DG 7.11	Standard Intersection
DG 7.12	Standard Walking Trail
DG 7.13	Standard Walking Trail Intersection With Road
DG 7.14	Standard Walking Trail Intersection With Snowmobile Trail
DG 7.15	Standard Snowmobile Trail
DG 7.16	Standard Snowmobile Trail Intersection With Road



NOTE:

1. LOCATION OF BUMPER POST (BOLLARDS) SHOULD BE APPROVED WITH ENGINEER PRIOR TO INSTALLATION. ARRANGEMENT IS SUBJECT TO CHANGE BASED ON LOCATIONS OF AND COORDINATION WITH ADJACENT ACCESS VAULTS.
2. THE TRAVEL PATH FOR ERRANT VEHICLES SHALL BE CONSIDERED WHEN POSITIONING BUMPER POSTS.
3. BUMPER POSTS TO BE SPACED NO MORE THAN 1.2m APART.

REGISTERED PROFESSIONAL ENGINEER
AUGUST 18, 2026
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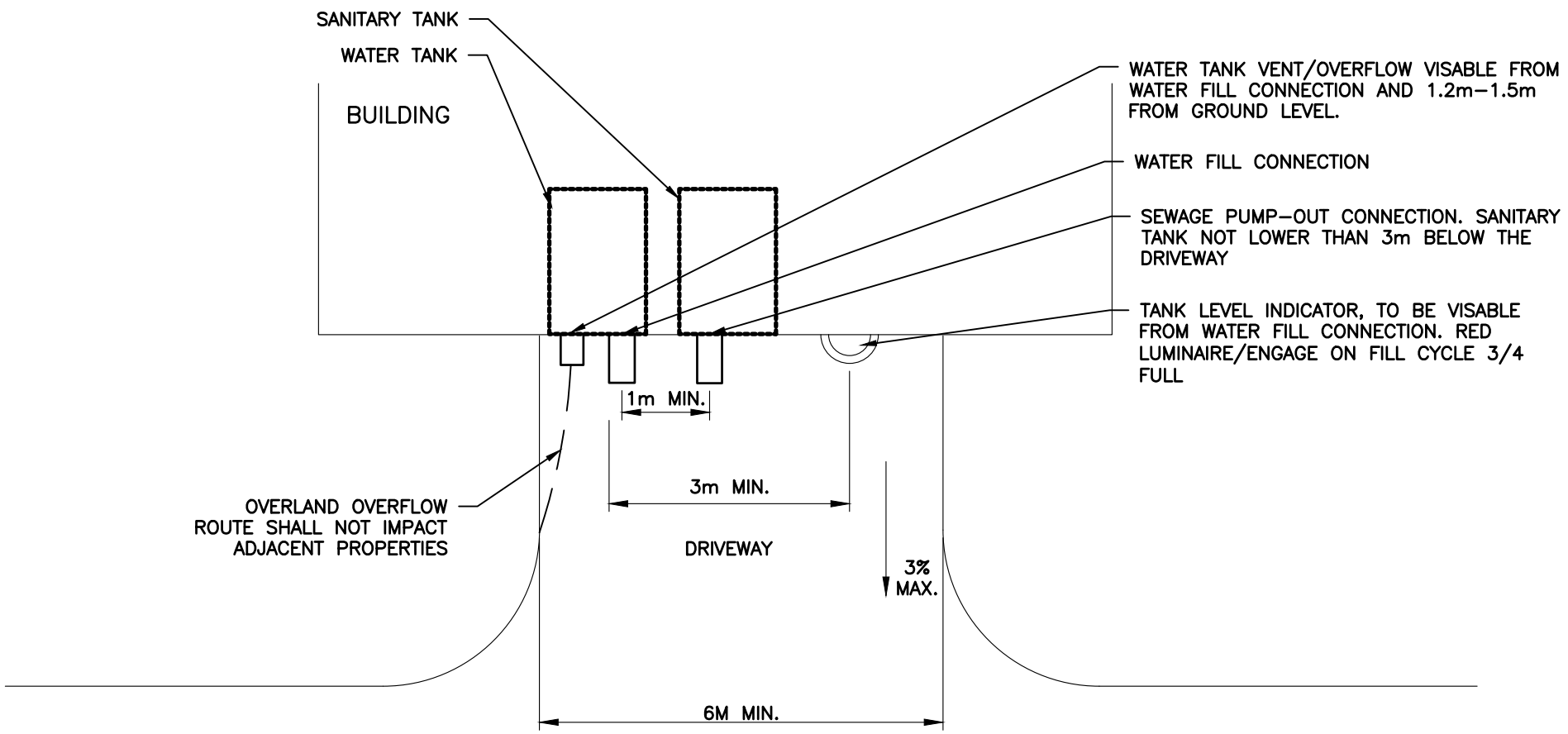
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TITLE
ACCESS VAULT BUMPER POST LOCATION & DRAINAGE REQUIREMENTS

DATE
AUGUST, 2026

SCALE
N.T.S

DWG NO.
DG 3.01



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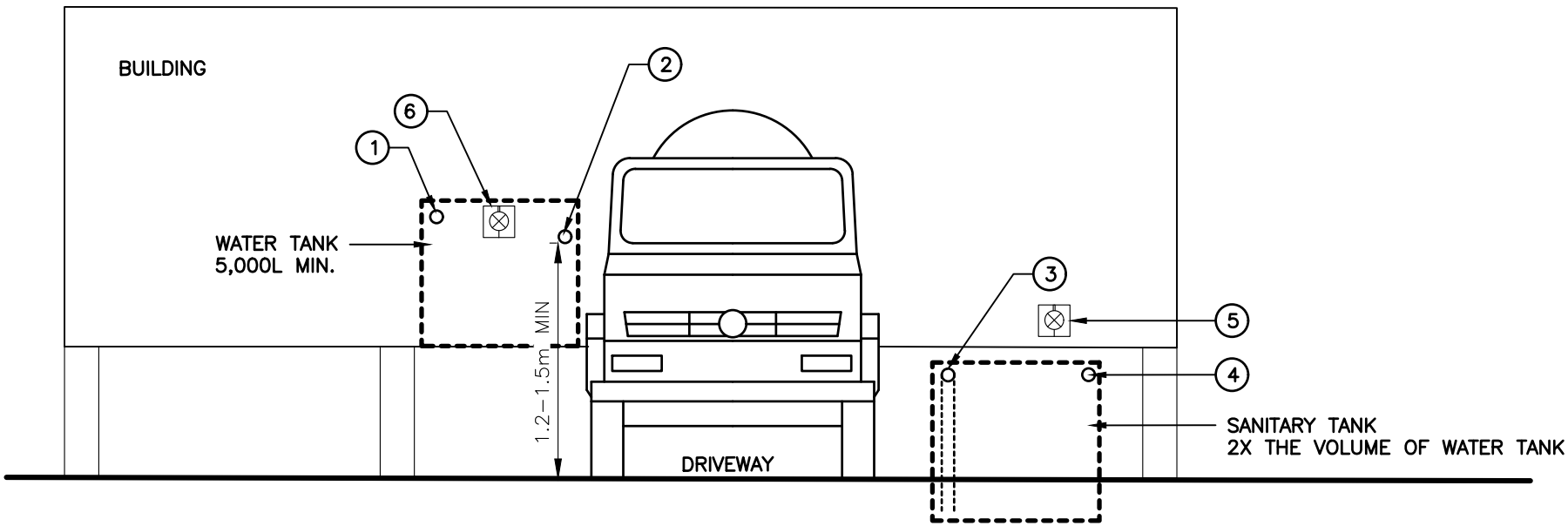
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TITLE
TRUCKED SERVICE DRIVEWAY LAYOUT DETAIL

DATE
AUGUST, 2026

SCALE
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DWG NO.
DG 6.01



KEY TO NUMBERED PARTS:

1. WATER FILL CONNECTION
2. WATER TANK VENT/OVERFLOW
3. SEWAGE PUMP–OUT CONNECTION
4. SANITARY TANK AIR–VENT
5. SEWAGE TANK LEVEL INDICATOR. LUMINAIRE/ENGAGE ON FILL CYCLE 3/4 FULL
6. WATER TANK FULL INDICATOR LIGHT

NOTE:

1. THE TOP OF THE SANITARY TANK CANNOT BE HIGHER THAN THE TOP OF THE WATER TANK IF THE TANK ARE WITHIN 2m OF EACH OTHER
2. MAXIMUM DISTANCE FROM SANITARY TANK TO PUMP OUT POINT IS NO GREATER THAN 10m

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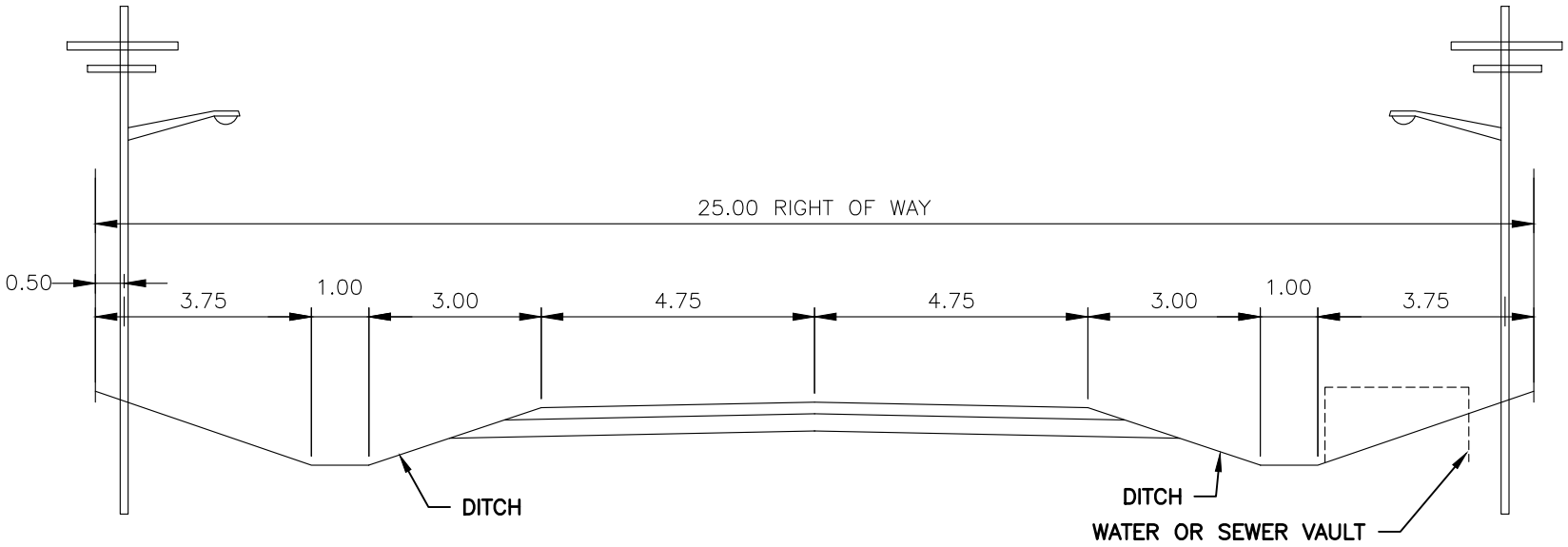
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TITLE
TRUCKED SERVICE DRIVEWAY SECTION DETAIL

DATE
AUGUST, 2026

SCALE
N.T.S

DWG NO.
DG 6.02



NOTE:
1. THE CROSS SECTION SHOWN IS PROVIDED FOR GENERAL INFORMATION ONLY. CROSS SECTION GEOMETRY SHALL BE DISCUSSED WITH AND APPROVED BY THE CITY OF IQALUIT.
2. SEE SPECIFICATION FIGURES FOR TYPICAL ROADWAY CONSTRUCTION.

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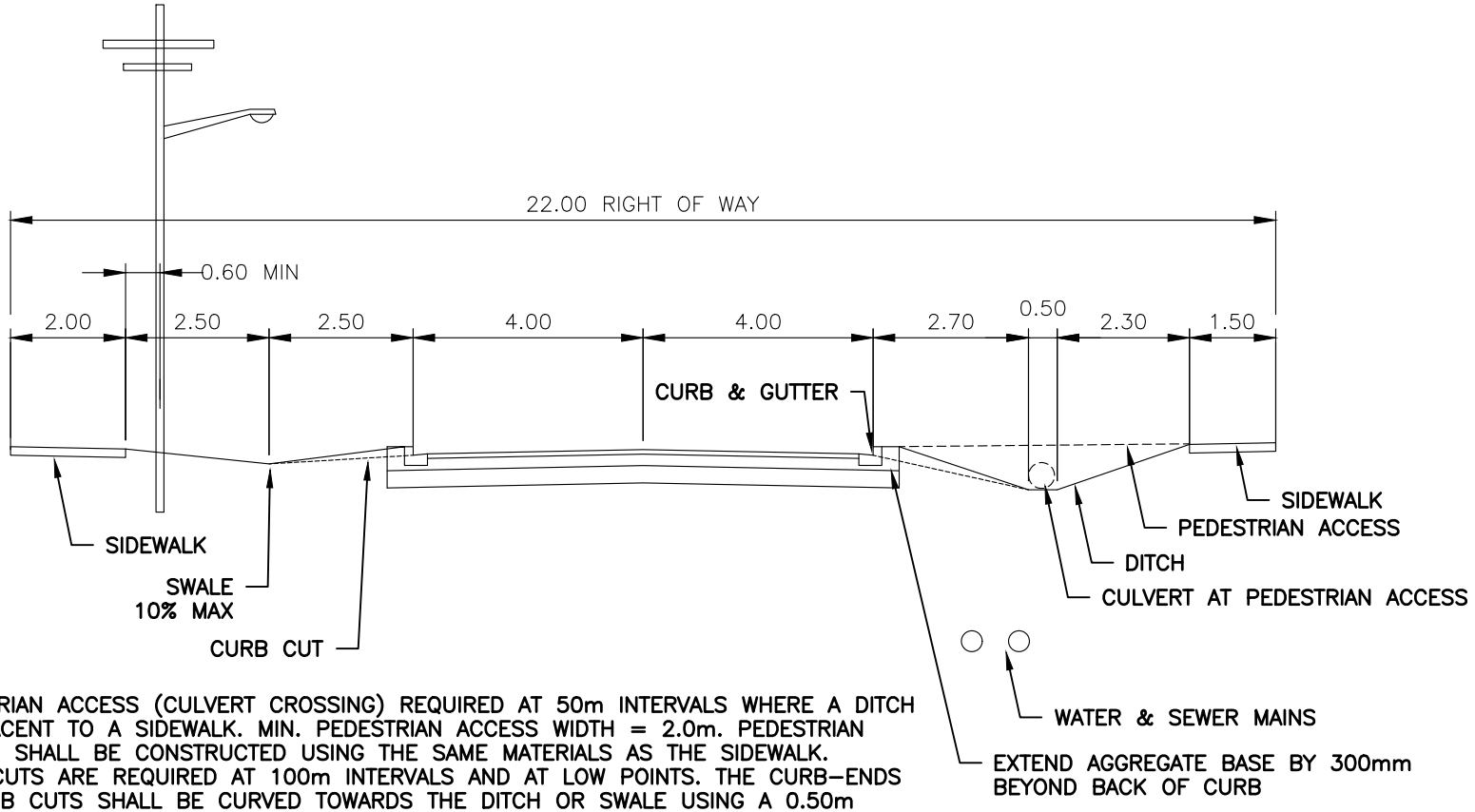
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TITLE
EXAMPLE OF ARTERIAL NEIGHBOURHOOD OR INDUSTRIAL CROSS SECTION GEOMETRY

DATE
AUGUST, 2026

SCALE
1:125

DWG NO.
DG 7.01



NOTES:

1. PEDESTRIAN ACCESS (CULVERT CROSSING) REQUIRED AT 50m INTERVALS WHERE A DITCH IS ADJACENT TO A SIDEWALK. MIN. PEDESTRIAN ACCESS WIDTH = 2.0m. PEDESTRIAN ACCESS SHALL BE CONSTRUCTED USING THE SAME MATERIALS AS THE SIDEWALK.
2. CURB CUTS ARE REQUIRED AT 100m INTERVALS AND AT LOW POINTS. THE CURB–ENDS AT CURB CUTS SHALL BE CURVED TOWARDS THE DITCH OR SWALE USING A 0.50m RADIUS. THE CURB CUT SHALL INCLUDE AN OPENING OF 1.0m AS MEASURED FROM THE FACE OF CURB. THE GUTTER SHALL CONTINUE THROUGH THE CURB CUT. A 1.0m WIDE CONCRETE APRON (150mm THICKNESS) SHALL EXTEND FROM THE GUTTER TO THE BOTTOM OF THE DITCH OR SWALE. CURB CUTS SHALL BE MARKED WITH A 1.2m REFLECTORIZED PVC MARKER POST TO MITIGATE SNOWPLOW DAMAGE.
3. THE CROSS SECTION SHOWN IS PROVIDED FOR GENERAL INFORMATION ONLY. CROSS SECTION GEOMETRY SHALL BE DISCUSSED WITH AND APPROVED BY THE CITY OF IQALUIT.
4. WHERE SWALES ARE CONSIDERED, THE ENGINEER OF RECORD SHALL DEMONSTRATE THAT THERE IS ADEQUATE CONVEYANCE CAPACITY FOR STORMWATER RUNOFF AND SNOW STORAGE.
5. SEE SPECIFICATION FIGURES FOR TYPICAL ROADWAY CONSTRUCTION.

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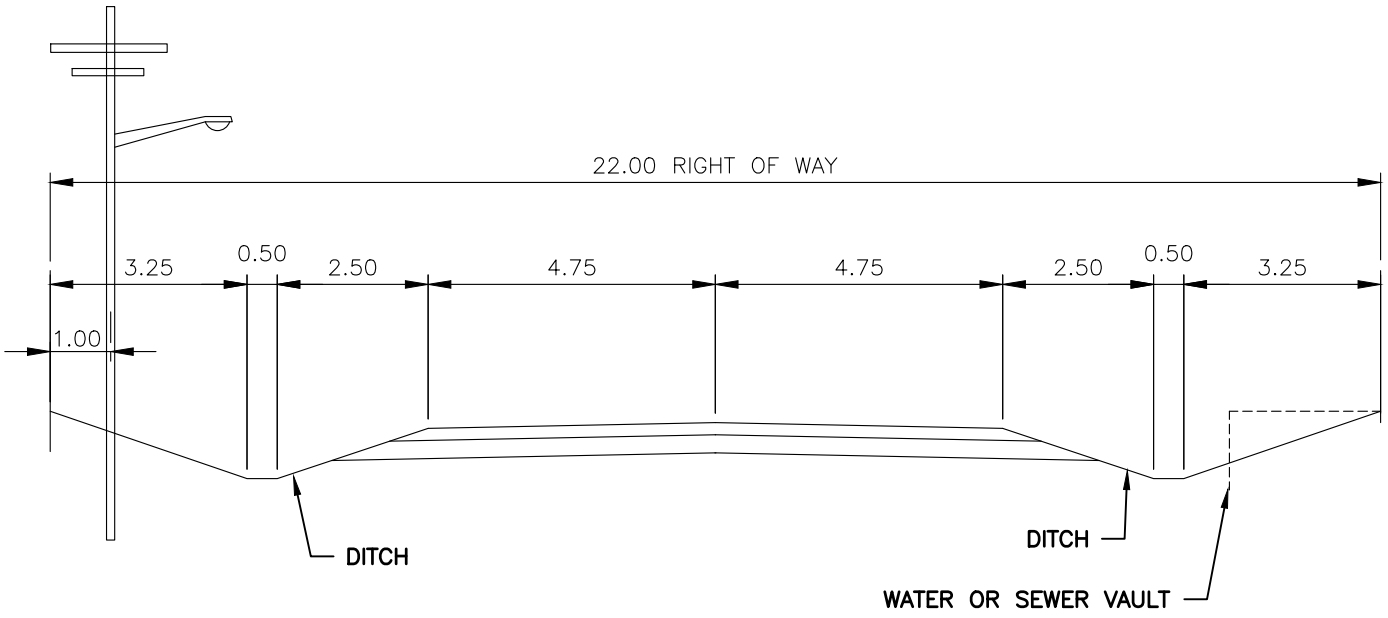
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TITLE
EXAMPLE OF COLLECTOR COMMERCIAL
CROSS SECTION GEOMETRY CONFIGURATION

DWG NO.
DG 7.02

DATE
AUGUST, 2026

SCALE
1:125



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2. SEE SPECIFICATION FIGURES FOR TYPICAL ROADWAY CONSTRUCTION.

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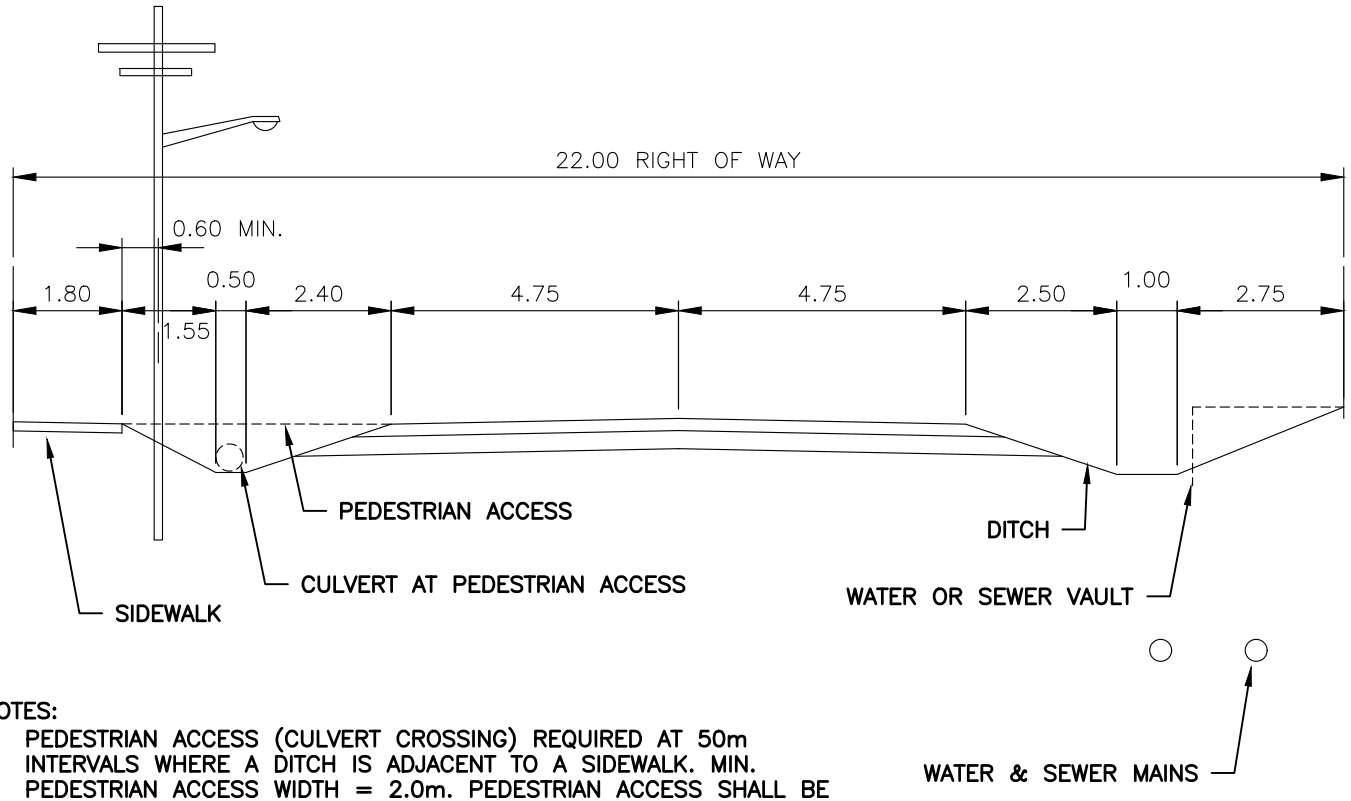
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TITLE
EXAMPLE OF COLLECTOR INDUSTRIAL CROSS SECTION GEOMETRY CONFIGURATION

DATE
AUGUST, 2026

SCALE
1:125

DWG NO.
DG 7.03



NOTES:

1. PEDESTRIAN ACCESS (CULVERT CROSSING) REQUIRED AT 50m INTERVALS WHERE A DITCH IS ADJACENT TO A SIDEWALK. MIN. PEDESTRIAN ACCESS WIDTH = 2.0m. PEDESTRIAN ACCESS SHALL BE CONSTRUCTED USING THE SAME MATERIALS AS THE SIDEWALK.
2. THE CROSS SECTION SHOWN IS PROVIDED FOR GENERAL INFORMATION ONLY. CROSS SECTION GEOMETRY SHALL BE DISCUSSED WITH AND APPROVED BY THE CITY OF IQALUIT.
3. SEE SPECIFICATION FIGURES FOR TYPICAL ROADWAY CONSTRUCTION.

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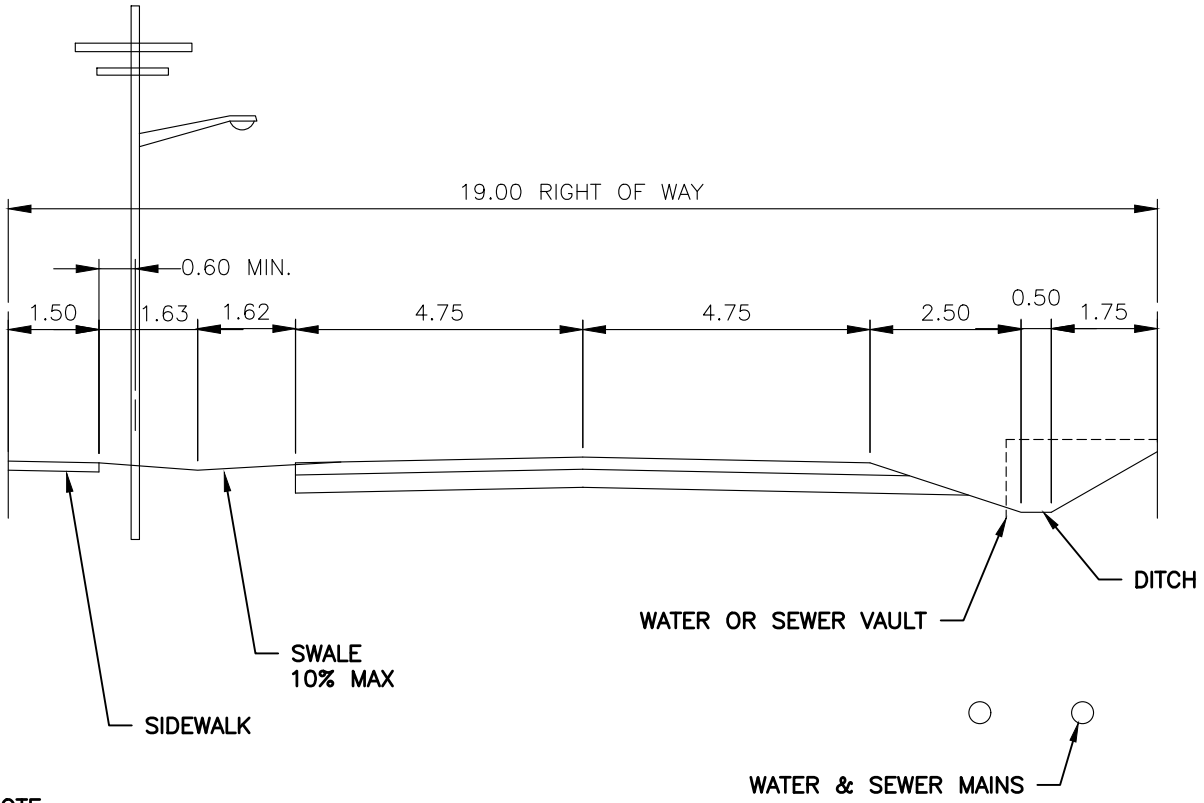
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TITLE
EXAMPLE OF COLLECTOR NEIGHBOURHOOD CROSS SECTION GEOMETRY CONFIGURATION

DWG NO.
DG 7.04

DATE
AUGUST, 2026

SCALE
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NOTE:

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2. WHERE SWALES ARE CONSIDERED, THE ENGINEER OF RECORD SHALL DEMONSTRATE THAT THERE IS ADEQUATE CONVEYANCE CAPACITY FOR STORMWATER RUNOFF AND SNOW STORAGE.
3. SEE SPECIFICATION FIGURES FOR TYPICAL ROADWAY CONSTRUCTION.

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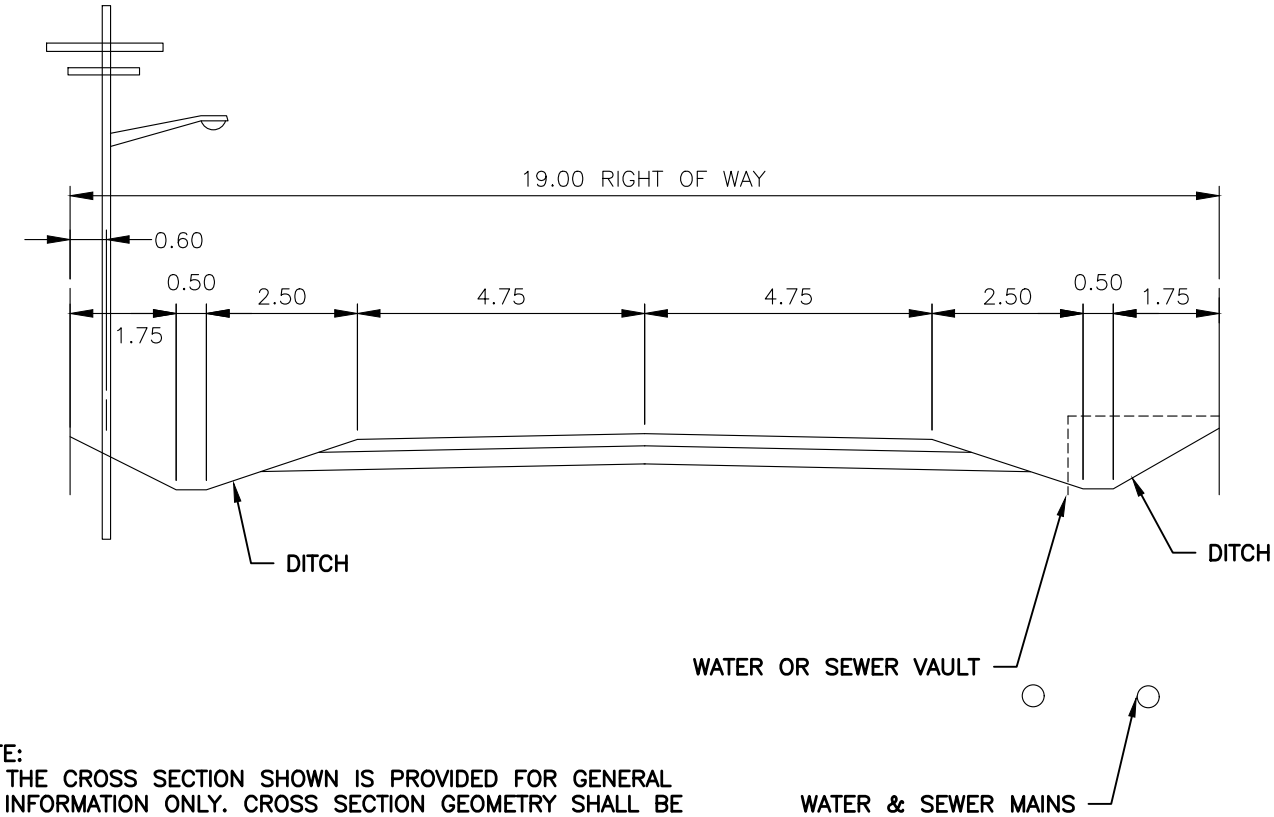
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TITLE
EXAMPLE OF LOCAL NEIGHBOURHOOD CROSS SECTION GEOMETRY CONFIGURATION

DATE
AUGUST, 2026

SCALE
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DWG NO.
DG 7.05



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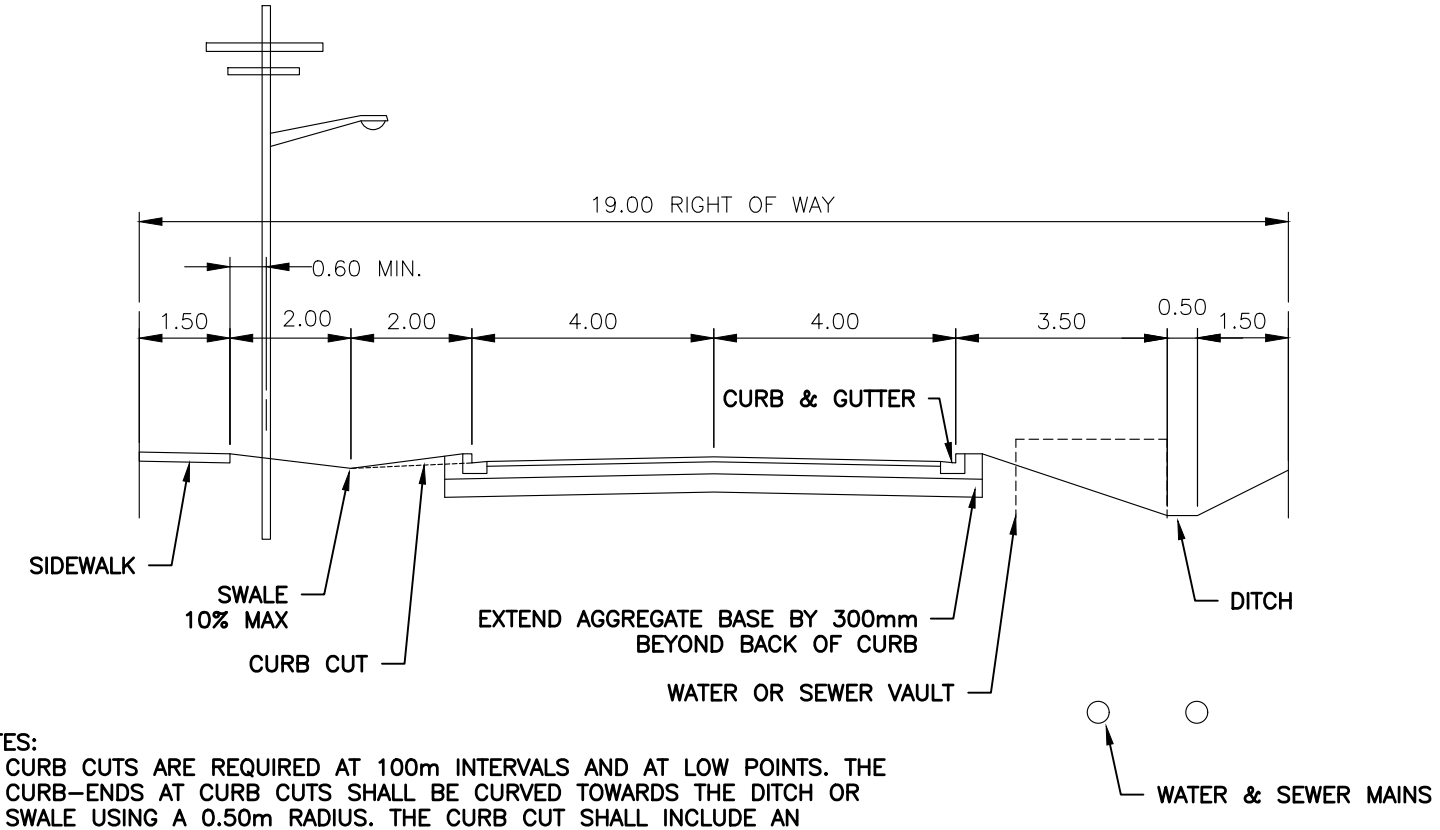
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TITLE
EXAMPLE OF LOCAL INDUSTRIAL CROSS SECTION GEOMETRY CONFIGURATION

DATE
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SCALE
1:125

DWG NO.
DG 7.06



NOTES:

1. CURB CUTS ARE REQUIRED AT 100m INTERVALS AND AT LOW POINTS. THE CURB–ENDS AT CURB CUTS SHALL BE CURVED TOWARDS THE DITCH OR SWALE USING A 0.50m RADIUS. THE CURB CUT SHALL INCLUDE AN OPENING OF 1.0m AS MEASURED FROM THE FACE OF CURB. THE GUTTER SHALL CONTINUE THROUGH THE CURB CUT. A 1.0m WIDE CONCRETE APRON (150mm THICKNESS) SHALL EXTEND FROM THE GUTTER TO THE BOTTOM OF THE DITCH OR SWALE. CURB CUTS SHALL BE MARKED WITH A 1.2m REFLECTORIZED PVC MARKER POST TO MITIGATE SNOWPLOW DAMAGE.
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3. WHERE SWALES ARE CONSIDERED, THE ENGINEER OF RECORD SHALL DEMONSTRATE THAT THERE IS ADEQUATE CONVEYANCE CAPACITY FOR STORMWATER RUNOFF AND SNOW STORAGE.
4. SEE SPECIFICATION FIGURES FOR TYPICAL ROADWAY CONSTRUCTION.

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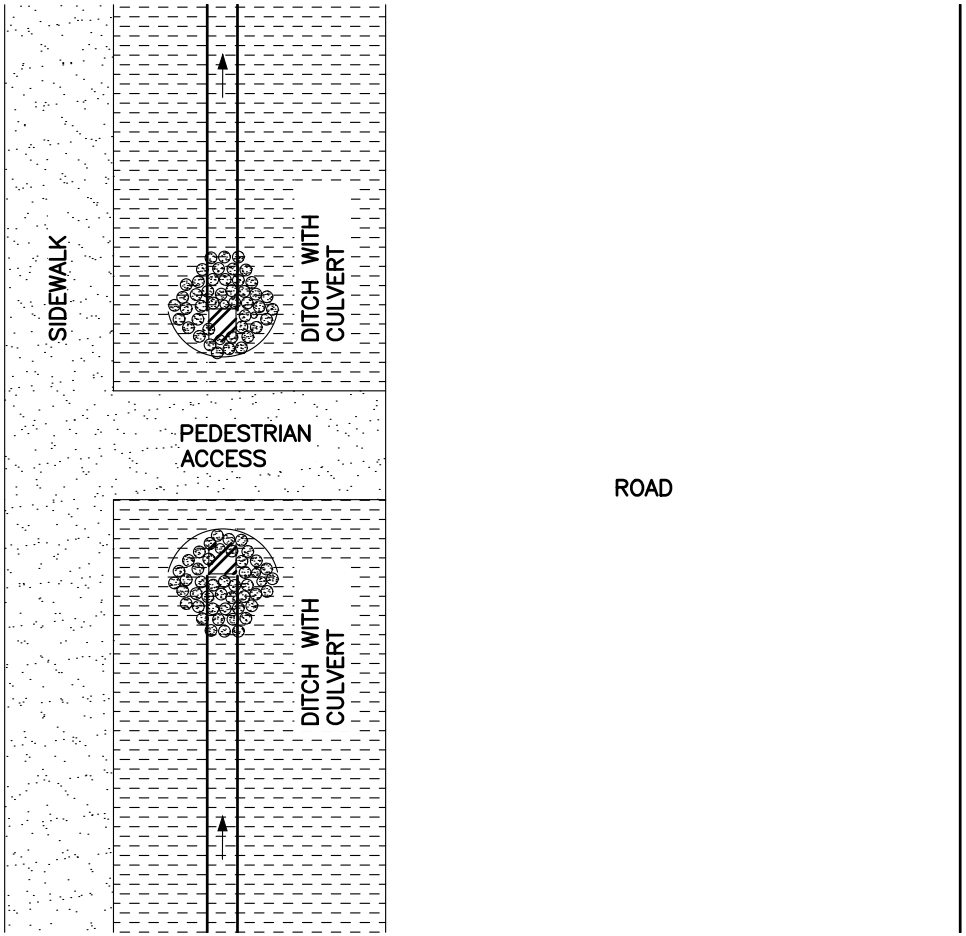
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TITLE
EXAMPLE OF LOCAL COMMERCIAL CROSS SECTION GEOMETRY CONFIGURATION

DWG NO.
DG 7.07

DATE
AUGUST, 2026

SCALE
1:125



NOTES:

1. PEDESTRIAN ACCESS (CULVERT CROSSING) REQUIRED AT 50m INTERVALS WHERE A DITCH IS ADJACENT TO A SIDEWALK.
2. MIN. PEDESTRIAN ACCESS WIDTH = 2.0m.
3. PEDESTRIAN ACCESS SHALL BE CONSTRUCTED USING THE SAME MATERIALS AS THE SIDEWALK.
4. INCLUDE CROSSWALK SIGNAGE WHERE APPLICABLE.

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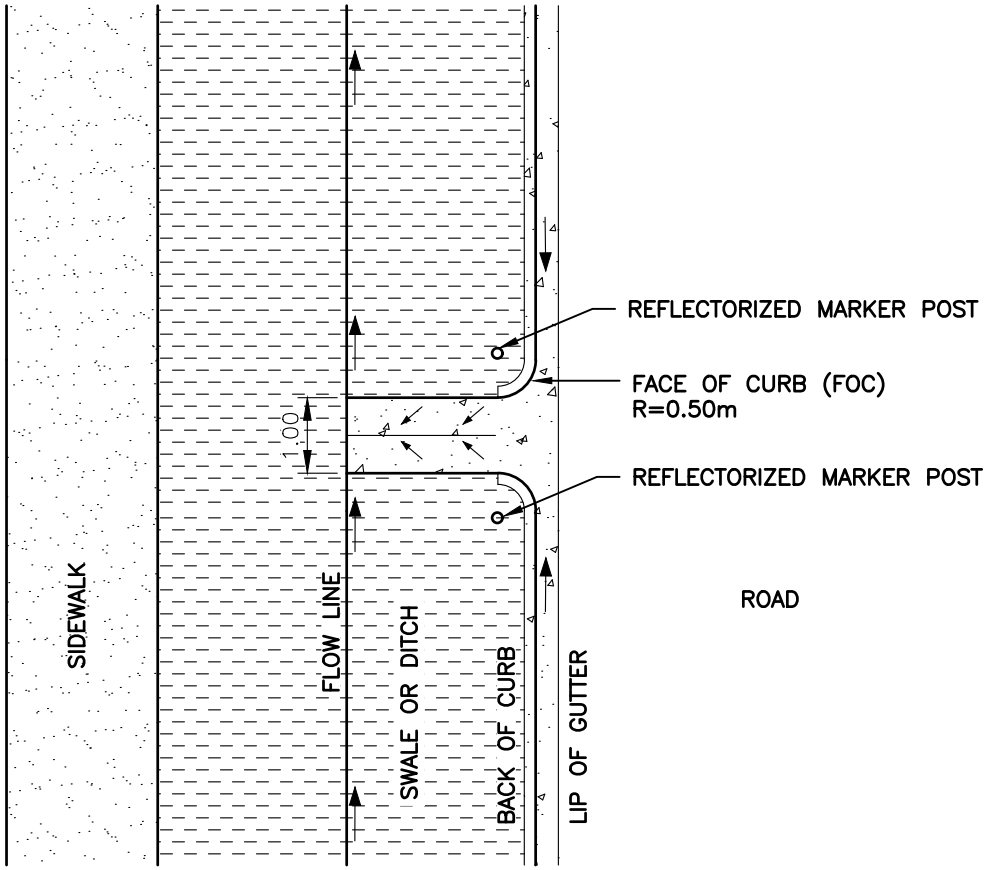
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TITLE
PEDESTRIAN ACCESS (DITCH CROSSING)

DWG NO.
DG 7.08

DATE
AUGUST, 2026

SCALE
1:125



NOTES:

1. CURB CUTS ARE REQUIRED AT 100m INTERVALS AND AT LOW POINTS.
2. THE CURB–ENDS AT CURB CUTS SHALL BE CURVED TOWARDS THE DITCH OR SWALE USING A 0.50m RADIUS.
3. THE CURB CUT SHALL INCLUDE AN OPENING OF 1.0m AS MEASURED FROM THE FACE OF CURB.
4. THE GUTTER SHALL CONTINUE THROUGH THE CURB CUT.
5. A 1.0m WIDE CONCRETE APRON (150mm THICKNESS) SHALL EXTEND FROM THE GUTTER TO THE BOTTOM OF THE DITCH OR SWALE.
6. CURB CUTS SHALL BE MARKED WITH A 1.2m REFLECTORIZED PVC MARKER POST TO MITIGATE SNOWPLOW DAMAGE.

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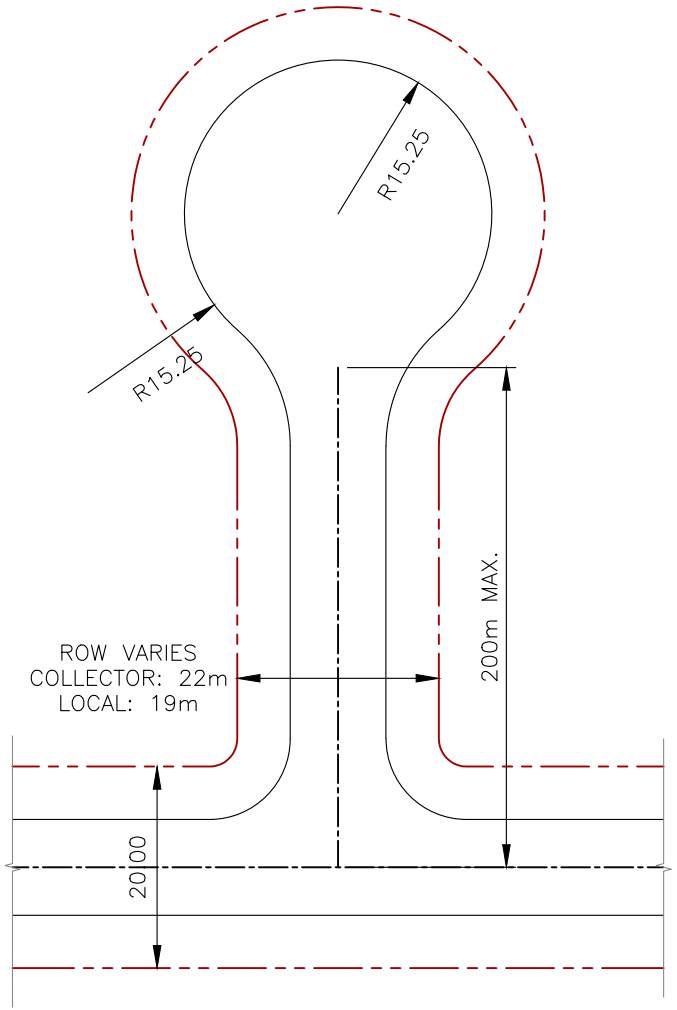
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TITLE
ROADWAY CURB CUT FOR DRAINAGE

DWG NO.
DG 7.09

DATE
AUGUST, 2026

SCALE
1:100



NOTES:

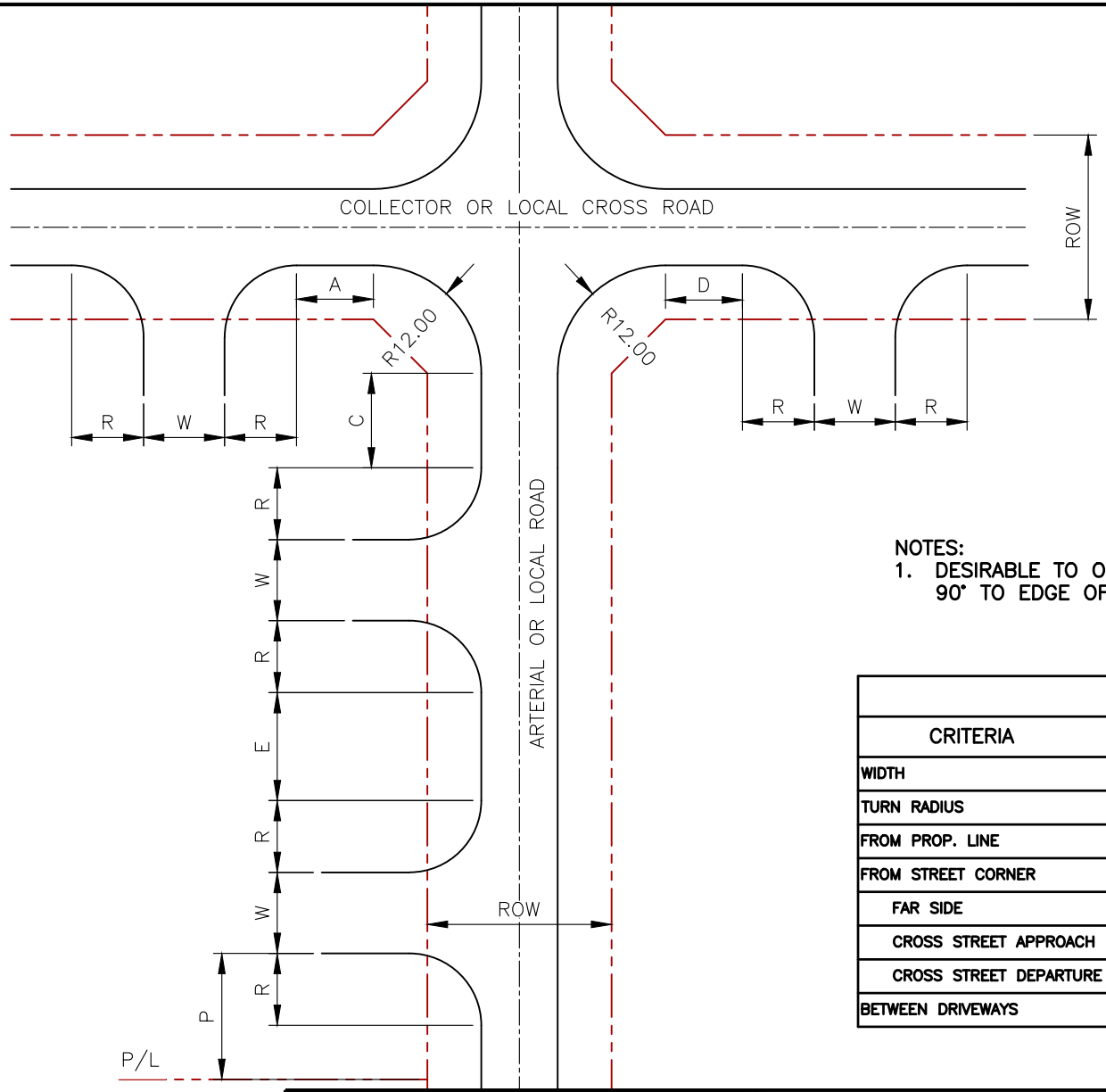
1. TURNING CIRCLE RADIUS IN THE CUL–DE–SAC TO BE 15.25m.
2. THE MAXIMUM EXIT GRADIENT FOR CUL–DE–SACS SHOULD BE +5.00% (BULB LOWER THAN ADJACENT STREET) OR 12% (BULB HIGHTER THAN ADJACENT STREET).
3. MAXIMUM LENGTH OF CUL–DE–SAC SHALL BE 200m, MEASURED ALONG THE STREET CENTERLINE FROM THE LINE TANGENT OF THE INTERSECTING STREET TO THE START OF THE TURNING BULB.

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TITLE: CUL-DE-SAC		DWG NO. DG 7.10
DATE: AUGUST, 2026	SCALE: N.T.S	



NOTES:
1. DESIRABLE TO ORIENT ALL TWO-WAY DRIVEWAYS AT 90° TO EDGE OF ROAD.

TYPICAL DIMENSIONS			
CRITERIA	DIMENSION REF.	COMMERCIAL	INDUSTRIAL
WIDTH	W	7.2 TO 12.0m	9.0 TO 15.0m
TURN RADIUS	R	4.5 TO 12.0m	6.0 TO 15.0m
FROM PROP. LINE	P	≥R	≥R
FROM STREET CORNER			
FAR SIDE	C	5.0m	5.0m
CROSS STREET APPROACH	A	5.0m	5.0m
CROSS STREET DEPARTURE	D	5.0m	5.0m
BETWEEN DRIVEWAYS	E	20.0m	20.0m

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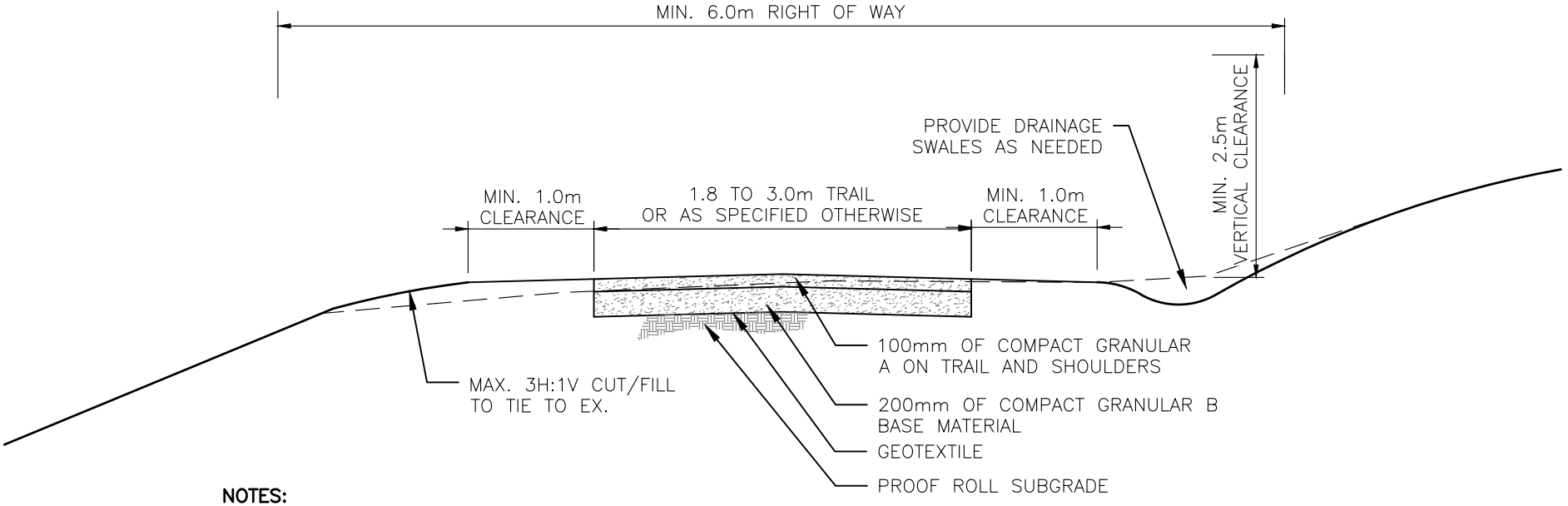
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TITLE
STANDARD INTERSECTION

DATE
AUGUST, 2026

SCALE
1:100

DWG NO.
DG 7.11



NOTES:

1. CROSS SECTION VARIES THROUGHOUT PROJECT AREA.
2. PROOF ROLL SUBGRADE TO THE SATISFACTION OF THE ENGINEER. ENSURING POSITIVE DRAINAGE.
3. WALKING TRAIL TO HAVE MINIMUM GRADE OF 2.00%.
3. WALKING TRAIL TO HAVE MAXIMUM LONGITUDINAL GRADE OF 12.00%.
4. STABILIZE ALL SLOPES WITH 150mm GRANULAR 'B' MATERIAL.
5. TRAIL SHALL BE CROSSFALLED AT 2% FOR POSITIVE DRAINAGE.
6. TRAILS SHALL INCLUDE 80mm ASPHALTIC PAVEMENT WHERE DIRECTED BY CITY OF IQALUIT.

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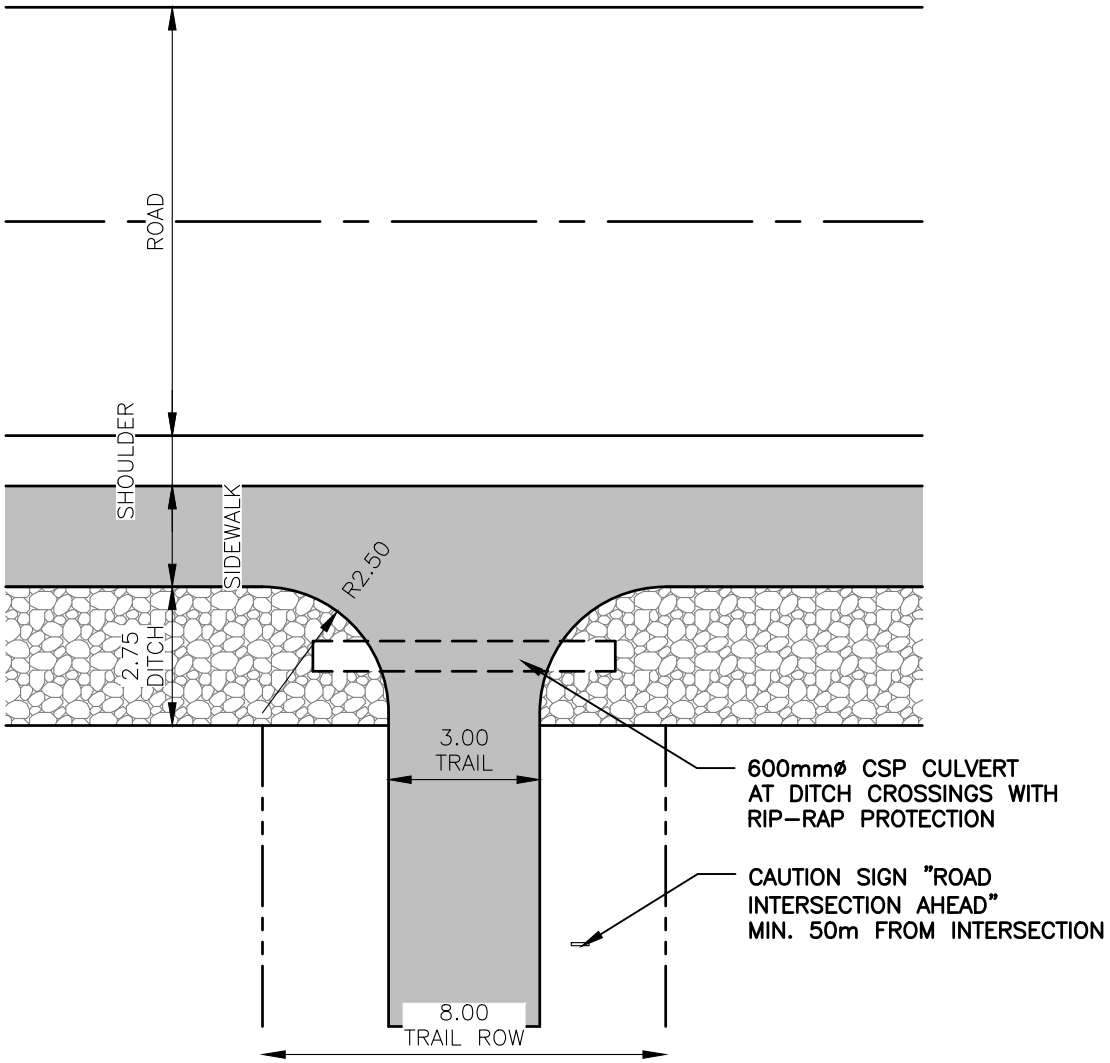
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TITLE
STANDARD WALKING TRAIL

DATE
AUGUST, 2026

SCALE
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DWG NO.
DG 7.12



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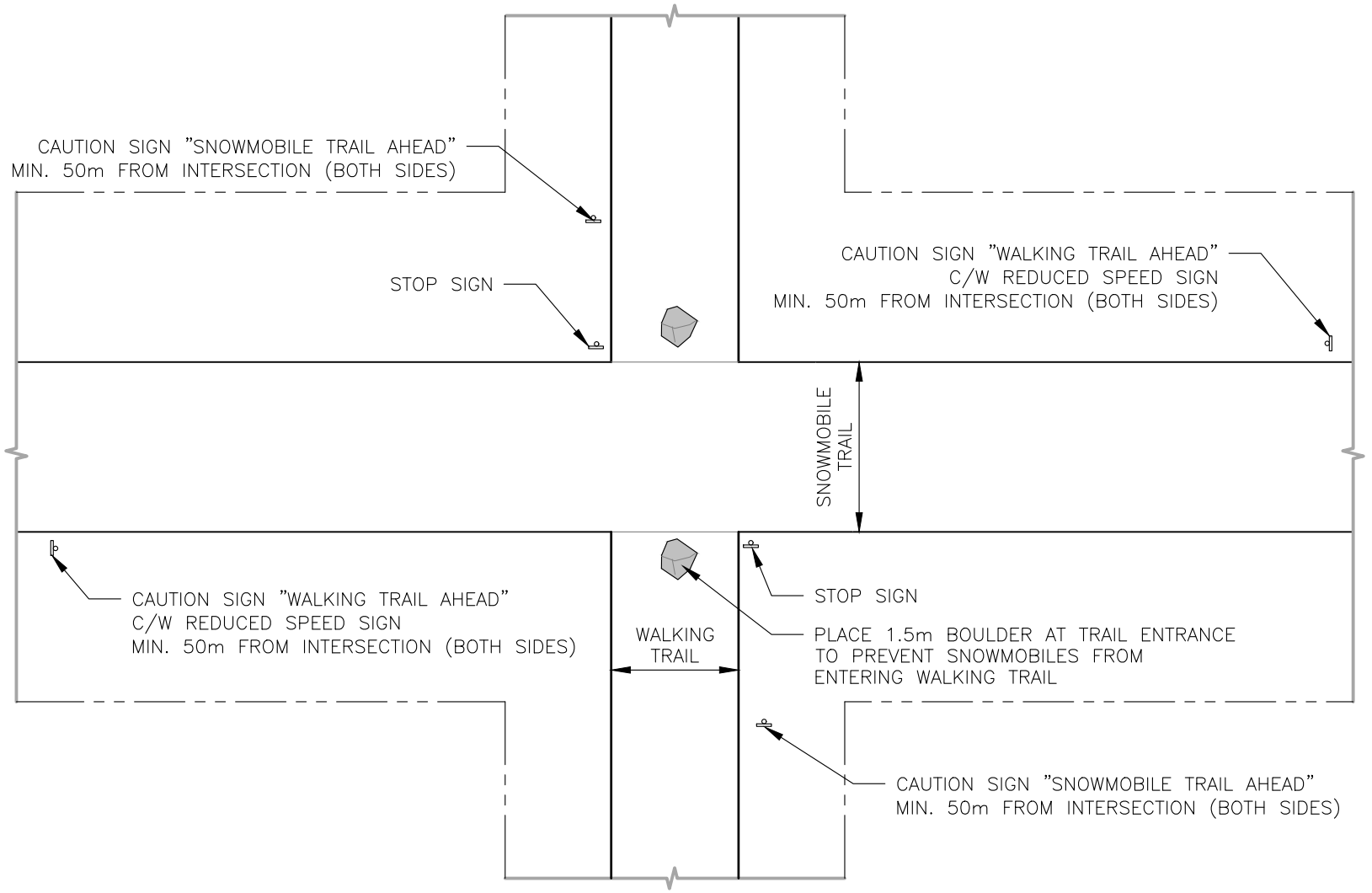
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TITLE
STANDARD WALKING TRAIL INTERSECTION WITH ROAD

DWG NO.
DG 7.13

DATE
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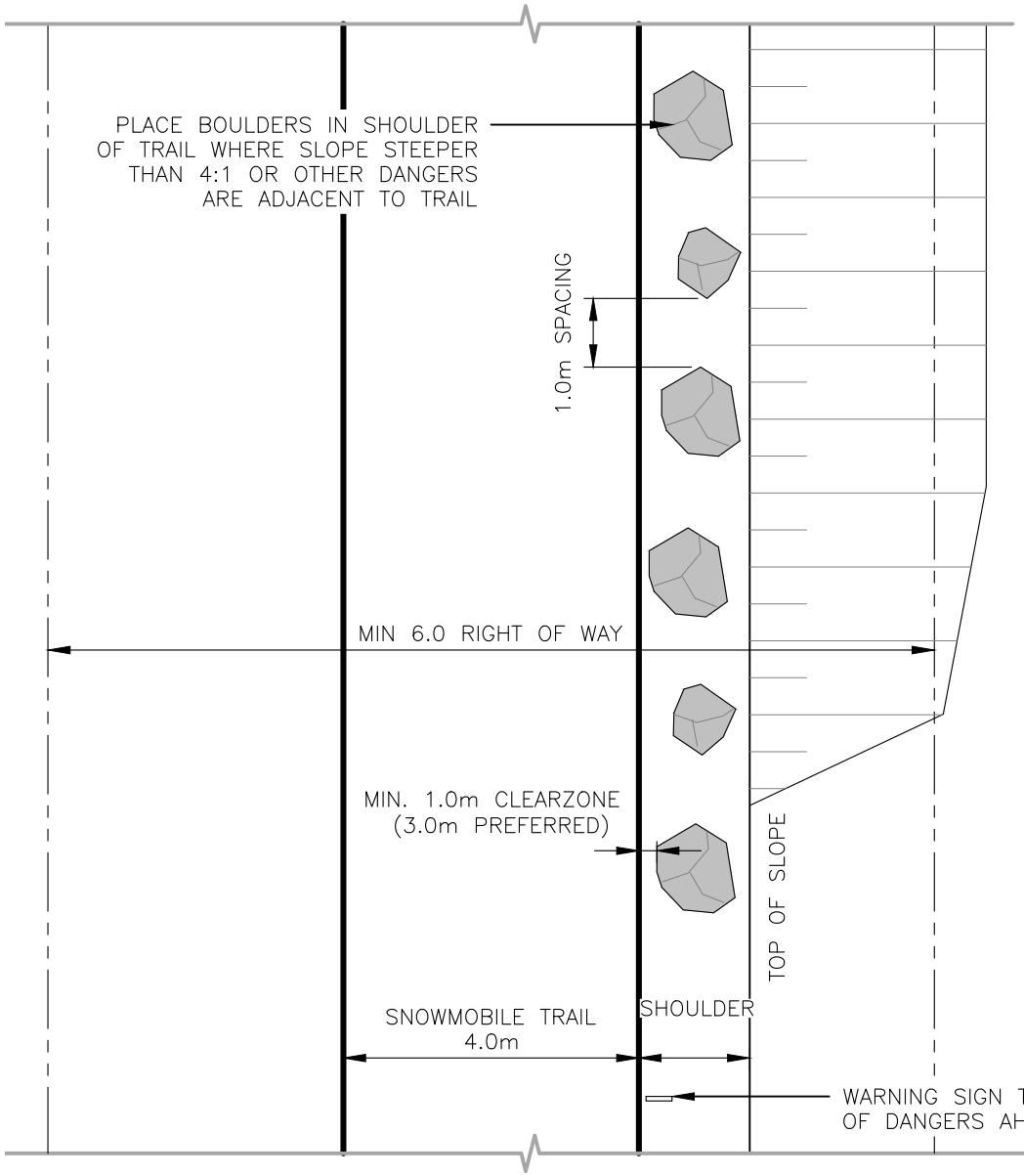
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TITLE
STANDARD WALKING TRAIL INTERSECTION WITH SNOWMOBILE TRAIL

DATE
AUGUST, 2026

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N.T.S

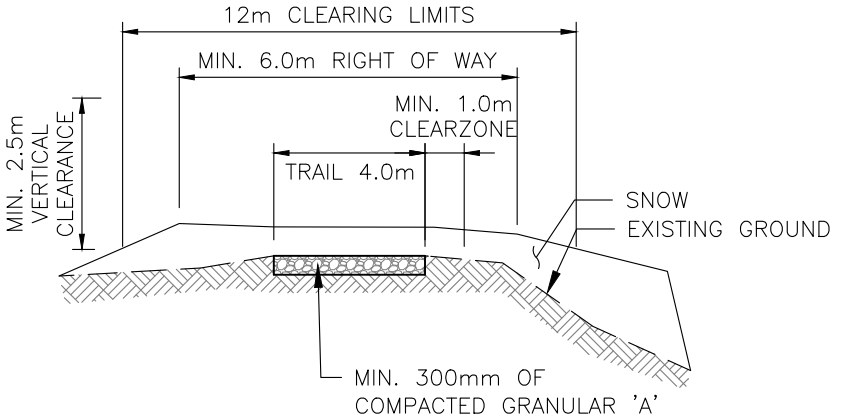
DWG NO.
DG 7.14



PLAN

NOTE:

1. REMOVE STONES AND STUMPS TO A MINIMUM OF 200mm BELOW FINISHED GRADE OF TRAIL SURFACE.
2. REGULAR GROOMING IS RECOMMENDED FOR HEAVY USAGE TRAILS. 150 TO 200mm OF SNOW IS REQUIRED TO GROOM.
3. CURVES TO BE GRADUAL AND NOT BANKED.
4. CLEARING OF ALL BRUSH AND BRANCHES WITH IN THE CLEARING LIMITS IS REQUIRED FOR SIGHT DISTANCES.
5. 50km/hr REQUIRES 90m OF VISIBILITY. 30km/hr REQUIRED 60m OF VISIBILITY.
6. MAXIMUM GRADE OF SNOW MOBILE TRAIL TO BE 12%.
7. ROUTE AND DISTANCE MAPS SHOULD BE PROVIDED.
8. STEEP SLOPES, TURNS, INTERSECTIONS, AND OTHER DANGERS SHOULD BE MARKED WITH APPROPRIATE SIGNAGE IN ADVANCE TAKING THE SLOW–DOWN DISTANCE RELATIVE TO SPEED INTO ACCOUNT.
9. BOULDERS TO BE PLACE ON SHOULDER OF TRAIL WHERE THERE ARE ANY DROP OFFS OR OTHER DANGERS ADJACENT TO TRAIL.
10. WATER CROSSINGS TO BE MARKED.
11. ROAD AND OTHER TRAIL CROSSINGS TO BE MARKED.

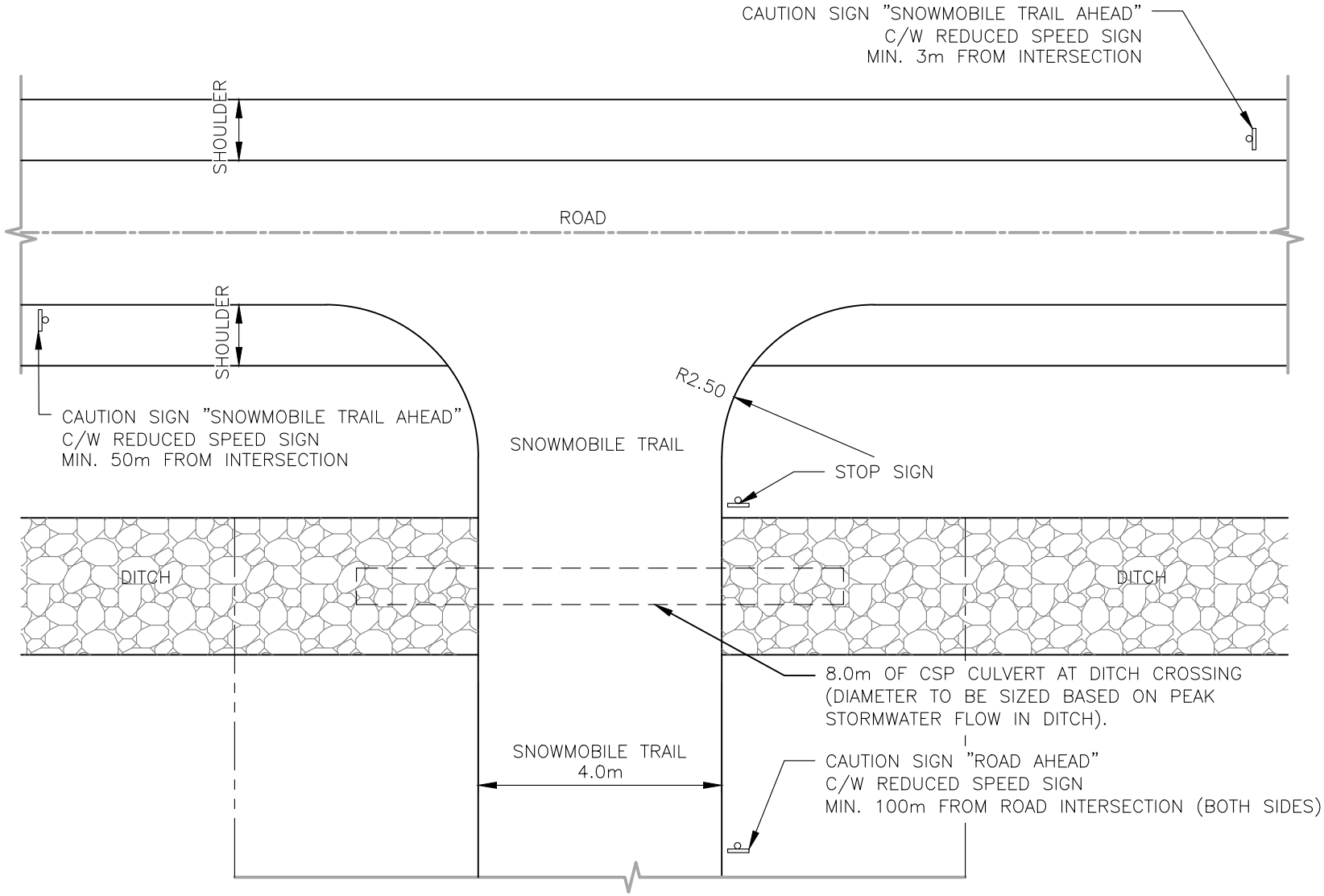


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TITLE	DWG NO.
STANDARD SNOWMOBILE TRAIL	DG 7.15
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TITLE
STANDARD SNOWMOBILE TRAIL INTERSECTION WITH ROAD

DATE
AUGUST, 2026

SCALE
N.T.S

DWG NO.
DG 7.16